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# ESTABLISHING COORDINATED CADASTRES

# AUSTRALIAN EXPERIENCES

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## ABSTRACT

Australian cadastral systems have been strongly influenced by the historical settlement of the Australian states and territories. An important consequence is that no cadastral office was ever established and as a result a coordinated cadastre never developed. Departments of Lands or Surveyors General departments administered the ever decreasing Crown lands as a result of rapid alienation, as well as the jurisdictions' surveying and mapping infrastructure. As a result Australia lacked a European style cadastral office providing a complete cadastral record which could be used for land administration purposes.

Land Titles Offices historically had the responsibility for all freehold or private lands, which now comprise the vast majority of land parcels in the states. These Offices have been responsible for examining all cadastral surveys and ensuring appropriate regulations for such surveys, however they have only ever been concerned with individual transactions in support of an efficient land market. The maintenance of the cadastral map for each jurisdiction however has usually remained under the control of the Surveyor General or in recent years a geographic information coordination agency. Increasingly the title register in each jurisdiction is including all Crown and government lands and is assuming the role of a European cadastre, albeit the cadastral index has legal significance since it is based on actual land titles.

Due to computerisation of the titles register and the establishment of digital cadastral data bases (DCDB), the trend in Australia is for the textual and spatial components of the cadastre to come together technically and administratively. This has allowed Australian jurisdictions for the first time to have a complete cadastral record to support land administration. The resulting model has permitted Australia to move from a land administration structure that was conceptually well behind that of most developed and many developing countries to a position at the forefront of developments due to innovation and computerisation.

The development of coordinated cadastres formed by upgrading the now complete DCDBs in Australia is the key in the future improvement of Australia's cadastral systems. This paper reviews this development and shows how the Australian systems differ from their European counterparts. It concludes by attempting to describe a future conceptual model for an Australian state wide geographic information system based on a legal cadastre. Australian states and territories are well advanced to achieving this vision.

## INTRODUCTION

Australian cadastral systems have undergone dramatic changes technically, operationally, structurally and institutionally over the past decade. The reasons for these changes have been metrication, micro-economic reform, quality assurance demands, the requirement for increased service provision and increased

efficiency, and the increased needs of clients and government. In some cases the changes have been information technology (IT) driven, but in most cases IT has provided the tools to implement structural and policy changes.

There has been a dual requirement to improve the efficiency of the cadastre in serving land market requirements (i.e. buying, selling, mortgaging and leasing land) as well as the rapidly growing demand for digital land related and geographic data. Governments need to know who owns what, its value, its use and where it is. At a practical level there is a rapidly growing requirement to integrate spatial data within a geographic information system environment.

This paper reviews Australian cadastral trends and endeavours to describe a vision for a future Australian cadastral system with emphasis on the spatial component or coordinated cadastre.

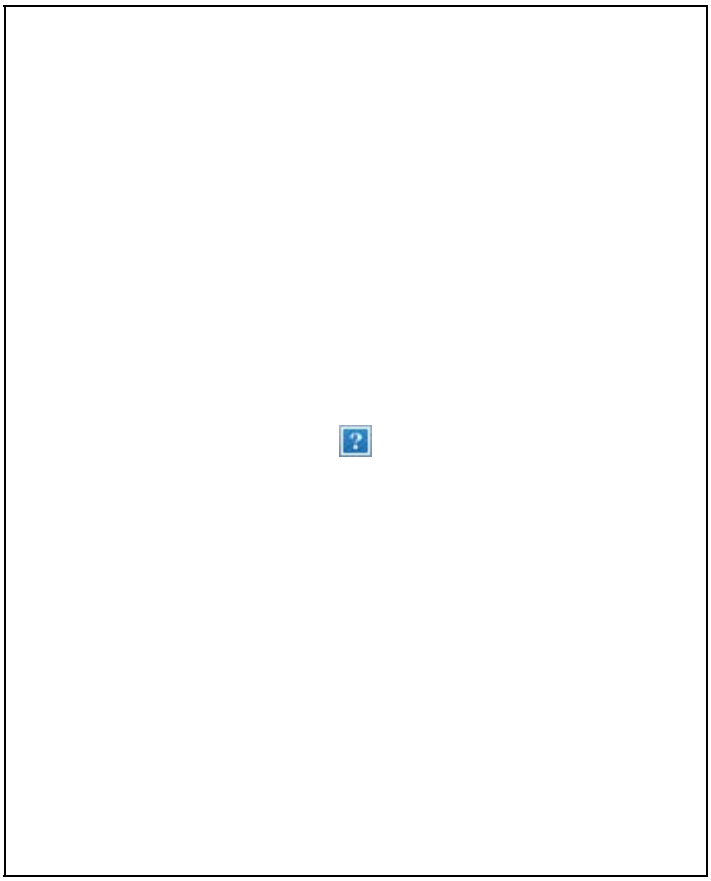

FIGURE 1

Cadastral concept (FIG, 1995)

# WHAT IS A 'COORDINATED CADASTRE'?

The paper discusses some important differences between European and Australian cadastral systems. As a result it is important to define a cadastre and a coordinated cadastre in the context of this paper.

The International Federation of Surveyors (FIG, 1995) defines a cadastre as a parcel based and up-to-date land information system containing a record of interests in land (e.g. rights, restrictions and responsibilities). It usually includes a geometric description of land parcels linked to other records describing the nature of the interests, the ownership or control of those interests, and often the value of the parcel and its improvements. It may be established for fiscal purposes (e.g. valuation and equitable taxation), legal purposes (conveyancing), to assist in the management of land and land use (e.g. for planning and other administrative purposes), and enables sustainable development and environmental

protection (Figure 1). A recent review of coordinated cadastres (Williamson and Hunter, 1996) identifies two major groups of digital cadastral data bases (DCDB).

First, the complete cadastral framework is shown graphically on a cadastral map, and when computerised is often termed a digital cadastral data base (DCDB). The coordinates of each parcel corner are an approximation of the "true" or surveyed coordinates. The accuracy of the coordinates can vary greatly depending on the requirements of the user. However in this case the important criteria is that the cadastral map shows all parcels, the topology is correct and the parcel framework is kept up-to-date. In some cases the absolute accuracy of coordinates may vary by hundreds of metres although the relative accuracy of coordinates in a localised area may be much better. This approach usually serves planning and valuation purposes. The maps are often used by Land Titles Offices for charting individual cadastral survey plans. Cadastral surveys may or may not be based on an accurate coordinate system. In all cases a cadastral survey results in a survey plan being lodged in the jurisdiction's Land Titles Office which forms the spatial basis for issuance of land titles.

Secondly, the cadastral map or DCDB is based on survey accurate coordinates determined by field survey which are used to define, describe and re-define parcel boundaries. For all practical purposes, the coordinates in this DCDB are the true coordinates. This is the result of a fully coordinated survey system. This requires a state coordinate system and a sufficient density of survey control. This approach usually results in an accurate cadastral map or DCDB where all coordinates in urban areas are accurate in a relative sense to about ±0.03m within a region. This is the ultimate development of the cadastral map or DCDB described in the first case above. This is the most common understanding of a "coordinated" cadastre in Australia. That is a coordinate cadastre consists of a coordinated cadastral survey system together with a survey accurate DCDB. In a manual form this is the spatial basis of classic European cadastres.

Today all states and territories in Australia have completed the establishment of their DCDBs as described in the first case above, albeit these DCDBs will need to be fine tuned for many years to come. One of the big challenges for most states or territories over the next decade is how to move towards the DCDB described in the second case - in other words how to upgrade a digitised DCDB to a survey accurate DCDB forming the central component of a coordinated cadastre. It is only now that DCDBs have been completed across Australia that jurisdictions are fully appreciating the significant difficulties of updating them or upgrading the accuracy of a digitised DCDB to one where all coordinates are survey accurate.

# THE HISTORICAL DEVELOPMENT OF AUSTRALIAN CADASTRAL SYSTEMS

In order to understand the current development of coordinated cadastres in Australia it is helpful to understand the development of Australia's cadastral systems, albeit briefly.

Australian cadastral systems are derived from individual surveys of individual parcels for individual owners in support of a land market system where land rights can be bought, sold, mortgaged and leased with security and relative ease. They were not derived from a complete cadastral record of all land parcels as shown on a cadastral map having its genesis in a land taxation and valuation system, which is the case with most European systems. As a result the systems did not commence with a cadastral map.

In summary, Australian cadastral systems are designed specifically to support the operation of the land market and the individual land owner. They were not designed as part of a wider land administration system albeit they have increasingly developed such a role.

For about the first seventy years of Australian settlement, all land transfers were carried out using the English system of Deeds Registration called the "Old System". It was not until the mid 1850s that Robert Torrens introduced his now famous system in South Australia to simplify land transfer, which had

become expensive, complicated and inefficient. The system quickly spread to all the Australian colonies (now states or territories), although several states still have significant remnants of the "Old System".

Today's cadastral maps had their genesis in the systems designed to manage the land ownership records concerned with private alienated lands. For the first century or so after the introduction of the Torrens systems, subdivisions of private lands were charted on index maps which had a very low spatial integrity. These maps were often copied from approximate valuation maps and were often used by many other authorities such as local government and utilities. There was major duplication in maintaining these base maps with as many as 20-30 different base map series being maintained in each state. These maps were rarely if ever kept up-to-date. The integrity of the cadastral system however was based on accurate individual cadastral surveys and plans. All these charting or index maps and cadastral survey plans were managed by the state and territory Land Titles Offices.

Due to the difficulties in undertaking surveys in this vast harsh country and the rapid settlement that occurred, especially after the gold rushes of the late 19th Century, settlement often preceded survey, even though the actual alienation of land was always based on a cadastral survey. These circumstances resulted in the development of the "isolated" cadastral survey system. As a result cadastral surveying in Australia has never been a part of a state-wide cadastral mapping process although in the last decade or so, with the establishment of cadastral maps, these processes are coming closer together. Cadastral surveys of individual land parcels are carried out to a high mathematical precision and are usually only connected into neighbouring land parcels. The surveys historically have not been based on state coordinate systems. Each cadastral survey is usually connected into one or more Permanent Survey Marks which tend to be concrete blocks or marks in concrete kerbs which will be integrated over time into each state's coordinate system.

Today's cadastral system is still basically designed to support the land market through a title registration system supported by isolated cadastral surveys of individual parcels. Land titles and cadastral survey plans are kept in the same centralised Land Titles Offices. The land titles are increasingly in computer form and now do not include a diagram of the parcel in their digital form. The title refers to a parcel number in the isolated cadastral survey plan (not a cadastral map) which created the parcel. Computerised indexes have been established in most jurisdictions which relate land titles to cadastral plans, street address, and to other identifiers used by utilities, land taxation, local government etc.

For historical reasons Surveyors General in each state of Australia have controlled the alienation of Crown lands, the licensing of cadastral surveyors and the carrying out of Crown land surveys (see Williamson and Enemark, 1996). They have also been responsible for maintaining the state geodetic framework and undertaking state mapping. They have not been responsible for checking or maintaining records of cadastral surveys of alienated or private lands - this has been left to the state Land Titles Offices. Surveyors General on the other hand have had the responsibility for compiling cadastral overlays for topographic maps particularly over the last 30 or 40 years, and over the last 10 to 20 years the creation of DCDBs. This has created confusion and tension in some jurisdictions in Australia, particularly in the development and maintenance of DCDBs, since the vast majority of parcels today are freehold and are administered by Land Titles Offices.

# THE DEVELOPMENT OF COORDINATED CADASTRES IN AUSTRALIA

The introduction of CAD/CAM, AM/FM and LIS/GIS, the need to reduce duplication, together with metrication, have been the major driving force to develop state-wide digital cadastral data bases over the last 20 years or so. These DCDBs have been developed by digitising the best available maps or surveys after they have been fitted together graphically using topographic maps as control. In general these maps were 1:2-4,000 in urban areas and 1:25,000 in rural areas. Importantly these moves to develop DCDBs have not been driven by land market requirements (or by the Land Titles Offices).

At the same time there has been a greater emphasis on the management of our cities and land resources with the result that governments are requiring to know the whereabouts of all land parcels in the state or territory. Ironically due to the form of the cadastral systems based on the Torrens system of title registration and its focus on land market activities of freehold lands, few states, if any, had until recent years a complete inventory of all land parcels. Still today several states do not have a complete inventory of all land parcels and interests in land in a readily accessible form. These trends gave an impetus to develop "complete" cadastral systems where all land parcels (either private or state lands) are shown in the title register and state-wide cadastral map (or DCDB).

In the last five years there has also been a requirement for national DCDB products for use by census, electoral commissions, defence and national utilities (i.e. telecommunications). Another impetus has come from the demand for digital road networks which rely on DCDBs for their integrity. The availability of DCDBs together with this activity has also attracted the interest of the private sector which is now seeing digital spatial information as a growth industry.

A major outcome from the above activities is that the spatial information industry is now being driven more by the users as distinct from the providers (and particularly the mapping agencies), as in the past. At the same time governments are viewing spatial data much more holistically and are now recognising DCDBs as arguably the most important component of the core spatial data sets in a state-wide spatial data infrastructure. However at the state level there is now increasing recognition that there is no "standard" DCDB - different users have different requirements (also see Williamson and Enemark,1996).

As mentioned the typical technique in establishing these computerised cadastral maps has usually been to fit the best available cadastral survey plans together on to a topographic base map using control surveys, fence lines, physical features, road boundaries, etc as control using a graphic "rubber sheeting" approach. This is particularly the process used in rural areas based on scales of 1:10-50,000. The resulting cadastral map is then digitised and the DCDB established.

In urban areas, field surveys and control have been used to a much greater extent with typical scales usually 1:1-4,000. Most computerised cadastral maps in urban areas were initially prepared by authorities responsible for water, sewerage and drainage in response to their requirement of digital maps to manage their services.

The result is that cadastral maps and DCDBs in Australia currently represent boundaries to a graphical accuracy. While large variations in the accuracy of the graphical coordinates of boundaries are possible in some areas, the accuracy of the scaled boundary coordinates in most state systems is about ±1 mm at map scale (±2.5 m at 1:2,500).

About 10-20 years ago users stated they would be happy with DCDBs having a graphical accuracy (about ±2-4m in urban areas to ±20m or more in rural areas) with coordinates of boundary corners being digitised from the best available maps. As the users became more familiar with GIS technology over the last decade they have demanded greater accuracy. This is particularly the case of the utilities and many local authorities. They are now demanding coordinate accuracies of the order of ±0.3m or better. This demand is resulting in a major effort to upgrade the accuracy of the graphical or digitised DCDBs to something approaching ±0.3m or better. The problems associated with this upgrading (and associated updating issues) are some of the biggest research issues facing the LIS/GIS community in Australia today. However some jurisdictions such as metropolitan Melbourne (including about 1 million parcels) have a DCDB accurate to about ±0.3m already.

At the same time some utilities and local authorities have questioned this upgrade approach and are considering establishing a survey accurate DCDB "once and for all" by resurveying all land parcels in their area of responsibility!

It is only in the last five years or so that Land Titles Offices have started to explore the use of the DCDB

as a computerised charting map and as a basis for checking cadastral survey plans for errors.

The other half of the "coordinated cadastre" equation is to have all cadastral surveys carried out on a state coordinate system. A move to introduce coordinated cadastral surveys has been under way in Australian states for over 20 years but has seen many difficulties. However it now appears well established and inevitable. Most states have introduced regulations to require all or most cadastral surveys to be based on state coordinate systems. At the same time all states are improving their state wide control networks and the availability of control data. This is being facilitated by the use of GPS technology. The vision of all cadastral surveys being undertaken on a state or territory wide coordinate system and submitted in digital form to state cadastral offices is now becoming a reality.

# INTERNATIONAL CADASTRAL TRENDS

Since Australian cadastral systems had their genesis in the development of land market systems based on isolated cadastral surveys, as distinct from land tax systems based on a coordinated survey approach, as is the case in European systems, Australian systems have never had complete cadastral maps. As a result of the reasons described above and more recently the influence of LIS/GIS and AM/FM, Australia has had to rapidly develop DCDBs almost from scratch. This has resulted in Australia being one of the few countries world-wide having complete nation wide DCDBs thereby putting the Australian states at the forefront of DCDB developments internationally.

There has also been a much greater recognition over the last decade of the importance of cadastral systems in the economic development and environmental management of countries (also see Williamson, 1995). As a result many countries are undertaking the completion of their cadastres through land titling projects and related initiatives. It should be recognised however that the development of an efficient land market, based on a complete cadastre, does not require a DCDB, and in many cases an emphasis on the creation of a DCDB will slow the land titling process down. Simply a land registration system supporting an efficient land market does not need a DCDB, but a DCDB, which is required by utilities and other users, does require the full support of a land registration system (and Land Titles Offices) to function. This dichotomy has caused an institutional dilemma both in Australia and overseas. It has resulted in more and more Land Titles Offices, and surveying and mapping organisations coming together or at least accepting a common purpose.

The trends in Australia to establish DCDBs and move to coordinated cadastres have much in common with other countries having a similar historical development (such as the USA and Canada), albeit Australia appears to be at the forefront of many of these developments having now complete DCDBs for all jurisdictions.

Western European countries have had coordinated cadastres providing complete cadastral maps and supporting land registration systems in many cases for well over 100 years. Utilities, local administrations and other users have had access to accurate paper cadastral maps, in some cases for centuries. Therefore there has not been the same urgency in these jurisdictions to establish DCDBs. However the LIS/GIS pressure has well and truly caused them to move rapidly in this direction. Today there are few, if any, western European countries which have completed a nation wide DCDB.

A feature of most of these European cadastral systems is that they are based on local coordinate systems. This creates many of the same difficulties faced in Australia in trying to relate cadastral maps to the national topographic mapping system based on the national geodetic control network. This relationship is fundamental if the cadastre is to be used as a layer or core spatial data set within state or national land or geographic information systems.

Most European systems are based on a classic cadastral structure as shown in Figure 2. The cadastral office was responsible for maintaining the cadastral map, the cadastral index and often the local coordinate reference framework. These cadastral offices were usually created in the 18th Century for land

tax purposes. Title registration systems were established later in the 19th Century as a result of the need for growing land markets in Europe. Importantly they were often established in Ministries of Justice and were quite separate from the cadastral offices albeit they did rely on the definition of land parcels provided by these cadastral offices. This separation of the cadastral map and the land title creates difficulties in many European countries as they move to automation of their records and the establishment of LIS/GIS.

The trend to bring these two organisations together is very evident in Western Europe.

This development of the classic European cadastral systems is in marked contrast to Australian cadastral developments. Australian Land Titles Offices play a much greater role in administering and recording cadastral surveys than their European counterparts. This has meant that any moves to improve Australian cadastral systems through improved cadastral mapping or the establishment of DCDBs relied substantially on the support of the Land Titles Offices.

Importantly however the European and Australian cadastral systems are clearly heading in the same direction as they move into a fully digital environment.

In summary it can be stated that all countries aspire to have complete cadastral systems in support of efficient land markets, and systems to manage their land resources and the environment. However while many countries would like digital cadastral maps (or DCDBs) it is only the developed countries that have been able to justify and support them technologically. In parallel with the development of DCDBs is a recognition that such systems require coordinated cadastral survey systems to update them efficiently.

Today the primary justification to establish a new coordinated cadastre in jurisdictions which have never operated one, comes from the need to support a DCDB. This in turn is being justified by the improved efficiency in managing our man-made, physical and natural resources. In addition there is a recognition that a DCDB, based on a coordinated cadastre, will also provide more efficient land market processes, especially regarding the subdivision of land and the carrying out and quality assurance of cadastral surveys.

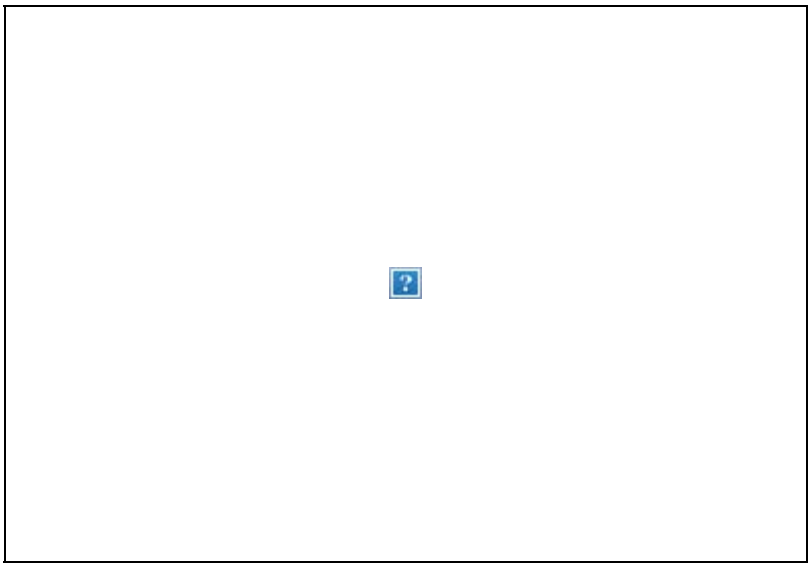

FIGURE 2

A conceptual model of a classic European Cadastre (after NRC, 1980)

# CURRENT INSTITUTIONAL AND POLITICAL ISSUES IN CADASTRAL REFORM IN AUSTRALIA

The move to a fully digital environment and the establishment of a survey accurate DCDB (or coordinate cadastre) is resulting in the re-engineering of the subdivision process including digital lodgement of cadastral surveys, checking of cadastral surveys, issuing of new titles and updating the DCDB. This is forcing a re-assessment of the traditional institutional relationships between Land Titles Offices, land and geographic information centres, and survey and mapping organisations. At the very least these organisations are coming closer together, although the trend is for these activities to be combined into one organisation. This trend is evident in both Australia and Europe.

The two technical developments which are pushing the organisations in this direction in Australia are first the availability of title, dealing and survey plan information in digital form and having a DCDB which can be used as a digital graphical interface to facilitate charting and searching land information. This is allowing all title and survey searching to be undertaken in real time at remote locations.

Secondly it is the trend towards coordinated cadastres where all cadastral surveys are carried out on state coordinate systems, where all cadastral surveys are submitted to the state cadastral office in digital form and where state DCDBs are upgraded to survey accuracy. This will allow all checking or quality assurance of cadastral surveys to be undertaken quickly and at low cost and will greatly facilitate updating the DCDB.

As mentioned, an issue which is quickly increasing in importance is the need to provide individually designed national DCDB products. The main users are statistics, census, national utilities such as telecommunications companies and increasingly defence users. The reality is that there are currently eight different cadastral systems in Australia, all with different standards. With the increasing need for national DCDB products there is increasing pressure for national standards or at least standards which are compatible across the states to ensure that national DCDB products can be produced and maintained with relative ease.

A potential threat to achieving efficient cadastral systems at a state level in Australia is an ad hoc approach to corporatisation or privatisation by some state governments. With the move to corporatisation and privatisation being promoted by all political parties in Australia increasing, there is the possibility of components of the cadastre being locked into historical arrangements to achieve short term gains. This has the potential of inhibiting the re-engineering of the key cadastral processes to deliver improved efficiencies to the wider public and government in the medium to longer term. Examples of this are the establishment of Land Titles Offices as State Owned Enterprises while geographic information offices or survey and mapping offices remain with central government. Another example is the privatisation of the maintenance and delivery of updates of the DCDB which may inhibit the re-engineering of the subdivision process and the associated activities of checking cadastral survey plans and the issuing of land titles. The key is to ensure that all cadastral processes can be re-engineered without being restrained by anachronistic institutional arrangements. Once the processes have been appropriately engineered, corporatisation and privatisation initiatives have a greater chance of delivering substantial real benefits in the medium to longer term.

# A VISION FOR COORDINATED CADASTRES IN AUSTRALIA

It is very difficult if not impossible to conceive a coordinated cadastre without fully understanding the structure and operation of the cadastral system of which it is an integral part and which it serves. All reforms to introduce a survey accurate DCDB and an improved cadastral surveying system (a coordinate cadastre) go hand in hand with reforms to the wider cadastral system including reforms to the title registration system. In order to place the concept of a coordinated cadastre in perspective, a suggested future vision for Australian cadastral systems is set out below and shown diagrammatically in Figure 3. Most states are well on their way to achieving this vision, albeit with slight differences to reflect local circumstances.

All land in a state or territory (including all private, state and Commonwealth lands, all Crown leases and all roads, parks, lakes, waterways, rivers and reserves) and all interests in land (easements, restrictions and responsibilities) would be included in the jurisdiction's title register.
- The title register and all indexes would be fully computerised. All dealings such as mortgages etc and all cadastral survey plans are scanned and are available digitally.
- Searching of all cadastral data such as titles, dealings, survey plans and survey control information to support cadastral surveys could be undertaken based on the registered proprietor, property identifier, location, street address, etc.
- All title data, dealings, control survey information, cadastral survey plans, DCDB and land indexes would be available electronically across the state in the field or remotely in a decentralised office with the graphical index being a special "charting" version of the DCDB.
- All transfers and dealings could be undertaken remotely in banks, building societies, solicitors' offices, surveyors offices or even in homes.
- All title registration, land transfer, cadastral surveying and mapping, maintenance of all indexes, maintenance of the DCDB and quality assurance of all activities would be coordinated by state-wide organisation or mechanism. However this administrative model should recognise the close integrated relationship between the cadastral components (DCDB and automated land titles system [ALTS]) and the spatial components (and particularly all the core spatial data sets forming the spatial data infrastructure in the jurisdiction), in such a structure.

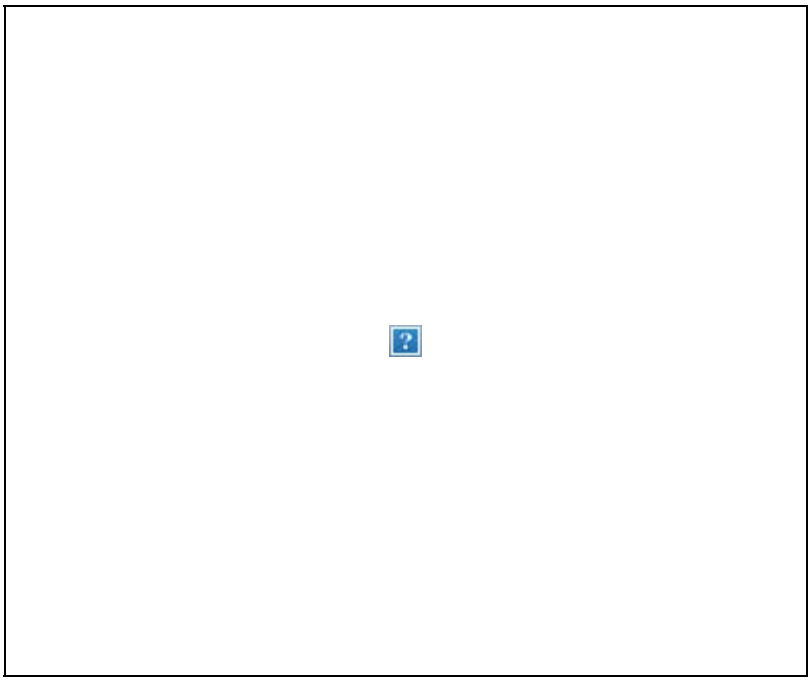

FIGURE 3

A conceptual model of an Australian parcel based geographic information system based on a legal cadastre

The proposed vision for a coordinated cadastre as part of the cadastral vision described above would have the attributes set out below. Different states are at various stages of implementing such a coordinated cadastre. Some are virtually complete while some have a long way to go.

- The coordinated cadastre (and DCDB) would include all separate land parcels and interests in land as described in the cadastral vision above.
- The DCDB would include all parcels and interests in land three dimensions
- The DCDB would be a key component of the state's core spatial data sets and spatial data infrastructure. Importantly it should be able to be fully integrated with other spatial data sets.
- Each parcel would have an unique parcel identifier and street address which would enable cross-

referencing to all other users (utilities, local government, land taxes etc).

- The survey accurate DCDB would represent the legal definition of all interests in land, albeit boundary coordinates would not have legal significance. The use of coordinates would not upset the present hierarchy of evidence in re-establishing parcel boundaries. Monuments and long standing occupation would still have the same status as in the "isolated" survey system although coordinates would be used as evidence for re-establishing boundaries where all other evidence has been lost. The DCDB would represent a continuous digital state title plan.
- The data model of the DCDB would allow easy creation and updating of national DCDB products.
- All cadastral surveys would be carried out on a state-wide coordinate system. All survey marks, parcel boundaries and easements would be based on this coordinate system.
- The coordinated cadastre and associated procedures would result in every point being able to be represented by a single set of coordinates having an accuracy of approximately ±0.03m in urban areas, ±0.2-0.3m in rural areas and ±0.5-2m in large properties or mountainous terrain.
- Each state is to be covered by an appropriate density of control survey marks. Maintenance of all marks in a region would be the responsibility of a regional authority or a designated person.
- All new subdivision data would be supplied in digital form and would update the various "layers" of the DCDB as appropriate.
- The DCDB could have different "layers" (or coordinates could have different values) or reflect different stages in the subdivision process, such as: a proposed ( at the planning approval stage) layer updated by the local authority, a surveyed layer (prior to approval by the State's cadastral authority) based on the surveyor's plan of survey, an approved layer showing all the basic data on the cadastral framework updated by the cadastral authority and an approved technical layer showing all the underlying coordinate and survey data updated by the responsible authority based on the digital surveyed data.
- Checking or quality assurance of cadastral surveys (particularly subdivisions) would simply be a matter of confirming that the new survey fits the existing coordinate framework.

# CONCLUSION

There are definite trends occurring world-wide in the technology and management of cadastral systems. Some of the most important changes are occurring in the cadastral surveying and mapping systems which support these developments. In particular are the trends to establish coordinated cadastres based on survey accurate digital cadastral data bases.

This paper has reviewed the reform of Australian cadastral systems, particularly over the last twenty years. The paper has focussed on the development of coordinated cadastres and DCDBs in Australia and their impact on the development of modern cadastres in each state and territory. These developments are similar to many developments occurring around the globe.

The paper argues that for historical reasons Australia lagged behind many developed countries in not having an efficient land administration system based on complete cadastral records. It concludes that due to computerisation and other initiatives, particularly over the past decade, Australia has been able to become a leader in the development of modern cadastral systems world-wide.

The paper has attempted to describe the vision for modern cadastres and associated coordinated cadastres which are evolving in all Australian jurisdictions. It is hoped that the experiences of Australia will be of interest to other countries which are modernising their cadastral systems.

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