Towards the Registration of Defined Property Boundaries in Ireland

Report of the

Inter-Professional Task Force on Property Boundaries

April 2014

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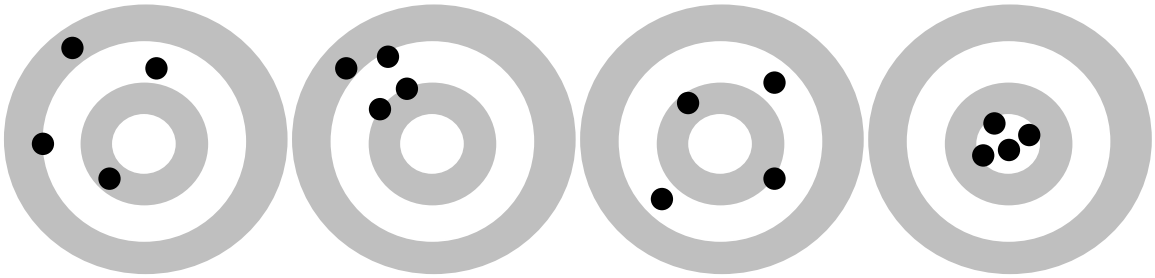
Table of Contents

Glossary of Terms

Explanatory note: - All references to land surveyors or other mapping professionals in this report and in the appendices should be read to mean the newly defined ***registered boundary surveyor*** to indicate a qualified professional (surveyors, engineers, architects or others) competent to carry out precise surveys of property boundaries for title registration to the level of precision required by the adopted standards.

Accuracy and Precision – Precision is the fineness or resolution to which measurements can be made with reliable repeatability. Accuracy is the closeness of measurements to actual reality. It should be noted that measurements of a particular point location may by accurate but imprecise – generally in the correct position, relative to reality, but varying considerably in position around that theoretically correct location, or they can be precise but inaccurate – all points very close together but in offset relative to the theoretically correct position. The following graphic from the world of target shooting provides an excellent illustration of the two concepts and the difference between them.



Not Accurate Not Precise	Not Accurate Precise	Accurate Not Precise	Accurate Precise

Attribute Data – database information, normally stored in tabular form in a computer system, usually a relational database management system, which can be associated with particular mapped locations, thus allowing the data to be analysed and viewed spatially, by means of a geographical information system or geo-browser, as well as being analysed using conventional relational database methods.

Bar Council of Ireland – is the regulatory and representative body for barristers in Ireland.

Boundary Segment – As used in this report, a boundary segment is the line of part of a legal property boundary which is shared between two specific adjoining owners and which has a uniform description. For instance, a length of concrete wall between two properties, the centre of which constitutes the legal boundary, would be a boundary segment. If at some point, the legal boundary changes to become offset from the wall,

or if the boundary changes from a wall to a hedge, then the attributes or the coordinates of the boundary segment can change.

Coordinates – coordinates, in the present context, define positions on the earth's surface in terms of distances east and north from a defined origin, plus height above a defined datum. Coordinate systems used in mapping will relate to a specific map projection and ellipsoid, q.v. In an Irish context four different coordinate systems may be encountered:

1. Cassini County coordinates – Defined with a central meridian for each county, resulting in inaccuracies at the borders of counties, if it is attempted to join more than one county into a single map. This coordinate system underpins 19th and early 20th century mapping, used for land registration, such as the County Series 6" to 1 mile, 25" to 1 mile. The survey technology used – triangulation by theodolite from an accurately constructed and observed base line, with detail being in-filled by the use of chainage. Large scale mapping using this system, may have high relative accuracy, i.e. when dimensions are scaled from the paper map in a localised area, but poor absolute accuracy (coordinate accuracy), particularly when the paper maps have been scanned and rectified into a geographic information system.

2. Irish Grid, also known as Irish National Grid, or more precisely as IG75 (since the third realisation in 1975 was the one eventually adopted) - This was an all-island grid, based on the transverse Mercator projection, which was in use during the second half of the 20th century. It suffered from anomalies (estimated at less than 0.4m), which became apparent with the introduction of GPS surveying technology, causing it to be replaced by ITM. However, it is still widely used by practitioners and other agencies and authorities, and conversion algorithms are available to convert coordinates in this system to ITM.

3. ITM – Irish Transverse Mercator. This is the current standard coordinate reference system for all national mapping. It is accurate (estimated at less than 0.02m) and fully compatible with GPS surveying methods and the WGS84 coordinate system. It is the standard used by the PRAI and all mapping submitted for property registration purposes much be based on ITM mapping.

4. WGS84 – This is a worldwide ellipsoid (earth model) used by GPS satellite navigation and surveying systems from which coordinates in latitude and longitude can be supplied.

CPD – Continuing Professional Development – is the means by which people maintain their knowledge and skills related to their professional practice. It is a structured approach to learning to help ensure competence to practice, taking in knowledge, skills and practical experience.

CPO - Compulsory Purchase Order – is a legal entitlement that allows certain State bodies which need to obtain land or property to do so without the consent of the owner. It may be enforced if a proposed development is considered in the public interest, for example when building railways or motorways where a land owner does not want to sell.

eConveyancing – Conveyancing is the process of transferring rights, restrictions and responsibilities relating to land. It is a complex process for which care and attention to detail is required. The conversion of this process into an electronic form called eConveyancing, is to reduce the time and cost required to complete the process and to improve the quality of the result by standardising and validating the information required.

Ellipsoid – The curvature of the Earth is not uniform around the globe and some mathematical shapes provide a better fit to the underlying shape of the earth in certain regions. In the case of Ireland, earlier mapping, including the County Series mapping and the Irish Grid mapping was based on the Airy Modified ellipsoid. Current ITM mapping is based on the European GRS80 ellipsoid, which bears a very close relationship to the GPS WGS84 ellipsoid, thus allowing compatibility between GPS position fixing and ITM mapping.

EI - Engineers Ireland – The professional body for engineers and engineering in Ireland.

GI (Geographic Information) - Also referred to, sometimes, as spatial information or spatial data. Any data or information which has a location component, such as a street address, a map reference or coordinates, which allows the data to be viewed, manipulated or analysed in map form.

GIS (Geographical Information System) – A computer software system, which facilitates the input, storage, manipulation, analysis, retrieval and display of Geographic Information

GPS (Global Positioning System) - A US space based satellite navigation system from which precise survey grade GPS receivers allow coordinates of any point on the earth's surface to be derived to sub-centimetre accuracy. Used extensively for aircraft, car and ship navigation, it is also the mainstay of modern surveying methods. There are four

systems in operation or development: Navstar GPS (USA), GLONASS (Russia), Galileo (Europe) and Compass (China).

IIS - The Irish Institution of Surveyors – a professional body representing Geomatic surveyors active in the areas of geodetic surveying, acquisition & processing of spatial data, creation & management of geographic information, and its use for the management of land.

INSPIRE – **I**nfrastructure for **Sp**atial **I**nfo**r**mation in **E**urope - is a European Union Directive to ensure that the spatial data infrastructures of the Member States are compatible and usable in a European Community and trans-boundary context.

IPI – Irish Planning Institute – is the independent professional body representing the majority of professional planners engaged in spatial and environmental planning in Ireland

IPTFPB – Inter-Professional Task Force on Property Boundaries – A group established by the Irish Institution of Surveyors and Law Society of Ireland in 2009 to research and identify issues related to boundary identification, definition, recording and dissemination of this data and its related information in Ireland. The group includes solicitors, barristers, engineers, architects, surveyors and planners.

ISDI - Irish Spatial Data Infrastructure (See also SDI below) - The Department of Environment, Community and Local Government (DECLG) is responsible for the implementation of the INSPIRE Directive (European SDI) in Ireland and is also charged with organizing, delivering and monitoring an INSPIRE compliant Irish Spatial Data Infrastructure (ISDI). To date this includes the development of a national portal for exchanging Irish spatial data, the development of data and service sharing agreements, and the monitoring and reporting of INSPIRE implementation in Ireland to the European Commission.

Land Register - is a public register operated by most countries to provide evidence of title, facilitate transactions and to prevent unlawful disposal of land. It normally consists of two parts, a) a title register which provides the name of the owner and a description of the rights, restrictions and responsibilities attaching to the land owned by them, and b) a mapping register which identifies the location of the land and describes its boundaries and extent.

Land Parcel - A land parcel or lot is a single contiguous area of land confined within property boundaries normally under one ownership

LR - Land Registry - Founded in Ireland in 1892, there has been a gradual and continuous programme of movement away from the older and limited system of recording Deeds (in the Registry of Deeds), to the more modern, flexible and comprehensive 'title registration' system provided through the Land Registry.

Law Society of Ireland – The professional body representing and regulating solicitors in Ireland

Legal Boundary – A legal boundary is the line on the ground where one owner's property rights end and the adjoining owner's property rights begin. It is not necessarily co-terminus with any physical or topographic boundary.

Map Projection – The curvature of the Earth prevents any extensive area of land from being represented accurately on a flat surface such as a map. To achieve a flat representation a map projection must be used. There are very many map projections in use, each with different qualities and different advantages and disadvantages, depending on what they are required to portray. In modern Irish large scale mapping only the Transverse Mercator projection need be considered, in conjunction with the Airy modified ellipsoid and the old national grid for the Irish Grid 1975, and with the GRS80 ellipsoid and the new national grid for the new ITM coordinate reference system

Node – a node is a point where two or more digital line segments intersect at a coordinate.

Ortho-Image – Usually an aerial photographic image or a satellite image in raster format, where the pixels have been manipulated to remove the inherent distortions due to satellite or aircraft attitude, perspective and the varying height of ground features, so as to provide a map image which is geometrically correct and to scale within the limitations of the process used.

OSI - Ordnance Survey Ireland - The national mapping agency of Ireland.

Parcel - A parcel or lot is a single contiguous area of land confined within property boundaries normally under one ownership

pdf – Portable Document Format – is a digital file format used to represent documents independent of application, software, hardware and operating systems.

Photogrammetry – A surveying technology which allows aerial photographic images to be viewed in stereo and measurements of visible features to be made from the images. Photogrammetry is the main survey methodology used currently by Ordnance

Survey Ireland for surveying its map products. The accuracy of photogrammetric measurements is limited by two major factors:

1. The photo scale of the original photography – the higher the aircraft flies when taking the imagery, and the focal length of the lens of the camera, the smaller will be the photo scale and lesser will be the precision with which features can be measured (see the entry on scale). Photo scale will also limit the precision with which features can be identified and coordinates recorded for them.

2. Photo images depend on visual interpretation. Shadow may often make it difficult for the photogrammetrist to interpret where precisely the centre line of a hedge, wall, tree line or other feature lies, leading to errors in location of the feature so mapped.

PRAI – The Property Registration Authority of Ireland – The official state authority established in 2006 and charged with the registration of property title in Ireland. It includes the Land Registry and the Registry of Deeds.

Precise Survey – A survey carried out using modern technology, such as GPS and/or total stations, giving coordinate point locations to sub-centimetre precision.

PRIME2 - is a new spatial data model developed by OSi for storing its large scale mapping databases. The new data model will ensure consistent and unique referencing of official topological information, both in terms of location and for ID tag referencing. OSi is currently migrating its entire large scale mapping to this new data model which includes a quality enhancement of the spatial information and is expected to be available to OSi customers during 2014.

Ransom Strip - is a small piece of land retained by the seller when the land is sold, as a mechanism for retaining control over the future use and/or development of the land. Commonly the ransom strip is a piece of land between the boundary of a property and the public road, thereby controlling access to the property. It can be quite small in width, circa 150 mm wide, sufficient only to be able to show it on a plan. However, the inaccuracy of mapping under the general boundaries rule and the snapping of boundaries by the PRAI to OSi detail, can lead to particular difficulties with this practice.

Raster – One of the two primary formats for storing and displaying map information. The map image is made up of a grid of pixels or cells (think of a TV screen picture) each of which can have attribute data or values associated with them and which can display map patterns or images when the cells or pixels are given a particular colour relating to the attribute or value.

Register of Boundary Surveyors – The establishment of an official registration board is recommended to list registered boundary surveyors capable of carrying out boundary surveys and submission of mapping for registration to the PRAI to a required standard. This registration board should operate independently of the PRAI and the various professional bodies, although the cooperation and assistance of these institutions should be sought and received regarding its composition and operation.

Registered Boundary Surveyor – (please see explanatory note at beginning of glossary) - Registration would be open to competent and qualified professionals (surveyors, engineers, architects and others) who could demonstrably meet the standards of competence required. They will most likely be professional members of the Royal Institute of Architects of Ireland, Engineers Ireland, the Irish Institution of Surveyors or the Society of Chartered Surveyors Ireland.

RoD – Registry of Deeds – was established in 1707 to provide a system of voluntary registration for deeds and conveyances affecting land and to give priority to registered deeds over unregistered registerable deeds. This registration system was superseded by the establishment of the Land Registry in 1892, and compulsory registration was extended to all Counties in June 2011 to advance the registration of titles in the Land Registry.

Relational Database – Large software and hardware computer systems which allow the input storage and rapid retrieval of large amounts of tabular data. The fields in these tables can contain numeric, text or image data and many geographic information systems are now based on relational database technology.

RIAI - The Royal Institute of Architects of Ireland – a professional body representing the architectural profession in Ireland.

RMSE - Root mean square error [$\sqrt{M((x - x_1)^2)}$] - is a frequently used measure in the GI sector to quantify the positional accuracy of geographic information. It computes the difference between mapped locations (map coordinates) and actual locations on the ground (now normally defined by accurate GPS measurements). Multiple measurements are collected and used to compute a single quality estimate.

Scale – map scale is a ratio between the actual dimensions of features on the ground and their representation on a paper map. For instance, a linear feature that measured 15 metres long on the ground would be represented at a scale of 1:2,500 by a line on paper which was 0.006m (6 millimetres) in length. If paper mapping is to be used to relocate the position of mapped features on the ground, scale is critical in determining the precision with which this can be achieved. In general, a line and its location on

paper cannot be comfortably perceived or measured if it is drawn thinner than 0.2mm. At a scale of 1:5,000 a line of this thickness on paper represents 1 metre thickness on the ground, so mapping at this scale cannot be used to determine location to greater precision than this. It should be noted that modern surveying technology measures features to actual 1:1 scale and can store the coordinates of points so measured as full size real world coordinates, and not as scaled down map representations.

SCSI – The Society of Chartered Surveyors Ireland – a professional body representing many areas of surveying in Ireland, including geomatics and mineral surveying, building surveying, quantity surveying, hydrographic surveying and valuation surveying. SCSI has institutional links with the Royal Institute of Chartered Surveyors in the UK.

Sliver polygon – a sliver polygon occurs in digital mapping when the same topographic feature is digitised separately on to different layers. If these layers are subsequently combined for analysis purposes, the lines which purport to represent the same feature will not coincide and many small polygons (gaps or overlaps) will be created where these lines cross and re-cross each other.

Snapping – This is a facility provided by many GIS systems which allows newly digitised points to be snapped onto existing points recorded in the mapping database if they fall within a specified distance from the existing point, such that subsequently both points have the exact same coordinate. Its purpose is to ensure that lines or features from a map correspond exactly with the lines representing the same feature in the mapping database, so that when analysis is carried out no spurious sliver polygons are created.

SDI - Spatial Data Infrastructure - is a network based solution of policies, standards and technologies to enable easy, consistent and effective sharing of public spatial information.

Title Boundary – See also *Legal Boundary* above. Title boundary is the boundary line registered with the PRAI which provides a visual representation of the registered title. This may or may not coincide with the legal boundary of the property on the ground.

Title Plans - are issued by LR in hard copy format based on OSi map scales (1:5000, 1:2500 and 1:1000). For enhanced clarity, Special Registration Maps are also available from LR in hard copy format at the next largest scale published by OSi, i.e. 1:5000 maps available at 1:2500 scale, and 1:2500 maps available at 1:1000 scale. Only certified copies of these plans and maps will be accepted for registration purposes. Both Title Plans and Special Registration Maps are derived from the PRAI digital parcel index map.

Title Register - is a part of a public land register, which provides the name and address of the owner, and a description of the rights, restrictions and responsibilities attaching to the land owned. In Ireland, the Title Register is the LR database of folios.

Topographic feature – A physical feature in the landscape, such as a wall or a hedge. In topographic mapping, such as that produced by OSi, topography features are mapped and their location indicated by point, line or polygon on the map. The nature and precision of these representations will vary with the scale of the map – the smaller the map scale, the more generalised the representation becomes. With larger scales the representation can become more realistic and precise.

Total Station – A tripod mounted surveying instrument which measures angles and distances and can compute the coordinates for surveyed points to centimetre precision.

Vector – An alternative format for storing and displaying map information. In this case the map image is made up of individual coordinate points, which can be strung together to make lines, which in turn can be assembled to make polygons. Attribute data can be associated with any of the points, lines or polygons to comprise a layer, theme or coverage in a Geographical Information System capable of carrying out complex analysis on the data and displaying it in map form.

CAVEAT:
The language in this glossary of terms has been simplified in order to facilitate meaning across professional groups and the general public.

The report was approved for publication by each of the professional bodies as follows:

3rd October 2013	Council of the Irish Planning Institute
16th October 2013	Standing Committee of the Bar Council
8th October 2013	Conveyancing Committee of the Law Society of Ireland
22nd October 2013	Council of the Irish Institution of Surveyors
6th December 2013	Engineers Ireland on the recommendation of the Civil Division
13th December 2013	Council of the Royal Institute of the Architects of Ireland

The approval of the Law Society is subject to the following amendment:

"The Law Society Conveyancing Committee has approved this report on the basis that the costs of implementing its recommendations be kept to a minimum and in particular those costs should be mitigated for property owners in so far as this is feasible."

1 Executive Summary

From its inception in the 1890s, as the Land Registry (LR), through to its current identity as the Property Registration Authority of Ireland (PRAI), the PRAI has accepted mapping for title registration based on an up-to-date large scale Ordnance Survey Ireland (OSi) map. The mapping of new sub-divisions of property was the responsibility of the applicants, and such new boundaries could either coincide with topographic detail shown on the OSi map or, be delineated without reference to OSi map detail. Such survey and delineation may or may not have been carried out by competent or qualified professionals. In a not inconsiderable number of cases the boundaries mapped without reference to OSi detail were inaccurately placed and, in the case of the boundaries outlined in coincidence with OSi detail, there was a lack of precision as to their location and nature on the ground due to the methods by which OSi mapping was produced, the scale at which it was published and the lack of clear definition regarding what topographic features were actually represented. The LR dealt with these inadequacies by guaranteeing title to registered land only, and providing no guarantee as to the precise location of the boundaries and extent of such land.

Two major technical advances in recent times have rendered this approach flawed:

1. The advent of digital OSi mapping prompted a campaign of digitisation of registered title boundaries, previously shown on archival paper mapping, to coincide with the new OSi mapping, which PRAI adopted as their standard base mapping. Various anomalies arose from this process as follows:
    a) It was now possible to zoom in on the digital mapping to scales much larger than the original paper maps, which exposed errors and inaccuracies which might have passed unnoticed on the original.
    b) Although many small inaccuracies were correctly rectified, the acceptance criteria which PRAI adopted for snapping title boundary detail to the new OSi topographic detail has led to circumstances where title boundaries were moved into coincidence where they should not have been, and conversely not moved in cases where they should have been, without notification to the registered property owners.
    c) These circumstances are exacerbated by the fact that the OSi mapping, by nature of its derivation, provides positional precision which is inadequate in terms of the degree of positional certainty which property owners require. This shortcoming is highlighted by digital mapping which can zoom to larger scales than the original map scale, thus showing inaccuracies that might have passed without notice at smaller scale.

2. It is now possible to survey to the accuracy of a coin using modern surveying methods, high precision GPS and total station equipment coupled with the new Irish Transverse Mercator (ITM) coordinate reference system; which can expose errors in precision and accuracy in both the underlying OSi mapping and the PRAI title boundary mapping.

PRAI have been unwilling to accept the evidence of such surveys and have continued to maintain their records on the basis of less precise OSi mapping and often flawed delineation based on previous submissions by applicants lacking surveying and mapping competence. Additionally there have been cases where title boundaries do not actually coincide with OSi mapped topographic features, but are erroneously shown on PRAI title mapping as so coinciding. These, together with a range of other issues have been detailed in full in the accompanying report.

In 2009 a group, composed of practitioners from professional bodies whose members - architects, engineers, surveyors, solicitors, spatial planners and barristers - are involved in the PRAI title mapping process, either as providers or users of mapping, came together to examine these issues. This group, known as the Inter-Professional Task Force on Property Boundaries (IPTFPB), organised a comprehensive survey of property professionals engaged in surveying or the use of mapping for property title registration, in the interest of providing a solid evidence base to their deliberations. This survey, by questionnaire, was followed by a series of workshops to further elucidate the issues.

This document provides a consolidation of the issues raised by this survey under the various relevant headings. These themes are presented in a series of appendices which set out the issues and solutions in an integrated and balanced way. The survey findings have been resubmitted to the participants in the original survey to ensure that the contents correctly represent their views on the issues raised. This report was further submitted to each of the professional bodies for their endorsement. The key findings; and it should be emphasised that these are only the most important recommendations from a long and very detailed report (full list is available in Appendix C), are as follows:

1. PRAI mapping should distinguish clearly between the accuracy of parcel index maps and title boundary maps.
2. The PRAI should introduce a system of colour coding on its mapping, to distinguish the levels of accuracy of title boundary lines and other annotation, based on the precision of their derivation.

3. More precise surveying should be promoted by the PRAI and such precision should take precedence in the PRAI mapping, over that which is known by the PRAI to be less precise.
4. That a system of registration be introduced which requires that registered boundary surveyors, who submit mapping for property registration, meet the required standards of qualifications and competence to ensure the precision and accuracy of mapping incorporated into the PRAI record meets the adopted standards.
5. That surveying and mapping to this standard be an obligatory requirement for all registrations which create new boundaries, sub-divisions and registrations subsequent to compulsory purchase, court orders or other statutory or administrative procedures.
6. That a simplified form of boundary agreement be introduced to allow adjoining property owners to agree the definition and location of their common title boundaries in a simple and inexpensive way.
7. That the description of "defined boundary" be introduced to refer to those boundaries which have been defined and surveyed by high precision methods, to defined standards, by registered boundary surveyors and for which adjoining owner agreements have been obtained regarding the definition and location of such boundaries.
8. That OSi be encouraged to produce its mapping to formally adopted national standards of accuracy and precision, and that topographic features shown on OSi mapping should be defined as to their physical identity, coordinate location, and the degree of precision to which they have been mapped. The advent of PRIME2 from OSi may address some of this issue.
9. A formal rectification procedure should be established by the PRAI and an appeals process or ombudsman be appointed to examine contested results of the rectification procedure.
10. Further research is required to produce a cost benefit analysis of the solutions proposed in this report.

2 Introduction

In 2001 under its second programme of law reform 2000-2007, the Law Reform Commission began a review of its work on reform of land law and conveyancing law in Ireland. This led to the launch of its eConveyancing project in 2003. There were three strands to this project; reform and modernisation of substantive law, an examination of the administrative aspects and an examination of the procedural aspects of conveyancing law. The first strand led to the enactment of the Land and Conveyancing Law Reform Act (Oireachtas, 2009) while the other two strands resulted in the publication of a Report on Modelling the Irish Conveyancing System (Law Reform Commission, 2006).

As part of the overall development of eGoverment services, public funding was made available to drive reform to make key government services available electronically and the Land Registry benefitted from these initiatives. As a result, all of the Land Registry folios and maps were converted to digital form in preparation for the introduction of eRegistration and eConveyancing.

In 2008 the Law Society's eConveyancing Task Force published their e-Vision (2008) which also proposed a number of radical changes to current policy and procedure. The primary recommendation was that the conveyance process be pared back to the basics of simply transferring title. Another key recommendation was that title to all land in the State, and any interests in land must be registered in the Land Registry. Currently a number of registration exemptions are provided for under section 72 of the Registration of Title Act 1964. The recommendation proposed that all of these exemptions should be removed to ensure that the Title Register is definitive, conclusive and all encompassing.

One of the main aims of the e-Vision is to ensure that property professionals can be confident in the reliability of information being supplied by an eConveyancing system, so there is a need for:

a) Quality assurance (validation of electronic information);

b) Standardisation (of data definitions and forms), and;

c) Enhanced professionalisation (better understanding of the different roles played by each of the property professionals).

Also in 2008 the Irish Institution of Surveyors (IIS) published a paper which stated that the PRAI non-conclusive boundaries are not reliable enough for eConveyancing, and proposed reform of boundary surveying as a necessary step for the introduction of an eConveyancing system. They proposed that title boundaries would first need to be defined on the ground and then surveyed to a high standard to supply reliable

mapping information for eConveyancing. They recommended the adoption of new standards and procedures for boundary surveys to enhance the quality of PRAI boundary mapping.

The IIS considered their paper and the Law Society's e-Vision to be complementary in that both were recommending change in Land Registry's procedures for their mapping and folios in preparation for the introduction of eConveyancing, so they met with representatives of the Law Society's eConveyancing Task Force and proposed the establishment of an inter-professional group with the following aims:

a) Analyse how the current system operates and identify its strengths and weaknesses;

b) Carry out a scoping exercise to identify issues related to boundary identification, definition, recording and dissemination of this data and its related information in Ireland;

c) Evaluate the significance of the issues identified and develop best practice approaches which are comprehensive and sustainable;

d) Prepare a cost benefit analysis for the solutions developed;

e) Determine and promote final recommendations dealing with policy, administration & service delivery levels.

Representatives from the following professional organisations and institutions, whose members are involved in submitting applications and mapping to the PRAI for registration, on behalf of clients, came together to discuss issues of mutual concern. The representative group met under the title of the Inter-Professional Task Force on Property Boundaries (IPTFPB) and the following list outlines the members of the group and the professional bodies they represent:

Professional Body	Representatives
Irish Institution of Surveyors	Dr Paddy Prendergast,
	Brendan Sweeny,
	Paul Corrigan,
	Mike Flynn,
	Muiris de Buitléir
Law Society of Ireland	Dr Gabriel Brennan
	Patrick Sweetman
Royal Institute of Architects of Ireland	James Pike
	Paul Kelly
Engineers Ireland	Colman Horgan
	Gerry Healy
	Gordon White
Irish Planning Institute	Brendan Allen
	Sarah Moran
Bar Council of Ireland	George Brady
	James Dwyer

Initial concern was focussed on the fact that, increasingly, errors and inaccuracies were becoming apparent in the PRAI mapping record brought about by a number of factors:

a) Changes in the title boundary record as a result of the migration of title boundaries from the PRAI mapping to new OSi digital mapping, on the new ITM coordinate reference system.

b) Conversion of the paper map archive to digital form thus allowing GIS technology to zoom on this mapping to much larger scales and resolution, exposing errors not immediately apparent at the original OSi smaller scale.

c) The use of precise surveying technology, including GPS, which can expose inaccuracies in both the new OSi mapping and the archival PRAI mapping.

d) Increasing cases of new applications, in which boundaries had been surveyed to high precision, being rejected by PRAI because they conflicted with existing inaccurately surveyed boundaries.

e) Increasing demand from clients that PRAI records should guarantee, not only the title to property, but also the extent of the property, i.e. the title boundary location. This is a responsibility which the state justifiably shirked in the past by the application of the non-conclusive boundaries rule, on the basis that precise boundary location, on a map, was impossible due to the limitations of the technology available at the time. This position is no longer tenable as a result of modern surveying technology.

As a result of the group's deliberations it was decided to carry out an extensive survey among members of the professional bodies, who were involved in the preparation of title boundary mapping for property registration, or who were users of such mapping, to ascertain the full extent and nature of the issues. This survey, carried out by questionnaire and by discussion groups was divided into a range of themes or topics to ensure that a full spectrum of issues was covered. It was conducted between January 2010 and March 2011 and the results were analysed, consolidated and are presented in full in the appendices to this report. These results were further validated by a series of workshops with each professional group and the re-circulation of the survey results in spring 2013. (See Appendix A for exact details of the methodology adopted).

The focus of the surveys and the feed-back from these surveys was primarily concerned with the problems of boundary definition and boundary location, so before addressing the specific areas of interest it would be useful to provide a brief introduction to the context of title boundary mapping and present the key issues raised in the survey together with recommended solutions, which if adopted by the PRAI would eliminate the great majority of the problems which affect the current property title mapping system in Ireland.

3 Problems relating to Non-conclusive Boundaries and OSi Mapping

It is accepted that, as regards the registration of title, the PRAI systems function well. However, in the context of recording and guaranteeing the boundaries of the land parcels to which that title applies, the PRAI system is deficient. The system of non-conclusive boundaries means that PRAI provides no guarantee as to the location of boundaries, merely that a boundary exists somewhere in the approximate location indicated on a relatively small scale, and often inaccurate, map. Equally, it provides no information on the physical nature of that boundary or where the legal boundary lies in relation to such physical features. This deficiency and lack of clarity has caused difficulties in the past, but until the advent of modern surveying methods there was little that could be done to improve the situation. Today, with the proliferation of such technology, glaring discrepancies are emerging between the accurately mapped location of physical boundary features and the mapping of these features using the less precise methods operated by OSi and the PRAI. It should be stated that this is no criticism of OSi, as their remit is to provide general mapping for the state, suitable for a very wide range of functions, and not specifically to provide mapping suitable for title boundary recording. However, it is unacceptable that, in the current digital age, less accurate official mapping is given precedence over precise and accurate survey and mapping, and that such flawed mapping is perpetuated in circumstances where high quality replacement mapping is available, but is rejected by the PRAI.

Secondly, in the absence of a clear definition of the nature of the features being mapped, the lines on the current PRAI title maps are ambiguous as to what topographical feature they represent and the relationship of the legal boundary to such topographical features is also undefined and ambiguous. In many cases a line on an OSi or a PRAI map may represent multiple features on the ground, or a feature of significant width, without specifying which feature is represented. This is an issue that will become increasingly problematical over time and current OSi and PRAI policy does not address the issue. The primary problem is that the mapping used by the PRAI to record title boundaries is based on OSi mapping, which is published at a scale, and derived by a methodology which lacks the accuracy and precision required for title boundary mapping.

4 Assumptions Regarding the Level of Accuracy Required for Title Mapping

For the purposes of examining the suitability of surveying and mapping methodology for title boundary determination, the following assumptions can be made:

a) Errors greater than 1m would be of a magnitude which could spark a boundary dispute if ownership of a strip of this width were to become an issue.

b) Errors of less that 0.1m are sufficiently small as to be unlikely to spark dispute except in exceptional circumstances, especially if the nature of the features and the location of the title boundary with regards to the features are described.

c) That precision for mapped boundaries should lie somewhere within these ranges, and preferably nearer the lower limit. Such mapping must be of a scale capable of representing that degree of precision.

5 Comparison of OSi Mapping and Mapping Derived from Precise Surveying against the Assumed Criteria

If the above assumptions are accepted then a survey methodology, capable of defining location to a precision of +/- 0.1m in terms of coordinates, could quite easily be implemented. For modern surveying technology using precise GPS positioning and total station surveying instruments, this is not an issue as most systems in current use achieve considerably higher levels of accuracy.

OSi mapping, on the other hand, is derived primarily from photogrammetry based on 1:40,000 photo scale imagery for 1:5,000 scale mapping, a process which is not capable of providing survey data to the required minimum precision (See Appendix F for a full discussion of this issue).

If, in addition to digital survey coordinates, paper mapping were to be derived from survey data and if this mapping was to be acceptable as an authoritative basis for defining boundaries on the ground, this mapping would need to be at a scale which would allow dimensions at the required resolution of around 0.1m to be measured. A scale of 1:500 is the minimum scale that fulfils this requirement. The map would also need a grid overlay of 20 m, or so, to facilitate accurate assessment of scale across the area of the map, allowing for the varying expansion of paper.

OSi mapping is produced at a maximum scale of 1:1,000 in urban areas, reducing to a scale of 1:5,000 in rural areas and no grid overlay is provided. Such mapping does not meet the standards necessary for accurate title boundary mapping, where a precision of +/- 0.1m is required. The accuracy of OSi mapping was quantified by Greenway and Curran (2005) as:

a) 1:1000 maps of urban areas with an accuracy of ±0.60m

b) 1:2500 maps or sub-urban and peri-urban areas with an accuracy of ±0.69m

c) 1:5000 maps or rural areas with an accuracy of ±1.22m

6 The Definition of a Title Boundary on the Ground

The primary reality of what constitutes a legal boundary is not a mapping issue at all. What exists physically on the ground and the acceptance of these features by the property owners involved constitutes the actual definition of a title boundary. A line on a map or a string of coordinates can symbolise the location of a physical boundary feature to high levels of accuracy, but two additional attributes are necessary before such a line can be interpreted in the context of a title boundary:

a) The specific physical feature, or the part of the physical feature, which the line represents must be specified. For instance:
    i. Concrete block wall - 230mm thick and 1.2m high
    ii. Earthen bank topped by hedge
    iii. Concrete post and wire fence.
    iv. Wooden super lap fence supported on timber uprights
    v. Drainage channel – 2m wide
    vi. Undefined line across open land
    vii. Specific boundary marks or monumentation
    viii. etc...

b) The relationship of the title boundary to these physical features must also be defined i.e.
    i. The concrete wall is a party wall and the title boundary runs through its centre.
    ii. The title boundary is off-set 4.5 metres to the east of the centre of the bank. The bank and hedge is entirely within the ownership of Folio X.
    iii. The title boundary follows a line joining the centre of each concrete post to the centre of the adjoining post.
    iv. The title boundary lies 50mm from the face of the super lap fencing on the side opposite the timber supports. The supports and fencing are entirely within the ownership of folio X.

v. The title boundary follows the eastern rim of the 2.0m wide drainage channel.

vi. The title boundary runs across open land and is defined by the following ITM coordinates. Buried boundary markers have been inserted at the following coordinate points.

vii. etc...

From the analysis so far it is clear that PRAI mapping falls between two stools. It is based on OSi mapping which is inadequate in scale and precision, and inadequate in the definition of the topographical features being represented, for acceptable title boundary recording. However, at the same time, this OSi mapping provides a degree of detail and a level of precision which gives the erroneous appearance that it is in fact recording accurate title boundaries thus leading to the problems outlined in the rest of this document and particularly in the detailed appendices outlining the problems being experienced by practitioners.

7 Recommended Solutions

To resolve this difficulty it is recommended that the PRAI introduce a number of reforms to their mapping procedures as follows:

a) Make a clear and absolute distinction between the PRAI parcel index map and the title boundary map (map submitted for registration).

b) Standards, of a higher level than those pertaining at present, relating to the precision of mapping being accepted for title registration purposes, would need to be adopted. This should involve registration of competent and suitably qualified registered boundary surveyors and their regulation to correctly implement a set of standards relating to surveying and mapping procedures and accuracies.

c) A system of identifying boundaries shown on title boundary mapping with regard to the different levels of precision and accuracy involved in their derivation is required. A system of colour coding of boundary lines, representative of the 5 different levels of precision as set out in section 7.3 is recommended.

d) A protocol that ensures that surveying and mapping of a higher level of precision will always take precedence, in the PRAI database, over mapping of less precision and accuracy.

e) A simple and inexpensive procedure for the agreement and definition of title boundaries between adjoining property owners is required.

The following suggests the basis of these new mapping procedures:

7.1 The Parcel Index Map

The purpose of the parcel index map is to allow the PRAI, the property owners, or members of the public to identity the approximate location of registered land parcels and their general relationship with each other. This index map need only be sufficient, in terms of accuracy and detail, to allow such an unambiguous identification of the land parcel. It should have no pretensions to defining the title boundaries to these parcels in any way and this declaration of its unsuitability for boundary definition should be emphasised in the strongest terms possible. This index map should, of course, continue to use the OSi background mapping, as is currently the practice. Also it should remain in continued use to define boundaries for parcels where better quality title boundary maps have not yet been registered (See Appendix E for a fuller exposition of this matter).

7.2 The Title Boundary Map

Title boundary maps should be related to each parcel on the PRAI parcel index map. This title boundary map would consist of title boundary definition at a precision commensurate with the survey methodology and mapping on which it is based. It would be quite separate from the PRAI parcel index map. These title boundary maps should be attached to each folio (where available) and there should be sufficient information on each map to allow the parcel to be reliably identified and re-established on the ground (See Appendix E for a fuller exposition of this matter).

7.3 Levels of Accuracy in Title Boundary Mapping

Five levels of mapping accuracy can be identified and they are listed here in order of increasing precision:

1. A title boundary line annotated on an OSi or PRAI map, which is not coincident with any pre-existing topographic detail shown on the maps and where the delineation is carried out using unknown and unspecified methods.
2. A title boundary delineated as coincident with a line representing topographic detail on OSi mapping at a scale of 1:5,000
3. A title boundary delineated as coincident with a line representing topographic detail on OSi mapping at a scale of 1:2,500
4. A title boundary delineated as coincident with a line representing topographic detail on OSi mapping at a scale of 1:1,000
5. A title boundary delineation that is derived from precision survey, to defined standards, by a qualified and registered boundary surveyor, where the physical features constituting the boundary and the relationship of the title boundary to

these features are specified in a schedule and the location of the physical boundary features are defined in terms of ITM coordinates and depicted on a map at 1:500 scale, or larger, as appropriate. The agreement of the adjoining land owners to such a title boundary definition would also be formally obtained.

As explained earlier in this section, maps at levels 1-4 are of a scale and precision incapable of providing evidence of accurate title boundaries. Maps at level 5, on the other hand can provide such evidence and the data contained in this map and its associated documentation would allow the reliable re-establishment of boundaries on the ground to the defined precision (See Appendix G for a fuller exposition of this matter).

7.4 Circumstances where precise survey and owner agreement should occur

It is suggested that PRAI should insist that mapping submitted for title boundary registration should be to the standard of maps at level 5 in all of the following circumstances (See Appendices E and U for a fuller exposition of this matter).

a) In the case of all boundaries created by a new sub-division, where an existing physical boundary mapped by OSi, or a PRAI mapped title boundary, does not exist.

b) In the case of boundaries resulting from the execution of a compulsory purchase order.

c) In the case of boundaries defined as the result of a court order.

d) In the case of the resolution of boundary disputes.

e) At the request of property owners, where adjoining owners formally agree the boundary definition schedules and precision mapping.

7.5 Precedence of Mapping derived from Precise Surveying

It is recommended that, for all the above circumstances, the delineation of such boundaries, resulting from precision surveying, on the PRAI title boundary map should take precedence over, and replace, all of the other forms of boundary delineation, and the lines of such boundaries should be colour coded on PRAI mapping (parcel index map and title boundary map) to distinguish them from other registered boundaries. The documentation (boundary features schedule, title boundary schedule, ITM coordinate list, 1:500 title boundary map, survey validation data, owner agreements and registered boundary surveyor's certification) should be registered as an integral part of the property title. Such precise boundary delineation should not be subject to the acceptance criteria used by PRAI for snapping title boundaries to OSi

topographic features i.e. the accuracy of their derivation should not be degraded on PRAI title mapping to inferior levels of accuracy (See Appendices G and L for a fuller exposition of this matter).

7.6 The Continued Use of Title Boundary Delineation Related to OSi Topographic Detail

Title mapping based on existing OSi background should continue for the present for all cases other than the five circumstances stated in section 7.4 above i.e. where entire parcels are being transferred and no newly defined boundaries or boundary change is involved, or where no issues have arisen between adjoining property owners, or between a property owner and the PRAI, regarding the nature or location of the title boundary, or a CPO or court order is not involved. It is suggested that this mapping, based on OSi topographical detail, should have clear warnings that the precision and accuracy of such maps is solely commensurate with the surveying and cartographic standards of the underlying OSi mapping and the methods by which previously registered title boundaries were mapped for registration and that there is every likelihood that errors, inaccuracies and imprecision are inherent in the delineation of the boundaries (See Appendix F for a fuller exposition of this matter).

It is recommended that colour coding of line work on PRAI maps (parcel index map and title boundary maps) should cover the 5 levels of mapping accuracy, so that anyone using PRAI title mapping can immediately be aware of the level of accuracy and reliability of any delineated boundary line.

The current policy of requiring the submission of precision maps that identify errors in the PRAI record, firstly to the OSi to rectify their mapping before correction of the PRAI record, is unacceptable. As already stated, if such a procedure were to be followed, the corrected boundary would be depicted by OSi at a scale and level of generalisation commensurate with their standard map scales and photogrammetric methodology, which are below the standard of accuracy required for title boundary definition. In effect the accuracy of the precise survey would be discarded, together with the definition of the features mapped leaving no documentary certainty as to the location of the boundary, despite the execution of a precise survey establishing that certainty.

7.7 Title Boundary Map - Page Size and Format

It is suggested that all title boundary maps should be to a default scale of 1:500, where possible. However, it is accepted that larger scales may be required in certain circumstances and these should be implemented and accepted where appropriate. It is also accepted that smaller scales may be appropriate where the underlying precision of the surveying methods does not warrant the larger scale, particularly where depiction

at such a larger scale might lead to higher levels of accuracy being imputed to the mapping than might actually be the case. A standard design format should also be followed, for reasons of homogeneity and consistency. Appendix H outlines the page formats and property areas related to a scale of 1:500. It is also recommended that map page format should be standardised at A3 and for larger extents a system of small scale index map and a standard map grid should be used to relate the individual A3 sheets to each other.

7.8 A Simplified Form of Owner Agreement of Title Boundaries

A simplified form of standard owner agreement to defined boundaries is required. The recommendation is:

a) That the property owners agree that the boundary, as viewed on the ground and as described in the relevant schedules, is their agreed boundary.

b) Those features, as scheduled, would be surveyed and mapped by the registered boundary surveyor to the appropriate precision and would be certified by the surveyor as an accurate depiction of the boundary so agreed.

c) The accuracy of the title boundary map would be the surveyor's legal liability in the event of dispute.

d) Coordinates and survey validation would be submitted in conjunction with the title boundary map and boundary feature schedule and would form part of the legal boundary definition.

A draft of such a boundary agreement is shown in Appendix U.

In this context it is recommended that boundaries, surveyed to high precision by registered boundary surveyors, meeting specified standards, and where contiguous owners agreement has been obtained, should be registered as ***defined boundaries***. The term conclusive, already in use in this general context, has over the years acquired layers of meaning which would render its continued use, in this particular context, ambiguous and potentially misleading. It is therefore recommended that a new term be adopted to describe registered boundaries, which have been defined as set out above.

7.9 Surveying issues regarding Sub-division

Specific difficulties exist in connection with the precise mapping of sub-divisions. Surveying and mapping can take place at three distinct stages:

a) At design stage – for instance, when a housing estate scheme map is prepared.

b) At setting out stage – when the plot, or plots, to be sub-divided are physically marked on the ground.

c) At "as built" stage – when finished boundary walls, fences, hedges etc. are in place.

It is recommended that, when surveying and mapping precise boundaries, two schedules should be completed, prior to surveying and mapping, and the obtaining of owner agreement –

a) A schedule describing the topographical or physical boundary features, together with coordinates should first be prepared.

b) A schedule defining the title boundary in relation to these physical features should then be set out.

In the case of subdivision the logical process is often reversed, in that the title boundary is set out first and the physical boundary is built subsequently. The problems that arise from this reversal of procedure are particularly acute in the case of scheme maps for housing estates.

Given the PRAI's recommendation that boundaries should be defined on the ground prior to surveying and mapping and the legal assumption that the boundaries between properties are those which physically exists on the ground, the definition of boundaries by means of precision survey and owner agreement, should only take place subsequent to the construction of a permanent physical boundary and not prior to such construction. This would require a suspension of the completion of boundary registration until final boundary features had been constructed, and the necessary schedules of physical boundary features and title boundary relationships completed, together with the precise surveying, mapping and signature of owner agreements.

However, houses on new housing estates are often sold off the plans, and these plans, in the form of scheme maps, are lodged with PRAI to form the basis for registration. This places a heavy duty on the developer to ensure that the design plan is based on an accurate survey of the external boundaries of the total land parcel being developed and that the scheme depicted fits within these precisely surveyed and mapped boundaries. It would also be a requirement that the developer ensure that the parcel boundaries, as delineated on this plan, are accurate. Furthermore it requires that when boundary walls or fences for the house plots are ultimately constructed at the end of the building process, they are located accurately in relation to the original design boundaries and scheme map. This does not necessarily happen under current circumstances. It would be advisable that registration, based on scheme maps in particular, should be designated as provisional only until the submission of the precise survey based on permanent boundary features is carried out and a document signed between adjoining owners or the developer indicating their agreement to these boundaries is completed (See Appendices G, L and T for a fuller exposition of this matter).

7.10 Property Boundaries in Multiple Unit Developments

Title boundaries within multi-unit developments pose particular problems. In this case the issues are:

a) Insufficiently large scale to represent the detail required to delineate title boundary in a building environment.

b) In the absence of alternatives, acceptance of inadequate and inaccurate plans, such as photographs of outline emergency escape plans, for title registration.

c) The difficulties of mapping complex three dimensional spaces.

The recommended solution to these problems is, in the first instance, an increase in the scale of title boundary maps used for the registration of individual units, to 1:50, which is the minimum scale that will allow architectural detail to the required resolution to be displayed. The use of index mapping at a scale of 1:200, or an appropriate small scale, to indicate the interrelationship of individual units is also recommended. Such an arrangement parallels the separate generalised index map and precision title boundary map recommended in the case of land and non-multiple unit developments (See Appendix P for a fuller discussion of this matter).

7.11 A Formalised Process for Boundary Rectification

A final major issue raised was the need for a two staged process including a) a formalised process for boundary rectification and b) an independent system of appeal against decisions of the PRAI relating to the rectification of mapping errors. Currently if a professional brings an error in PRAI mapping to the notice of the PRAI, the decision rests with the PRAI as to whether the error should be rectified or not. PRAI may consider the error trivial in the context of the general boundaries rule or for other reasons relevant to the PRAI. It can be the case that the rectification of a single error in the boundary of one property may trigger a cascade of anomalies in the mapped boundaries of adjoining properties, a sequence of events which, perhaps, the PRAI are loath to set in motion. However, the error may be far from trivial to the property owners involved and may urgently need to be set right. At present there is no formal procedure to request a boundary rectification and no appeal of the initial decision. If the PRAI refuse to rectify the error, that is the end of the matter and there is no further means of redress, other than the courts. It should be noted that the question at issue here does not concern boundary disputes or disagreement between adjoining property owners regarding the location of a boundary, but simply a straightforward error between the actual location of a boundary on the ground and its recorded location on PRAI mapping.

Thus it is recommended that a formalised process be established to request rectification of boundaries and that a process of appeal also be instituted to adjudicate on issues

where there is a difference of opinion between a property owner and the PRAI regarding the mapped location of a property boundary on PRAI mapping (See Appendix L for a fuller discussion of this matter).

8 Conclusions

In concluding, it should be noted that this report is not an academic exercise. It has been generated directly from the experiences of professionals across a wide range of disciplines, based on their dealings with the PRAI on matters of mapping for property registration. The issues raised are all substantial problems which the practitioners have encountered in their day to day work.

It should also be noted that the solutions, which have been recommended in the report do not call for root and branch reform of the PRAI, which might cost large sums of money at a time when the public purse is severely strained. The solutions are all relatively simple improvements to current procedures, whose implementation would smooth the operation of property registration and could conceivably involve cost saving, by removing causes of ambiguity and misunderstanding.

The major recommendation of instigating a system of registration and standards for registered boundary surveyors, and using their high quality boundary surveys to incrementally improve the accuracy and precision of the PRAI title mapping record, provides a means by which the PRAI can substantially improve the quality of its record over time at little or no cost to itself. Other recommendations, such as, the clear separation of parcel index mapping and title boundary mapping, colour coding to indicate the degree of precision which can be expected of any particular title boundary line, the clear differentiation between topographic features as shown on OSi mapping, which are the responsibility of OSi, and registered title boundaries, which are the remit of PRAI and, the principle of giving precedence to mapping of higher precision over mapping which is of lesser precision, are equally important and their implementation would generate a very considerable increase in the value and usefulness of the PRAI mapping record. Many other anomalies have been noted and solutions recommended in the appendices, and a resolution of each issue, although small in itself, would lead to a cumulative improvement in the operation of the PRAI.

Additionally, these recommendations if implemented, will significantly contribute towards the future development of an Irish Spatial Data Infra-structure (ISDI). Parcel boundaries properly defined in this manner constitute a fundamental data theme supported by robust legal evidence upon which other layers of spatial data can be associated with certainty. Conversely, the current association of higher layers to non-conclusive boundaries which have little evidence to support them, considerably weakens the whole ISDI and leads to many delays, uncertainty and waste of resources.

In the separate sections in the appendices that follow, based on practitioner feedback, this principle will be reiterated again and again as the issue of mapping precision is at the core of current title boundary mapping problems.

It is hoped that the PRAI and OSi will accept the findings of this report in the spirit in which they are offered, as a genuine and cooperative attempt by the expert property professionals who do business with the PRAI, to improve the quality of title registration mapping for the benefit of the PRAI itself and also, and most importantly, to improve the quality of service which the PRAI can offer to its ultimate customers – Irish landowners.

9 References

CLGE - Comité de Liaison des Géomètres Européens, 2012, *Measurement Code for the Floor Area of Buildings*, CLGE, Brussels, pp 1-20
http://www.eureal.eu/static/doc/booklet_EN.pdf

Department of Justice (DoJ), 2012, *Land Registration Rules*, Statutory Instrument Number 483 of 2012, Stationary Office, Dublin,
http://www.irishstatutebook.ie/2012/en/si/0483.html

Greenway I. & Curran S., 2005, *Ordnance Survey Ireland – Life After New Mapping*, IRLOGI Conference, Dublin, pp1-13

Greenway I., 2006, *Developing Ireland's National Mapping: A Progress Report*, Ordnance Survey Ireland, Dublin, pp1-9

INSPIRE Thematic Working Group Buildings, 2013, *D2.8.III.2 INSPIRE Data Specification on Buildings v3.0rc3*, European Commission, Brussels, PP 1-309
http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_BU_v3.0rc3.pdf

INSPIRE Thematic Working Group for Cadastral Parcels, 2010, *D2.8.1.6 INSPIRE Data Specification for the spatial data theme Cadastral Parcels v3.0.1*, European Commission, Brussels, PP 1-124
http://inspire.jrc.ec.europa.eu/documents/Data_Specifications/INSPIRE_DataSpecification_CP_v3.0.1.pdf

Law Reform Commission, 2006, eConveyancing: Modelling the Irish Conveyancing System, Law Reform Commission, Dublin, LRC 79 – 2006, pp 1-56
http://www.lawreform.ie/_fileupload/Reports/Report%20eConveyancing.pdf

Law Society eConveyancing Task Force, 2008, *eConveyancing: Back to Basics – Vision of an Electronic System of Conveyancing (eVision)*, Law Society of Ireland, Dublin, pp 1-4,
http://www.tfpb.ie/Publication%20of%20eVision.pdf

Oireachtas, 2009, Land and Conveyancing Law Reform Act, *Number 27 of 2009*, Stationary Office, Dublin, pp1-143
http://www.irishstatutebook.ie/2009/en/act/pub/0027/index.html

Oireachtas, 2005, *Safety, Health & Welfare at Work Act, Number 10 of 2005*, Stationary Office, Dublin, pp1-95 http://www.irishstatutebook.ie/2005/en/act/pub/0010/index.html

Oireachtas, 1964, *Registration of Title Act, Number 16 of 1964*, Stationary Office, Dublin
http://www.irishstatutebook.ie/1964/en/act/pub/0016/index.html

Prendergast, W.P., Flynn, M., Corrigan, P., Sweeny, B.F.S., Martin, Á. & Moran, P., (2008), *Green Paper Proposing Reform of Boundary Surveys in Ireland*, Irish Institution of Surveyors, Dublin, pp 1-109.

http://www.irish-surveyors.ie/downloads/best_practice_guidelines_for_boundary_surveys_final_2.pdf

Property Registration Authority, (2013), *Mapping Practice (first published 1st Nov 2010, updated 1st Feb 2013)*, Property Registration Authority, Dublin, http://www.landirect.ie/eng/Legal_Professional_Customers/Legal_Practices_Procedures/Practice_Directions/12_Mapping_Practice/

Property Registration Authority, (2012), *Practitioner's Guide 2012: Mapping Procedures for First Registration of a Property, Sub-divisions of Registered Property and Rights over Registered Property*, Property Registration Authority, Dublin, http://www.landirect.ie/eng/Legal_Professional_Customers/Mapping%20Guidelines/Practitioner's_Guide_2012_Mapping_Procedures_for_FRs,_subdivisions_and_rights.pdf

Property Registration Authority, (2007), *Digital Mapping Project - Digitisation Protocol (Version 1.3)*, Property Registration Authority, Dublin, pp 1-46 http://www.landirect.ie/eng/Legal_Professional_Customers/Mapping%20Guidelines/Digital_Mapping_-_Digitisation_Protocol/Digitisation_Protocol.pdf

10 Appendices

Explanatory note: In editing the responses to the survey of practitioners every effort was made to keep as closely as possible to the structure of the survey and the replies of the participants. A degree of repetition across the different themes is therefore to be expected.

A Methodology of Survey and Analysis

The IPTFPB conducted an electronic survey of professionals involved in the property sector on the issues related to boundary mapping in Ireland from June 2010 to March 2011 to determine:

a) The scale of the issues being experienced by property professionals
b) An explanation of the detail of the issues involved, and;
c) Suggestions on how these issues might be resolved.

323 valid responses were received in a stratified sample of the property professions (Table 1). The sample sizes from both solicitors and land surveyors were large enough to have margins of error less than ± 10% and the sample sizes for engineers, architects and spatial planners have margins of error slightly above ± 10% for their responses. Therefore the responses for the survey have a 90% confidence level with a margin of error or circa +/- 10%.

Table 1 – Validity of the sample sizes achieved for the Survey

Profession	Population Size	Required sample for +/-10% Error Margin	Responses Received	Sampling Error Achieved	Completion Rate
Land Surveyors	375	57	65	± 9.3%	17.3%
Solicitors	7,500	67	105	± 8.0%	1.4%
Engineers*	400	58	46	± 11.5%	11.5%
Architects	2,415	66	55	± 11.1%	2.3%
Planners	700	62	39	± 13.0%	5.6%
Barristers	2000	65	1	∞	0.05%
GIS Analysts	?	?	2		
Others	?	?	10		
Total			**323**		

The qualitative information gathered in the survey was processed, analysed and validated in a number of stages (table 2). Stage one involved abstracting all the quantitative data and creating charts, tables and maps. Stage two necessitated creating individual reports for each of the professional groups involved, abstracting the qualitative responses, colour coding them and then collating them into one document. Stages 3, 4 and 5 were carried out by the analysis team including an engineer, a solicitor and a surveyor. Stage 3 and 4 involved classifying these responses into main categories, and then stage 5 identified the main issues from the responses within each category and then developed preliminary proposals on how each of these issues might be resolved. Stage 6 required the drafting of one page summaries for each issue identified setting out a) the Current procedures, b) Difficulties being experienced, and c) Proposed solutions.

The replies, in many cases, were cryptic, idiomatic and not always couched in diplomatic language. To bring the results to a publishable standard considerable editing was required. In carrying out this editing process every effort was made to ensure that all comments and points of importance were included and the edited text was re-circulated to the participants for review to ensure that what follows, represents their views, and that nothing of substance has been added or omitted.

Table 2 - Stages of Analysis of the Qualitative Results collected in the Survey

Stage	Tasks Performed
1	Create a report from www.surveygizmo.com of the all the responses which included tables and charts of the quantitative results.
2	Create reports from www.surveygizmo.com for each profession using filters available, extract qualitative responses into word, colour code for each professional group, and combine groups into one document.
3	Initial classification of answers into a) Advocating Change, b) Neutral to Change, or c) Not Advocating Change
4	Secondary classification of qualitative data into main categories, such as: a) OSi Mapping b) PRAI Map - Issues already completed c) PRAI map - Accuracy Issues d) PRAI Map - Rectification e) Declarations of Identity
5	Identification of issues from within each main category
6	Formulation of preliminary proposals to resolve main issues identified and prepare a 1 page summary for each issue setting out a) Current Procedure, b) Difficulties being experienced, and c) Proposed Solutions
7	Host a series of CPD workshops to inform, discuss and collect feedback on the preliminary survey results and the solutions proposed.
8	Circulate the final results to the 70 property professionals who indicated in the survey their wish to participate to ensure the results a) properly captured the concerns they raised and the solutions they proposed and b) were still valid in 2013

Stage 7 involved a series of four CPD workshops held in spring 2011 (Table 3) to inform the members of the professional bodies of the survey results, and to discuss the feasibility and practicability of solutions proposed for the core issues identified.

Table 3 – Attendance at series of CPD Workshops on the Preliminary Survey Results

	RIAI 30th March 2011	**EI** 7th April 2011	**IIS** 14th April 2011	**Law Society** 28th April 2011
Attendance	23	37	53	52

The analysis of the survey data took far longer to complete than anticipated, so the final results were further validated in spring 2013 by circulating 70 of the survey respondents who indicated their wish to participate further to ensure a) the results property captured the concerns voiced in the survey and b) that these results were still valid in 2013.

The summaries of the qualitative data follow a standard format:

a) The current procedures are outlined.

b) The difficulties being experienced by those who replied to the survey are outlined.

c) Solutions, to resolve these difficulties, are proposed.

In some instances, where the theme may be complex, an introductory section outlining the background to the topic is included. It should also be noted that the summaries of the questionnaires contain duplication, as many of the same issues arose under different thematic headings. No effort was made to edit out this duplication, as it was felt that the text should keep to the content of the replies as closely as possible. It should also be noted that, even in cases where it is not explicitly stated, or it is not clear from the context, the text is based robustly on the contents of the survey.

B Quantitative Results

The first surprising, even alarming result was that over a quarter of professionals (27.7%) were not aware that property boundaries registered in the Land Registry or in the Registry of Deeds are non-conclusive and are not guaranteed by the State. Non-conclusive boundaries were defined in the survey as "The Register does not contain sufficient information to define the boundary either legally or geometrically. Consequently, the boundary is open to challenge, and is not guaranteed by the State."

Another striking finding was the high percentage of respondents (78%) who recorded having difficulties with existing boundary mapping (Table 4). Prior to the survey a figure of 25% to 30% would have been considered as high, but an average of 78% suggested a much deeper problem.

Table 4 - Incidence of boundary mapping issues encountered by property professionals

Have you encountered any of the following boundary mapping issues?	Yes	No	N/A
a) Boundary disputes resulting from mapping issues?	87.3%	11.7%	0.9%
b) Difficulty establishing a boundary on the ground using a Title map?	90.8%	6.7%	2.5%
c) Difficulty resolving a boundary survey with a Title map?	83.7%	12.8%	3.5%
d) Inconsistency between areas on Title maps and areas as measured on the ground?	91.7%	5.4%	2.9%
e) Difficulty resolving Rights of Way and/or Easements on Title maps and Rights of Way and/or Easements on the ground?	67.8%	25.7%	6.5%
f) Differences between two adjoining Title maps? (gaps or overlaps)	72.8%	24.3%	2.9%
g) Differences between two Title maps for the same property?	52.4%	45.0%	2.6%
Total	**78.2%**	**18.7%**	**3.1%**

65% of professionals stated that they were concerned with certifying Declarations of Identity for title maps which are based on non-conclusive boundaries. If the State Agencies supplying these official maps do not accept the risk relating to them, why should property professionals be required to accept this risk? Essentially, it was felt that property professionals are using their professional indemnity insurance to mitigate the additional risks involved.

Finally, the results indicate a significant appetite for change (Table 5). Professionals indicated a wide range of extra information they would like to be included on boundary/Title maps. If the recommendations are that the title and the mapping registers should be more definitive, and all encompassing to prepare for the introduction of eConveyancing, then this extra information should be considered for inclusion.

Table 5 - Additional information requested for inclusion on boundary/title maps

What information is currently not included in this map that you like to be included?	Yes	No	N/A
a) Title boundaries (line of registered boundaries)?	87.4%	3.9%	8.7%
b) Physical features (including annotation of type)?	85.0%	5.1%	9.8%
c) Occupation line (current limit of occupation)?	67.2%	18.6%	14.1%
d) Legal boundary (the intentions of the parties)	89.4%	4.3%	6.4%
e) Land area (extent) of property?	86.6%	6.9%	6.5%
f) Dimensions and coordinates?	91.4%	4.1%	4.5%
g) Rights of way and easements?	94.2%	2.1%	3.7%
h) Other? (please specify below)	32.3%	9.2%	58.5%
Overall Result	**84.5%**	**6.1%**	**9.4%**

C Summary of Qualitative Results

This table provides a full list of all the solutions proposed under each of the themes examined in the written comments received from the 323 respondents during the survey. These solutions are then classified under the five columns on the right-hand-side (Professional Bodies, PRAI, OSi, Other State Agencies and new legislation) to specify where the responsibility for implementing the solutions lies.

Relevant Appendix	**Qualitative Data**	Develop & Implement Good Practice Guides by **Professional Bodies**	Collaborate with **PRAI** to review & implement new mapping procedures	Collaborate with **OSi** to review & implement new mapping procedures	Collaborate with **Others** to review & implement new mapping procedures	Communicate proposals for **new legislation** to government
D	**Access to PRAI Digital Map Data**					
	PRAI to provide access to digital vector mapping (relevant parcel only available at present)		Include adjoining parcels			
	Access to specified scanned copies of historical title maps to be made available to surveying & mapping professionals to allow evolution of boundaries over time to be analysed		✓			
E	**Indicative Boundaries versus Definitive Boundaries**					
	PRAI to encourage registration of defined boundaries to improve accuracy of PRAI mapping		✓			
	PRAI to encourage submission of precision survey of all mapping for first registrations		✓			
	Surveying & mapping methodologies and standards to be developed for precision survey & mapping of boundaries.	✓	✓	✓		
	Develop & introduce a simplified form of boundary agreement	Draft in	✓			

		Appendix U				
	PRAI to develop & implement a protocol which outlines: a) a hierarchy of reliability of boundaries based on the precision of their derivation - 5 levels are proposed as follows: ▪ boundaries surveyed by registered surveying & mapping professionals using modern survey methods to adopted standards with an accuracy attribute of < +/- 0.1m ▪ Boundaries associated with features on 1:1000 OSI maps with an accuracy attribute of +/- 0.60m (should this be improved by OSi?) ▪ boundaries associated with features on 1:2500 OSI maps with an accuracy attribute of +/- 0.69m ▪ boundaries associated with features on 1:1000 OSI maps with an accuracy attribute of +/- 1.22m ▪ registered boundaries not associated with OSi features and of unknown accuracy b) a boundary labelling method (tagging & colour coding) is implemented on mapping to ensure the boundary accuracy level is clear to property professionals		✓ ✓	Should accuracy of 1:1000 mapping be improved?		
	Acceptance of annotated boundaries on PRAI or OSi maps by unskilled applicants should be discontinued - competence of surveying & mapping professionals to be checked by the PRAI	✓	✓	✓	✓	
F	**Ordnance Survey Ireland Mapping**					
	OSi to improve their mapping such that: a) topographic features on OSi maps to contain attributes as to their nature & extent b) an improvement in the positional accuracy of topographic features to meet a new defined set of national standards (based on international norms) to be promulgated by the NSAI c) Quality assessments to be conducted in accordance with ISO standards for quality evaluation for spatial data and results published	✓		✓ ✓ ✓		
	OSi should make efforts to overcome interpretational shortcomings of aerial photogrammetry by more rigorous field checking on the ground			✓		
	High quality mapping information from defined boundaries could be used by OSi if surveying & mapping standards were correctly implemented. This would represent a significant new source of high quality information from hundreds of survey & mapping professionals around the country for OSi	✓		✓		
G	**PRAI Mapping - Accuracy**					

	Reliability attribute required for registered defined boundaries to record one of 5 levels of accuracy		✓			
	PRAI to manage accuracy of registered boundaries in the digital mapping (landowners to remain responsible for accuracy standard submitted)		✓			
	Land Registration Rules to be reviewed to make them more appropriate to modern surveying methods and digital mapping	✓	✓			✓
	Snapping of registered boundaries to OSi features to be switched off when a defined boundary has been registered		✓			
	Parcels containing defined boundaries would have a title boundary map attached to the folio		✓			
	High quality surveys used to gradually update accuracy of LR parcel index map		✓			
H	**PRAI Mapping - Scale and Page Format**					
	PRAI title maps to be issued at standard scale of 1:500. Larger scales may be necessary in certain circumstances, so possibility to specify larger scale to be provided. Where land parcels cover an extended area requiring multiple A3 maps, an index map at a smaller scale should also be provided		✓			
	Boundaries on title maps to be colour coded to indicate their reliability (based on the precision of their derivation). Map legend to include colour coding		✓			
	PRAI to supply all title maps at A3 format, or A4 if preferred		✓			
	20m ITM grid (grid spacing may change for other scales) to be overprinted on all PRAI title maps at 1:500 and ITM values to centimetre precision to be stated for all four corners of the map. A scale bar to be included on all title maps		✓			
I	**PRAI Mapping - General**					
	A critical review of www.landdirect.ie website to be carried out to improve reliability: a) interruptions during transactions resulting in double charging b) warning before completion of transactions of any lacunae in the information being provided before committing to paying a fee		✓ ✓			
J	**PRAI Mapping - Issues Completed with Digital Mapping System**					
K	**Extent/Area of Parcels and Properties**					
	A protocol needs to be implemented setting out a hierarchy of land parcel area values based on the precision of their derivation, and area values on folios and title maps should include a label identifying					

	the level of precision. Three levels can be inferred: a) Boundary survey by registered boundary surveyor to an adopted standard & methodology b) Areas derived from improved OSi maps where boundaries for published areas are indicated using area braces (re-introduced) or in black compared to other features in grey. This measure should be in association with improvements in the positional accuracy of topographic features on OSi maps c) Existing areas from OSi maps & PRAI title maps where coincidence of title boundaries and OSi features (from which these areas are computed) is not explicitly defined	✓	✓ ✓	✓		
	Where a boundary survey has been carried out by a registered surveying & mapping professional to an adopted standard & methodology, the resulting area value should take precedence over previous values for the same parcel (in map & in folio).	✓	✓			✓
	Areas derived from the PRAI digital map should take precedence over areas quoted in folios		✓			✓
	Area values published by the PRAI should be colour coded to indicate their source		✓			
L	**Rectification of Mapped Title Boundaries**					
	Mechanism required to set aside the PRAI adoption criteria for associating registered boundaries with OSi features in certain circumstances: a) Where the precision & accuracy of OSi mapping is demonstrably lower standard than existing registered boundaries or new boundaries submitted for registration b) Where the offset of a title boundary from a topographic feature is deliberate c) Where the title boundary in the PRAI archive is coincident on the ground with a topographical feature delineated on the OSi map, but where the distance between the lines portraying this feature on the old and new mapping exceeds the adoption criteria		 ✓ ✓ ✓			 ✓ ✓
	Introduce a simple boundary agreement form to allow adjacent owners correct title boundaries incorrectly located on the PRAI digital map (& switch off snapping)	✓	✓			
	PRAI to implement a system of accuracy/reliability attributes for registered boundaries - see 7.3 above where 5 levels are proposed. PRAI to accept mapping submitted for registration only where the accuracy level of the mapping submitted is higher than or equal to the accuracy level of the existing registered boundaries.		✓			✓
	Development and implementation of a standard schema for the description and classification of topographical features	✓	✓			
	Development of standards, specification and guidelines for precision boundary surveys & mapping	✓	✓	✓		

	Registration and regulation of surveying & mapping professionals for carrying out boundary surveys, and submitting mapping to the PRA	✓	✓			✓
	PRAI to be proactive in approach to resolving known discrepancies in its digital mapping. Co-operation of landowners should be sought by the PRAI to resolve issues	✓	✓		✓	
	Establish an independent Appeals Authority (with representatives from professional bodies and PRAI) to resolve discrepancies in the PRAI mapping where there is disagreement between the landowner and the PRAI	✓	✓		✓	✓
M	**Property Boundaries Associated with Dynamic Features**					
	A detailed clarification on the current legal realities, PRAI requirements and procedures with regards to: a) Changes to courses of streams & rivers b) Changes to the High Water Mark in coastal areas due to erosion or accretion c) Sudden natural horizontal movements of land due to landslide, subsidence, earthquake or flooding		✓ ✓ ✓			
	A simple procedure is required for rectifying boundaries in the case of watercourse changes due to natural causes		✓			
	Wider access to historical data in the PRAI archive by legal and surveying & mapping professionals in certain circumstances would assist in proposing logical solutions	✓	✓			✓
N	**Property Boundaries to the Centre of Public Roads**					
	A detailed clarification of the current legal status of land parcel areas computed to the road centreline is required. In particular, the issue of land physically ceded by a property owner (under planning regulations) but not yet taken in charge by the road authority requires clarification	✓	✓	✓	✓	
	The definition of what physically constitutes the centre of a public road for title mapping purposes needs to be defined, and procedures specified for surveying and mapping this feature. The use of OSI road centrelines is considered inappropriate	✓	✓	✓		✓
O	**Property Boundaries used for Land-Use Zoning and Planning**					
	A clarification is required defining the exact nature and legal status of the boundaries which planning authorities use on their land-use zoning maps	✓			✓	
	A clarification is required with regard to the legal definition of boundaries of parcels for which planning applications are granted.	✓			✓	

	PRAI title boundaries should be accepted by planning authorities as the most suitable boundary for both land-use zoning and grants of planning permission				✓	
	All State bodies should use the same base map rather than different map bases to improve integration between public databases. This should be based on the PRAI database of title boundaries, rather than the large scale OSi map base	✓	✓	✓	✓	
P	**Property Boundaries in Multi-Unit Developments**					
	PRAI should increase the standard required for mapping Multi-Unit Developments. A minimum scale of 1:50 for individual units and 1:200 for floor plans of individual buildings is proposed		✓			
	Recommended that the Measurement Code for floor area of Buildings published by CLGE (2012) and adopted by INSPIRE should be adopted for Multi-Unit Developments in Ireland	✓	✓		✓	
	Recommended that plans for Multi-Unit Developments be prepared and certified by competent professionals (architects & building surveyors)	✓	✓			
Q	**Additional Information**					
	Recommend a review of section 72 of the Act to significantly reduce registration exclusions for eConveyancing so that the titles register is definitive, conclusive and all encompassing. Recommend registration as burdens on the folio, such as the following: a) Designation as a protected structure b) Designation as a National monument c) Inclusion in the Sites & Monuments Register/Record of Monuments & Places d) Inclusion in Special Areas of Conservation (SACs) e) Inclusion in Special Protected Areas (SPAs) f) Inclusion in Natural Heritage Areas (NHAs)				✓	✓
	Improved standards of surveying and mapping accuracy, and annotation already recommended for boundaries should also apply to all easements to improve clarity	✓	✓			
	PRAI should review issuing title maps with and without special features. A single map showing all information is preferable		✓			
R	**Coordinates, Measurements and Monuments**					
	Develop standards and procedures using modern surveying methods to survey and supply high quality (+/- 0.1m) coordinates to the PRAI for registration of boundaries	✓	✓			✓

S	**Declarations of Identity**					
	Establish a working group representing the Law Society, Engineers Ireland, Irish Institution of Surveyors, Society of Chartered Surveyors and the Royal Institute of Architects of Ireland to develop a standardised good practice procedure based on international practice for submission to the professional bodies involved for adoption and implementation by their members. The new procedure should: a) Include a mandatory site visit to check that title boundaries on the PRAI map corresponds to boundaries on the ground b) Identify and document the physical features on the ground with which the title boundary is associated c) Identify and rectify any discrepancies and 'ransom strips'	✓				
	Consider if the registration of Declarations of Identity in the PRAI was desirable	✓	✓			✓
T	**Registration and Regulation of Professionals preparing and submitting maps to the PRAI**					
	PRAI to only accept mapping submitted and certified by registered survey & mapping professionals in following circumstances, i.e. a) Sub-divisions b) First registrations c) Rectification of errors Ultimately in all transfers of property	✓	✓			✓
	Insurance bonding of registered boundary surveyors to be required	✓	✓			✓
	Good practice guidelines for precise surveying & mapping of boundaries (jointly developed between professional bodies and the PRAI) and issued by the PRAI	✓	✓			
	Develop a course(s) at level 9 (masters, or post-graduate diploma) in boundary surveying and land registration for existing surveying & mapping professionals	✓	✓		✓	✓

D Access to PRAI Digital Map Data

a) Current Procedures

Since December 2012 copies of the digital polygon is supplied at a cost of €120. However, for these to be used, background OSi digital mapping, at a cost of a further €100, is required. PRAI supply paper copies of Title Plans of properties to landowners and professionals and copies of title plans for individual and multiple properties are supplied in digital form to public bodies. It is likely this facility was provided to comply with the requirements of "data and service sharing" under the EU INSPIRE Directive.

Paper copies of maps originally submitted for registration are only supplied to the landowner or their solicitor.

Currently, OSi supply A4 copies (or larger) of their digital data for purchase by the general public.

Digital submission of maps is permitted as long as it is accompanied with an exact paper copy (for lodgement in the instrument) - rules for digital submissions are outlined in pages 106 to 109 in the IIS green paper proposing reform of property boundaries

b) Difficulties being experienced

Most surveyors, engineers and architects capture and manipulate mapping information in digital form rather that working with paper, in order to:

i Significantly improve the accuracy of their work.

ii To improve the efficiency of their work process.

iii To effect cost savings for clients.

The lack of access to PRAI mapping information in digital form requires paper copies to be scanned, geo-rectified and in some cases re-digitised which:

i Necessitates additional costs for clients though this is unlikely in the current commercial climate so profits margins reduce instead.

ii Has additional cost due to duplication where information is re-digitised. This re-digitisation also degrades accuracy by introducing small human and technical errors when trying to re-create the same line digitally.

iii Increases opportunity for inaccuracy to creep into the work from scanning and geo-rectification. In most mapping systems geo-rectification requires a minimum of 4 coordinates. Only 2 coordinates are quoted on PRAI Title Maps

and the values seem to be rounded to the nearest metre which only permits the accuracy of geo-rectification to +/- 0.5m at best)

iv There are cases where a purchaser or an adjoining landowner would desire access to a particular historical title map for parcel extent clarification purposes, but they are precluded from access by the rule which limits access to the owner and his professional representatives.

c) Proposed Solutions

Professionals need access to PRAI digital vector mapping to carry out their duties accurately and efficiently. On-line download of vector boundary files from the www.landdirect.ie website or similar access to the coordinate vector data is recommended. It would be particularly useful if:

- Vectors for adjoining parcels should be included in the digital data supplied by the PRAI along with the vectors for the property in question;

Access to a raster (in pdf format) certified, dated and numbered digital copy of title maps on-line is recommended, if the vector map is not obtainable. PRAI paper or raster maps should contain coordinates in all 4 corners given to 2 decimal places (cm).

Access to historic title maps associated with previous transactions involving a land parcel should be available in digital form to interested parties, i.e. owners of contiguous adjoining properties and their professional representatives and bona fide potential purchasers and their professional representatives.

E Indicative Boundaries versus Defined Boundaries

It is possible for property boundaries in a land registration system to have a number of major attributes. For instance:

i **Definition** – The physical nature of the boundary can be accurately described and defined.

ii **Location** – The position of the boundary is capable of being located, in terms of its dimensioned relationship to permanent or semi-permanent features in the landscape or special survey monumentation, or in terms of coordinates based on a defined coordinate system which are capable of reliable repositioning on the ground.

iii **Agreement** – Defined boundaries can be formally agreed between the adjoining landowners as constituting the accepted boundary between their two properties. Once such an agreement has been arrived at, it should be possible to register these agreed boundaries with the PRAI.

It should be noted that current legislation (sections 86 to 88 of the Land Registry Act 1964) allows for boundaries to be registered as conclusive.

i Section 86 permits boundaries determined by the courts to be registered as conclusive.

ii Section 87 permits boundaries to be registered as conclusive if adjoining neighbours agree.

iii Section 88 permits the registration of all new boundaries as conclusive.

Of course it is equally possible for registered boundaries to have none of the characteristics specified above, as is the case with the current system of non-conclusive boundaries. In the context of land registration boundary mapping, the term "conclusive" is considered to be misleading, as it has intimations of absoluteness and perfection, which are often qualities difficult to associate with surveying and mapping. Degrees of precision or accuracy are concepts which are much more applicable. It is a reasonable principle that, when surveying property boundaries, where considerable monetary sums are at issue, that more precise and more accurate mapping should take precedence over mapping which is less precise and less accurate. This is a principle which should find common acceptance across the spectrum of government agencies, property professionals and property owners and it is the principle which underpins the following discussion and recommendations.

When Land Registry mapping was instituted at the end of the nineteenth century a decision was taken to base the mapping of land parcel boundaries on the existing Ordnance Survey, 25 inch and 6 inch, Cassini projection, County Series, mapping. This

mapping lacked sufficient precision and accuracy to allow the precise definition of the location of boundaries. It also mapped topographic rather than legal boundaries and the two did not always coincide. Perhaps for these or other reasons, the decision was taken to adopt a system of non-conclusive mapped boundaries. Under this system, the delineated boundary line on the Land Registry map is an indication only that a boundary exists somewhere in the general vicinity of this line but offers no evidence as to its exact nature or location. The fundamental problem with this system is that it is, at the same time, both too precise and not precise enough, for its purpose (see the main report for a full elucidation of this paradox). It should be noted in passing that, in contradistinction to the PRAI system, many European countries operate a system of cadastre, in which boundaries are accurately surveyed, monumented and definitively recorded for property valuation and taxation purposes, but also for property registration.

a) Current Procedures

Mapping for the registration of the sub-division of land parcels must be submitted on the most current and largest scale version of the OSi map available, or on a certified copy of the PRAI map. The boundary lines are delineated by the applicant and are accepted provided they do not conflict with previously registered boundaries. Although PRAI recommend the use of competent surveyors, no level of qualification or competence is actually required of those submitting such mapping and no checks are carried out by PRAI to verify the accuracy of the submitted boundaries.

As already stated, the boundary line on the map offers no evidence as to the nature of the boundary feature, nor does it offer evidence of the exact location of the legal boundary on the ground.

All boundaries shown on submitted mapping and incorporated into the PRAI records are non-conclusive boundaries, unless specific and relatively difficult procedures are carried out to register them as conclusive.

b) Difficulties being Experienced

There is a lack of understanding among the public regarding the current non-conclusive system and this creates much confusion for clients and often leads to the apportioning of blame for difficulties and errors to the professional advisor rather than to the shortcomings of the system.

Non-conclusive boundaries can lead to misunderstandings between different professionals involved in the registration process. Certain professionals may put ultimate trust in the written word and may be unaware of the accuracy limitations of survey technology and the application of the general boundaries rule.

Mapped boundaries, which are defined as non-conclusive provide no reliable evidence in situations where it is necessary to establish a boundary on the ground.

Non-conclusive boundaries can be the cause of boundary disputes because challenges are more easily issued due to lack of clarity in the PRAI records.

Non-conclusive boundaries place surveying and other land and property professionals in the invidious position of being approached by clients to resolve seemingly straightforward technical problems but being unable to assist because of the non-conclusive nature of the official state mapping.

Non-conclusive boundaries remain non-conclusive even in cases where considerable effort and expense may have been expended to resolve a boundary issue to the satisfaction of the land owners concerned. The same issues may arise at a future date, requiring the process to be repeated again unnecessarily.

It can be argued that an integral part of guaranteeing title is guaranteeing the precise land area to which that title applies. Non-conclusive boundaries fail in this respect.

In the absence of conclusive, or defined, boundaries, resort to the courts is the only option available in the event of a boundary dispute, if negotiation, mediation or arbitration fails. This is an extremely costly and wasteful procedure.

The inaccuracy of mapping, made acceptable by the state's use of the disclaimer of non-conclusive boundaries, allows conflicts of boundary location to occur on the PRAI index map, where no such conflict occurs on the ground. Conversely, conflicts can also occur on the ground, which do not appear on the PRAI map.

Surveying technology is now so advanced that boundary definition and surveying to very high levels of precision is possible. It is inefficient and wasteful to degrade mapping provided by such advanced systems to the level of data acquired by older or less accurate methods, simply to conform to the non-conclusive boundaries system.

The primary reason for declaring title boundaries non-conclusive, i.e. the inability to define and survey them to sufficient levels of precision, now no longer exists, due to modern surveying technology.

As set out in the principle enunciated in the preamble to this section and in the main report, more precise and more accurate survey and mapping should always take precedence over that which is less so. It is wrong, as is currently the case, to give mapped data, acquired by out of date or inaccurate methods and often by unqualified and incompetent persons, precedence over high quality survey data, acquired using

precision equipment, by highly qualified professionals. However, there is, of course, a need to ensure that such high quality data conforms to a defined set of standards.

c) Proposed Solutions

It is proposed that improvement of the accuracy and completeness of the boundary record should be one of the principal aims of the PRAI in relation to its title mapping.

It is accepted that the current system based on OSi mapping with the disclaimer regarding non-conclusive boundaries is the reality, but due to the serious inadequacies of this mapping for the purpose of title boundary registration, this should not preclude the possibility of incremental improvement over time by using modern methods.

It is recommended that modern surveying and mapping methods have removed many of the reasons which made conclusive boundaries unfeasible in the past, and that as a result, PRAI should now instigate a policy of encouraging the declaration of defined boundaries, in the interest of their customers right to clarity and state guarantee, not alone to their title of their property but also to the boundaries and extent of that property.

It is recommended that PRAI should encourage the use of precision survey in all mapping submitted for title registration. To this end, title boundary mapping submitted in cases of first registrations, sub-divisions, error correction and boundary dispute resolution, should be to required standards and carried out by expert and registered practitioners. This coupled with a simplified form of property owner agreement would make such boundaries capable of being rendered defined.

It is recommended that PRAI introduce a simplified form of boundary agreement, allowing property owners, only in the circumstances where a precision survey is being carried out, to agree the description and definition of the title boundaries, thus allowing the four components of a defined boundary to be registered, namely – a) clear description of the physical features constituting the boundary, b) clear definition of the location of the title boundary relative to these physical features, c) precise surveying and mapping of these features to a level of accuracy and precision which allows their subsequent verification and re-establishment on the ground and d) a formal agreement by the adjoining property owners of their acceptance of the boundaries so defined (see Appendix U for a full exposition of a simplified form of boundary agreement between adjoining property owners).

In proposing a solution cognisance should be taken of the principles outlined in the introduction to this section and in the main report regarding levels of precision. A protocol should be implemented which identifies a clear hierarchy regarding title map boundaries, based on the precision of their derivation. A method of labelling such

mapped boundaries, so that this method of derivation is clear, is also necessary. Five levels of precision can be inferred (see 7.3 above):

i Survey of a specific land parcel by a competent and registered surveyor using precision equipment, for the express purpose of determining and mapping the title boundaries of a land parcel. For this data to become part of a publicly accessible and guaranteed data set, it would be necessary for strict rules regarding qualification and registration of practitioners to be in place and also strict guidelines as to the methodology and standards to be used in carrying out the survey. This process of precision survey would embrace all attributes of a title boundary, namely description and definition of its physical features, the definition of the title boundary relative to these features and its accurate location by means of ITM coordinates and accurate mapping. In circumstances where a precision survey would be required, the obtaining of agreement of the common boundary between adjoining land owners, so defined and so located, as the boundary of their properties would not pose a major problem particularly if a simplified and inexpensive form of agreement was instigated (see section 4 on basic assumptions above). This mapped boundary, which incorporates the higher level of precision and accuracy, should replace boundary lines on the PRAI title boundary mapping which have been surveyed to a lesser degree of precision. In effect a title boundary determined to this higher level of precision coupled with boundary definition and boundary agreement, would constitute a defined boundary.

ii An improved OSi map, in which topographical features, which are indicated by lines on the maps, are identified as to their nature. This should be coupled with an improved level of accuracy of topographical feature coordinates in the OSi maps to meet a new defined set of national standards. Although it is recommended that precision boundary survey should become the norm in the longer term, because of the inability of OSi mapping to meet the necessary standards due to its scale and lack of sufficient precision, the improvement of the accuracy of the OSi mapping in the meantime would be beneficial, since so many existing registered boundaries are associated with the OSi features. Three distinct levels of precision can be associated with OSi mapping, related to their published scale.

The acceptance of annotated boundary lines on a PRAI certified copy map or an OSi map sheet by an unskilled and unqualified applicant should be discontinued.

F Ordnance Survey Ireland Mapping

a) Current Procedures

Many properties were registered using the 19th century OSi mapping at scales 6" and 25" to 1 mile on separate Cassini projections for each County. This mapping was primarily produced for taxation and land registration purposes. The positional accuracy of this mapping does not meet 21st century accuracy needs due to projection inconsistency along County boundaries and inaccuracy of 19th century survey methods, compared to modern methods.

OSi replaced this old mapping with new surveys at scales of:

i 1:1,000 of urban areas surveyed from 1967 to circa 1993

ii 1:2,500 of sub-urban & peri-urban areas surveyed from 1992 to 2004

iii 1:5,000 of rural areas, surveyed from 2001 to 2005

However, these three surveys used different specifications, so a harmonisation programme (PRIME1) was executed before delivery of the new mapping on the ITM coordinate reference system to the PRAI to digitise their boundaries (OSi are currently implementing a quality enhancement programme (PRIME2) for this mapping, which is due for completion in summer 2013). Registered boundaries on the old Land Registry paper maps were moved during the PRAI digital mapping project to be associated with features on the new OSi digital maps. Section 73 of the Registration of Deeds and Title Act 2006 gives precedent to the new digital boundaries over their positions on older paper maps.

If professionals discover appreciable positional discrepancies in OSi features, they can report the error to the OSi via custserv@osi.ie and documents clarifying the discrepancy should be attached. OSi will examine the feature and correct it if the discrepancy is confirmed. However, the corrected feature is currently supplied to the PRAI in updates of OSi mapping at agreed intervals, which are not publicly known.

b) Difficulties being experienced

As stated and demonstrated in the main body of this report, OSi mapping, at the scales at which it is provided and the methods by which it is surveyed, is inadequate for the recording of accurate title boundaries. In addition to this basic failing, professional respondents to the survey itemised a series of shortcomings which are listed below:

i Complete properties have been omitted on OSi maps because of misinterpretation of aerial photographic data.

ii Houses, in particular are depicted as being larger than they actually are, due to roof lines being digitised rather than walls at ground level.

iii There are inconsistencies between line detail where two OSi maps meet.

iv Old ditch lines under heavy overgrowth are often misinterpreted when surveyed using aerial photography, due to difficulties identifying features under shadows and the indistinct nature of the physical feature.

v The OSi map provides no indication of the nature of the feature surveyed and depicted nor, in the case of an amorphous feature, does it indicate which part of the feature is being depicted.

vi Detail surveyed by modern precision methods often misaligns with OSi detail when the maps are overlaid, indicating uncertainty and inaccuracy in the OSi map.

vii The accuracy of features on OSi maps has in cases been found to exceed the stated accuracies claimed by OSi. In many cases the old 25-inch County Series mapping is more reliable than the digital 1:1000 mapping.

viii Many respondents considered OSi mapping to be over-priced.

c) Proposed Solutions

The main body of this report has argued cogently for a hierarchy of surveying and mapping accuracy to be incorporated into the mapping used by PRAI, with detail at different levels of precision being tagged and colour coded accordingly. If such a system were implemented it would greatly reduce the impact of the errors and flaws in OSi mapping as it affects PRAI mapping. This is not to say that OSi mapping should not be considerably improved from its current standard.

It is recommended that OSi mapping specification should be improved in the following areas:

i Topographical features delineated on OSi mapping should be defined as to their nature and extent.

ii Detailed survey and mapping standards should be published, based on international norms, to be promulgated as national standards by the National Standards Agency of Ireland, to which OSi mapping would be required to conform. Validation statements should be compiled and published for tranches of mapping, covering the OSi national coverage, indicating how such mapping conforms to the stated standards.

iii Efforts should be made to overcome the interpretational shortcomings of aerial photography, by more rigorous field checking on the ground.

G PRAI Mapping – Accuracy

a) Current Procedures

The PRAI digital mapping project and the www.landdirect.ie portal for access to the PRAI mapping database has significantly improved the service for delivering PRAI maps to property professionals. Property boundaries are now shown on the new PRAI maps using thin red lines rather than outlined in red using thick markers as in the past. Also the extension of compulsory first registration to all counties to speed up completion of registration of all land in the State is an important step forward to ensure one comprehensive system will be available to manage all land within the State.

The fact that this new PRAI digital mapping is on the ITM coordinate reference system for Ireland is significant because it provides mapping professionals with the ability to survey boundaries using GPS equipment to centimetre accuracy. Information from new boundary surveys can now define locations far more accurately than the PRAI maps and the OSi maps upon which they are based. There is now a need to adopt modern standards for regulating new surveys and using these standards to integrate this high quality information into the PRAI digital mapping.

The OSi digital maps on which these new PRAI maps are based were produced using modern surveying methods, but not to any defined standard (organisational, national, or international). The OSi has published a number of accuracy statements for their mapping. The first statement published in 2005 (Greenway & Curran) supplied the information in RMSE format (root mean square error), which is the most common method used internationally for quoting map accuracy and is also used by the EU INSPIRE Directive. However, the points tested to quantify this accuracy were points of hard detail (buildings, walls, corners of kerbstones, etc) and not a random sample which should also include soft detail (bushy features along property boundaries) in order to provide a true statistical result. Therefore, these results are statistically skewed, and overstate the case with regard to accuracy of PRAI property boundaries.

OSi Map Scales	OSi Accuracy Statement 2005	International Norm for Accuracy = 0.2mm x map scale
1:1000	RMSE = ± 0.60m	RMSE = ± 0.20m
1:2500	RMSE = ± 0.69m	RMSE = ± 0.50m
1:5000	RMSE = ± 1.22m	RMSE = ± 1.00m

Currently, the PRAI does not accept responsibility for accuracy of boundaries registered in their digital mapping. Currently the landowner is responsible for the accuracy of boundaries submitted for registration, and other than a conflict check with previously registered boundaries (which may itself be incorrect), no accuracy checks are carried out by the PRAI on data submitted and no defined accuracy standards

apply. If a LR boundary is identified as being incorrect, PRAI recommend the landowner to contact OSi to correct it, or get the adjoining owner's agreement, or go to court to resolve the issue.

b) Difficulties being Experienced

In some cases, the old, paper based LR maps can be more accurate than the new digital maps. Changes made during the digital mapping project has led to mapping errors, which may have been based on incorrect assumptions, or interpretations of OSi mapping of inadequate precision. In many cases the new PRAI digital mapping is significantly in error when compared to boundary surveys carried out by property professionals using modern surveying equipment, or previous correct representations on paper folio maps. The current practice of unilaterally amending boundaries with regard to OSI maps (during the digital mapping project and on receipt of revised OSi maps) is not appropriate without formalised accuracy checks and results in perpetuating discrepancies in the new PRAI digital mapping.

The new PRAI digital mapping suffers from a range of problems which include:

i Registered boundaries obviously in error - drawn through buildings on adjoining properties.

ii In cases, where new housing is contiguous along a road frontage, the boundary locations of all parcels can be in error, having been offset by an error in the boundary location of the first sub-division. In some cases this has been corrected in the digital mapping project using the adoption criteria, but in many more cases, the error was larger than the adoption criteria and the problems remain.

iii OSi maps regularly show one line when there are multiple features in close proximity on the ground. Two issues arise here a) the OSi digital map does not contain attributes for the line on the map to distinguish which feature has been surveyed (although property professionals can make assumptions on the basis of the survey techniques OSi employ), and b) PRAI adopt the OSi line if within the PRAI adoption criteria, even where the title boundary is coincident with a different feature than the one shown on the OSi map.

iv The PRAI operate adoption criteria to allow them to alter (snap) a registered boundary onto an OSi feature. Three issues arise here a) in many cases small errors in the paper maps were corrected by associating the registered boundary with the positions of features on the new OSI maps, and b) the snapping of title boundaries to OSi features in some cases has introduced errors that previously did not exist, and c) in many cases the errors involved were larger than the adoption criteria used, so these issues were not corrected, even though the correction may have been warranted.

v There are cases, where title boundaries have been registered offset from features not yet constructed. However, the use of the adoption criteria during

the digital mapping project and on receipt of revised OSi maps has snapped these title boundaries to new OSi features when they should more correctly be offset from them.

vi If a boundary submitted for registration conflicts with an existing registered boundary, the PRAI will reject the new registration. The PRAI will accept any boundary if it is not in conflict with an existing registered boundary and in many cases in the past incorrect boundaries have been adopted under this rule. This rule should now be replaced with a rule which compares the accuracy standard of the submitted boundary with the accuracy standard of the existing boundary. A number of levels of accuracy will be necessary to manage the PRAI digital mapping databases and registration should proceed when the accuracy of the boundary submitted for registration is at a higher level than the existing registered boundary.

vii Buildings shown on the new digital title mapping are regularly 10 to 15% larger in area than they are in reality because OSi surveys its maps using aerial photography which gives a building roof-line rather than the building footprint. This is an OSI issue rather than a PRAI issue, but it should be possible to attach an attribute to buildings in the PRAI digital mapping to distinguish which category it is. This information would be very useful to clarify critical clearances between buildings and property boundaries in certain situations.

The primary issue is that OSi mapping (in its current form) on which the PRAI digital map is based is only good enough to identify the location of properties. It is not reliable enough for recording title boundaries because of:

- Uncertainty of what feature on the ground the OSi line represents (no attributes);
- Uncertainty on the positional accuracy of OSi features due to the lack of defined accuracy standards;
- The scales of OSi maps are not large enough to secure clarity and accuracy in many instances, especially in urban areas.

The second main issue is that the current PRAI mapping procedures do not help to identify and resolve problems in the PRAI digital mapping. In some cases the PRAI has refused to correct mapping accuracy issues of less than 1 to 2 meters, even though high quality survey information was available, because they consider that high accuracy is not required in their non-conclusive mapping system.

The third main issue is the need to ensure PRAI maps are consistent over time when property boundaries on the ground have not changed. The lack of defined accuracy standards for the revision of OSi maps and the adoption of the features in these OSi maps by the PRAI using only their adoption criteria has the potential for property

boundaries to be inconsistent over time. The PRAI mapping procedures should ensure registered boundaries are consistent over time.

c) Proposed Solutions

The PRAI must take on the responsibility of managing the accuracy definitions of the property boundaries in its mapping database (the landowner retains the responsibility for the accuracy of information submitted). The benefits of this policy change far outweigh the cost of developing and implementing new standards for surveys and mapping within a revised version of the Land Registration Rules 2012 more appropriate to modern surveying methods and digital mapping.

It should be possible to switch off the snapping of certain registered boundaries to OSi features in circumstances where the boundaries have been properly defined.

Two options are proposed:

Option 1: Boundaries are defined on the ground between adjoining neighbours using boundary agreements and then they are surveyed at an appropriate high standard of accuracy (scale 1:500 and at a precision of +/- 0.1m), so that the map is capable of reliably identifying the boundaries and the extent of the property involved. The detailed map from this boundary survey is used in the contract for transfer and is submitted to the PRAI and attached to the folio (only boundaries defined in this way would have a map attached to the folio). The PRAI index map remains as an index map and is not updated using the more detailed information. This option requires significant procedural changes and the adoption of standards externally by property professionals and minimal changes within the PRAI.

Option 2: Similarly boundaries are defined on the ground between neighbours and a high quality detailed map of the boundaries is prepared along with the boundary agreements. When this information is submitted to the PRAI, the detailed map is again attached to the folio, but in this case the high quality survey information is used to correct and update the PRAI index map. This will need a system of reliability tags to be introduced to allow the high quality information be integrated into the PRAI mapping database and it will also require the PRAI to manage the accuracy of registered boundaries. These reliability tags would allow property professionals have confidence in using PRAI mapping, rather than the opposite with the current non-conclusive disclaimers. The benefit of this approach is that the PRAI mapping database would be continually upgraded with high quality information into the future and would over time become a reliable national mapping database.

This high quality information could also be used by OSi to update their mapping if appropriate defined surveying & mapping standards were used and validated. This means that surveys from hundreds of property professionals around the country could be used as a significant new source of high quality data by the OSi. Significant benefits would also accrue to OSi mapping in the long term.

Circumstances under which such a survey would be required should be set out, initially involving all sub-divisions, error rectifications and boundary dispute resolutions but ultimately involving all transfers including first registrations.

Finally, the accreditation of competent and qualified property professionals in the form of a register is required, together with clear standards for surveying and mapping to manage the collection and validation of this high quality information for the State.

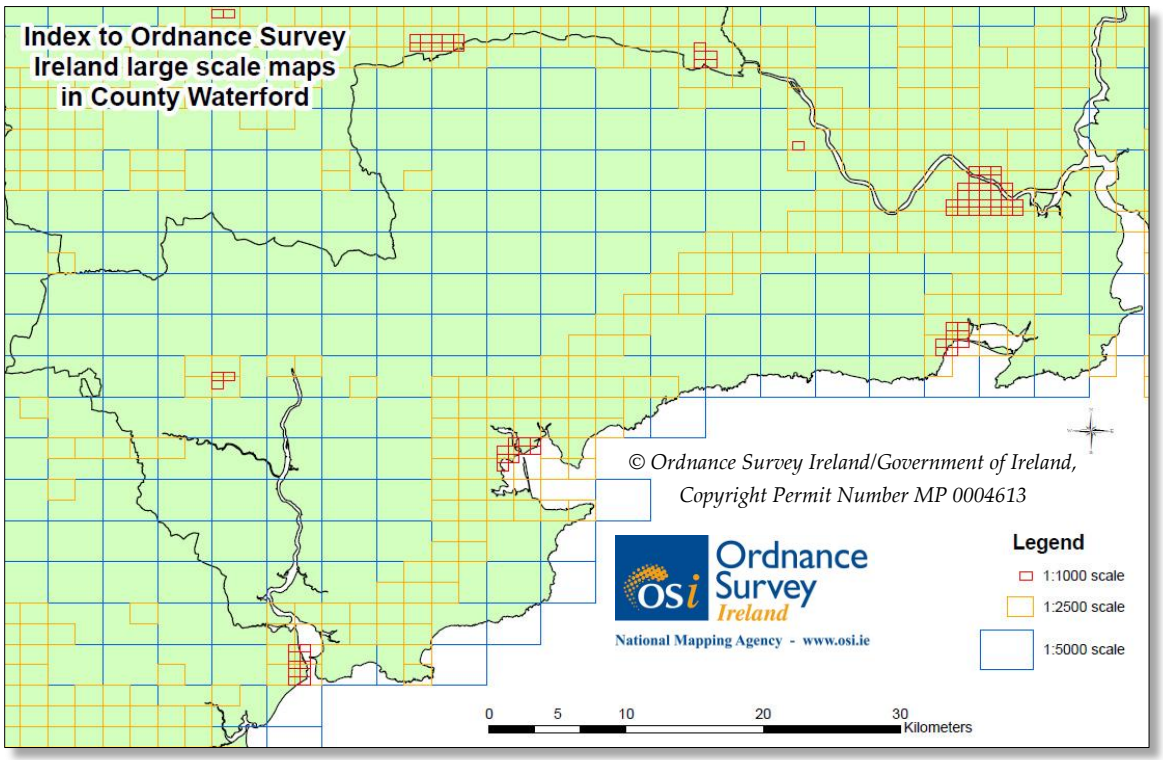
H PRAI Mapping - Scale and Page Format

a) Current Procedures

The PRAI is obliged to use the latest version of the OSi's mapping as the base mapping for their boundary database. Currently the OSi supply their maps at three different scales - 1:1,000, 1:2,500 and 1:5,000. Each of these scales relate to a different degree of precision and accuracy. The international norm for this relationship is 0.2mm (width of finest line on the map) multiplied by the map scale. The OSi published the accuracy of their maps in 2005 (Greenway & Curran) as: (*RMSE = Root mean square error = $\sqrt{M[(x - x_1)^2]}$.

OSi Map Scales	OSi Accuracy Statement 2005	International Norm for Accuracy = 0.2mm x map scale
1:1000	RMSE* = ± 0.60m	RMSE = ± 0.20m
1:2500	RMSE = ± 0.69m	RMSE = ± 0.50m
1:5000	RMSE = ± 1.22m	RMSE = ± 1.00m

The mapping of urban areas is at the larger scale of 1:1000 to provide more detail and a higher accuracy for areas with higher land values and more complex topographic detail. Correspondingly, the 1:5000 maps of rural areas have less detail and are less accurate, and the mapping of suburban and peri-urban areas at 1:2,500 falls between these two extremes. The following index map of Co. Waterford illustrates the typical distribution of OSi mapping at the different scales:



In most urban areas these new OSi scales are larger than the scales used for the older paper maps – 1:1,000 replacing 1:2,500 and 1:1,250. In rural areas, however, the process has been reversed. The official scale has been reduced from 1:2500 (25" to 1 mile approx.) to 1:5000. This has led to degradation in the precision of title boundaries, originally delineated on old County Series 1:2,500 mapping, but now transferred to the less precise 1:5,000 mapping.

Currently the PRAI only supply their maps on A3 paper which in some cases can mean multiple maps for one folio. This is a valid procedure, provided that these maps are overlaid with a grid so that adjoining A3 sheets can be accurately related and a small scale index map is provided. Neither of the latter two requirements are currently provided.

PRAI regularly issue the new ITM Title plans at scales larger than the original OSi scales available for the specific area. Enlarging mapping from its original design scale can be misleading. As already mentioned above, the scale at which a map is published is an implicit statement of its precision. When such a map is enlarged, either photographically or by plotting the coordinates at a larger scale, the inherent accuracy does not change, but the larger scale gives the false impression that the mapping precision is commensurate with the larger scale. A clear statement of the original design scale and the map precision is necessary on all enlarged mapping and should be integrated with the map sheet. This is not current PRAI procedure.

Title plans, Special Registration maps, PRAI compliant OSi mapping and other mapping issued by PRAI as a result of official map searches are, in many cases, at too small a scale to allow the clear intention of the property owners to be ascertained. As clearly set out in section 5 above, a map scale of 1:500 is the minimum scale which allows boundaries to be delineated to an acceptable accuracy and clarity.

The facility with which PRAI mapping can be scanned, geo-registered, rectified and enlarged, or the base OSi digital mapping zoomed for viewing at ever larger scales, effectively breaks the link between paper map scale and precision inherent in the mapping. Inconsistencies and errors can now become apparent, which went unnoticed on the original paper map.

The adoption criteria currently used by the PRAI (2007) are as follows:

Scale of PRAI Paper Map	Distance on paper map in mm (pen width = 1mm)	Rural Agricultural Land (individual plots of 0.4 hectare or more)	Urban, per-urban, rural & commercial (individual plots of less than 0.4 hectares)
1:10560	1mm = 10.56m	± 20.00m	
1:2500	1mm = 2.50m	± 5.00m	± 3.00m
1:1250	1mm = 1.13m	± 2.50m	±2.50m
1:1056	1mm = 1.06m	± 2.00m	± 2.00m
1:1000	1mm = 1.00m	± 2.00m	± 1.00m

These criteria only take cognisance of original OSi map scales and provide no guidance for dealing with mapping supplied to PRAI at larger scale and at much higher precision, in the form of precise surveys carried out by competent professionals.

The coordinates on corners of PRAI maps (Title Plans, Special Registration Maps, and Official Map Searches) are stated as integers in metres. It is unclear whether these values have been rounded to the nearest metre or whether they represent the precise value of the corner. This should be explicit.

c) Proposed Solutions

It is recommended that all PRAI paper mapping involving title boundaries should be issued at a standard scale of, at least, 1:500, which is the minimum scale at which title boundaries and topographic detail can be delineated to an acceptable level of precision and accuracy (see the main report for a full elucidation of this matter). It is understood that larger scales may be required in certain circumstances.

Boundaries shown on such PRAI mapping should be clearly colour coded to indicate the scale of map from which they were derived, or the precision with which they were surveyed (again see the main report for fuller details). Details of this colour coding should be printed on all maps issued together with caveats regarding the relationships between precision, accuracy, scale and survey methods.

It is recommended that PRAI should standardise on paper map formats of A4 and A3 for most paper mapping issued. In the context of map format, the PRAI produce title maps at a maximum format size of A3. In relation to map formats the following should be borne in mind: at a scale of 1:500, DIN paper formats would cover the following land areas allowing a page margin of approximately 15mm:

Format	Paper Size	Map Area Size	Ground Dimension	Area
A4	297 x 210 mm	260 x 180 mm	130m x 90m	1.17 Ha
A3	420 x 297 mm	290 x 260 mm	195m x 130m	2.54 Ha
A2	596 x 420 mm	520 x 290 mm	280m x 195m	5.46 Ha
A1	840 x 596 mm	580 x 520 mm	405m x 280m	11.34 Ha

Map reproduction costs increase as the page format increases. There is an economic imperative to keep map format to a maximum of A3 if possible. There is also an issue of handling convenience. The A3 format giving a map area of 195 metres by 130 metres is more than adequate to cover both urban and rural house parcels on a single sheet. Larger land parcels could be catered for by a small scale index map with sectional A3 sheets.

A 20m ITM coordinate grid (40mm at scale of 1:500) should be overprinted on all PRAI issued maps to allow distortions of scale due to variability in paper expansion or map

reproduction methods to be checked and corrected. ITM coordinate values, to centimetre precision, should be stated for 2 grid intersection points at opposite corners of the map sheet. A scale bar should also be included on all maps.

Where land parcels cover an extended area, requiring multiple A3 sheets at 1:500 scale, or larger, an index map at smaller scale should be provided.

I PRAI Mapping – General

This section covers general mapping issues together with administrative difficulties and difficulties associated with accessing the PRAI's www.landdirect.ie website, not covered in other appendices.

a) Current Procedures

Currently PRAI only supply paper copies of the title plans of properties to landowners and professionals. Digital boundaries, for individual properties, are available at a cost of €120. Copies of Title Plans for individual and multiple properties are supplied in digital form to public bodies. It is likely this facility was provided to comply with the requirements of the EU INSPIRE directive. Paper copies of maps originally submitted for registration are only supplied to the landowner or their solicitor.

Digital submission of maps is permitted so long as it is accompanied with an exact paper copy (for lodgement in the instrument) - rules for digital submissions are outlined in pages 106 to 109 in the IIS Green Paper

PRAI folio and mapping data may be accessed and downloaded via the www.landdirect.ie website for a fee. This data comprises raster data and there is only very limited access to digital vector data.

b) Difficulties being experienced

Most surveyors, engineers and architects capture and manipulate mapping information in digital form rather that working on paper:

i To significantly improve the accuracy of their work.

ii To improve the efficiency of their work process.

iii To effect cost savings for clients.

The lack of access to PRAI mapping information in digital form requires paper copies to be scanned, geo-rectified and in some cases re-digitised which:

i Imposes additional cost due to duplication where information is re-digitised. This re-digitisation also degrades accuracy.

ii Increases opportunity for inaccuracy to creep into the work from scanning and geo-rectification.

A number of problems have been encountered in accessing the PRAI www.landdirect.ie interface.

i Difficulty in carrying out a map based search as opposed to searching by owner name or folio number.

ii Lack of pre-warning that no map may be attached to the folio being purchased, i.e. the applicant seeking a map may only become aware that there is no map available after he has paid the fee.

iii The absence of adjoining parcel boundaries on down-loaded title maps.

iv Long delays in providing special features mapping.

v Interruption in the www.landdirect.ie interface, often occurring in the middle of a transaction, causing the customer to forfeit a fee.

c) Proposed Solutions

Professionals need access to PRAI digital vector mapping to carry out their duties accurately and efficiently. On-line download of vector boundary files from the www.landdirect.ie website is recommended.

It is also recommended that:

i Access to earlier versions, in the form of scanned copies of title mapping, is made available to allow professionals to analyse the evolution of boundaries and parcels over time.

ii A critical review of the Land Direct website is carried out to improve reliability. In particular to ensure that service is not interrupted during a transaction, or if it is, that the customer is not charged and secondly, that the customer is warned prior to the completion of a transaction of any lacunae in the information being provided, before he has committed and paid a fee.

J PRAI Mapping – Issues Completed with Digital Mapping System

a) Background

This section has been included because the issues mentioned here were raised by the respondents to the survey. It is acknowledged that these problems have already been dealt with effectively by PRAI and they are to be commended for the following:

i. The provision of the www.landdirect.ie portal is considered to be a worthwhile initiative and comparable to similar systems in Europe;

ii. The adoption of the new ITM coordinate reference system by the PRAI for their digital mapping was an excellent choice for the future;

iii. The completion of the digital mapping project on time;

iv. The extension of compulsory first registration to all Counties to speed up the completion of registration of all land in the State.

This section has been included for reasons of completeness.

b) Difficulties being experienced

There is some lack of awareness on the "in-lining/out-lining" issue with regards to PRAI mapping. Boundaries were outlined in a thick red line in the old paper mapping system, but in-lining or outlining is not used in the new digital mapping system, where the centreline of the relevant boundaries are plotted using a thin red line.

PRAI maps having a mixture of imperial and metric scales can lead to confusion and has the potential to cause confusion to by users. The migration of all base mapping to metric scales is proposed.

All PRAI mapping should be standardised and tied into using one national mapping system. Ireland's new coordinate reference system (ITM) is the preferred choice rather than the older Irish Grid (IG75) because it is more modern, more accurate and is GPS compatible. This permits the PRAI to define boundaries using ITM coordinates.

The conversion of PRAI mapping to digital form should be completed quickly to facilitate the adoption of digital methods by practitioners and users as soon as possible. The conversion was completed by the PRAI in July 2011 in a 5 year period.

The Land Register should be completed by introducing compulsory registration for all Counties with the eventual closure of the Registry of Deeds. Compulsory registration was extended to the last two Counties (Dublin & Cork) on 1st June 2011 for all property transfers. It is estimated that between 2 to 300,000 properties are still registered in the

Registry of Deeds, so this migration to Land Registry will take some considerable time still.

Some maps attached to deeds in the Registry of Deeds are more than one hundred years old and can be very difficult to relate to an up to date map of the same area, and sometimes title maps are not available for unregistered properties. The move towards registration of all properties in Land Registry should be fast tracked. Additional triggers will also be needed to complete this migration to Land Registry for the migration of properties which would not normally be transferred.

c) Proposed Solutions

Most of these issues have already been resolved by the PRAI digital mapping system and no further action is required.

K Extent/Area of Parcels and Properties

The area of any given parcel of land is its actual area on the ground. Measurement of this area involves surveying and the closeness of the measurement to the reality depends entirely on the precision of the surveying method. A map is merely the graphical representation of a survey and its accuracy is similarly dependent on the precision of the surveying method, and additionally the scale at which the map is printed or displayed. For the area of a land parcel to be defined accurately two conditions must be fulfilled:

i The boundaries must be clear and obvious on the ground and defined degrees of tolerance must be specified to match the precision with which the boundary features, by their nature, can be identified for measurement.

ii The technology and methodology used to carry out the measurement must be specified and agreed degrees of tolerance specified to conform to that precision.

It follows that no absolute value for area is possible and that area values can only be defined in terms of a computed value +/- a given tolerance.

The above reality has special relevance where parcel or property area may be the basis for valuation, potential property tax assessment, as a trigger for social housing on development land or as a basis for calculating agricultural aid or subsidies or any other procedures where land area bears a relationship to monetary value. Clear rules need to be defined to ensure a fair and agreed area value in all such cases.

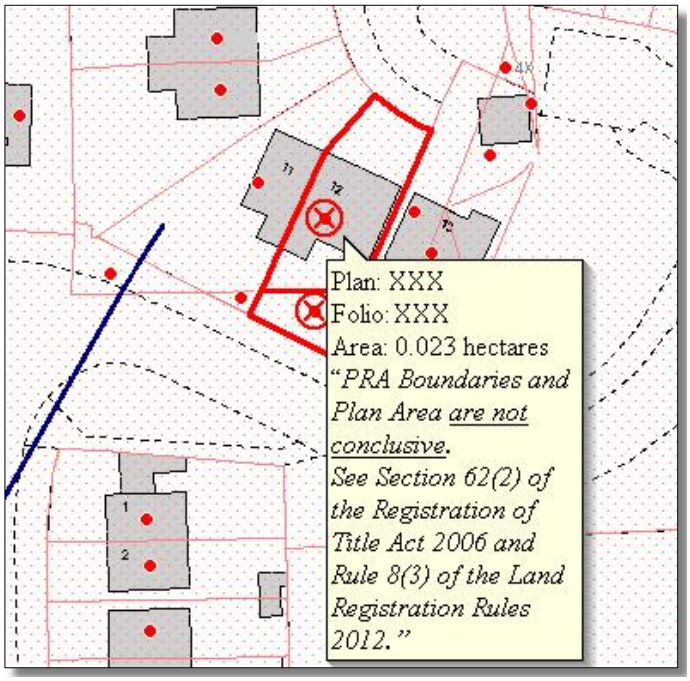
A map of a land parcel is a graphical representation of that land parcel. The characteristics of such a map, for instance scale, the degree of generalisation involved, coordinate values of boundary change points, identification of boundary features mapped, etc. are related to the processes by which a map is produced, and the judgements made, and decisions taken in its production. Areas measured from the map, either by scaling from a paper product or by coordinate computation from a digital product, may differ considerably from the reality. However, area values shown as labels on title maps are independent of the cartographic geometry of the map on which they appear and their derivation must be indicated explicitly, either in the general description of the characteristics of a particular map series, or in the legend or footnotes of a particular map.

It would seem clear that in all cases where monetary value is involved (sale and purchase, taxation, provision of subsidies or social housing imposition etc.) the area of a land parcel should be that which is computed to the highest degree of boundary definition and the highest degree of technical precision available and relevant to the

circumstances. What these processes should be would vary from case to case. For instance, the degree of accuracy required for the fair valuation of agricultural land would be considerably lower than that required for high value urban land. Equally, in the absence of precision parcel surveys, the values indicated by OSi or PRAI would stand, unless land owners felt the need for higher precision in certain circumstances. However, the rule should still be **- the higher precision definition of parcel area should take precedence, in all cases, over a lower precision definition.**

With this principle in mind we can examine the current reality regarding the parcel areas displayed on the OSi and the PRAI documentation.

a) Current Situation (Procedures)



Areas on Land Registry maps are non-conclusive from a legal perspective. Land Registry folios contain a note that neither the description nor the title plan is conclusive as to the extent of the area of the property. In the recent past Land Registry have adopted a practice of not including the area on new folios being opened, and no reasons have been given for adopting this new practice. The area of the property is now supplied (since autumn 2010) by picking the seedpoint of the property in www.landdirect.ie. (In the case of older folios, this value may not match the value shown on the folio). This new procedure was introduced to ensure compliance with the requirements of the specifications for cadastral parcels under the EU INSPIRE Directive. The size displayed is computed using the coordinates of the property boundaries in the PRAI digital mapping database. The size is displayed to 3 decimal places of a hectare (accuracy = 10 sqm). This is anomalous as the OSi mapping from which the PRAI map is derived only give values to 2 decimal places (100 sqm).

b) Difficulties being Experienced

Purchasers and vendors of property are most interested in the land area of the property because it gives them a measure of the value of property in relation to its area. The purchase price in many contracts may be based on a price per hectare or per

square metre. In all cases where an assessment of value related to area is required, there is a need for a reliable and definitive source of parcel area information.

Areas stated on folios and areas on Land Registry maps often do not match each other, nor do they match the areas stated on OSi maps and in many cases, they do not correspond with areas computed from a precision site survey. None of these areas currently complies with any identifiable standard. This situation is exacerbated further in those cases where boundaries are dynamic in nature (streams, rivers, high water mark, etc.).

c) Proposed Solutions

In proposing a solution cognisance must be taken of the principles outlined in the introduction to this section. A protocol needs to be implemented which identifies a clear hierarchy regarding land parcel area values, based on the precision of their derivation. A method of labelling such values so that this method of derivation is clear for each value is also necessary. Three levels of precision can be inferred:

i Survey of a specific land parcel by a competent and registered land surveyor using precision equipment, for the express purpose of defining and mapping the boundaries of the land parcel and defining its area to an adopted standard. For this data to become part of a publicly accessible and certified data set, it would be necessary for strict rules regarding qualification and registration of practitioners to be in place and also strict guidelines on the methodology to be used in carrying out the survey.

ii An improved OSi map, in which topographical features, which are indicated by lines on the maps, are identified as to their exact nature together with a clear indication of which of these are bounding lines, indicating the land area for which an area value is given. This could involve the reintroduction of areas braces, and/or the highlighting of features bounding the area for which an area value is indicated, in contradistinction to other features, i.e. area boundary features could be shown in black and other features in grey. This should be coupled with an improved level of accuracy of topographical feature coordinates in the OSi maps to meet a new defined set of national standards. Parcel areas derived from this new mapping should indicate a precision commensurate with the standards achieved by the number of decimal places used.

iii In terms of PRAI mapping it should be borne in mind that topographic features, as indicated on OSi mapping, are not necessarily identical with legal boundaries. Where such boundaries do coincide in terms of definition and location, the PRAI should use the land parcel area value supplied by the OSi. To comply with INSPIRE requirements trailing zeros could be added to the

decimal, provided it was clearly stated that the number of decimal places was not an indication of the precision of the measurement.

Where there is a difference between the registered legal boundary and the OSi topographical feature, the PRAI area should be computed using PRAI land parcel boundary coordinates.

In cases where parcel surveys are carried out by suitably qualified and registered persons (as suggested in "i" above - see Appendix T for a fuller exposition of this matter) and are submitted to PRAI as part of an agreed registration procedure, the area value derived from such survey should be displayed on the PRAI parcel index map in preference to either the OSi or PRAI derived value.

It is suggested that colour coding could be used in displaying these three different types of area values. This would provide users with a clear indication of the relative reliability of each area value type and the standard to which it has been derived.

Areas displayed on the PRAI digital map should take precedence over the areas quoted on the folio, since the mapping should contain the most current and most accurate survey information for the parcel.

L Rectification of Mapped Title Boundaries

a) Current Procedures

What follows relates to the rectification of the map record of title boundaries. The PRAI map record requires rectification on two main grounds:

i To correct errors or anomalies introduced by the process of aligning title boundaries shown on existing title maps in the PRAI archive, to topographic boundaries shown on the new OSi ITM mapping.

ii To correct errors due to inaccurate mapping, submitted in the past by applicants for first registration or sub-division and to improve positional accuracy of registered boundaries.

The PRAI are required by statute to use the OSi large scale maps (at 1:1000, 1:2500 & 1:5000 scales) as their map base and under the non-conclusive boundary system the PRAI associate registered boundaries with features on these OSi maps. To manage this association process the PRAI have formalised their adoption criteria (Table 1, section 5, Digitising Protocol, PRAI, 2007).

Scale of PRAI Paper Map	Distance on paper map in mm (pen width = 1mm)	Rural Agricultural Land (individual plots of 0.4 hectare or more)	Urban, per-urban, rural & commercial (individual plots of less than 0.4 hectares)
1:10560	1mm = 10.56m	± 20.00m	
1:2500	1mm = 2.50m	± 5.00m	± 3.00m
1:1250	1mm = 1.13m	± 2.50m	±2.50m
1:1056	1mm = 1.06m	± 2.00m	± 2.00m
1:1000	1mm = 1.00m	± 2.00m	± 1.00m

This means that PRAI boundaries are snapped to (moved into association with) OSi features if the distance between the registered PRAI boundary and the OSi feature is less than the adoption criteria at the relevant map scale. Many registered PRAI boundaries were snapped to OSi features during the PRAI digital mapping project, and in many cases the PRAI digital boundaries so derived, successfully corrected small mapping irregularities due to inaccuracies, scale and projection issues.

These adoption criteria are still in operation to cater for updates of OSi mapping into the future. Although many of these paper map scales are no longer used, the adoption criteria are still applied related to the scale of the map on which the first registration occurred. Therefore a folio originally registered on a 6 inches to 1 mile map (1:10560) and now registered on the new OSi 1:5000 map of rural areas will continue to use the adoption criteria of ±20.00m. Similarly a folio originally registered on a 1:2500 scale map and now registered on the new OSi 1:5000 map will use adoption criteria relating to 1:2,500 mapping.

Current PRAI procedure allows mapping for first registration and sub-division to be submitted by incompetent and unqualified persons, without any checks on the accuracy of such mapping. The practice of rejecting boundaries, mapped subsequently, which are accurate and which have been surveyed by qualified professionals using high precision equipment, where they conflict with previously registered inaccurate boundaries is illogical and leads to errors being perpetuated in the PRAI record.

Registered PRAI boundaries, as delineated on title mapping, can be changed at the moment using a variety of means. The following is an outline of the principle means of changing existing boundaries on PRAI maps:

1 A court order after the Court has defined a particular location of a property boundary. [Section 32/Rule 95]

2 A deed of rectification can be submitted to correct a registered boundary.

3 The PRAI may change a registered boundary in the following circumstances:

   i. Clerical errors [Section 32/Rule 7];

   ii. Adjustment to maps to reflect OSi data [Section 61/Rule 146].

   iii. Entry of boundaries by agreement [Section 87/Rule 141]

   iv. Settlement of boundaries on transfer [Section 88/Rule 142]

   v. Entry of boundaries in certain cases [Section 86/Rule 140]

There is also a need to distinguish between deeds of transfer and deeds of rectification. Stamp duty applies to land transfers involving a consideration whereas stamp duty does not apply to rectifications which are correcting the location of registered PRAI boundaries, i.e. to ensure the PRAI map record records the situation on the ground more accurately.

b) Difficulties being Experienced

Movement in the position of registered boundaries during the digital mapping project has highlighted inconsistencies between digital registered boundaries in the new system and registered boundaries on older paper copies of Land Registry maps. Landowners have been informed that the new digital registered boundaries take precedence, unless an error is identified, and this has stimulated an examination of whether the new registered digital boundaries correctly record the boundaries on the ground.

PRAI regularly rectify their parcel index map unilaterally where adjoining landowners are not informed. In other cases where errors have been identified, the PRAI have refused to rectify the error, even though the new PRAI map does not conform to maps submitted for the original registration. The current means of rectifying mapping errors

involves a lack of rigour, because the procedure is not transparent. The present system lacks a procedure for the speedy rectification of errors and as a result problems continue unresolved.

Deeds of rectification are expensive, time consuming and complicated especially if adjoining neighbours cannot agree on the location of the boundary on the ground. The rectification of mapping errors involve considerable effort and as a result are rarely resolved but are more commonly put to one side. Consequently, the mechanism to ensure that the national database of registered PRAI boundaries is updated to correspond to actual boundaries on the ground is not effective, thereby causing the PRAI's mapping to remain in error and in many instances to continually degrade.

The snapping (movement and association) of PRAI boundaries to topographic features on the new OSi digital maps during the digital mapping project gave rise to a number of difficulties:

i There may be multiple topographic features on the ground and the OSi survey the dominant feature which may not be the property boundary. Therefore when the PRAI snap the registered boundary to the feature on the OSi map, the PRAI map records an incorrect location for the registered boundary. This is quite a regular occurrence.

ii The distance between the OSi feature and the registered PRAI boundary may be greater than the adoption criteria thus not permitting PRAI to make the association to the OSi feature, even when the property boundary and the OSi detail are one and the same on the ground. PRAI will normally refuse to amend the registered PRAI boundary even when requested to do so by an affected landowner, thus leaving the PRAI map record in error. This can be very difficult to resolve in practice.

iii If a registered PRAI boundary runs parallel to, but is offset by a distance from an OSi feature, then the PRAI registered boundary is regularly snapped to the OSi topographic feature, so that the PRAI map records an incorrect location for the registered boundary.

PRAI recommend the following procedure for offsetting a boundary from a feature:

i A note should be inserted into the supporting information distinguishing the title boundary, the feature used for the offset and the dimension of the offset.
ii A clarification note should also be included on the map which specifies the title boundary, the feature used for offset and the dimension of the offset.

For offset boundaries the PRAI will append an attribute on the title boundary (radius = zero tolerance) to ensure that it is not snapped to an OSi feature. However, this

procedure can only apply to new applications for registration and has no effect on boundaries already recorded in the PRAI system.

The snapping of registered PRAI boundaries to features on OSi maps using the same adoption criteria is expected to continue into the future as new editions of OSi maps are supplied to the PRAI. It should be noted that when new OSi mapping updates become available, it is unclear whether the topographic features in the new OSi maps are compared with the current PRAI title boundaries or with the original PRAI record. This could mean in certain circumstances that the title boundary would move incrementally to follow changes in the OSi map which were within the adoption criteria, whereas the overall shift from the original mapped position may exceed the adoption criteria. This can and will give rise to inconsistency in PRAI maps over time where the current shape and size of a parcel may be different from the historical shape and size of the same parcel.

The question of whether the boundary line being moved is more accurate or less accurate than the line surveyed by OSi has not been addressed and no acceptable standards are in place against which such decisions can be measured.

Giving precedence to inaccurately surveyed and registered boundaries over accurately mapped precise boundaries, simply because they were submitted earlier in time, perpetuates inaccuracy, and is unfair to the applicant supplying accurate and correct mapping.

It is especially difficult to rectify boundaries in housing developments where many boundaries need rectification for the above reason. This problem has been continually flagged by the PRAI over the years as their biggest mapping issue. Additionally neighbours can hold people to ransom using 'ransom strips' and the PRAI mapping is not sufficiently accurate to clarify the situation reliably. It is understood that the process of aligning boundaries with new OSi topographic detail, under the PRAI adoption criteria, will eliminate many of these anomalies. However, it will not eliminate all such problems.

Finally, farmers may lose money due to them from the EU Area Aid program because inaccurate parcel boundaries are being used to calculate the area of their fields and plots.

There is a new procedure to report mapping errors to OSi via custserv@osi.ie for which there is no cost to clients. Delays have, however, been recorded for the correction of OSi mapping and the supply of these corrected OSi maps to the PRAI seem only to occur during planned mapping updates, so clients can wait significant periods to have erroneously mapped title boundaries corrected. Such delays can lead to mapping

conflicts between the approved map that a land owner has received from OSi and the mapping on the PRAI system.

Although this procedure is useful and resolves certain problems, the major issue, as stated elsewhere in this report, is that the OSi mapping, because of lack of a sufficiently large scale and imprecision due to its method of derivation, is inherently unsuitable for the accurate recording of title boundaries.

Many respondents expressed the strong opinion that there was a need for a system of appeal, to an independent arbiter, in circumstances where PRAI refused to correct errors in their mapping, despite being presented with incontrovertible evidence that such errors existed. At present the PRAI's decision is final and the property owner is left with no means of redress other than recourse to the courts.

c) Proposed Solutions

The PRAI adoption criteria for associating registered title boundaries with OSi features can cause serious problems. A mechanism is required to allow the adoption criteria to be set aside in certain circumstances:

i Where the precision and accuracy of the OSi mapping is demonstrably of a lower standard than title boundary mapping, either in the PRAI archive already, or newly submitted for title registration.

ii Where the offset of a title boundary from a mapped topographical feature is deliberate.

iii Where title mapping already in the PRAI archive, indicate clearly that the title boundary shown on such a map is coincident on the ground with the topographical feature delineated in the new OSi mapping, but where the separation of the lines delineating this feature on the new and old mapping exceed the adoption criteria.

iv In each of these cases the application of the adoption criteria causes inaccuracies to be introduced into the PRAI mapping. Such changes involve interference with the rights of property owners and the non-conclusive boundaries rule does not dispel the confusion and potential for dispute which arises when boundaries are indicated on title mapping which clearly do not conform to the reality on the ground.

It is recommended that a simple and inexpensive form of boundary agreement be introduced, which would allow property owners, whose title boundaries are incorrectly indicated on PRAI mapping, due to the operation of the adoption criteria, to have the error rectified.

i Such agreements need not relate solely to rectifications relating to the adoption criteria. It is also recommended that the simple form of agreement

should allow the adjustment of mapped title boundaries where the error, regardless of its cause, is being corrected against OSi detail, or where the properties owners define their boundary on the ground and record it by means of a precise survey.

ii A system of accuracy attributes for boundaries should be implemented and boundaries should be disassociated from an OSi feature if the method of surveying and mapping the boundary was more accurate than the means used to survey the corresponding OSi feature. A hierarchy of accuracy attributes can be suggested:

   a) Boundaries precisely surveying by registered surveyors using precision instrumentation and operating to defined standards and procedures, with an accuracy attribute of ± 0.10m

   b) OSi 1:1000 maps with an accuracy attribute of ±0.60m

   c) OSi 1:2500 maps with an accuracy attribute of ±0.69m

   d) OSi 1:5000 maps with an accuracy attribute of ±1.22m

   e) Registered PRAI boundaries not coincident with OSi features and of unknown quality

It is recommended that a number of other initiatives be introduced also. These are discussed more fully in other sections of this document but they are mentioned here because they are relevant to the matter of mapped boundary rectification:

i The development of a standard schema for the description and classification of topographical boundary features. This should include a definition of the precision with which title boundaries can be associated with such features, based on their physical nature. It should be noted that this variation in the precision, with which a title boundary can be ascertained relative to an amorphous feature like a hedge in comparison with a hard feature such as a concrete wall, is unrelated to the precision with which a title boundary location can be pinpointed by means of coordinates derived from appropriate surveying equipment and procedures.

ii The development of standards, specifications and guidelines to be applied to precision survey to render it acceptable to PRAI for title boundary mapping.

iii The registration and regulation of registered boundary surveyors deemed qualified by PRAI to produce precise title boundary survey and mapping to the required standards. Currently members of a number of professional bodies – architects, engineer and surveyors – are active in this area. It should be a matter of negotiation and agreement between the PRAI and the relevant professional bodies to designate acceptable levels of education, qualification, knowledge, experience, competence, expertise, certification and registration

which would allow specified members of the relevant professional bodies, duly certified, to operate as registered boundary surveyors.

iv Most importantly, the hierarchy of accuracy outlined above should be adhered to and the PRAI should accept title boundary surveys carried out to higher standards of accuracy than OSi mapping, which has been agreed by affected landowners, and amend the title boundary record accordingly.

v The PRAI should be proactive in its approach to inconsistencies which arise regarding its title mapping, both during the process of transferring to the OSi ITM map base, and where conflicts arise between previously submitted inaccurate mapping and newly submitted accurate mapping. In particular, where current procedures, such as the acceptance criteria rules, or the modifications suggested in this document are insufficient to resolve discrepancies, the affected landowners should be consulted and their cooperation sought in resolving the issue.

vi Finally, a formal procedure should be established to rectify the location of title boundaries on PRAI mapping, and an appeals procedure/authority should also be instituted which could rule on mapped boundary issues, where there is disagreement between an individual property owner and the PRAI. Such an appeals process would be specifically to deal with cases where a property owner demonstrates that the boundary of his property is erroneously shown on PRAI mapping, but where currently the PRAI is unwilling to rectify the matter and in the absence of the possibility of appeal, the owner is faced with recourse to the courts to seek correction of the error in PRAI mapping.

M Property Boundaries Associated with Dynamic Features

a) Current Procedure

The position of some features can move gradually over time due to natural forces such as erosion and deposition along streams, rivers and the coastline, and others can also move quite quickly due to natural forces such as flooding, landslides, subsidence and earthquake. Boundaries on the ground can therefore move out of correspondence with the title boundary.

There are 3 separate situations involved:

i Course change by rivers and streams.

ii Movement of the High Water Mark (HWM) due to coastal erosion or accretion.

iii Sudden movements of land due to flooding, landslide, subsidence or earthquake.

In the case of the natural movement of stream and river courses, adverse possession or boundary agreements can be used to bring boundaries on the ground and registered boundaries back into correspondence. Changes to the registered title boundary map would require an application to be made to the PRAI. It is unclear whether the PRAI adoption criteria for moving registered boundaries to conform to OSi boundaries within given tolerances would be used to rectify the boundary location change in such cases. Different rules apply where watercourse change is as a result of human intervention rather than natural causes, and in these cases the registered boundary should remain unchanged.

Because of the nature of the survey methods used by the OSi (direct survey at 6 inch scale, presumably using chainage and accepting the seaweed line as the high water mark and by interpretation of the extent of vegetation from aerial photography in the 1:50,000 mapping) the HWM must be accepted as a particularly vague boundary and the rule of non-conclusive boundaries would also apply. Attempts to define it conclusively would be fraught with difficulty, if not impossible.

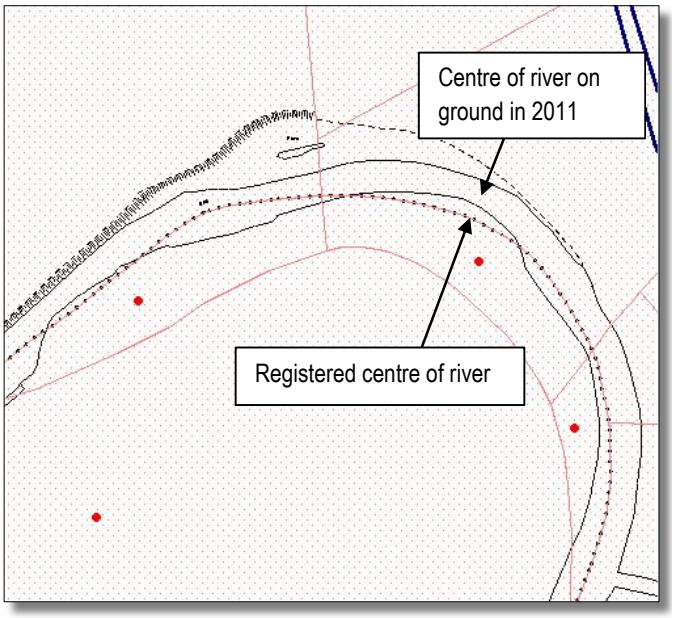
Land lost to the sea due to coastal erosion remains registered to the landowner, but occupation rights beyond the high water mark cannot be exercised. Coastal defences may be carried out by the landowner above the high water mark, or below the high water mark when in collaboration with the relevant local authority, planning permission having been obtained. However, it would appear from recent case law, that once natural erosion has taken place the owner, as an individual, may not carry out coastal defence work below the high water mark. The same can apply to banks of rivers which are tidal, and are portrayed as tidal by the OSi mapping showing the high

water mark running along the bank of the river. Land acquired by an adjacent landowner due to accretion may be registered on the basis of possessory title but would require an application to PRAI to amend the title boundary map.

It is unclear if there is a prescribed procedure to re-establish registered boundaries after the movement of boundary features down the slope during landslides. It must be assumed that the PRAI land parcel boundary maps would remain unchanged. The re-establishment of a physical boundary would be a matter of agreement between adjoining landowners.

b) Difficulties being Experienced

Showing the original course of a river or stream as the true legal boundary if the situation on the ground is now quite different, is problematical, particularly in the context of an operational land market.



There is a lack of clarity as to whether landowners are obliged, from time to time, to make application to PRAI to have these changes registered or whether PRAI rules with regard to bringing land parcel mapping boundaries into coincidence with new OSi mapping will resolve the issue.

Access to historical data in these situations would be very important. The PRAI index map is on open access, but access to copies of the original documents and maps submitted for registration is restricted to relevant property owners and their professional representatives.

c) Proposed Solutions

A detailed clarification of the current legal realities, PRAI requirements and procedures relating to these circumstances would be very useful.

A simple procedure is required for rectifying boundaries in the case of watercourse change due to natural causes.

Wider access to historical data, in certain circumstances, would assist in proposing logical solutions.

N Property Boundaries to the Centre of Public Roads

a) Current Procedure

The practice of mapping land parcel boundaries to the centreline of adjoining public roads causes a number of unresolved issues. The PRAI states in its Mapping Practice (2013), that "Where registration is made to the centre of a road or stream, the map is not to be taken as conclusive evidence that such, portion of same is included in the property" which confuses rather than clarifies the situation.

There are two possible legal options with regard to ownership of a public road:

i A public road where the road authority is responsible for maintaining it, but ownership of the soil underneath and air above rests with the adjoining landowners.

ii A public road where the road authority is responsible for maintaining it and ownership also rests with the authority (by virtue of a CPO or transfer by the prior owner).

In both instances it can be said that the road is 'in charge' but ownership exists independently of the responsibility of the road authority to maintain the road.

b) Difficulties being Experienced

When a planning permission requires a physical boundary wall of a property to be set back a problem of responsibility ensues. The property owner still has legal responsibility for this land but has no right to use or occupy it. The area released is no longer within the control of the owner, i.e. it is outside his boundary wall and therefore publicly accessible. However, it still remains in his ownership and until the roads authority take it in charge, by paving it and incorporating it into the public road the land owner is liable for any occurrences which happen on that land.

Defining the centre of the road can be difficult. A number of different definitions are possible and the location of the road centre changes with reference to each definition. For instance, should road centres be defined with reference to:

i Boundary features on either side of the road? Where walls or fences are involved, this can be reasonably straightforward, but it can be difficult where the boundary is indicated by the centre of overgrown banks or ditches. These can take time to define and the result can be open to interpretation.

ii The edges of the metalled road? This is far simpler to ascertain, but these edges can change due to re-alignments or road re-surfacing, causing movements of the defined centre over time and thereby making it difficult to confirm previous centrelines during ground surveys.

iii The road centreline on OSi maps? This latter option is the option chosen by PRAI as the definition of the road centre. It should be noted that this line was mapped by OSi for purposes other than the definition of legal boundaries, or indeed for the mapping of the topographic centre of a road feature and its suitability as a legal boundary definition must be questioned.

iv By agreement with the property owner on the opposite side of the road.

c) Proposed Solutions

A clarification of the current legal status of land parcel areas, mapped to the road centre is required. In particular, the issue of land physically ceded by a property owner, but not yet taken in charge by the road authority requires clarification.

The definition of what, physically, constitutes the centre of a public road, for title mapping purposes needs to be defined and procedures specified for measuring and mapping this feature. The use of the OSi road centre feature, which was not designed for the purpose of legal or topographical boundary definition, needs to be reconsidered and a suitable alternative definition put in place.

O Property Boundaries used for Land Use Zoning and Planning

a) Current Procedure

Local Authority planners use features on OSi maps rather than registered boundaries on PRAI maps to define the boundaries of land-use zones. The zoning applies to the land, and not to the owner, i.e. if the land is transferred, the zoning transfers with the land.

Grants of planning permission provide development rights for land but these grants apply to the site, not to the individual, who is assumed by the planning authority to be the legal owner. Some city or county development plans may include requirements which restrict the provision and exercise of development rights to locals, so developments rights in some circumstances may not transfer with the land.

Planners accept the validity of mapping information supplied with planning applications which is used for location purposes only. Sites are digitised onto the planning register and the coincidence of the planning site boundary with the PRAI registered boundary is currently assumed, though not checked.

b) Difficulties being Experienced

Planning drawings are accepted in good faith. It is assumed that they are accurate and representative of the property/site extent. As with application to PRAI for registration, drawings submitted for planning application need follow no standards with regard to accuracy and may be prepared by unqualified persons. The applicant for planning permission must declare his ownership interest in the plot which is the subject of a planning application, but the planning authorities normally do not check either the nature of the title nor do they check the exact boundary or the land parcel to which the title applies. On the other hand, there have been cases where some planning authorities have been known to make title checks and refuse permission if they are not satisfied with the applicant's title to the land. Disputes between adjoining neighbours may arise over title to property arising from a planning decision, which can ultimately lead to litigation.

Zoning of land is delineated by lines which do not necessarily coincide with any particular, clearly defined, and described topographic feature or title boundary. This can later cause problems if disagreement arises regarding precisely what area is subject to specific zoning restrictions or other planning restriction.

c) Proposed Solutions

A clarification is required defining the exact nature of the boundaries which the planning authorities use on their land use zoning maps.

A clarification is also required with regard to the legal definition of the boundaries of parcels for which planning applications are granted.

In general principle the PRAI title boundary should be accepted by the planning authorities as the most suitable boundary for both land use zoning and grant of planning permission. It is accepted that different planning requirements may exist within the boundaries of larger land parcels and that such areas may be subject to different planning constraints, although contained within a single title boundary. It is, however, confusing and inappropriate, to have small areas of land, so called sliver polygons, which are created due to misalignment of boundaries from different data sets, subject to differing planning constraints, as the differences of designation are due to mapping inconsistencies only, and not to any reality.

All state bodies should use the same base map and not operate different map bases. This would allow the better integration of specialist overlay themes relative to a unified base map and therefore facilitate the integration of such thematic data sets, particularly with regard to common boundaries. In this context every effort should be made by the relevant data holder, to implement the provisions of the INSPIRE directive, as fully and as soon as possible.

P Property Boundaries in Multi-Unit Developments

a) General Background

In Appendix 5a of the Practitioner's Guide (PRAI, 2012) a number of key stipulations are made:

i That the plan for registration should be based on the developer's design drawing i.e. an architectural floor plan, to a standard metric scale - building floor plans in such circumstances will normally be at a scale of 1:50, 1:100 or 1:200 depending on the amount of detail to be shown.

ii That the drawing should be contained within an A3 page size.

But at:

i At 1:50 A3 will measure just under 20m x 15m

ii At 1:100 A3 will measure just under 40m x 30m

iii At 1:200 A3 will measure just under 80m x 60m

The following table shows map dimensions, in millimetres, for a number of common construction features at these three scales:

Construction feature	Scale of 1:50	Scale of 1:100	Scale of 1:200
230mm concrete block wall	4.6mm	2.3mm	1.2mm
115 mm single thickness brick or concrete block wall	2.3mm	1.2mm	0.6mm
150 mm mass concrete wall	3.0mm	1.5mm	0.8mm
Dry-lining on 50mmX25mm battens	0.8mm	0.4mm	0.2mm
Dry-lining on plaster dabs	0.5mm	0.3mm	**0.1mm**
Plaster skim and finish coat	0.2mm	**0.1mm**	**0.05mm**
Timber framed stud partition	2.5mm	1.3mm	0.6mm

As 0.2mm is the accepted minimum line thickness possible on drawings and in the case of the construction features listed above, a double line with a space between is required to portray the features, the scale of 1:200 is inadequate to represent the smaller features. A scale of 1:100 is required if major composite construction features are to be represented i.e. a 230mm concrete wall with battening and dry-lining to either side and, if distinction is required between the various components, a minimum scale of 1:50 is necessary.

On this basis, if accurate delineation of units in multiple developments is required, a scale of 1:50 is necessary to represent each individual housing unit. It is noted that title documents relating to multi-unit developments describe title boundaries in very great detail. The plan accompanying such documents must be at least in sufficient detail, to

compliment the textual descriptions and not overtly conflict with these descriptions. It should be clearly stated on such plans, however, that in case of conflict, the textual description will take precedence over the plan delineation. It should also be noted on these plans that detail shown, and areas computed are for property registration purposes only. In cases of usable floor area measurement for rental, valuation of taxation purposes, it is recommended that the Measurement Code for the Floor Area of Buildings (CLGE, 2012) should be followed.

Drawing at 1:200 would be acceptable as an index map only, as at this scale individual construction features cannot be distinguished.

For external features, such as the boundaries of landscaped common areas, mapping at a scale of 1:500 is recommended, as for normal land boundaries.

b) Current Procedures

Design and layout plans are normally prepared and submitted to the Land Registry in advance of any sales of units within a multi unit development and registrations are documented in relation to these plans. Occasionally, property maps outlining common areas are completed later to permit occupation of some units before some mapping issues have been resolved.

c) Difficulties being Experienced

It is unclear where to put the title boundary lines relative to construction features in apartment blocks. Much of the PRAI guidelines are contradictory. Sections of these guidelines stipulate minimum paper weight and dpi resolution for plans, together with instructions for the use of a thin red line outlining each apartment unit, all of which indicate a requirement for a considerable level of precision. On the other hand one section of the guidelines suggests that a digital photo with a hand held digital camera, taken through glass, without proper orientation, of a wall-mounted "Emergency Evacuation Plan", a plan which in many cases is diagrammatic rather than accurate, would suffice for registration purposes.

Registration from "as planned" rather than from "as built" drawings, can lead to considerable error in the registered title plan.

It is the practice to define title boundaries within apartment blocks to considerable levels of detail, because this is necessary to deal with the management and maintenance of these buildings, and to ensure that the individual apartment unit owners have clarity about what they may remove, modify or interfere with. This high level of specificity conflicts with the non-conclusive boundaries rule and the inaccuracy of the mapping accepted by PRAI, leading potentially to confusion and dispute.

The type of mapping or plans accepted by PRAI in certain cases falls well below acceptable standards. The use of photographs of evacuation plans, mentioned above, is a case in point.

Transfer of common areas and structural features to a management company is fraught with risk in the absence of accurate plans at a suitable scale.

There is considerable difficulty in defining and mapping complex three dimensional spaces.

d) Proposed Solutions

It is recommended that PRAI should increase the standard required for title mapping in multi-unit development. It is suggested that this should a least be commensurate with the degree of precision with which the title boundary features are specified in the verbal description of title. It is also recommended that this plan be sufficiently detailed to show the components which constitute title boundaries and major structural features. A minimum scale of 1:50 is recommended for each individual unit, with the larger development indicated in index form at 1:200.

It is recommended that the Measurement Code for the Floor Area of Buildings (CLGE 2012) adopted by the INSPIRE Thematic Working Group on Buildings and now part of version 3.0 of the INSPIRE data specifications on Buildings (INSPIRE, 2013), should be followed, wherever relevant.

It is recommended that plans should be prepared by competent professionals in the relevant areas of expertise. Submitted plans should be certified, as to their accuracy, by the relevant professional, in the case of buildings by an architect or building surveyor.

Q Additional Information

a) Current Procedure

The PRAI used to supply title maps and special registration maps at a cost of €25, on which burdens, rights of way, way-leaves and pipelines were not included. To access this additional information a certified title map with 'special features' was required at a cost of €50. However, since September 2012, all title maps and special registration maps cost €40 on which these additional features are now included.

Section 72 of the Act lists many items which do not require registration, so information from the PRAI is often incomplete, and this additional information is difficult and sometimes impossible to acquire.

b) Difficulties being Experienced

To minimise expense most people opt to purchase the cheaper title map, but this map gives only a partial view of the situation, and even if the 'special features' map is purchased, it may not reflect all the issues affecting title due to the fact that many such matters have been exempt from registration in the past.

Property professionals currently find it difficult to establish rights of way, way-leaves and easements on the ground from the PRAI title map. The width of such easements is rarely recorded.

The lack of adequate accuracy and precision in the title maps issued and the absence of mapping of a sufficient scale to support such precision and accuracy is a major problem. The absence of a boundary description schedule adds to this lack of clarity.

c) Proposed Solutions

The PRAI register should provide a comprehensive source of data relating to title. Matters which are currently excluded, such as listed building status, designation as a national monument, inclusion in the Sites and Monuments Register/Record of Monuments and Places, Special Areas of Conservation (SACs), Special Protection Areas (SPAs), Natural Heritage Areas (NHAs), and other similar statutory, and EU directive burdens, should be included as a burden on the property folio. A review of Section 72 of the Act should be carried out to significantly reduce registration exclusions to prepare for the introduction of eConveyancing. The Law Society eVision recommended that no interest should affect title unless it is registered to ensure the title register is definitive, conclusive and all encompassing.

The issues relating to the accuracy, precision and scale of the map have been covered thoroughly in other parts of this document, as also has the requirement for a detailed boundary description schedule. It is recommended that, in addition to title boundaries,

the standards and criteria indicated should also be applied to all mapping matters, including rights of way and other easements. The assumed, or documented, widths of rights of way should be reviewed in the light of modern farm vehicles and machinery.

PRAI should review the practice of issuing separate title maps with and without special features. A single title map showing all information would be preferable.

R Coordinates, Measurements and Monuments

a) Current Procedure

The new PRAI digital map is based on ITM coordinates derived from OSi maps. Copies of the OSi digital maps can be purchased to access these coordinates and copies of the PRAI digital maps can now be purchased also. Measurements can be directly extracted from digital maps. It should be borne in mind that the precision of OSi mapping is not of a quality that would render it suitable for positioning boundaries on the ground.

Positioning monuments along boundaries, such as boundary stones, was regularly carried out in Ireland during the 18th century and many examples of these monuments are still in existence today. The practice died out during the late 19th and early 20th centuries when Land Registry started using OSi mapping to reflect land parcels.

b) Difficulties being Experienced

As PRAI boundary mapping is derived from OSi mapping, the accuracy of the PRAI map cannot be higher than the original OSi mapping which is of a scale and a precision unsuitable for title boundary mapping. OSi maps in many instances provide a single line on the map which regularly represents multiple features on the ground as the feature which the line represents is not stated. This ambiguity is transferred to the PRAI mapping. Consequently, folio maps are open to interpretation, even if their coordinates were available. Coordinates derived from PRAI mapping would suffer from a lack of precision due to the methodology used in the production of the OSi mapping on which the coordinates are based. Such coordinates would be of little use in attempting to re-locate a boundary on the ground even if the disclaimer inherent in the non-conclusive boundaries rule was set aside. Dimensions relative to permanent features on the ground could be of assistance in locating boundaries on the ground from documentary records.

However, coordinates for change points, i.e. points where the boundary line changes direction, would be the most useful and precise, for this purpose, as all other dimensional information (area, dimensions, length of perimeter etc.) can be derived from coordinate data. The new ITM coordinate reference system adopted by the PRAI is both accurate and GPS compatible, so is ideally suited for coordinating boundaries far more accurately than heretofore. It should be borne in mind that although the coordinate system incorporates the necessary precision for accurate and repeatable re-positioning of boundaries, it must be coupled with a methodology encompassing suitable instrumentation, procedures and competence to achieve acceptable results.

Although physical boundary monuments are common in many European cadastral systems, their use can be problematical. In rural areas, where boundary features are

often soft and impermanent (hedges, ditches, drainage channels, timber or post and wire fences) finding a suitable location on a boundary to locate a marker can be difficult. Ensuring that such a marker remains permanently in place and is not interfered with, or does not impede necessary changes to the land, can be even more challenging. It is arguable whether such monumentation is really necessary if the coordinate system and current survey instrumentation allow the positioning of a point on the ground to centimetre accuracy. Survey markers in urban areas, where permanent and hard surfaces are available to allow the insertions of survey markers, is a more viable proposition.

c) Proposed Solutions

For coordinates to be acceptable for boundary location they must be derived to certain levels of precision. Such precision is not inherent in the OSi map base or the PRAI land parcel boundary mapping. It is proposed that procedures should be put in place to allow boundary coordinates, derived from high precision surveys, by registered and qualified professionals, to be included as part of the registration process and that mapped boundary lines derived from this process be integrated with the PRAI parcel index map (see Appendix E for a full exposition of this matter).

S Declarations of Identity

a) Current Procedures

Financial institutions providing mortgages for property purchases need to minimise the risk to their investments and purchasers also need certainty that they can access and enjoy ownership of their new property and all its associated services. A legal document known as a declaration of identity is required to meet these needs. In passing, it should be noted that declarations of identity will still be necessary in situations where boundaries are registered as defined boundaries because such declarations cover more than just ownership.

Solicitors and financial institutions do not physically inspect properties, but instead delegate this necessary task to mapping professionals such as surveyors, engineers or architects. These professionals are required to carry out the physical inspection of the site and prepare and sign a declaration of identity.

The content of the declaration depends on the nature of the property. Different forms of declaration are required because of varying circumstances and the degree of complexity depends on the nature of the property.

The declaration should provide the purchaser with assurance that the property:

i is the vendor's to sell;

ii is not cut off from public roads or services;

iii that buildings and its services are wholly confined within the registered title boundary;

iv that the existence and location of easements and rights of ways, etc. are confirmed.

A declaration should not be made without stating the assumption on which the declaration is based, one of which should be that the property boundaries on the mapping supplied by the PRAI are non-conclusive. Declarations may subsequently be used as evidence to redefine a boundary.

Declarations of identity are onerous documents to complete. It is important, therefore, to distinguish between what is required for the legal process and other interesting information which the purchaser may require. Vendor disclosure was recommended by the Law Society of Ireland in their e-Vision for eConveyancing and it has already been introduced in the UK. The UK experience of disclosure is that it covers possibly too much information and there is, as yet, no standard adopted for the content of a vendor's declaration.

b) Difficulties being Experienced

Many respondents (solicitors, architects, engineers and surveyors) commented that it is an unrealistic expectation that a conclusive opinion can be based on non-conclusive data which is open to interpretation and has not been certified by a mapping professional. Therefore the consensus was that no meaningful declaration can be based on non-conclusive data alone.

i The current procedure for completing a declaration of identity is not standardised.

ii Thorough site inspections are not always conducted – simply walking the site may not be sufficient to identify and quantify boundary discrepancies correctly.

iii Resurveys are rare so discrepancies in PRAI mapping are perpetuated because they are not identified or corrected.

Declarations of identity operate by transferring the risk associated with non-conclusive boundaries from the PRAI (and indirectly OSi) to property professionals' professional indemnity insurance. Such declarations are open to challenge after they are issued, so care is needed if professional reputation is not to be damaged. It should be noted however, that a declaration involves personal liability, so they should not be signed by a mapping professional in the absence of professional indemnity insurance.

c) Proposed Solutions

It is recommended that a working group be established, to include representatives of the Law Society, Engineers Ireland, the Irish Institution of Surveyors and the Royal Institute of Architects of Ireland, to develop a standardised good practice procedure for such declarations, based on the best international practice, for submission to the professional bodies involved, for adoption and implementation by their members.

This new procedure should:

i Ensure that the declaration always includes a check that boundaries on PRAI mapping corresponds to the boundaries on the ground, therefore site visits should be mandatory.

ii Identify and document the physical features on the ground with which the boundary is associated.

iii Identify and rectify any 'ransom strips' – small areas of lands that are either included in two adjoining properties or alternatively are excluded from both properties.

iv Consider if the registration of declarations of identity in the PRAI would be feasible and/or desirable.

Issues which are dealt with extensively in other parts of this report also impinge on the declaration of identity. These matters include:

i The enhancement of the accuracy of OSi / PRAI mapping.

ii The availability of boundary definition information relating the legal boundary to topographic boundary detail on the ground.

T Registration and Regulation of Professionals Preparing and Submitting Maps to the PRAI

a) Current Situation (Procedures)

PRAI Practitioner's Guide (2012) state that the applicant is responsible for the accuracy of the areas and boundaries given in documents lodged. Currently there is no requirement to follow any formally adopted standards. To ensure that the mapped locations of boundaries and rights submitted for registration reflect the applicant's intentions, it is recommended that:

i The locations of boundary corners, rights of way, pipelines etc. be unambiguously defined and clearly marked on the ground before survey for registration is carried out.

ii Maps submitted for registration be prepared and certified by competent land surveyors.

Although the PRAI recommend that the preparation of maps should be carried out by certified and competent surveyors, this is merely a recommendation and not a requirement. No indication is given as to what PRAI consider competence or what kind of certification would be acceptable.

A competent person is defined in the Safety, Health and Welfare at Work Act (2005) as a person who possesses sufficient training, experience and knowledge appropriate to the nature of the work to be undertaken. Competence could be checked by the PRAI with reference to these criteria.

b) Difficulties being Experienced

It would appear that many practitioners with no surveying or mapping experience and no formal qualifications are, in the eyes of the state, deemed qualified to certify mapping for land registration purposes. Neither certification nor competence of land surveyors are checked by the PRAI.

An inordinate amount of time is wasted by PRAI (and indeed by applicants) because of the need to reject maps submitted for registration purposes, which contain errors or are incompatible with pre-existing boundaries shown on PRAI mapping. This is attributable to two causes:

a) that those preparing maps for registration purposes often have no formal training and therefore cannot be relied on to produce accurate survey and mapping.

b) that there are inaccuracies in the PRAI mapping which result in incompatibility between such PRAI mapping and newly submitted mapping which is correct and accurate.

With modern, accurate surveying techniques it is possible to precisely survey boundary location and represent it on a map. Carrying out such a precision survey is, in fact, the most accurate way to define a boundary. However, a major difficulty is that PRAI will not accept better quality mapping which conflicts with pre-existing parcel boundaries surveyed to a less precise specification by OSi, or that conflict with pre-existing boundary lines delineated by previous, often unskilled and unqualified, applicants. This is a situation that ensures inaccurate boundary mapping is perpetuated and that accurate mapping which would improve the overall quality of the PRAI boundaries database is discarded.

c) Proposed Solutions

PRAI should only accept mapping submitted for sub-divisions, first registrations, error rectification, boundary dispute resolution and ultimately for all properties on transfer in cases where such boundaries were not previously precisely surveyed, which are prepared and certified by appropriately qualified and registered professionals. Insurance bonding for such professionals should be considered as a necessary requirement, to protect both the PRAI and the applicant from negligence or error on the part of the professional.

To this end it is recommended that a register of Registered Boundary Surveyors be established to be overseen by an independent registration board which would validate the competence of those submitting mapping for title registration purposes.

All surveying submitted to the PRAI should be:

i Carried out using best practice guidelines (jointly developed between professional bodies and the PRAI) to be issued by the PRAI.

ii Based on the use of modern surveying techniques using GPS and total stations.

iii Referenced to the new ITM coordinate reference system.

Boundaries surveyed and mapped by registered professionals to best practice standards, should be certified and take precedence over less accurate boundary mapping in the PRAI database.

Precision title boundary surveys, OSi derived boundaries and unskilled applicant delineated boundaries should be colour coded to facilitate users in understanding the

different levels of precision and accuracy involved (see Appendix E for a fuller exposition of this issue).

Develop a course, or courses, for surveying & mapping of property boundaries at level 9 (masters or post-graduate diploma) aimed at existing professional stakeholders.

Develop and publish best practice guidelines for the survey and mapping of property boundaries.

U Draft Boundary agreement

The following is a proposed draft for a simple title boundary agreement between adjoining property owners:

Boundary Agreement

We, the undersigned, the freehold owners of the two properties defined below, hereby agree the description and location of the common boundary between these two properties, as set out in the schedules below is the agreed title boundary between these properties.

Property 1 - Land in the townland of ....., County.....
part of PRAI Folio No: ....., of which I, ...
am the freehold owner, as indicated on the map attached.

Property 2 - Land in the townland of ....., County.....
part of PRAI Folio No: ....., of which I, ...
am the freehold owner, as indicated on the map attached.

Schedule of Boundary Features:

Segment 1.....
.....
.....
Segment 2.....
.....
.....
Segment 3.....
.....
.....
etc……

Note: Each segment should consist of a length of boundary which is of the same construction, i.e. where the entire length of the segment is homogenous and conforms to the description of the physical construction of that segment. A separate segment description should be given for each different construction. In addition to the description of the physical construction of the boundary, the location of the title boundary relative to the physical boundary should also be supplied.

Schedule of Coordinates (ITM coordinate reference system)

.....

.....

.....

.....

.....

.....

Certification by Registered Boundary Surveyor:

I, ... being a registered boundary surveyor, licence number: ..... hereby certify that I have inspected the above boundary in the company of the two landowners, and that the description of the agreed boundary as outlined in the schedules listed above and the map attached are an accurate description of the boundary in compliance with the standards set out in the Irish Institution of Surveyors guidelines for Boundary Surveys and in accordance with the requirements of PRAI Mapping Procedures.

Signed: ..... Registered Boundary Surveyor

Address: ……..……...

Email: …….. @ ……

Telephone Numbers: …….

Signed:.....,……. (Insert home address of landowner here)

(freehold owner of Property 1)

Signed:.....,……. (Insert home address of landowner here)

(freehold owner of Property 2)

WORKING TOGETHER TO BENEFIT LAND OWNERS IN IRELAND

The Bar Council
James Dwyer SC
George Brady SC

Irish Planning Institute
Sarah Moran
Brendan Allen

Engineers Ireland
Gerry Healy
Colman Horgan
Gordon White

The Law Society of Ireland
Dr Gabriel Brennan
Patrick Sweetman

Irish Institution of Surveyors
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Muiris de Buitléir

The Royal Institute of the Architects of Ireland
James Pike
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