The Development of the Cadastral Survey System in New South Wales

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Abstract

This article reviews the development of the cadastral survey system in N.S.W. Particular emphasis is given to an understanding of why the system developed based on isolated survey principles. In reviewing the development, three critical periods have been considered: early survey administration; 1788-1831; the formative years; 1831-1864; and refinement, 1864-present.

Introduction

The role of cadastral surveying in the development of N.S.W. has been to describe and mark on the ground, parcels of land for alienation and conveyancing. In the last decade, the role has been expanding to include cadastral mapping and the compilation of digital cadastral data bases. The historical development of the cadastral system in N.S.W. gives an insight into the reasons for the present structure of the system. Such an understanding is necessary if change is contemplated.

Central to this understanding is an appreciation of the "isolated" survey system using "fixed" boundaries - one of the major limiting factors in the modernisation of the N.S.W. cadastral system.

In reviewing the development of the N.S.W. survey system, three critical periods have been considered: 1788-1831; 1831-1864; and 1864-present.

Early Survey Administration: 1788-1831

At the time of settlement, the land laws which were introduced into the colony were based on the English system of conveyancing. This system had a significant effect on surveying during the first 40 or 50 years of the colony, but particularly the period to the end of the eighteenth century.

During this same period, interest and activity in surveying in England increased due to the enclosure movement. For example, during 1790-1815, 60% of the manuscript maps in the Bedford Record Office were enclosure maps (Thompson, 1968, p.33). If any influence did occur from England on the system developing in New South Wales, it would have been from the procedures to produce the enclosure maps. The surveyor's role in the colony was very similar to this type of work, as described by Thompson (1968, p.36), which was "mapping, measuring, staking out allotments, and describing in writing the boundaries".

In comparison to later years, few surveys were carried out prior to 1800 in the colony. The first Surveyor General, Augustus Alt (1787-1802), and his deputy, Charles Grimes (Surveyor General, 1803-1808), were responsible for any that were performed, these being influenced by the English system of describing land. This system relied on stable settlement and well-established monuments - a situation very much lacking in the new colony. An example of one of these early descriptions is given by Truscott (1894): "Thirty acres of land to be known by the name of Dooley's farm, laying and situate on the North Shore of the harbour of Port Jackson opposite the Field of Concord", dated 15th September, 1796. See Figure I for an example of a deeds description dated 1819.

The lack of interest in precise definition of boundaries is appreciated by Cumpston (1954, p.42):

"At the very beginning a small, very small, number of persons in a continent of almost inconceivable vastness, had at their disposal land which had no owner. It is true that it was the property of the Crown; but the Crown had already approved of free grants."

Regarding the method of describing land prior to the term of John Oxley (Surveyor General, 1812-1828), Sir Thomas Mitchell (Surveyor General, 1828-1855) stated in evidence to the 1855 Royal Commission, appointed to inquire into the Surveyor General's Department (The Legislative Council of N.S.W., 1856, p.p. 3-21), that the early grants "were attached to some watercourse in almost every case". Partly as a consequence of this and also to chart some observable natural features, the first boundaries described were those of the river system, the early grants being surveyed from bank to bank.

In the Third Report by Commissioner Bigge (1823), who was sent to N.S.W. by the Home Government to investigate and report on the state of the Colony, he described the existing situation.

"The business of the surveying department had fallen into arrear, either on account of the disproportion of the establishment to the increase in business in it, or the frequent interruptions occasioned by the long absences of Mr Oxley, Mr Meehan and Mr Evans on tours of discovery; and by the distances at which the operation of admeasurement were to be executed."

From his investigations, Bigge found 324,251 acres granted in 1820, but thousands of blocks in the country and four-fifths of the blocks in Sydney and Parramatta without title (Fletcher, 1969).

Bigge claimed a lackadaisical method of allocating lands. Settlers pre- ceded surveyors, whose preoccupation with Admiralty work allowed only 145 farms to be mapped in 1820. He claimed surveyors had no incentive and that they were poorly paid; even if the surveyors did hasten, the deeds took a long time to be completed. At every stage in land matters, Bigge claimed there was abuse (Roberts, 1924, p.23).

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The system of granting land was one of the greatest factors in encouraging the "isolated" survey system in the colony. A settler would approach the government for a grant of land of an area selected by him. The number of acres to be granted would be placed against the settler's name and published in the Gazette. Such lands would be approximately charted on a map. When opportune, the Surveyor General would notify the settlers in a particular district when a surveyor would be there to carry out a survey. When the time arrived, the surveyor would mark out as many farms as he could in the time available. The problems associated with this procedure were endless (Hallmann, 1973, p. 4). The measurements and prepared description were returned to the Governor's secretary who made out the grants. After placing the Colonial Seal, registering the grant and the payment of fees, the document would be delivered to the applicant (Bigge, 1823, p.36). Roberts (1924, p.27) in fact stated that "until 1822, 'sitting down' on land was the usual way of obtaining it." The process was very slow and inefficient and was criticised by Bigge; however, it did not change to any degree for another 40 or 50 years.

Most of the surveys which were carried out between 1800-1820 were done by James Meehan, a Deputy Surveyor General for many years and Acting Surveyor General, 1808-1812. It was during this period that the survey methods peculiar to the colony began to develop -much of the development must have been due to Meehan. He was highly thought of as both a person and a surveyor. Governor Macquarie considered him "a most excellent Land Surveyor, active, diligent and correct in his surveys, a man of strict honour and integrity" (Reilly, 1958).

The system of charting up to the 1820s was an extension of the system introduced by Alt. Simply, as field notes of each survey came to hand, the charts were updated -the charts were not based on any trigonometrical survey but created by simply plotting each grant next to the other. The accuracy of the charts is described by Hallmann (1973, p. 7).

"The inter-relation of the settlements within one district or to those in another, or the settlements to the coast line, was not established by any general survey, so what was the true location on the charts of any plotted portion in relation to others was mostly a matter of conjecture."

Even though more staff were attached to the Survey Department, it appears that the problems of large back-logs of surveys was far from rectified in 1826. In a report of that year from Oxley to Governor Darling, Oxley claimed that the principal portion of the lands granted by Governor Macquarie remained un-surveyed at the time of his departure in 1821 and of those appropriated by Governor Brisbane, at least half of their boundaries remained unascertainable in 1826 (Hallmann, 1973, p. 7).

The situation at the close of the 1820s had not improved, as described by Roberts (1924, p.80):

"So dilatory was the survey and so incomplete had previous methods been that more than half the settlers in Australian colonies had no claims to their lands, even though they were within the official boundaries of settlement."

Roberts stated that, at the time, approximately four million acres of land had been chosen piecemeal over an area six times that amount, with much un- recorded settlement beyond this as well. Cumpston (1954, p. 53) describes a similar state of affairs for surveys in 1829.

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In many cases the settlers were not assured of the extent or limits of their property; their boundaries when they came to be measured would be found to overlap owing to the vague descriptions given by the settlers when reporting the selections they had made."

Most of the early surveyors in the colony were from a military or naval background. It cannot be stated with certainty what effect this had on the development of the survey system, but it would have encouraged flexibility. Whatever the consequence, the end result was that, by 1830, the basic principles of our present "isolated" survey system had been laid. Such a survey is measured and marked in isolation with the only measured connections, if any, being to adjoining parcels.

The first official recognition in the colony of the need for a general survey was by Commissioner Bigge, who recommended that the Colony be divided into counties, hundreds and parishes. Governor Brisbane anticipated this directive from Downing Street and instructed Oxley to commence the survey in 1822. Oxley appears to have made no moves to meet this request. In January, 1825, the Home Government gave Brisbane a recommendation to commence a general survey and to divide up the colony accordingly. In December, 1825, when Governor Darling arrived, his Royal Instructions contained a similar directive. Oxley was not prepared to commence the general surveying "owing to which a very considerable extent of the lands, already located and granted, remain to this day unsurveyed (11 March, 1826)" (Cumpston, 1954, p.47). Darling evidently gave an order to Oxley to commence the survey in July, 1826, but he refused - he claimed he needed more surveyors.

In 1828, upon the arrival of Deputy Surveyor General, Major Thomas Mitchell, Darling overrode Oxley and directed Mitchell to commence "a proper trigonometrical survey" (Cumpston, 1954, p. 53). Mitchell's survey, which was more of a reconnaissance survey, did not achieve the objectives required of it; however, it was the first attempt at rationalising the system of "isolated" surveys in New South Wales.

In 1833, Stanley became Secretary of State of the Colonies. Cumpston (1954, p. 87) describes the dissatisfaction of Stanley with Mitchell's performance in carrying out a general survey as directed.

It appeared to Stanley that Mitchell should have carried out a general survey and valuation directed principally at the settled areas, and a political subdivision into counties, hundreds and parishes. The aim of the survey, in Stanley's mind, was to tie all the land grants together in some coordinated system. Mitchell, on the other hand, proceeded to carry out a trigonometrical survey of the whole country, not tying in any grant boundaries. His opposition to such a survey, as envisaged by Stanley, continued for the duration of his term of office. This must be considered the first attempt to introduce a coordinated survey system in N. S. W. Since this survey system was not introduced, it helped reinforce and consolidate the "isolated" survey system which has remained to this day.

For further details of the directions given to Mitchell regarding the survey, refer to the Commission given to him by Governor Darling on the 19th October, 1831, and the Instructions given to him on the 7th November, 1848, by the Colonial Secretary (Legislative Council of N.S.W., 1852).

Most of the surveying activity in the Colony up to 1831 was directed at granting land in rural areas for farms. However, since first settlement, surveyors were also involved in the laying out of towns. For example, the first streets in Sydney were laid out in 1789. Alt laid out Parramatta in 1790 and Evans laid out Bathurst after the Blue Mountains were crossed. Several other towns and villages were laid out during the period, the most notable being referred to as the Macquarie Towns (Darby, 1983). Maps of these towns were kept in the Office of the Surveyor General for public reference.

During the early period of settlement in the colony, there was little need for a private surveyor, since practically all surveys were of Crown Land (Hall-mann, 1973, p.3). The records show, however, that Thomas Florence advertised in Sydney to carry out private surveys in 1826 (Reilly, 1970, p.54). Florence subsequently joined the Survey Department and took his turn at attempting to reduce the huge back-log of surveys.

The Formative Years: 1831-1864

During this period, the consolidation and establishment of survey practice in the Colony occurred. More particularly, regulations developed for the control of surveys, and a licensing system was introduced for contract surveyors. These factors and others during the period helped firmly establish the "isolated" survey system as the method of defining title boundaries in the colony. See figure 2 for an example of a survey plan dated 1833. Diagrams such as this only began to appear in about 1830. Prior to this, only field books, descriptions and charting on the general cadastral map were carried out.

In 1837, the Government first established a Board to assess the qualifications of persons desiring to be employed as Assistant Surveyors in the Surveyor General's Department. Due to a recession in the colony during the early 1840s, government funds for the Surveyor General's Department were severely curtailed. As a consequence, a considerable number of government surveyors lost their positions; however, these surveyors were issued with a license and were allocated a district in which to operate -they became known as "licensed" or "contract" surveyors. The first licensed surveyors took up their positions in 1844 (Hall-mann, 1973, p.210). These surveyors served a twofold purpose; firstly, they carried out surveys for the government as they had previously but also they were permitted to carry out private surveys; a service previously not officially available to the public. This group of surveyors were the forerunners of today's private and consulting surveyors. The surveyors employed by the government at that time were referred to as simply "government" or "salaried" surveyors - they did not hold a license like the contract surveyors.

The history and development of regulations during this period also consolidated the "isolated" survey system using fixed boundaries. The first "regulations" known to exist are two circulars issued by the Surveyor General to various Assistant Surveyors in 1836. These circulars concerned the marking of corners. Richards (1925) suggests that: "This circular (15th April, 1836) would appear to be the origin of the existing practice of marking corners". This comment appears justified considering the wording of the circular: "I have now to request, in order to have a more accurate marking and identification of the actual corners of all sections and portions of land measured for sale, that in accordance with the mode adopted by the Government of the United States." For more details on these early regulations, refer to Beaver (1880) and Williamson (1982). This early circular, however, cannot be considered as a regulation in the modern sense, since it was a "request" and more of a plea to improve standards.

The first recorded regulation, in the modern sense, to control methods of marking and measurement of surveys is dated the 10th April, 1848 (Legislative

Figure 1: A deeds description dated 1819. The Australian Surveyor, March, 1984, Vol. 32, No. 1
The earliest recorded instruction to Government Surveyors is dated 9th July, 1853, and is titled "Instructions for Marking Crown Land by Government Surveyors" (Legislative Assembly of N.S.W., 1859, p.158). This instruction describes precisely the method of marking corners in both rural and urban areas.

By the end of this period, the survey methods for Crown lands were firmly established. The directions for government surveyors in 1858 regarding the marking of boundaries comprise three pages with detailed diagrams (Legislative Assembly of N.S.W., 1858, p.650). The Regulations for the guidance of licensed surveyors connected with the Survey Department of N.S.W. published in 1864, consist of a detailed book of instructions numbering 16 pages. The procedures for measuring and marking boundaries found in these directions and regulations were more refined but differed little in substance from the 1848 to 1853 regulations mentioned previously. The "isolated" survey system using fixed boundaries was now firmly entrenched by both regulation and practice.

The 1853 regulations were the first to emphasise different survey and marking procedures to be adopted in town and rural areas. The 1858 regulations consolidated these differences. The slightly different approach for surveys in urban and rural areas has remained in survey regulations to the present day.

The most important event regarding surveys during this period was probably the Royal Commission appointed to inquire into the Surveyor General's Department in 1855 (Legislative Council of N.S.W., 1856, p.p. ... together with the minutes of evidence and appendix are one of the best insights into the survey system up to this time. The Commissioners were highly critical of the accuracy of Surveyor General Mitchell's "Three Sheet Map! of the 19 counties, last published in 1834. They claimed that the map, at a scale of 8! miles to an inch, 'cannot have any claim to the character of a 'trigonometrical survey' in the correct and ordinarily received acceptation of the term" (Legislative Council of N.S.W., 1856, p.8). The Commissioners expressed their surprise that, considering the monies expended on surveys since the preparation of the "Three Sheet Map", no steps had been taken to commence a survey based on "more accurate methods of observation and construction".

Regarding the general map prepared by Mitchell, of the south eastern portion of Australia, at a scale of 35 miles to one inch, the Commissioners stated that; "The defective nature of its construction, and the minuteness of its scale, render it of little service" (Legislative Council of N.S.W., 1856, p.8). Their views were similar regarding Mitchell's map of the Harbour of Port Jackson at a scale of 9 1/4 chains to an inch, published in 1853. They stated that: "...its scale alone renders such a map entirely useless" (p. 10).

The Commissioners' attention was particularly drawn to the methods for charting the boundaries of the parcels of occupied or alienated lands. Under Mitchell's system, these lands were plotted on the County maps at a scale of

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two miles to an inch. Such maps were almost entirely the result of chain and compass measurements.

The Commissioners were critical of the general survey, since it did not fix the position of any of the granted and occupied lands. They were also critical that the survey, due to its accuracy, could not be used to assist surveyors in checking their work or to form the groundwork for the compilation of the County maps (Legislative Council of N.S.W., 1856, p. 9).

The system of surveying and marking boundaries of grants was not criticised by the Commissioners, although they recognised the potential problems with the system, that very serious difficulty might be experienced if the survey marks were destroyed or lost.

The use of licensed or contract surveyors was wholly condemned by the Commissioners. They claimed that the licensed surveyors lacked supervision and had no incentive to carry out surveys of a reasonable standard, amongst other matters. They were critical of the time spent by surveyors travelling from one survey to the next in no organised manner and also the time wasted in office work preparing plans, descriptions and reports. Regarding the salaried surveyors, they were of the opinion that the expense so incurred is so extravagant in proportion to the work performed, as to leave no room to doubt the existence of very great mismanagement (Legislative Council of N.S.W., 1856, p.14).

The Commissioners made a number of recommendations which are relevant to this discussion. Regarding the system of alienation of land, they suggest the following (Legislative Council of N.S.W., 1856, p. 15):

"The system under which every application for the purchase of particular lands is entertained should be at once abandoned. It is evident that in so extensive a territory as New South Wales, it must be impossible to maintain a sufficient staff of surveyors to meet the demands of the public under this system, which seems to be founded on no law, but to have grown up by degrees, until every one imagines that he has a right to require, that any lands which he may point out should be surveyed for sale, at whatever cost and inconvenience to the Department and consequent detriment to the interests of the public."

The problems highlighted above are increased by the existence of the isolated' survey system. The problems occasioned by this system are still in existence today.

The Commissioners recommended that a trigonometrical survey should be commenced, based on sound scientific principles and marked in a permanent and conspicuous manner. They suggested that the first step would be to select and monuments all the future stations and to relate all future surveys to these stations, based on a true astronomical azimuth. The triangulation could follow in due course. Interestingly, this is, in general, the same procedure as is laid down in the Survey Coordination Act, 1949. The Commissioners recognised all the benefits to be gained from the introduction of the system, such as for cadastral mapping, boundary redefinition and the checking of survey measurements.

It appears that the period while Sir Thomas Mitchell was Surveyor General was critical in the development of the survey system in N. S. W. During his term of office, it may have been possible to introduce a coordinated cadastral survey system; however, due to his personal priorities, this was not to be. The Commissioners summarised the situation as follows (Legislative Council of N.S.W., 1856, p.20):

"It appears to us, however, that the devotion of the Surveyor General to 'feature' and general surveys, and his long absences from the actual supervision of his Department, have contributed materially to its disorganisation, by withdrawing his attention from ordinary and more immediately important duties connected with the transfer of land from the Government to the settler."

Amazingly, Mitchell disclaimed "all responsibility for the acknowledge disorganisation Even though many authors have thought highly of Mitchell (see, for example, Reilly, 1958, and Bolton, 1975), the official view has not been as kind. Governor Darling considered Mitchell to be 'a hard working, rude, ill-tempered fellow who quarrelled with everyone, and who, I may add, is still as much detested as ever by those who have any business to transact with him' (Cumpston, 1954, p. 66). An official minute attached by the Colonial Office to the papers of the Royal Commission in 1855 regarding Mitchell's performance as Surveyor General stated: "...the survey of the Colony has been very much neglected and very imperfectly performed" (Cumpston, 1954, p. 221).

In all fairness to Mitchell, it must be accepted that the Colony prospered during his term of office, with much of Eastern Australia being opened up and settled. Certainly the "isolated" survey established itself during this period, however, it appears that no other system may have been possible or suitable. Mitchell may well have been a "scapegoat" for the lack of a system which was virtually Impossible to introduce at that time. In fact, no state in Australia has yet achieved the system which the Commissioners envisaged.

Audley (1866) was a strong supporter for the survey system adopted by Mitchell. He claims that Mitchell's techniques for his famous 'Three Sheet Map' were at the forefront of technology at the time. Audley (1866, p. 117) refers to a textbook for Surveyors General of Colonies published in 1841 which specifically states that alienation of land with its associated location survey should precede the trigonometrical survey. He claims that Mitchell's feature surveys served the needs of the government, military and settlers of the day. The book referred to by Audley could well be the "Report on Surveying; Considered with Reference to New Zealand, and Applicable to the Colonies Generally" written by R. K. Dawson, Captain, Royal Engineers. This report was commissioned by Lord John Russell and is dated 22 December, 1845, Tithe Commission Office, Somerset House. The publication is appended to the Report from the Select Committee on South Australia, found in the Irish University Press series of British Parliamentary Papers (Colonies, Australia, 2, p.p. 340-354). The fourteen page report gives the views of Dawson "on the most economical mode of effecting a survey in New Zealand, with general correctness but without minute accuracy; and the probable expense of such survey per square mile".

Audley's views on the alienation of land, such land being sold or granted on acreage, support the practice that a percentage of extra land should always be included (1866, p. 117):

"A percentage allowance involves a present sacrifice of land. A trigonometrical survey calls for heavy outlay of money; and it appears to me there can be no difficulty in choosing the alternative for an infant colony."

Regarding criticisms of the survey methods used, Audley recognised the deficiency of the magnetic needle (which was an integral part of the circumferentor) but considered its use was justified since reasonable relative accuracy could be obtained with such equipment. He considered that the overlaps in charting grant boundaries were not as serious as they appeared since there were
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need for a trigonometrical survey. Audley held the opinion that, if Mitchell had attempted to get his surveyors to abandon the compass and adopt more precise methods, “he would have brought the work to a deadlock”.

In evidence to the Royal Commission in 1855, Mitch–II conceded that the “system of isolated surveys” was expensive; however, it was the only solution since “we want to see the land peopled” (Audley, 1866, p.91). Mitchell supported the isolated approach to the Commissioners when arguing against Sir George Gipps’ suggestions to use a system similar to the U.S. Public Lands Survey.

“Good land only occurs in isolated patches, and the Australian mode of surveying the country is adapted to its character, and will ever be found the best suited to its colonisation and the security of possession. No such systems as may suit Ireland, or Canada, or New Zealand - or even South Australia - will answer here so well as what has grown into gigantic use from great practical experience.”

The Crown Lands Alienation Act, 1861, introduced another era which significantly affected surveyors - “selection before survey”. In referring to this act, Hall (1895) states: “By its indiscriminate free selection before survey clause, which made all thoroughfares and riparian rights subservient to the individual grab of anyone who selected a 40 acre portion”. Such legislation promoted uncoordinated and haphazard alienation with the consequence that only an “isolated” survey approach could be used.

The last major development to affect the survey system during this period was the introduction of the Real Property Act, 1862. This legislation was evidently received with trepidation: “Natural alarm has been taken here at the introduction of the new system of registering titles” (Audley, 1866, p.111).

The effect on the survey system was the introduction of a special license to practise under the Act and a move to generally tighten survey methods and practices. This legislation was the driving force which, over the years, has substantially transferred the control of the majority of surveys in the State from the Surveyor General to the Registrar General. Since the Registrars General have not had an intimate knowledge of surveying, they have failed to make, nor investigated moves to change the “isolated” survey system, other than supporting modifications to the regulations which simply reinforced the system.

Refinement: 1864–present

The period from 1864 to the present represents refinement and consolidation of the isolated survey system. It has seen the development of the system of licensing of surveyors, with the final result being the introduction of a system of registration. Methods of measuring and marking surveys were refined, although the basic principles inherent in the “isolated” survey approach have remained firmly intact. The application of new equipment for use in cadastral surveying has made it possible to perform some surveys more quickly, although this is often doubtful. The new equipment, starting with the introduction of the steel riband and theodolite in the 1870s, has increased the internal accuracy of surveys, but again the basics of the system have not changed. Overlaps and errors in boundary definition have been reduced by the detailed checking of survey plans by the Crown Lands Office and the Registrar General’s Office. The charting of all “isolated” surveys has been refined; however, the charting system is still based primarily on the principle of the “part to the whole”. See Figure 3 for an example of a survey plan dated 1880.

Figure 3: Plan of survey of Crown portion dated 1880.

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The deficiencies of the present system have been widely recognised throughout this period. Beaver (1953) quotes Adams (Surveyor General, 1868-1887) as stating in 1865:

"How it happens after an experience of 60 years that the Surveys of the Colony are found to be in such a state, or why in all this time, they have never advanced a step beyond the method of measuring land by James Meehan, the first Colonial Surveyor, at a period when neither the requirements of the Colony called for nor the resources admitted of a better system."

In 1885, the Commissioners who were appointed to report on the Victorian survey system summarised their opinions of the state of surveys at that time and reported as follows (p.x): "That the surveys made in the early days of the colony were, for the most part, extremely faulty and unreliable and that, as a rule, the dimensions of allotments, as marked out by surveyors on the ground, differ from the dimensions of the same as given in the grants." Due to the similarities between the systems in Victoria and N.S.W., these comments would have equally applied to N.S.W.

An article by Pickett (1891) refers to the Victorian system as "obsolete". He states that: "The system in vogue here at the present time has served its object, viz., that of getting a large amount of work done at a small cost, and keeping survey operations in advance of settlement." He goes on to say that the surveys ". . .were laid out roughly in the past . . .but why perpetuate the result, when the cause is removed." A few years later, Hall (1895) refers to the N.S.W. system at that time: "Under the existing arrangements it can never be a success. It has no foundation; it had no head." This comment also concerns the situation that there was no position of Surveyor General in N.S.W. from 1891 to 1911. From 1891 to 1904, the position was associated with that of Chief Surveyor in the Department of Lands, and from 1904 to 1911 it was combined with the Office of Under-Secretary for Lands (Editorial, The Surveyor, 1911).

The system in operation today differs little from that in the 1860s. Surveys are still related to an "arbitrary" magnetic meridian -not the true meridian. The boundaries of each parcel are "fixed" and are still described mathematically by bearings and distances. Corners are marked in a similar fashion to 1860; however, the referencing of corners is, today, marginally better. In general, boundary surveys only connect into or describe adjoining parcel boundaries, as in the past. The accuracy of measurements of boundaries over the period has increased by approximately 100 times, although it is often claimed that the use of such highly precise cadastral surveys is not justified. After (1960), a Surveyor General of Victoria, had very strong views on the accuracy of cadastral surveys. He claimed: "It is a form of invested superiority idiotocratically with an accuracy complex that goes far beyond the personal capacity and ability of the surveyor - and he knows it and still persists".

Even with tertiary academic qualifications for the surveying profession, and a supposed high standard of ethics and morals, a number of surveyors are still brought before the Board of Surveyors of N.S.W. each year for professional misconduct. It is obvious to any practitioner that other offenders are never brought to justice. On the other hand, in all fairness to the system, it operates remarkably well considering the inherent deficiencies of the system. In N.S.W. the deficiencies are overcome by such practices as identification surveys, which are carried out nearly every time a property is conveyed. The development of the system is described by Barrie (1976): "In time, all over the country, as settle-

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The major changes which occurred during this period regarding the control of surveys and the carrying out of surveys may be considered under three headings:

1. Surveys for the alienation of Crown lands;
2. Surveys of land held under the Real Property Act; and
3. Surveys of land held under Old System title.

Up to the introduction of the Surveyors Act, 1929, all surveyors wishing to carry out surveys of Crown land had to be specially licensed under the Crown Lands legislation of the day. Surveys of Crown land had to be performed as directed by the regulations laid down by the Surveyor General. These regulations have been refined over the years, as discussed previously. New or revised regulations or instructions were issued in 1848, 1864, 1882, 1886, 1901 and 1914. These latter instructions, titled 'Regulations for the Employment of Licensed Surveyors', remained in force until they were partially superseded by the Survey Practice Regulations, 1933. The Department of Lands published further revised instructions in 1964 and 1980. These latter regulations must be followed in addition to the Survey Practice Regulations when performing Crown surveys. The above instructions should not be confused with directions issued to salaried surveyors of the Department of Lands in 1853, 1858, 1872 and 1884.

Since the introduction of the Real Property Act, 1862, surveyors had to be specially licensed under this Act and the later Real Property Act, 1900, before they could practise under these acts. As a pre-requisite, surveyors had to first obtain a license to survey from the Board of Examiners of the Dept. of Lands (Beaver, 1979, p. 340). The requirement for a special license under the Real Property Acts ceased with the introduction of the Surveyors Act, 1929. It should be remembered that all surveys performed under the Real Property Acts were of freehold or alienated lands -therefore, in general, they were "private" surveys. It appears that the system for operating under the Real Property Act, 1862, was abused. The Registrar General was not primarily concerned with surveys. As Beaver (1980) comments: "...it was the surveyor's responsibility to maintain a standard of professional conduct and skill in marking Real Property Act surveys". Willis, a former Registrar General, commented in 1940 that, up to 1906, there was no control of subdivision of private lands, that many of the early subdivisions were "paper" surveys and it was very doubtful whether some of them were ever marked on the ground. This view is supported by comments by D. M. Mainland to a paper by Gregson (1893): as follows: "Only a few years ago it was by no means uncommon for subdivisions of private land under the Real Property Act to be made on paper, and the plans deposited in the Land Title Office, without the portions being marked out on the ground at all, or perhaps only marked in the most perfunctory and temporary manner". The unsatisfactory nature of the system is also noted by Weingarth (1913), where he comments that anyone could lodge a Real Property Application prior to 1880 -after that date, the practice was restricted to licensed surveyors. He also commented (p. 44): "It is well known that years
before, subdivisions were made by surveyors not licensed, who never had any supervision over the survey, and had no interest whatever, excepting the fees paid for their signatures."

After much agitation by The Institution of Surveyors, N. S. W. Inc., the Registrar General finally published "Instructions to Surveyors Specially Licensed under the Real Property Act, 1900" in 1915. These instructions were superseded by the Survey Practice Regulations, 1933.

Prior to the Surveyors Act, 1929, there was no requirement for a surveyor to be licensed in order to carry out surveys of land held under Old System title. After the Act, such surveys could only be performed by a surveyor registered under the Act and complying with the Survey Practice Regulations, 1933.

The Surveyors Act, 1929, required that all persons wishing to practise as a surveyor and carry out boundary surveys had to be registered under that Act. The Act also set up a Board of Surveyors, which is responsible for administering the Act and Regulations. Very few changes have been made to the Act and Regulations since they were introduced in 1929 and 1933, respectively. One of the most important changes has been the introduction of the requirement that a candidate for registration must first hold a university degree in surveying - this requirement was phased in during the 1960s. See Figure 4 for an example of a plan of subdivision dated 1973.

Conclusion

Historically, the "isolated" survey system, using "fixed" boundaries, developed for good reason. The major factors in its development were:

1. The early governors were more concerned with administering convicts and feeding the colony than in developing a survey system.
2. There was always a severe shortage of surveyors in the colony, with the consequence that surveys for grants or sale of lands were always in arrears.
3. The policy of "selection before survey" for many years, over a vast area in a totally uncoordinated haphazard manner, meant that settlers simply "picked the eyes" out of available land. Considering the considerable distances between surveys, there was virtually no possibility of introducing a coordinated system.
4. The terrain and vegetation throughout the colony did not lend itself to a coordinated approach with the instrumentation that was available at the time.
5. Generally, the Government has never invested any substantial sums of money in the cadastral system. The whole cadastral surveying and conveyancing system in the colony was, and today is, based on the principle that "the user pays". As Dale (1976, p. 203) states: "Cadastral surveying in Australia developed on the basis of individual surveys of individual parcels by individual surveyors for the benefit of individual clients".

There have been numerous attempts and moves over the last one and a half centuries to introduce a coordinated cadastral survey system into the State but, for one reason or another, these attempts have failed. The system is still based on "isolated" surveys - a system which developed in the early part of the 19th century. All surveys are still related to some arbitrary magnetic meridian. The charting system still operates on the principle of "working from

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the part to the whole” with the individual surveys comprising the basic control for cadastral mapping. Fletcher (1969, p. 18), a former Surveyor General of N.S.W., states: “The methods of survey in Australia have been developed to meet the special requirements of land settlement, engineering projects, and mapping in a pioneering and sparsely populated country. They have been influenced by the standards of education of the surveyor, the nature of the terrain and vegetation cover and the types of instruments available. Generally, the surveys have been isolated and only related to each other in a haphazard way.”

The original “isolated” survey system in N.S.W. was designed for rapid, sporadic alienation of small pockets of land spread over a large area. The initial system was not designed specifically for conveyancing. As the conveyancing in the State increased, the deficiencies of the system of deeds registration became more evident. Partly in response to this, and partly due to the Australia-wide movement to improve conveyancing systems, the Torrens system of title registration was introduced into N.S.W. in 1862 with the Real Property Act. The turn of the century saw a reduction in the alienation of land and an increase in the subdivision and conveyancing of freehold lands. From this time onwards, the cadastral surveying system was continually refined so that it could better meet the needs of conveyancing. By the 1970s, the system was refined and secure enough that it adequately met the needs of the title registration authority, the Registrar General’s Office of N.S.W. This authority is basically satisfied with the system and is not promoting change to cadastral surveying methods.

Throughout the 1970s and early 1980s, other increasing demands have been placed on the system. The major demand has been to prepare large-scale cadastral overlays for the several topographic map series. A growing demand has come from both State and local government attempts to introduce land information systems based on digital cadastral data bases. The present cadastral survey system is proving inadequate to cope with these new and increasing demands.

Considering the inherent weaknesses in the system, it is surprising that the system operates as well as it does; however, at present, the system is really only serving conveyancing needs. The system operates well at the moment because it is supported by a large number of highly qualified legal and surveying professionals operating within a sophisticated conveyancing system. The deficiency of the survey system is seen, however, by the fact that virtually every conveyance requires the subject parcel boundaries to be re-surveyed as part of the preparation of an identification survey report.

Another reason that the system appears to be operating satisfactorily is that, due to the densification of the geodetic network, the linking of surveys and the improved accuracy of surveys, charting of the cadastral framework is improving. As Barrie (1977) claims, surveying and charting is simply catching up with a relatively stable settlement pattern.

The primary aim of this article has been to outline the historical development of the isolated survey system in N.S.W. Secondary aims have been to describe the system and to show that it development for good reason. Such an appreciation places the system in perspective and makes change easier. It is suggested that the isolated survey system is not satisfactorily serving the present needs of the State. The system is considered to be one of the biggest limiting factors on the introduction of an efficient cadastral and land administration system in New South Wales.

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