

DIGITAL MAPPING IN LAND REGISTRATION, AND ITS RELEVANCE  
TO THE POSSIBLE DEVELOPMENT OF A GEOGRAPHIC  
INFORMATION SYSTEM IN THE UK

P J Smith

H.M. Land Registry  
Lincoln's Inn Fields  
London WC2A 3PH

ABSTRACT

This paper examines the results of a technical study carried out by Her Majesty's Land Registry relating to the possible use of the large scale digital mapping published by the Ordnance Survey, as the basis of a future computerised land registration mapping system. The study confirmed technical feasibility, although a detailed examination of costs and benefits did not fall within the scope of the study, and these were not rigorously evaluated. An initial experimental interactive graphics system was further developed into a prototype production system which has now been installed in a land registry, and is being used in live operation, in order to study cost/benefit and organisational implications. First results from this pilot study will be described at the Conference. A UK government appointed committee of enquiry has been considering how geographic information in the UK should be handled in the future. This paper considers the relevance of a computerised land registration mapping system to the possible future development of a comprehensive geographic information system in the UK.

INTRODUCTION TO H.M. LAND REGISTRY

HM Land Registry is a government department which administers the system of registration of title to land in England and Wales. Registration of title to all land is not yet complete, but in areas such as London, more than 98% of the land is registered. About 7000 HMLR staff are employed in 13 district land registries, and at a headquarters office in London. Approximately 1400 staff are engaged in cadastral surveying and cartographic work.

The primary official records created and maintained by HM Land Registry are the register, the filed plan and the public index map. For each registered title there is held a register, identified by a unique title number, which provides a description of the land, the name of the owner and any incumbrances on the land, such as mortgages, restrictive covenants etc. The title to registered land is guaranteed by the State.

Under modern practice, every registered title has its own official filed plan. The Registry also maintains a series of large scale index maps showing the position, extent and title number of every parcel of registered land.

First registration of unregistered land in England and Wales takes place on the first sale or long lease after the area in which property is situated is declared by statutory instrument to be a compulsory registration area. Registration of land for the first time is therefore of a sporadic nature, but after land becomes registered, all dealings are subject to registration.

Before completion of a purchase of land, a purchaser or his solicitor will initiate an inspection of the public index map to determine whether a property is already registered. If it is not, a deed of conveyance is prepared, and an application for first registration is made. After registration, a land certificate containing copies of the register and filed plan is issued to the landowner. A sale of registered land is carried out by the execution of a transfer in a simple form, which is then completed by registration.

## THE EXISTING MAPPING SYSTEM

### The Map Records

The 9.5 million filed plans and 400,000 index maps and index map sections held by HMLR are, by statute, required to be based on the Ordnance Survey map. In practice, both the map records are almost invariably at the largest published scale (ie. 1/1250 in urban areas, 1/2500 in rural areas) although filed plans may also be produced at 1/500 or larger scales. Surveys to update the filed plans or index maps are undertaken by both OS and Land Registry surveyors.

The published Ordnance Survey maps used are topographical maps. Land Registry staff add cadastral information to the maps or map extracts in the form of colourings, symbols and annotations. The extent of land in each registered title is shown on both index maps and filed plans by a red edging around the inside of the land parcel boundaries. Where boundaries are undefined by physical features, they are plotted from the plans and descriptions in the deeds, and dimensions are added where necessary. In rural areas, complete published OS maps may be used as index maps. In urban areas, the OS map detail is divided into index map sections. The borders of index map sections are edged in green, each red edged parcel is marked with a red parcel number, and each map section plan is bound into an individual stiff covered B4 sized book with a

parcels index, which indicates the title numbers of land comprised in each numbered parcel. Apart from red edgings, parcel numbers and title numbers, other colourings are not normally added to index maps. However, filed plans may show a variety of colourings, dimensions and annotations.

### The Street Card Index

HMLR also holds a very comprehensive series of card indexes of the roads or streets shown on all its index maps. The card indexes provide a quick and easy means of identifying the index map or map section on which any property falls.

### Basic Mapping Procedures

When an application for registration is received, the procedures employed by HMLR plans staff are as follows:-

- (1) the correct index map is identified, and withdrawn from the map store.
- (2) the plans and descriptions in the deeds are examined, and any inconsistencies between deeds and OS map detail are investigated and resolved.
- (3) the property description is drafted for the register, and the official filed plan is prepared, together with a copy for the land certificate.
- (4) the land is indexed on the public index map.
- (5) the new filed plan and the index map are refiled.

In addition, on the sale of part of a registered title (ie a mutation), the land transferred is edged and numbered in green on the vendor's filed plan and land certificate plan.

Plans staff also process applications for official searches of the index maps, office copies of filed plans, and carry out a wide variety of maintenance and map revision tasks.

### THE PROBLEMS

Generally the existing mapping system operates well, but there are a number of significant and recurring problems which may be summarised as follows:-

- (1) intensive use of manpower resource in filing, retrieving and keeping track of map records in use.

- (2) maintenance of map records, both in terms of their physical condition and their level of update.
- (3) duplication of effort in indicating identical extents of registered titles on filed plans, their certificate copies and on the public index map.
- (4) maintenance of consistent cartographic standards.
- (5) inflexibility inherent in a system where one map or plan may be required for use by several staff at the same time.

#### COMPUTERISATION OF THE REGISTRATION SYSTEM

Developments which have been undertaken by HMLR to computerise its records may be considered under two broad headings, as described below.

##### Computerisation of the Register

The Land Registry has for some years been engaged in the design and development of a computer system for the creation and maintenance of its register records, the provision of searching and copying services, and the related handling procedures. It is the intention to implement an on-line distributed processing system based on a 'host' and 'satellite' configuration. The 'host' mainframe computer will be an IBM 4381 situated at one of HMLR's offices at Plymouth. Each district land registry will be a 'satellite', using an IBM 4361 computer, and will be linked to the host at Plymouth using BT Kilostream links. The system will be introduced into HMLR on a progressive basis. Full implementation will take place at the Plymouth District Land Registry in the latter half of 1986, and will then be introduced successively to other land registries.

##### Digital Mapping Technical Feasibility Study

HMLR has carried out a two year technical feasibility study into the possible use of OS digital mapping as the basis of a system for holding its official filed plan and public index map records on a computer. The study commenced in early 1983, when a specification was drawn up of HMLR's requirements for a turnkey package which could be used for trials and experimentation. Intergraph was finally selected as the supplier, and a hardware/software package was installed at HMLR in the Autumn of 1983.

The hardware consisted of a VAX 11/730 computer with additional processors to speed graphics processing, with 2 Mb main memory, 2 x 84 Mb fixed disc units and a tape drive. The CPU was linked to a 2 screen monochrome/colour graphics workstation with a digitising table, and an 8

pen plotter. The basic system software used was VMS. Intergraph IGDS software was used for interactive graphics and file manipulations, and the linking of graphics to database entries. A small experimental network database was created, using Intergraph DMRS data management and retrieval software. Like the manual card index and filing system, the experimental database provided broadly similar, but much enhanced facilities for searching for properties on a digital public index map, and for retrieving digital filed plans of registered properties for display or plot.

A report on the project produced in February 1985 indicated that the use of digital mapping technology for the preparation and maintenance of HMLR's filed plan and public index map records was technically feasible and that benefits were likely to accrue in the following areas:-

- (1) Speedier, more comprehensive and less labour intensive system of storing and retrieving map records.
- (2) More effective maintenance and security of map records.
- (3) More efficient and less labour intensive system for production and up-date of map records.
- (4) Production of map records at consistent high standards of cartographic quality and accuracy.
- (5) Possibility of providing on-line access to map records by external users in the longer term.

The terms of reference for the feasibility study did not include the full evaluation of operational efficiency and cost feasibility of using a digital system. Accordingly, it was decided that a two year pilot study would be mounted at a district land registry, using converted map records for one of the local authority areas served by that registry. A full scale feasibility study would also be mounted to investigate the implications of converting HMLR's entire mapping system to digital in the long term.

#### THE PILOT STUDY

The local authority area selected for the pilot study was the district of Corby in Northamptonshire, having a population of 51,500, and a total land area of 80 square kms. Using 'OS translator' software supplied by Intergraph, Ordnance Survey digital mapping was converted to the Intergraph format. The 108 Ordnance Survey feature codes were reduced by holding them on 6 levels on the system, although all original feature codes remained separately identifiable

if required, as they were translated into Intergraph colour codes.

Further system and software developments took place from February 1985 to May 1986 to provide the present pilot digital mapping system incorporating the following principle features.

The OS map detail is divided into map sections, each of which is held in a separate graphic design file. As in the manual system, map section boundaries are designed to follow road centre lines, streams, and other permanent boundary features. As each map section is created, the roads and house names and numbers within each section are entered into the database.

Land Registry graphical information in respect of each registered title is created interactively, and linked to the database. As in the manual system, the extent of each registered property is indicated by a red edging which follows the inside edge of the topographical features demarcating the boundaries of the property. Each registered property also has its parcel number, together with any required colour references (by coloured hatchings, edgings etc.) to show the extents of areas of land affected by easements, restrictive covenants etc.

A diagram giving an outline of the database structure is shown at Annex A. The data retrieval software is utilised as an enhanced form of street index under the manual system. Suitable macro command procedures have been prepared which enable a workstation operator to enter a property address, and then initiate search routines which result in the correct map section being displayed automatically on the screen. The initial display is in the index map format, that is to say, all registered properties are shown edged with red and labelled with their parcel numbers. By 'highlighting' any individual edging or parcel number with the cursor, information on the database entries relating to the title in question are also displayed (ie. title number, tenure etc.). The database structure also enables the correct map section to be selected directly through the Land Registry title number, if the property is registered and the title number is known, and provision has been made for searching by reference to a Unique Property Reference Number (UPRN) if this facility proves to be required for more general application in the future.

Under the digital system, the public index map sections and filed plans are no longer held as separate physical documents in paper form, but all form part of one integrated land information database. The database software provides the means of searching to enable the required information

to be retrieved and displayed automatically. Normally there is no requirement for hard copy of public index map displays, but the system provides the means to display the appropriate graphics for any individual title, and to plot colour copies in a 'filed plan' format with appropriate Land Registry headings and annotations. These are used as copies for the proprietor's Land Certificate, and also for office copies requested by intending purchasers. An example of a 'digital filed plan' is shown (in monochrome) at Annex B.

The pilot system commenced live operation in May 1986 and is being used to provide information for the assessment of potential costs and benefits to HM Land Registry. The pilot system is also of a more general interest, as a land information system capable of expansion or integration into a more comprehensive geographic information system.

#### GEOGRAPHIC INFORMATION SYSTEMS IN THE UK

At the present time, the position in the UK is that a large number of land information systems are in existence, most of which are not automated or interrelated to any degree. A UK government appointed committee of enquiry has been considering how geographic information should be handled in the future. It seems doubtful whether there will be a move to combine the functions of the many different organisations into a single, or small number of authorities concerned with land use and administration, or who otherwise deal with data capable of spatial referencing. The most likely possibility appears to be that individual systems may be referenced or be capable of being referenced to a common spatial framework, and that appropriate standards may be established and accepted for data definition and formatting for interchange of information between systems and sub-systems. As to the latter, even within HMLR, this problem exists as between the proposed computerised register and map databases, although we believe this problem can be resolved without any great difficulty.

In the UK, the Ordnance Survey map with the National Grid referencing system is widely regarded as being the common spatial framework to which UK geographic information systems should be related. This leads one to consider certain features of HMLR's pilot digital mapping system which may have a wider interest and application in the context of the development of interrelated geographic information systems. These may be summarised as follows:-

- (1) The system is based on the Ordnance Survey map, and should thus be capable of being related to

other systems referenced to the same base map.

- (2) The data retrieval system developed at present provides the OS map extract on which a property falls (whether registered or not), if it can be described by postal address, or nearest street name. The system is capable of being developed to permit searching by an agreed UPRN of a parcel.
- (3) A public index map search will, for registered land, generally speaking provide the legal extent of ownership of a land parcel, which is of great interest to all those concerned with land use and administration.
- (4) In some cases, the map detail shown on the HMLR database will be more up-to-date than published detail, as later detail will have been digitised in by HMLR from the Ordnance Survey SUSI service (Supply of Unpublished Survey Information) and from surveys carried out by OS and HMLR surveyors for registration purposes.
- (5) Under the present law, the register is private, and access is normally restricted to registered proprietors and those having their authority to inspect the register. However, there is some possibility that the law may be changed in the future. With the establishment of appropriate links between the Land Registry's register and map databases, landowners' names and other information could be accessed quickly and easily by the public, as is already possible in many other jurisdictions.

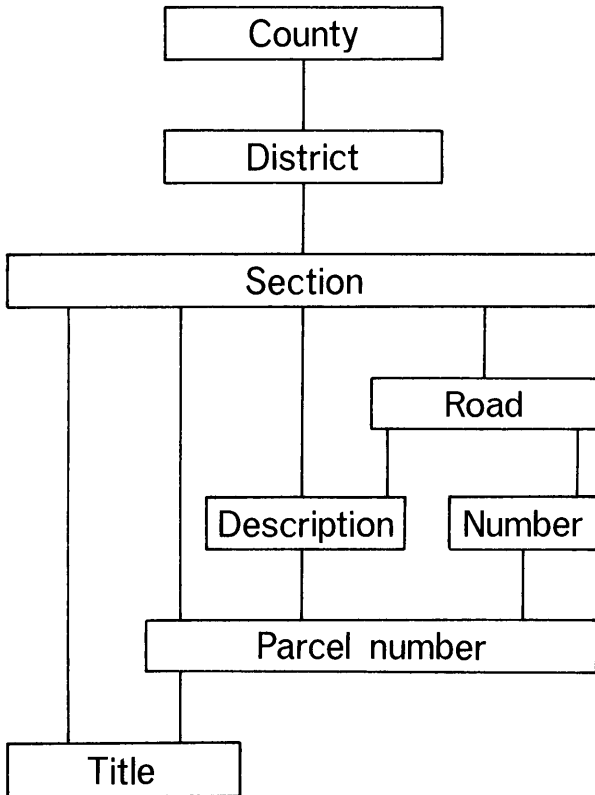
#### CONCLUSIONS

Computerisation of HM Land Registry's register and mapping records appears to offer many benefits and advantages, primarily by way of improved speed and quality of service to the public, and accessibility for on-line users in the long term. Whilst these benefits are of immediate interest to those concerned with conveyancing, the introduction of computer technology may in the longer term also provide the basis of a key sub-system in a comprehensive geographic information system of the future.

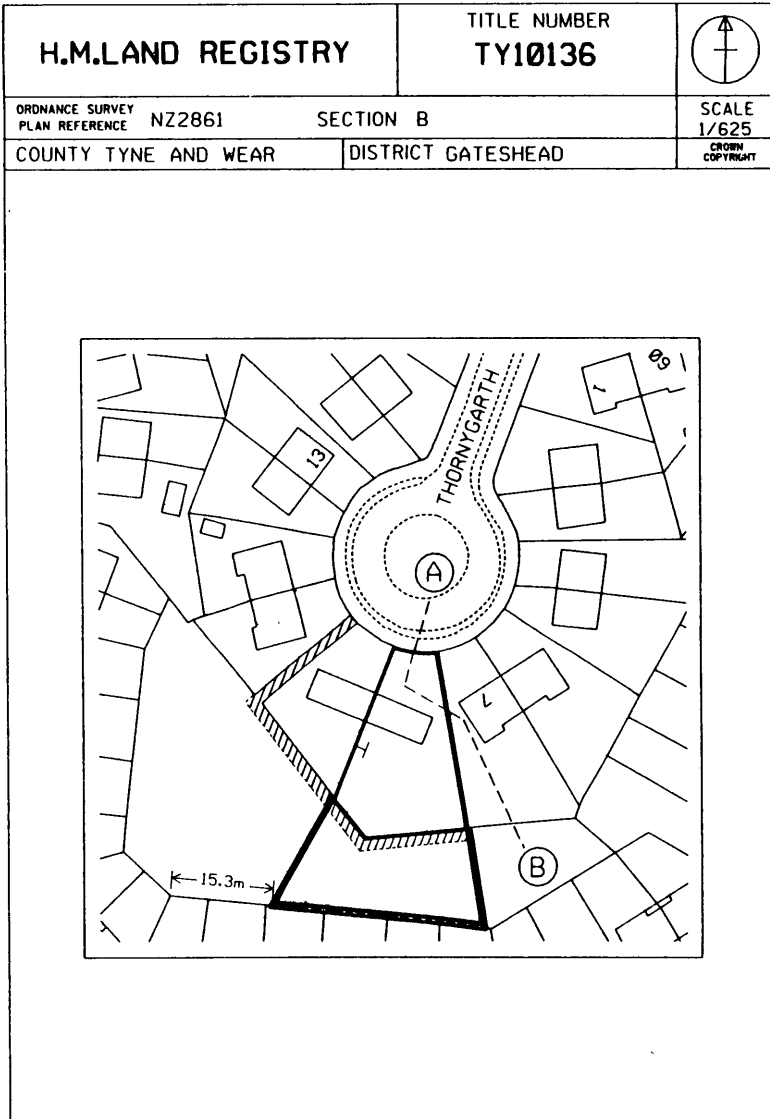
The views expressed in this paper are those of the author, and do not necessarily represent the views of HM Land Registry.



# H.M. LAND REGISTRY DIGITAL MAPPING DATABASE STRUCTURE



Title No	Freehold/ Leasehold	History details	Office copy Parameters
----------	------------------------	--------------------	---------------------------



Example of a formatted copy of an official filed plan. Bold markings such as edgings, hatchings, broken lines, circled letters and dimensions are shown on the original in a range of colours.