EirGrid Evidence Based Environmental Studies
Study 9: Settlement and land use

Literature review and evidence based field study on the effects of high voltage transmission development on patterns of settlement and land use

May 2016

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This document has been prepared by EirGrid plc with the assistance of RPS Group.

The evidence contained in this study has been provided by RPS Group.

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SUMMARY

This is an evidence-based study undertaken by experts in land use planning. The research examines the actual effects of the construction and presence of high voltage transmission infrastructure on patterns of settlement and land use in Ireland. Such projects include overhead lines, underground cables and substations.

The purpose of this study has been:

- To gather information on patterns of settlement and land use near to existing transmission infrastructure.

- To establish the effects of existing transmission infrastructure on patterns of settlement and land use.

- To review land use planning policy in various Development Plans, to determine whether any policy change has arisen as a result of the construction and operation of existing transmission projects.

The routing of transmission projects is a complex process. It requires a balance between a number of issues, including EirGrid's obligations to ensure a safe and secure transmission grid, land use constraints, engineering and other technical requirements, cost, and environmental protection. The infrastructure has the potential to affect the environment, including patterns of settlement and land use.

A literature review of transmission projects from around the world was carried out, including review of Environmental Impact Assessments (EIAs). There are few examples where significant impacts on patterns of land use and settlement were predicted. Overall, such impacts tended to be local i.e. within the vicinity of towers and circuits. In built up areas. Issues are more likely to arise because of possible restrictions on future land uses. There is much published information on best practice route design and site design guidelines which accounts for a wide variety of conditions and environments. This may explain why there is an absence of recorded significant impacts on patterns of settlement and land use.

In broad terms, the existing transmission network generally avoids urban areas and seeks to avoid areas of environmental significance; however, it interacts with urban fringes and passes through agricultural/rural areas. It is noteworthy in this context that, since the 1920s, Ireland's population has nearly doubled and over 60% now live in urban areas. Outside of urban areas, the population is widely dispersed.

To investigate effects of transmission projects on patterns of land use and settlement, 31 case studies were chosen; 17 with existing overhead line (OHL) circuits, 10 with substations and 4 in construction. Sites were located in rural, rural/urban and urban areas. Land uses included agricultural, commercial and amenity. Four control sites had no infrastructure. Coexistence[1], development density, planning policy and planning application history were all investigated.

Low levels of coexistence were found in rural areas but significant coexistence occurred in urban, urban/rural areas. This probably indicates a greater intensity of mixed land use development in urban areas. A low incidence of coexistence was found within 0-30 metres (m) of a OHL and this is probably due to health and safety guidance and/or site/design requirements. Development density in proximity to transmission infrastructure was examined and no significant variation with development densties at a distance from such infrastructure were found.

Planning and land use policy over the last twenty years was reviewed to see if it has influenced, or been influenced, by recent programmes of transmission infrastructure development. In the 1990s, development plans showed a varied awareness of the importance of transmission infrastructure. By the mid-2000s, plans referred to the grid and renewable energies, as well as to protection of sensitive landscapes and residential amenity. Since the mid-2000s, ESB clearance distances have been articulated in development plans[2] and some development plans refer to specific transmission projects within their functional areas. Overall, the importance of secure electricity supply was articulated in current development plans; in some instances, transmission infrastructure is noted as a local physical constraint for development.

[1] Coexistence of buildings alongside transmission infrastructure.
[2] Under the Electricity (Supply) (Amendment) (No.2) Act, 1934 there is a statutory requirement for persons to give notification in writing of their intention to build within 25 yards of the centre line of an existing OHL transmission circuit. Electricity Supply Board (ESB) safety distances are currently 20m for 110kV and 30m for 220kV.

Overall, over the last twenty years planning policy in respect of transmission infrastructure has increased, with planning authorities referring to safety distances and seeking underground cable (UGC) in urban areas. In urban areas, some route corridors have been incorporated into development plans as green corridors. It is suggested that a lack of any significant policy change is probably due to the fact that there is a greater understanding of the need for, and benefit of, a strong transmission grid, combined with an approach to grid development projects that seeks to minimise impacts on settlement and sensitive land uses. This should continue to be a priority in the planning and development of all transmission projects.

Over 300 planning applications for development located within 125m of OHLs were reviewed to see if existing transmission infrastructure had influenced patterns of settlement or land use. From the rural group of applications, only one alteration to a single dwelling was found where the minimum safety distance[3] could not be achieved. From the rural/urban group of applications, two residential developments incorporated existing transmission infrastructure into their site plans. The principle of development was not affected. In the urban group of applications, two cases were found where OHL was a factor in the decision to refuse permission.

It is clear from this that the presence of transmission infrastructure can affect site design, primarily by means of incorporating existing infrastructure into a scheme; however, the key determinant for decision-making seems to be to ensure that established ESB clearance distances are not compromised.

Four transmission construction sites were studied to identify any impacts on patterns of settlement and land use. After the announcement of all transmission projects, planning applications continued to be submitted indicating that there are overriding considerations for people other than the presence of transmission infrastructure.

This study has established no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use; however, transmission infrastructure can be a local physical constraint on development.

[3] ESB lateral distance

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1 INTRODUCTION

1.1 THE SCOPE OF THIS PROJECT

In April 2012, EirGrid published the *Grid25 Implementation Programme 2011-2016*, and its associated Strategic Environmental Assessment (SEA).

The SEA identified a number of Environmental Mitigation Measures envisaged to prevent, reduce and, as fully as possible, offset any significant adverse impacts on the environment of implementing the Implementation Programme.

Environmental Mitigation Measure (EMM) 3 concerns *Preparation of Evidence-Based Environmental Guidelines*. These are intended to comprise a series of authoritative studies examining the actual effects of the construction and existence of transmission infrastructure in Ireland. The studies would thereby provide benchmarks to facilitate the robust preparation of projects with an evidence-based understanding of likely environmental impact.

Three types of studies are envisaged under EMM3:-

- **Environmental Benchmarking Studies**: to determine the actual effect, in respect of a number of environmental topics, of the construction and existence of transmission projects in a representative range of Irish environmental conditions – typical, non-standard, and worst-case. The studies, while authoritative, are conceived as an ongoing body of work that can be continuously updated to take account of new information and/or developments in understanding arising from practice and research;

- **Evidence-based Environmental Design Guidelines:** deriving from the factual basis and evidence contained in the initial Benchmarking Studies, these will provide practical guidance to practitioners and consultants in the planning and design of transmission infrastructure from the perspective of a particular environmental topic. These might comprise new guidelines, or the updating of existing guidelines;

- **Guidelines on EIA for Transmission Projects in Ireland:** Accompanying, or incorporated into the Design Guidelines, these are intended to provide an agreed and authoritative format for the preparation of Environmental Impact Assessment (EIA) for transmission projects in Ireland, again in respect of particular environmental topics.

This Study is one of the Environmental Benchmarking Studies – to determine the actual effect of the construction and existence of transmission infrastructure in Ireland on its receiving environment.

1.2 THE SCOPE OF THIS STUDY

The key aim of this study is to examine and benchmark the actual effects of the construction and operation of high-voltage transmission projects in Ireland on patterns of settlement and land use. This topic title and subject matter is informed by the typical significant impacts likely to affect "human beings" for Type 20 Projects[4] identified in the Advice Notes on Current Practice in the Preparation of Environmental Impact Statements[5].

The scope of "Human Beings" as a topic in EIA, is further considered in section 2.3 of this report. It is evident from both EU and national legislation and guidance documents that this is a topic which covers the "*existence, activities and well-being of people*" (Environmental Protection Agency, 2003). The broadness of this EPA definition means that the topic of "Human Beings" might be presumed, by affected landowners, the general public and other stakeholders, to address all potential sensitivities experienced by a human population. However, many topics which can affect human beings are considered under separate topic headings, such as human health (EMF), noise etc. These impacts are therefore not considered as part of this study, although they are addressed in other studies within the overall suite of the Evidence-Based Studies.

This study focuses on patterns of settlement and land use which include amenity and recreational land uses. Indicators of change tend to be directly manifested in the environment and the actual effects, if any, of the construction and operation of high-voltage transmission projects can be observed and determined. This includes new or changing land uses, land use patterns and intensity of use, changes in the built environment or matters which may directly influence such indicators i.e. planning policy or planning decisions which have been specifically informed by the existence of transmission infrastructure.

While EIA considerations have played an important role in determining the aim and scope of this study, it must be recognised that EIA is only one part of a decision-making process in respect of the consideration of high-voltage transmission projects by a relevant competent authority. Issues beyond those normally considered within an EIA context may arise in the planning of a transmission project and play a significant part in the wider decision making process. In particular, this includes compliance with and / or delivery of governing legislation and national policies.

[4] Type 20 projects include *inter alia* "Construction of Overhead Powerlines".

[5] Environmental Protection Agency 2003

The specific objectives of this study were:

- To assemble adequate and appropriate baseline information concerning land use and settlement patterns within representative high-voltage transmission project contexts.

- To establish the actual effects of the construction and operation of existing 400 kV, 220 kV and 110 kV transmission projects on patterns of settlement and land use.

- To review planning policy to determine whether any policy shifts have arisen as a result of construction and operation of existing 400 kV, 220 kV and 110 kV transmission projects on patterns of settlement and land use.

- To provide a factual basis for recommendations to inform any subsequent Evidence-Based Design Guidelines for transmission projects in Ireland.

In summary, this study seeks to establish whether existing high-voltage infrastructure has an identifiable influence on patterns of settlement and land use. It comprises a literature review and examination of case study sites in Ireland with a review of planning decisions and policy documents.

1.3 THE TRANSMISSION NETWORK AND PATTERNS OF LAND USE AND SETTLEMENT

Electricity supply is an essential service in Ireland's economy. The transmission system is a meshed network of 400kV, 220kV and 110kV high voltage circuits, with 156 high voltage substations (see Figure 1.1). The transmission system therefore plays a vital role in the supply of electricity[6].

The development of the transmission network is the responsibility of EirGrid, the Transmission System Operator (TSO), under statutory instrument SI445/2000[7]. EirGrid is committed to delivering quality connection, transmission and market services to its customers and to developing the transmission grid infrastructure required to support the development of Ireland's economy.

Grid development requires a careful balance between meeting the technical requirement for a project, the costs of that project, and the environmental impact of that project.

[6] Transmission Development Plan 2008-2012 EirGrid

[7] SI445/2000, entitled European Communities (Internal Market in Electricity Regulations, 2000)

ESB, as the Transmission Asset Owner (TAO), is charged with constructing the transmission assets as specified by the TSO. ESB also has the role of Distribution System Operator (DSO) with which the TSO coordinates planning and development requirements. An overview of the primary types of transmission infrastructure, including an outline of construction methodology is set out in **Appendix E**.

EirGrid is committed to ensuring that transmission infrastructure development is undertaken in an environmentally sensitive manner, including in terms of patterns of settlement and land use. The significance of any adverse effects of transmission infrastructure development depends on the location and scale of the proposed infrastructure and the potential for mitigation measures. This is why transmission infrastructure development is undertaken and constantly reviewed by suitably qualified experts as the design of a scheme progresses.

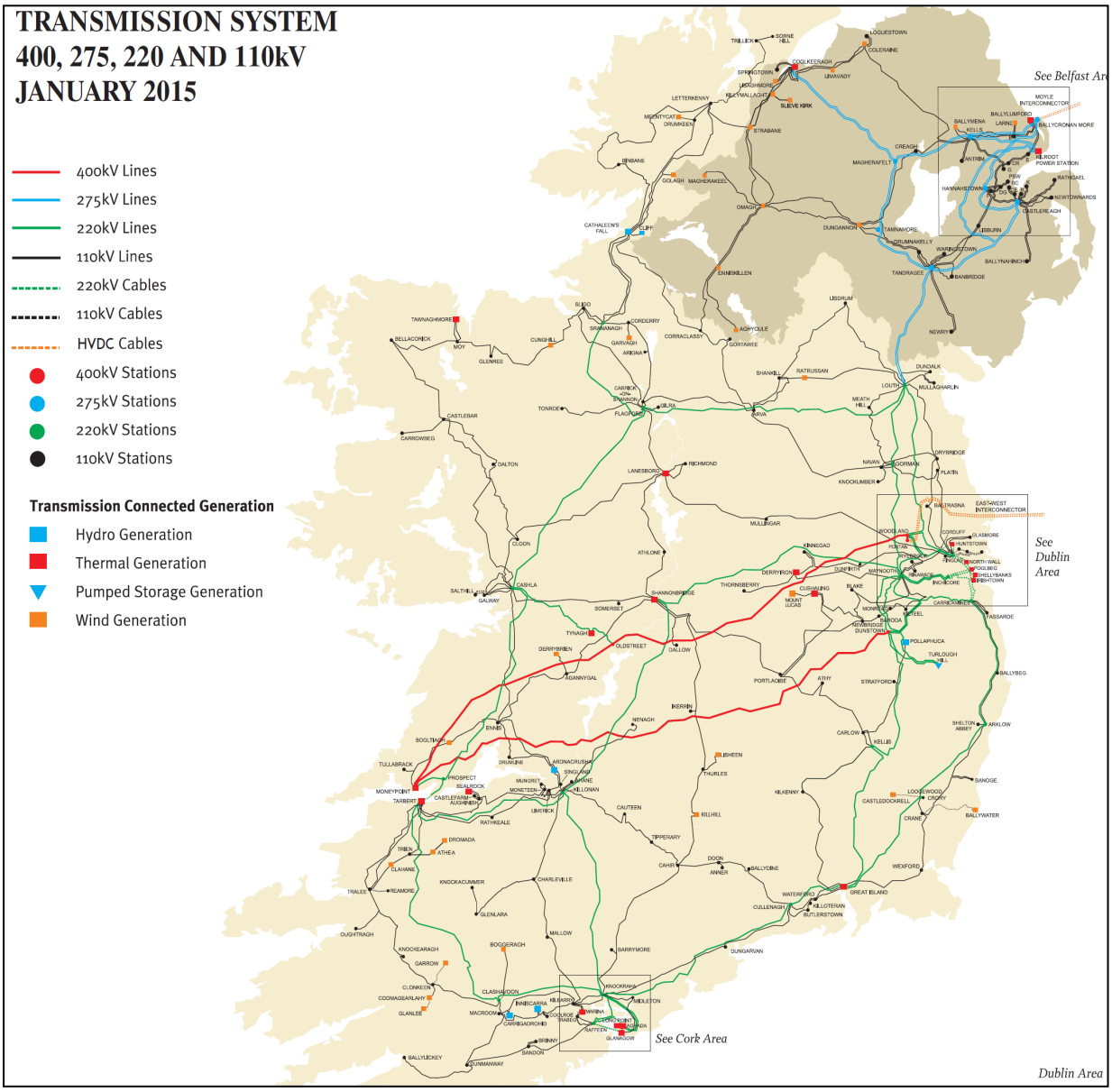


Figure 1.1 EirGrid and SONI's Transmission System Map (January 2015)

1.4 THE STUDY LAYOUT

The study begins with a literature review in order to set out its background, context and objectives and provides information on the importance of the assessment of potential impacts on patterns of settlement and land use from transmission infrastructure projects. The study then focusses on a number of case studies which examine the relationship between transmission infrastructure and patterns of settlement and land use. Recommendations are also included in the conclusion.

Chapter 1 establishes the scope, aims and layout of the study, as well as providing context to the existing transmission network in Ireland.

Chapter 2 is a literature review which positions the study in the context of existing international, European and national research and publications. It considers how potential impacts on patterns of land use and settlement are addressed in EIA, route planning, design guidelines and planning decisions. The chapter also considers whether no significant prevalence of impact may be as a consequence of established mitigation.

Chapter 3 explores the relationship between the existing high-voltage electricity network, and patterns of settlement and land use in Ireland, in terms of geo-demographic characteristics, trends, landcover and land use activites.

Chapter 4 presents the case study methodology which focuses on a qualitative examination of 31 study sites (and 4 control sites), reviewing their planning decisions and governing policy documents. The screening process behind the selection of these sites is provided. The chapter also explains how information was collated for different distance intervals for the various analyses and explains the basis for the indicators used in the study.

Chapter 5 considers existing levels of coexistence of buildings within certain distance intervals of transmission infrastructure in Ireland. It also considers existing levels of coexistence of land use (agricultural, commercial, amenity and tourism) with transmission infrastructure.

Chapter 6 examines trends in development density in proximity to high-voltage transmission infrastructure. Other influences that may have a bearing on development density are considered.

Chapter 7 examines planning policy to determine whether any policy shifts have arisen as a result of construction and operation of existing high voltage transmission infrastructure projects. Whether such projects have already influenced, or have the potential to influence, patterns of settlement and land use is investigated. Development plans (local and strategic) from several Irish planning authorities were reviewed and comparisons between various policy approaches in respect of transmission infrastructure are presented.

Chapter 8 outlines the review of over 300 planning applications located within 125 metres of existing high voltage transmission infrastructure. These applications were reviewed for all case study sites to help determine if existing transmission infrastructure had influenced any of the planning decisions.

Chapter 9 examines 4 case studies of transmission infrastructure construction in Ireland to assess the impact of construction on patterns of settlement and land use. Planning applications in the case study sites were compared with County level figures for the same periods – the key context being that in these cases, transmission infrastructure development is creating a change in the receiving envrionment. Case study findings were also compared to findings of the literature review.

Chapter 10 provides a summary of the context, objectives and main findings of the study. The findings are split into impacts from the presence of infrastructure on patterns of settlement and land use, on agricultural land use, on commercial land use, on community/social/tourism land use, construction and planning policy responses. Recommendations for future transmission infrastructure projects are also provided.

2 LITERATURE REVIEW

2.1 OVERVIEW

A review of international, European and national publications has been undertaken in order to position the study into the context of existing research. Key objectives of the literature review are: -

- To establish if existing research and related publications have identified links between transmission infrastructure and new or changing patterns of settlement and land use;
- To identify and review international, European and national EIA and transmission route planning guidance, and establish the basis for identified potential impacts of transmission infrastructure projects insofar as they relate to patterns of settlement and land use; and
- To review planning applications (and supporting documentation) for transmission infrastructure projects, to establish if and how patterns of settlement and land use have been addressed within application particulars, and how these issues have been considered in the assessment of the applications for such projects by the various decision making authorities.

The review methodology involved a combination of on-line resources and the library resources of University College Dublin.

2.2 RESEARCH STUDIES

The literature review found no international, European and national authoritative empirical or evidence based studies which examine the effect of high-voltage transmission lines on patterns of settlement and land uses, including amenity-related land uses.

In California, Impact Assessment Inc (Impact Assessment Inc., 2003), randomly sampled 200 transmission route corridors (500 ft either side of a circuit for one mile lengths) of five different voltage categories in order to determine the distribution of land use and selected census variables. However, the purpose of that analysis was to evaluate policies for managing electromagnetic field (EMF) exposure rather than to determine the effect, if any, of the transmission circuits on land uses *per se*.

It is evident from the literature review that, over the past two decades, research addressing the impact of transmission circuits on “human beings” has primarily concentrated on the areas of property value and human health. This research has focused on the prevailing hypothesis that attitudes and the ‘perception of harm’ (even where no actual harm, risk or impact has been shown to exist) can influence people and have a bearing on property value (i.e., the price people are willing to pay) for properties near existing or proposed transmission infrastructure. In this regard, Bell (1999) states that *“... all the factors that have an influence on a property’s desirability and therefore its value*

are traced back to the market's perceptions," reflecting both buyers and sellers *"... needs, tastes, fears, sensitivities, desires and anticipations..."*.

It should be noted that these various studies do not specifically address or explain the fact people continue to purchase property, or build new properties, in proximity to transmission infrastructure. This is very relevant to any consideration of patterns of settlement and land use. The influences of other physical factors or attributes in the property price determination process over and above the existence of transmission circuits is therefore an important observation (Bell, 1999 and others). This includes matters which are very site specific or attitudinal (e.g. a desire to live on family owned land or beside particular facilities / services).

This highlights the potential limitations in the methodology of any study which looks to rationalise human behaviour and its interaction with its environment, specifically because:

- Very site specific or attitudinal influences cannot be quantified on the basis of casual or anecdotal observation (Des Resiors, 2002; Furby et al., 1988; Chalmers and Voorvaart, 2009); and

- Only localised studies can assess detailed land use impacts. This observation was made *inter alia* in a study prepared for the Department of Communications, Energy and Natural Resources (DCENR) (Ecofys, 2008) entitled 'Study of the Comparative Merits of Overhead Transmission Lines Versus Underground Cables' (hereafter referred to as the Ecofys Report); this study concludes that "*detailed impacts on land use can only be assessed locally as a function of the inherent, local use of the land in question, and is typically a site specific issue*".

The Ecofys Report (2008) also identified that "*permanent impacts may include land sterilisation in the exclusion zones around either OHL* [overhead line] *or UGC* [underground cable]". The land use section of that report also provides some useful context regarding agricultural use, noting for example that most activities can continue beneath an OHL circuit. In respect of potential impact on future development (of relevance for this study in respect of patterns of land use and settlement), the Report notes "*Properties through which an electrical transmission system is routed could be impacted by a hindrance to future development, particularly within the boundaries of the wayleave*".

Founded in 1921, CIGRE, the International Council on Large Electric Systems, is an international association for sharing knowledge and joining forces to improve electric power systems. In 1995, Working Group 22.14 (Environmental Concerns and Regulatory Control) reviewed the effects of high-voltage overhead transmission line circutis in the areas of transmission line design, planning, routing, construction and operation. The results of the study were reported in *'High-voltage Overhead Lines Environmental Concerns, Procedures and Impacts'* (CIGRE, 1999). In general, it found that overhead transmission circuits can impact on land use by imposing restrictions on existing and future land use under or in the vicinity of the circuit. In this regard, it sets out that *"Restrictions in the form of land use resulting from the presence of overhead lines are mainly caused by the tower structures and*

conductors, or by the electrical safety clearance requirements. The area of land under the tower structures is occupied by them. Restrictions in the use of land under the conductors vary, depending on their earlier use and on stipulations restricting the use of the line corridor in different countries". This finding is further advanced for Ireland by EirGrid in its SEA of the *Grid25 Implementation Programme 2011-2016*, (published in 2012) which compares impact implications of UGC versus OHL options. It concludes that *"it is unlikely that the transmission lines, whether installed as overhead lines or underground cable, will result in excessive sterilisation, given the building proximity distance generally sought for such infrastructure".*

In specific respect of industrial areas, the CIGRE Report advises that *"The construction of transmission lines in industrial areas does normally not cause any major problems with regard to land use if the line reservation was taken into consideration when the use of the land was planned ……. Often the area under the lines can be used for storage of low height goods only, or for car parking but in many countries industrial buildings can be allowed under the conductors".*

Finally, with reference to urban settlements the CIGRE Report notes that "*The existence of transmission lines in built-up areas will lead to restrictions in the planning of future land use. Change in land use of the area under the lines is not a major problem, but problems are caused by the encroachment of other developments on the line corridor resulting, for example, in the location of towers in the immediate vicinity of dwelling areas, and raising the question of alleged health risks….. Problems resulting from these changes in the land use can be diminished by utilising the line corridors for various functions, such as car parking, gardening, footpaths, access corridors etc".*

Overall it is observed from the literature that where potential impacts in respect of patterns of settlement and land use are identified, they tend to focus on localised impacts relating to the immediate vicinity of the tower structures or under OHL circuits. The literature also identifies the existence of transmission infrastructure in built-up or urban areas as more likely to lead to restrictions (albeit localised) in the planning and development of future land uses.

2.3 EIA LEGISLATION AND GUIDELINES

EIA is an important and effective tool for predicting the potential environmental consequences of proposed developments. It is a means to identify potential adverse effects before they occur, and determine appropriate mitigation measures to eliminate or reduce their impact. The consideration of "human beings"' is explicit within EU and national legislation for EIA.

Paragraph 3 of Annex IV of the EIA Directive also requires "*A description of the aspects of the environment likely to be significantly affected by the proposed project, including in particular population ….".*

European and national EIA guidance documents have been reviewed to see how they elaborate on the scope of the "Human Beings" impact assessment and in particular on the issue of settlement patterns, land uses and amenities. They have also been reviewed to see if they provide any specific guidance for how these topics should be treated in the context of transmission infrastructure projects.

- **International/European:** In 'Guidance on EIA: Scoping' (Environmental Resources Management, 2001) relevant matters identified to address are whether the construction, operation or decommissioning of the project would involve actions which will cause physical changes in the locality (topography, land use, changes in water bodies, etc) or result in social changes, for example, in demography, traditional lifestyles and employment.

  Other matters which the document identifies as being important to consider are whether there are existing or future plans for land uses in or around the project location which could be affected by the project or whether there are any areas in or around the location which are occupied by sensitive land uses which could be affected by the Project.

  In 'Guidance on EIA: EIS Review' (Environmental Resource Management, 2001) it is recommended that a check be undertaken to determine whether direct, primary effects on land uses, people and property are described and, where appropriate, quantified.

  There would appear to be limited EIA guidelines relating specifically to transmission projects. Exceptions include the Former Yugoslav Republic of Macedonia's '*Sectorial EIA Guidelines - Construction of Overhead Powerlines for Transmission and Distribution of Electricity*' (2006) and South Africa's '*Environmental Impact Assessment Guidelines for Transmission Lines within the Southern African Power Pool Region'* (1999). Both documents refer to potential impacts to human beings and the human environment arising from transmission projects. However, as the documents provide general guidance for transmission projects, the potential impacts identified are also of a general nature. Relevant extracts from these documents are set out below:

  - *"Construction of the overhead power lines has potential implications for such issues as: land use; population and housing; recreation and transportation.*
  - *In selecting a route or a proposed overhead power lines development due consideration must be given to avoiding residential areas, recreation areas to the maximum extent practical, and in particular to avoid densely developed residential areas.*
  - *Construction of a* [sic] *overhead power lines may have impacts in relation to disturbances of land uses such as roads, amenity areas, recreational areas etc.*
  - *If the proposed overhead power line is located in a settled area, dislocation of people living in the inundation zone is possible.*
  - *Construction of a* [sic] *overhead power lines will result in an increase in traffic in the vicinity of the site as a result of construction workers and construction vehicles accessing the site. Once a* [sic] *overhead power line is operational this should result in minimal traffic activity as such facilities being extensively automated"* (Project Management, 2006).

  and

- *"The most common environmental impacts related to transmission power lines include: effects on existing land use (land value, ecologically sensitive cites [sic], existing utilities e.g. telecommunications"* including *"disturbance of existing land use"* (SAPP Environmental Sub-Committee, 1999).

- **Scotland:** In Scotland, '*A handbook on environmental impact assessment – Guidance for Competent Authorities, Consultees and others involved in the EIA Process in Scotland*' provides practical guidance about the EIA process. It does not specifically address patterns of settlement and land use; however, Appendix 5 is of potential relevance insofar as it considers issues likely to arise in the EIA process in respect of outdoor access i.e., *"the diverse collection of activities which are linked by common values and by a dependence on open air settings for their practice or enjoyment. It can range from walking to windsurfing to bird watching."* Both area-based facilities and linear access facilities (e.g. public rights of way, cycle routes etc) are identified as relevant to EIA. Types of effects on people's ability to enjoy open air recreation in the countryside are identified in Appendix 5 Table 2, and examples of potential outdoor impact are identified in Appendix 5 Table 3. These latter impacts are listed below:-

  - Loss/closure/extinguishment
  - Diversion
  - Reduction in amenity
  - Enhancement of amenity
  - Intrusion
  - Obstructing access routes
  - Restrictions on types of access
  - Enhancing access
  - Changes to setting and context

  In respect of *"powerlines, masts and other pylons"* the potential outdoor access impacts identified are *"effects on valued landscape especially in remote countryside".*

- **Ireland:** In Ireland, the '*Advice Notes on Current Practice in the Preparation of Environmental Impact Statements*' (Environmental Protection Agency, 2003) identifies the typical effects, emissions and residues which could arise in the context of human beings as being: economic opportunities, health effects, nuisance and risks/hazards. Section 2 of the Report further considers these areas of potential impact and identifies issues which may be examined under the Human Beings topic in more detail as including:-

  - Economic Activity – will the development stimulate additional development and/or reduce economic activity, and if either, what type, how much and where?
  - Social Consideration – will the development change patterns and types of activity and land use?

- Land use – will there be severance, loss of rights of way or amenities, conflicts or other changes likely to ultimately alter the character and use of the surroundings?
- Health and Safety – will there be risks of death, disease, discomfort or nuisance?

Section 3 identifies topics usually addressed under each environmental aspect for particular projects. Project Type 20 as identified in the Advice Notes, includes *inter alia* 'Construction of Overhead Power Lines'. Developments of this class are noted to *"be of environmental concern because their impacts are repeated over their length"*. Typical significant impacts identified as likely to affect Human Beings relate to "*Amenities, Settlement Patterns and New Land uses".*

Section 5 provides an indication of possible problems which may arise in EISs in respect of various environmental topics and issues. For the Human Beings topic it advises *"this topic can rapidly expand to include many topics (such as property prices, employment creation or commercial competition) outside the scope of an Environmental Impact Statement. Other areas such as nuisance or threats to health can often be omitted".*

2.4 ROUTE PLANNING AND DESIGN GUIDELINES

High-voltage transmission infrastructure, particularly overhead line (OHL) circuits, are evident across a wide range of geographic regions, topographical conditions and rural and urban areas, linking generation sources to demand centres. It is evident from the literature review that route planning and design guidelines tend to reflect general planning principles which can account for a wide range of different conditions and environments, rather than site or line specific measures - *"Their importance is in the breath of discussion, from a planning approach, and not route selection"* (CIGRE, 1999).

In order to reduce the potential effect of new OHL transmission projects, best practice route planning seeks to avoid, where possible (and having regard to the specific requirements of the project), heavily populated areas on the grounds of general amenity. The intention is to minimise the number of people affected and the degree to which they are affected. In '*Development near Overhead Lines – Planning and Amenity Aspects of High-voltage'* (National Grid, 2008), it is specified this is in order to *"reduce the visual effect of the line".* For the purposes of this suite of evidence-based studies, visual impact is considered separately to Human Beings, notwithstanding the fact that visual impact has the potential to impinge on the amenities enjoyed by the population of a receiving environment.

Other relevant route planning and design guidelines are considered below:-

- **International/European:** '*High-voltage Overhead Lines Environmental Concerns, Procedures and Impacts*' (CIGRE, 1999) provides useful information on the criteria to be applied for optimum transmission circuit route selection. Section 4.2.3.3 of the report provides recommendations to assist in the early selection stage of routing options. These recommendations are presented as a

"general planning principle" only. They relate primarily to minimising the visual impact of overhead line transmission circuits; no specific guidance refers to land use and/or settlement.

- **United Kingdom:** Guidelines for routing new high-voltage OHL transmission circuits were issued in 1959 and remain widely used within the electricity supply industry. These guidelines are known as the 'Holford Rules' (National Grid Company, 1992) after their author. When Lord Holford presented his rules to the Royal Society of Arts in November 1959, the paper describing this presentation, records his reference to the rules as *"…. this rough guide, which can never become a formula because each line has to be considered in great detail and on its merits".* In 1992, the guidelines were reviewed and supplemented by the National Grid Company.

  The Holford Rules are primarily concerned with minimising the visual effect of OHL through careful routing. Rule 7 is potentially relevant to this study and recommends approaching urban areas through industrial zones if they exist. It also advises investigating the comparative costs of undergrounding *"when pleasant residential and recreational land intervenes between the approach line and the substation*", although it does caveat that this should be for *"lines other than those of the highest voltage".*

  In the Supplementary Notes added in 1992, in respect of 'Residential Areas' the rules advise *"Avoid routeing close to residential areas as far as possible on grounds of general amenity".*

  Another important guidance document in the UK is *'Sense of Place - Design Guidelines for Development near High-voltage Overhead Lines*' (National Grid Company, 2008). These guidelines focus on the technical and design issues facing developers of development lands in close proximity to existing OHL. They primarily address issues relating to residential development, identified as "*clearly one of the more sensitive forms of development in close proximity to overhead power lines*"; however, they are acknowledged as being equally relevant to other forms of development.

  National Grid Company also has guidelines which inform the approach it takes towards the siting and design of new substations. The guidelines are known as the 'Horlock Rules' (National Grid Company, year not specified). The consideration of adjoining uses and the amenity of local inhabitants is specifically advised under the heading 'local context, land use and site planning'. Points of relevance include *inter alia*:

  - Point 6: *"The land use effects of the proposal should be considered when planning the siting of substations and extensions*". Issues for consideration are noted as including the potential sterilisation of nationally important land (e.g. Grade 1 agricultural land and sites of nationally scarce minerals) and the effects on land drainage.

- Point 8: *"Space should be used effectively to limit the area required for development consistent with appropriate mitigation measures and to minimise the adverse effects on existing land use and rights of way, whilst also having regard to future extension of the substation".*

The above guidance documents are very useful for routing overhead line circuits and for general development near OHL circuits. With the exception of requirements to maintain electrical safety clearances and the achievement of EMF standards it is noted that there is no specific minimum lateral distances that must be maintained between OHL circuits and development (and in particular residential development), relating to settlement and land use.

- **Scotland:** In Scotland, the Holford Rules (including the NGC Supplementary Notes) were amended by Scottish Hydro Electric Transmission Limited (SHETL) in 2003. An additional note now included by SHETL addresses 'Line Routing and People' and sets out *"The Holford Rules focussed on landscape amenity issues for the most part. However, line routeing practice has given greater importance to people, residential areas etc. The following notes are intended to reflect this.*

  a) Avoid routeing close to residential areas as far as possible on grounds of general amenity.

  b) In rural areas avoid as far as possible dominating isolated houses, farms or other small-scale settlements.

  c) Minimise the visual effect perceived by users of roads and public rights of way, paying particular attention to the effects of recreational, tourist and other well-used routes".

- **Ireland:** There are no industry wide route planning and design guidelines for transmission infrastructure in Ireland.

  The SEA of *EirGrid's Grid25 Implementation Programme 2011-2016* is not a route planning guidance document and it does not identify specific objectives in relation to land use; however it does include related considerations for new infrastructure provision under the heading 'population', namely "*to minimise proximity of development to concentrations of population in order to reduce actual and perceived environmental effects".* Conversely the same document also identifies populated or 'settlement' areas as providing an opportunity for routing power circuits; the periphery of these areas in particular being identified potentially suitable for integrating such infrastructure provided they do not impinge on residential or other land use types, e.g. hospitals and schools (EirGrid, 2012). In this regard, it is presumed this is only where a particular OHL route is required to tie into a new or existing substation serving the particular settlement.

  In terms of electrical clearances under the Electricity (Supply) (Amendment) (No.2) Act, 1934 there is a statutory requirement for persons to give notification in writing of their intention to build within 25 yards of the centre line of an existing OHL transmission circuit. This clearance distance, often reproduced in statutory development plans, relates to public safety, and specifically the falling distance of a support structure. It does not relate to general matters of land use or amenity. In

practice, however, route selection of OHL circuits carried out over the past 20 years in Ireland has aimed to achieve an aspirational lateral clearance of 50 metres from the centreline of a transmission circuit to the closest point of any dwelling (ESB/IFA, 1985). This is considered further in **Chapter 8.**

2.5 PLANNING APPLICATION/ASSESSMENT DOCUMENTATION

This part of the literature review focuses on planning applications for transmission infrastructure projects primarily in Ireland. The objective is to establish if and how patterns of land use and settlement have been addressed in planning applications (and the supporting documentation included therein) and how they have been considered as part of the assessment of the application by the relevant competent authority.

The majority of applications are Irish and the An Bord Pleanála has been the competent authority; as such, there is an obvious consistency of approach to determination. **Table 2.1** summarises the findings of the planning application review undertaken. In many instances, while baseline information is often provided in planning applications, potential significant effects are rarely identified in respect of human beings in general, or patterns of settlement and land use in particular.

Table 2.1 Review of Transmission Infrastructure Project Applications

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
Beauly-Denny	220 km of 400 kV OHL linking Beauly and Denny (Scotland)		Environmental Statement submitted with application	In the '**Land Use'** Chapter of the EIS the potential effects of the development are summarised as follows: *"The long term, direct land use effects of the proposed project are therefore limited to the immediate area underneath the overhead transmission lines, towers, the area required for substation construction or redevelopment and a small no. of locations where access tracks would be retained for permanent use following the construction stage."* With regard to **tourism**, reference is made to studies which examined the perceived potential impacts upon business performance and turnover. In terms of the tourism sector a survey in respect of the development highlighted that for 40% of respondents offering accommodation and 44% involved in activity centres, fishing and estates, the OHL circuit may have some form of negative effect. In respect of construction effects, it was generally regarded by respondents as temporary in nature. There is no specific reference to **settlement pattern** (although reference to the SEFTL notes on Holford Rules in relation to 'Line Routeing and People' could be considered to address this) and other **amenities** (which are addressed under different environmental topics).
			Technical Assessors Report	Relevant points incorporated in the technical assessment include: **Tourism:** At 16.1.1 it states there are no specific guidelines or requirements, or indeed *"industry standards"* for the assessment of tourism and recreation effects, set out in any regulations or any other statutory or advisory guidance on the preparation of EIAs. However, *"outdoor access impact assessment"* is covered by guidance in Appendix 5 of SNH's publication 'A Handbook on Environmental Impact Assessment'. Under the heading of '*Powerlines, Masts and other Pylons*, Table 4 identifies the following examples of "*potential outdoor access impacts"*: loss/closure/ extinguishment; diversion; reduction/enhancement in amenity; intrusion; obstructing access routes; enhancing access; and changing the setting and context. The assessment also refers to the fact the wider tourism and recreation market is predominantly affected by extraneous factors, including adverse changes in exchange rates, levels of real disposable income, uncertainty over terrorist attacks, and weather patterns. In conclusion it is found the *"most impacts on recreational interests are likely to be short term, and would occur during the construction period when issues such as noise and disturbance, closure, diversion and obstruction of access routes, visual intrusion and loss of amenity would arise. In addition, it seems inevitable that some access routes would be less attractive to users following the construction of the line."*

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
Corderry – Garvagh Glebe	Hibernian Wind Power sought consent for 6 km 110 kV OHL (comprising 6 no. steel angle masts and 25 no. double wooden pole sets) and a substation, in County Leitrim	PL12.VA0001	An Bord Pleanála Inspectors Report	Relevant considerations included *"the topography of the area, the relatively small number of public roads in the vicinity and the sparse population and dwellings, particularly in its more remote southern section along with the nature and location of associated structures would not in my opinion give rise to a significant loss of amenity. I am mindful also that it was stated at the Hearing that the line would be a minimum of 80m from the nearest dwelling".* In his assessment of **Residential Amenity**, the Inspector noted: *"There are dwelling houses scattered in the area of the proposed route particularly towards its northern section although I consider that the proposed routing of the line ensures that any visual impact on these existing properties would be minimised."* The Inspector ultimately recommended a refusal for this development specifically on the basis of proposed location of the 110 kV substation *constituting "an incongruous and obtrusive feature that would interfere with the character of the landscape and which would seriously injure the visual amenities of the area".*
			An Bord Pleanála Decision	ABP determined the proposed development "*would not seriously injure the amenities of the area, or of property in the vicinity, would be acceptable in terms of traffic safety and convenience, would not be prejudicial to public health, would be acceptable in terms of its effect on the environment and would therefore be in accordance with the proper planning and sustainable development of the area".*
East-West Interconnector	EirGrid sought consent for a new subsea cable, a transition joint bay at landfall, a land cable with cable joint bays and a converter station with cable bay	PL17.VA0002	Environmental Report submitted with application	An Environmental Report was prepared for both the land and marine elements of the scheme. It does not address **settlement pattern** or **land use**. In respect of the Report for the land based elements of the scheme baseline information relating to economic activity, tourism and recreation, population and community is included in the Socio-Economic Chapter (Chapter 13). Potential impacts focus on the construction side, and are either positive (in terms of local revenues around the area of construction and *"significant economic benefit in terms of local employment"*) or are considered temporary in nature.
			An Bord Pleanála Inspectors Report	One of the key issues identified by the An Bord Pleanála Inspector is the impact of the construction process on the **amenities** of residents adjoining the route corridor. She concludes: **"***The construction phase would be likely to, in my opinion, affect the amenity of the area by reason of noise, dust generation and increased traffic. I consider, however, that these temporary impacts can be satisfactorily mitigated against and in this regard, I do not consider that the affects will have adverse long-term consequences."*
			An Bord Pleanála Decision	ABP determined the proposed development *"would not adversely affect the integrity of a European site, seriously injure the amenities of the area or of property in the vicinity of the proposed development or be prejudicial to public health or safety, and would be acceptable in terms of traffic safety and convenience".*
Letterkenny to Glenties (Binbane)	EirGrid sought consent for a new 68 km 110 kV and new 33 km OHL linking Binbane to Tievebrack to	PL05.VA0003	Environmental Impact Statement submitted with application	In relation to **Human Beings**, the EIS sets out the population, employment and socio-economic activity and notes changes in population in the various towns and rural areas. In relation to the impact of the development, the EIS states that expenditure associated with the project would result in economic benefits to the local economy.

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
	Ardnagappary and associated new substations. All in Co Donegal.			**Land Use** is considered in Chapter 13 "Material Assets" of the EIS. The impact of the proposed development focuses on the permanent and temporary land-take associated with it. In the consideration of alternatives and residential amenity, the EIS states route options avoid significantly built up areas; however, it notes the location of housing in the Crolly area poses severe constraints along this section and necessitated locating the circuit within the periphery of the area of especially high scenic amenity at Groganmore. Section 13.1 describes **land use** and notes bog land is the most dominant land use. The EIS notes the impact of the development and concludes the loss of forestry land, including that owned by Coillte, a being the most significant impact - in terms of area impact and its importance as a financial resource. It states that there would be limited impacts due to loss of agricultural lands at polesets and angle tower locations and the impact would be mitigated by the siting of structures to minimise such losses. In terms of **tourism** facilities, the EIS states the nearest recreational area is approximately 670 m away, and states while the development might tend to diminish the attractions in the area, it is unlikely to have a tangible effect on the tourism industry in the area given its location away from the coast and the seasonality of the industry.
			An Bord Pleanála Inspectors Report	The Inspector notes **tourism** is a key sector for County Donegal. He also notes the amenities listed in the EIS are more than 1.5 km away from the proposed circuit. The views of Bord Failte that visitor numbers would not be reduced are noted. The Inspector concludes: "*Large power line structures are definitely both intrusive and unattractive. The extent to which it is possible to absorb a power line into a view is examined in the Appendix dealing with landscape impacts. The difference in impacts between wooden pole-sets and steel lattice towers is noted".* In relation to **land use** the Inspector notes while the EIS "*rightly identifies the loss of forestry land as the largest impact by area it would appear that the perceived loss by landowners is the prevention of development or development opportunities coupled with devaluation of existing property."* He concludes saying *"impacts of this nature certainly exist but must be balanced against the common good. The balance between common good and individual disadvantage is difficult to estimate".* The Inspector recommended a split decision, to include refusing permission for that part of the development relating to the proposed 110 kV distribution circuit on the grounds of unacceptable negative impacts on visual amenity in the area traversed by the proposed circuit.
			An Bord Pleanála Decision	ABP determined the proposed development "*would not be prejudicial to public health or safety …….. and would be acceptable in relation to impacts on the scenic and other amenities of the area and of property in the vicinity …..".* In deciding not to accept the Inspectors recommendation to refuse approval for the distribution element the Board considered *"that route options were significantly constrained in this part of Donegal by reason of the proliferation of houses constructed throughout the low lying and coastal rural areas, resulting in the proposed new high tension lines being routed in part through less populated scenic upland areas".*

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
Lenalower to Screeb	ESB Networks sought planning permission for a 48 km 110 kV OHL linking Lenalower to Screeb, Co Galway and associated upgrading of the existing Screeb substation. The OHL element would comprised 276 primarily pole set structures.	PL07.VA0004	Environmental Impact Statement submitted with application	The EIS acknowledges most of the study area is *'undeveloped land'*. Where development has taken place it is generally along the coast and is primarily used for agriculture and associated activities, as well as tourism and rural settlement. The main mitigation concerning human beings is identified as appropriate route selection in the areas of landscape, ecology and cultural heritage. In particular it is noted that the circuit route avoids heavily populated areas for visual and amenity reasons. It is also noted that it is intended to provide at least 50 m separation between the OHL and existing houses. The land uses to be crossed by the development is identified as including bogland (60%), farms and gardens (24%) and forestry (17%).
			An Bord Pleanála Inspectors Report	The Inspector notes that *"the impact on human beings will vary considerably over the length of the route, reflecting population density, settlement patterns and land use".* In terms of the impact on tourism the Inspector notes "*it is inevitable that an overhead structure of this type would have a deleterious impact on scenic amenity".* He also refers to Bord Failte's conclusion that the impact on tourism would not be significant, and that while the circuit would pass through some visually sensitive landscapes, use of the N59 route was preferable to the southern R226 option. The assessment was based on avoidance of the more popular coastline settlements, and because the main road had few stop-off points for tourists.
			An Bord Pleanála Decision	ABP determined the proposed development "*would not be prejudicial to public health or safety …….. and would be acceptable in relation to impacts on the scenic and other amenities of the area and of property in the vicinity …..".*
Cashla – Galway	EirGrid sought planning permission for two new 110 kV circuits linking the existing Cashla to Oranmore, Co Galway. The development totals 2.42 km.	PL07.VA0005	Environmental Report submitted with application	An Environmental Report was included in the application titled 'Landscape, Cultural Heritage and Ecology Reports'. It does not specifically address settlement pattern, land use or amenities.
			An Bord Pleanála Inspectors Report	The assessment by the Inspector focuses on need, appropriate assessment screening, visual amenity, roads and built heritage.
			An Bord Pleanála Decision	ABP determined the proposed development "*would not seriously injure the amenities of the area, or of property in the vicinity …..".*

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
Kilpaddogue, Tarbert, County Kerry	EirGrid sought planning permission for a new 220/110KV substation with associated works including the removal of 220/110 overhead circuits and their replacement by a reduced number of lines plus underground cabling.	PL08.VA0007 Kilpaddogue, Tarbert, County Kerry	An Bord Pleanála Inspectors Report	In respect of **Human Beings,** the Inspector considered that the proposed development is sited a greater distance away from any dwelling than the existing substation at Tarbert Island and the removal of a number of OHLs will significantly improve the general amenities of residents in the area. Taking this into account and the temporary nature of construction related impacts (i.e., noise and vibration) the Inspector concluded that the construction period will mean an element of disruption for residents but "*the overall impact on human beings in the area will be slightly positive".* In terms of **land use**, the Inspector had strong concerns about the loss of what he considers to be *"quite a significant loss of zoned land".* He states: *"The choice of site has excessively impacted on the overall value of this stretch of coast as a strategic industrial reserve for deep water related industrial uses. I consider this to be quite a significant loss, albeit one that is somewhat theoretical without knowing in detail what type of industrial uses may be attracted to the area. I consider that it is a significant loss of zoned land, but it is impossible to quantify the real extent of loss or to assess just how avoidable this loss is".*
			An Bord Pleanála Decision	Having regard to *inter alia* "*the planning history of the area, with particular regard to planning permission granted by ABP for the upgrade of the Tarbert generating station and the LNG terminal to the west", ABP determined that the proposed development "would not seriously injure the amenities of the area or of property in the vicinity ….."*.
Millstreet, Co Cork	EirGrid sought planning permission for a new Millstreet 220 kv/110 kV substation	PL04 .VA0008	Environmental Report submitted with application	An Environmental Report addresses **"human beings"** and advises that information was collated relating to "*population, employment and economic activity, land use and zoning, tourism, community facilities and public utilities within the vicinity of the proposed development".* The route selection process is identified as a key factor in locating the development *"in an area with the lowest potential for negative impacts on the human environment. Sensitive receptors such as residential housing, schools and commercial facilities have been avoided as far as possible."* The Report also identifies the potential for negative impacts during construction due to visual impacts, increased noise, traffic disruption and dust. However, these are considered temporary and will cease on completion of construction.
			An Bord Pleanála Inspectors Report	The main issues identified by the Inspector did not include reference to settlement pattern, land use and amenities (although the particular concerns of an objector living 360 m from the proposed development were considered by the Inspector having regard to the particular characteristics of the area).
			An Bord Pleanála Decision	Having regard to *inter alia* "*the planning history of the area and the pattern of development in the area, including the existing substation and existing and permitted windfarm developments"*, ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity ….."*.

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
Brickendown, near Cashel, County Tipperary	Bord Gáis Éireann sought planning approval for a new 110 kV substation and associated site works	PL23.VA0009	*Environmental Report submitted with application*	An Environmental Report addresses **"The Human Environment".** In terms of potential impact on **land use** it notes *"substation structures are not intensive"* and *"the small amount of land lost due to the development relative to the abundant availability of similar land in the immediate vicinity" …. "means that the substation will have a minor impact on land use".* In terms of potential impacts on **recreation and amenity** it is noted *"the proposed development is not expected to have a significant, adverse impact on recreation and amenity in the surrounding area. The proposed development is not particularly visible from local roads or other known recreational areas and there are no significant distant effects".*
			An Bord Pleanála Inspectors Report	The assessment by the Inspector focuses on issues such as traffic hazard, impact on health, noise and impact on groundwater. In respect of, landscape impact he notes the following *"There are numerous examples of substations throughout the country and in a rural context they represent an industrial alien presence". However, he continues "the proposed [sic] would be located beside an existing 110 kV line and having visited the area I would consider the location to be relatively unobtrusive".* In terms of tourism, the Inspector identifies the Rock of Cashel as the key tourism attraction (located c. 5 km away). *He states "the proposed development should have no impact on the Rock of Cashel or its environs. While the site is located within an attractive landscape it is by no means a major tourist route or [sic] does it have the visual resonance of Slievenamon or the Galty Mountains".*
			An Bord Pleanála Decision	Having regard to *inter alia* "*the planning history* " and " *the pattern of development in the area, and the separation distance from existing houses in the area*, ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity …..".*
Clashavoon Dunmanway	EirGrid sought planning approval new 110kV OHL connecting the existing 110kV substation at Dunmanway, Co. Cork to the existing 220/110V substation at Clashavoon, Co. Cork	PL04.VA0010	Environmental Report submitted with application	An Environmental Report submitted with the application addresses "**human beings**". In terms of population and settlement it addresses the location of the project relative to nearby towns advising that "*The route avoids the main centre of population in the northern section of the line, i.e. Macroom. This proposed route crosses over sparsely populated areas avoiding clusters of dwellings."* It also identifies that parts of the wider South West Region are "*very significant in terms of tourism and attract a large number of tourists to the region".* While the general **land use** of the area is described, it is not identified as being impacted by the proposal. The Chapter concludes *"There are no significant constraints in relation to human beings. The implementation of appropriate mitigation measures (as described in the chapters on Ecology, Landscape and Visual Impact and Cultural Heritage) will ensure there will be no significant residual impact on the environment from the proposed development with regards to Human Beings."*
			An Bord Pleanála Inspectors Report	Consideration of "human beings"' and 'Material Assets' by the An Bord Pleanála Inspector included the economic benefits of the proposal, **tourism/amenity** value, potential loss of development value, interference with farming activities, noise and EMF.

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
				The Inspector acknowledges the "*specific attractions in the area*", *"community initiatives"* such as a network of walks, and *"leisure attractions"* in the area such as a woodland walk. In his assessment of impact, the Inspector finds: *"There is little doubt but that the concentration of power lines in certain areas contributes to a loss in amenity and tourist value to the area, however, I would consider the impact to be very minor, although the incremental loss of landscape value from a wide variety of agricultural, residential and industrial activities in the area would be very significant over time".*
			An Bord Pleanála Decision	Having regard to *inter alia* "*the planning history of the area",* ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity* …..".
Patch, County Kerry	A new GIS 220/110kV substation, extension of existing AIS substation (Trien substation) and associated 'loop-ins' and new 110 kV OHL circuit between the Trien substation and planned windfarm at Cloghboola.	PL08.VA0011	Environmental Report submitted with application	The Environmental Report which accompanied the application addresses "**Human Beings"** in the context of human and animal health and disruption to agricultural land use. There is no specific consideration of land use and settlement pattern,
			An Bord Pleanála Inspectors Report	The Inspector does not specifically address land use or settlement pattern; however, he did address impact on residential amenity. In conclusion, in respect of Human Beings, the Inspector sets out " *I am satisfied that the substations are sufficiently removed from the nearest dwellings, and subject to mitigation measures proposed in the form of screening, there would be no significant direct impact arising from substation locations. Construction impacts while significant would be of temporary nature. Based on the information presented to the Board, it would also be reasonable to conclude that there will be no significant impact on human beings from the proposed UGC."*
			An Bord Pleanála Decision	Having regard to inter alia "*the planning history of the area and the pattern of development in the area, including the existing substation and existing and permitted wind farm developments",* ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity* …..".
Ballynahulla, Co Kerry (known as the East Kerry North West Cork Project)	New 220/110 kV GIS substation and localised modifications to existing Clashavoon-Tarbert Circuit. It also included 9km of UGCs.	PL08.VA0012	Environmental Report submitted with application	The Environmental Report which accompanied the application addresses Human Beings. In terms of identifying impacts associated with the development of relevance to this study the, Environmental Report sets out: • Population – "*the careful siting and design of the cable route and the proposed electricity substation means that the proposed development will avoid any towns and villages".* • **Land-use** – *"..due to the siting and design of the proposed substation and the underground nature of the new cable connections this development will not affect agricultural uses in the area and will not alter the overall land use characteristics of the area"* • Tourism and **Amenities** – "while the location has no specific areas of tourism interest, the siting of structures associated with the development has been carefully considered in order to minimise the potential landscape impacts and associated attractiveness of the area for tourism and amenity purposes." In relation to construction it is noted that the impacts "*will be*

Proposed Development	Details	Reference No.	Reference Document	Reference to Settlement Pattern, Land Use and Amenities
				temporary in nature and will not impact on recreational or tourist amenities in the area and the predicted impact will be very low and of short duration". The NTS of the Report concludes "*Due to the nature of the receiving environment as well as the careful line routing and design process, the proposed development will not have any significant negative impacts in terms of human beings".*
			Inspectors Report	The Inspector does not specifically address land use or settlement pattern; however he notes the location of the proposed substation as being in a "*sparsely populated rural area"*
			An Bord Pleanála Decision	ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity* …..".
Mullingar, Co Westmeath	New 110 kV circuit from Mullingar substation (Co Westmeath) to Kinnegad substation (Co Meath)	PL.25.VA0013	Environmental Report	The Environmental Report which accompanied the application did not include a specific section addressing Human Beings. While there is no specific consideration of land use and settlement pattern, Distance to populated areas was considered during the route corridor identification process and generally it was noted that the indicative circuit route *"should avoid residential properties and community buildings"* where possible...
			An Bord Pleanála Inspectors Report	In respect of "human beings" and Material Assets' the Inspector notes that "*it was quite evident that significant weight was assigned to the setting back of the OHL, as far as practicable from residential properties. In all instances, a minimum of 50 metres is achieved".*
			ABP Decision	Having regard to *inter alia* "*the pattern of development and character of the area",* ABP determined that the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity* ….'
Dublin North Fringe	New 220 kV substation building and associated works	PL.25.VA0014	Environmental Report	Chapter 4 addresses "human Beings" and focuses on population, socio-economic activity and health impacts associated with EMF. Land use is addressed in section 13.3. While it is noted that the principal land use is agricultural, the site of the proposed substation site is HT (High Technology) and the proposed use is 'permitted in principle'. In terms of potential impacts it is noted that in the long term the lands are to be developed into an industrial park. In the meantime when the substation is developed the land would no longer be available for farming purposes.
			Inspectors Report	The Inspector does not specifically address land use or settlement pattern; however the zoned status of the proposed site location is noted and the Inspector concludes that *"the proposed development does not conflict with the land use zoning objectives for the area as contained within the statutory local plans"*
			An Bord Pleanála Decision	ABP determined that the having regard to *inter alia* "*the pattern of development in the area, and the separation distance from the existing residential development in the area"* the proposed development "*would not seriously injure the amenities of the area or of property in the vicinity* …..".

The review of planning assessment documentation (summarised in **Table 2.1** above) found potential impacts are identified as occurring both during the construction and operational phases of development.

In terms of land use, the various applications and assessments focus briefly on the extent of development relative to the prevailing land use (and the "area of impact"). Depending on the nature of land use the potential impacts identified vary. In most cases it is acknowledged best practice routing techniques avoid settlements and set development away from individual dwellings thereby minimising impact on residential amenity.

In the case of tourism and recreational land use, reference is also made to best practice routing techniques to avoid key tourism attractions (in particular), with the distance between the proposed development and particular sites / amenity areas often highlighted. While it is presumed (albeit without evidence) throughout the majority of the applications that a transmission development will diminish the attractions in the area (primarily with reference to visual impact), it is generally concluded that such development is unlikely to have a significant negative overall effect on the tourism industry.

As set out in **section 2.3** (in respect of EIA legislation and guidelines), the "Human Beings" EIA topic facilitates consideration of the potential socio-economic benefits associated with the development of high-voltage transmission infrastructure. In the applications reviewed, this includes *inter alia* reference to improving the electricity supply to the general location and potential for local revenues associated with the construction phase of the project; however, these potential benefits are not given spatial dimension in terms of how they might positively influence settlement pattern and land use. As such, they are not considered further in this study.

2.6 CONCLUDING COMMENTS

Research on the impact of transmission infrastructure on "Human Beings" primarily focuses on the prevailing, but unproven hypothesis that attitudes and the 'perception of harm' influence how people perceive, behave and interact with their environment. The particular focus to date has been on the relationship between the potential health implications of transmission infrastructure and on property economics. However, no related link has been established between these concerns and patterns of settlement and land use activity including amenities (as opposed to amenity which is directly related to attitudes and the perception of harm).

It is evident that where potential impacts of transmission infrastructure on "Human Beings" are identified in published sources (especially EIA related guidelines), they tend to occur at a very general heading level. In responding to this, EIS's simply describe baseline information related to such headings e.g. the population (including settlement), socio-economic and land use (including recreation and tourism) characteristics of the area in which the transmission project is to be routed or sited. Potential impacts are rarely identified at a macro level, i.e. likely to result in shifts in population, new land uses or rezoning of land etc. In this regard, it is evident from routing guidelines that a key factor for this is a robust route

identification and evaluation process which seeks to avoid or minimise impacts on the human population in the first instance.

Aside from broader routing considerations, it is evident that the focus of published material is on detailed route design and site design; in the various EIS's 'potential impacts' are generally concentrated in the immediate area of the towers, under the OHL transmission circuit and on/around substation sites.

The focus of other literature is on responsive site layout and design measures to best accommodate development proposals (in particular residential development) and existing high-voltage infrastructure. This has potential implications for patterns of settlement and land use at the local level i.e. the distinctive way in which the physical components of the development (buildings, roads and paths) are laid out relative to the transmission infrastructure; however, it does not suggest any more significant influence at work in terms of affecting development in such locations (e.g. restricting development).

Having regard to all the above, there are two broad findings of this literature review:-

(a) The absence of any definitive literature addressing the potential impact of transmission infrastructure development upon patterns of settlement and land use. Having regard to the established existence of transmission infrastructure worldwide this may suggest that there is no significant prevalence of such impact, perhaps as a consequence of established routing guidelines and principles, combined with the application of localised routing mitigation, such as the siting (or re-siting) of structures to avoid, or otherwise facilitate, existing or new development.

(b) The various guideline documents relating to design and siting of dwellings and other development in proximity to established transmission infrastructure suggests that this is a widespread, long-established and accepted activity, albeit within parameters relating to matters of detailed design and layout of development, such as clearance distances.

3 PATTERNS OF SETTLEMENT AND LAND USE IN IRELAND – AN OVERVIEW

3.1 SETTLEMENT PATTERN IN IRELAND

Ireland's population increased by 42% in the period 1926 – 2011 (from approximately 2.9 million to 4.5 million people) (Central Statistics Office, 2011). Population growth is particularly evident from the 1960's onwards reflecting the development of the national economy (which in turn is reflected in the need for, and expansion of the transmission network as referred to **section 1.2**). Over this period, geo-demographic trends, and in particular rural and urban population dynamics, have greatly changed the shape and profile of the Country. For example, in 1961, 46.4% of the population lived in urban areas and 53.6% lived in rural areas. However, by 2011, 62% of the population lived in urban areas and 38% lived in rural areas; representing a rural urban shift of 15.6% of the population. This is graphically represented in **Figure 3.1** below.

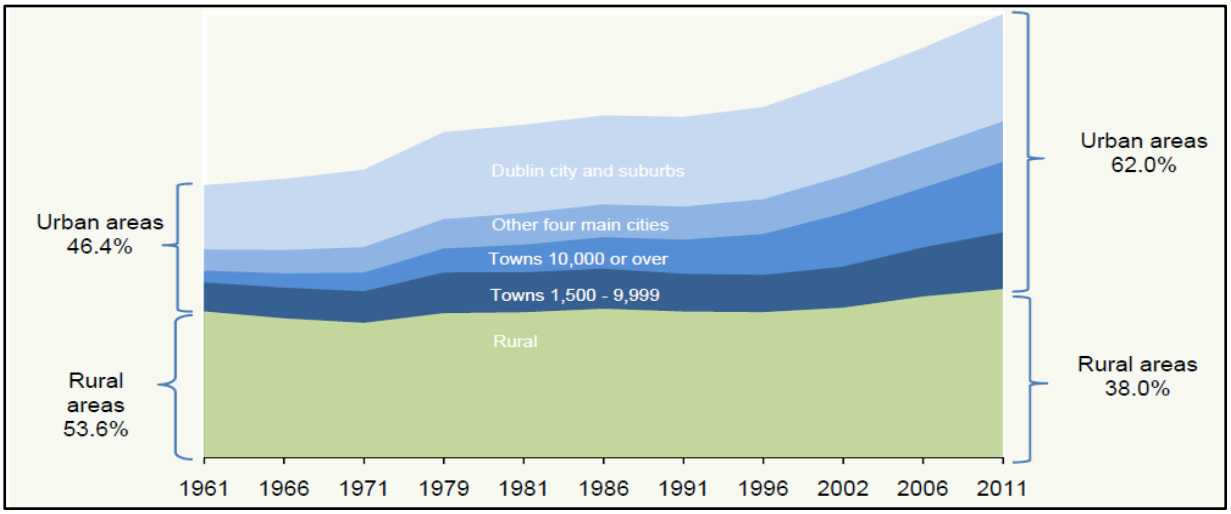


Figure 3.1 Urban and Rural Population 1961 - 2011

Source: This is Ireland – Highlights from Census 2011, Part 1

While Ireland continues to experience a relatively low population density compared with other European countries, with an average of just over 60 persons per square kilometre, changing population dynamics means that it has become increasingly urbanised. Resulting rural restructuring, urbanism, ex-urbanism (i.e., moving from urban areas to rural areas including one-off housing) and urban sprawl are directly influencing patterns of settlement and land use in the country.

To understand the relationship between the high-voltage electricity grid and geo-demographic trends across the Country, **Figure 3.2** shows the change in population between the period 1996 and 2011**, Figure 3.3** profiles population density (2011)**, Figure 3.4** shows all towns with a minimum of 50 inhabited houses (2011), and **Figure 3.5** shows the percentage of one-off housing by electoral division (2011). The high-voltage electricity network (2012) has been included in all figures.

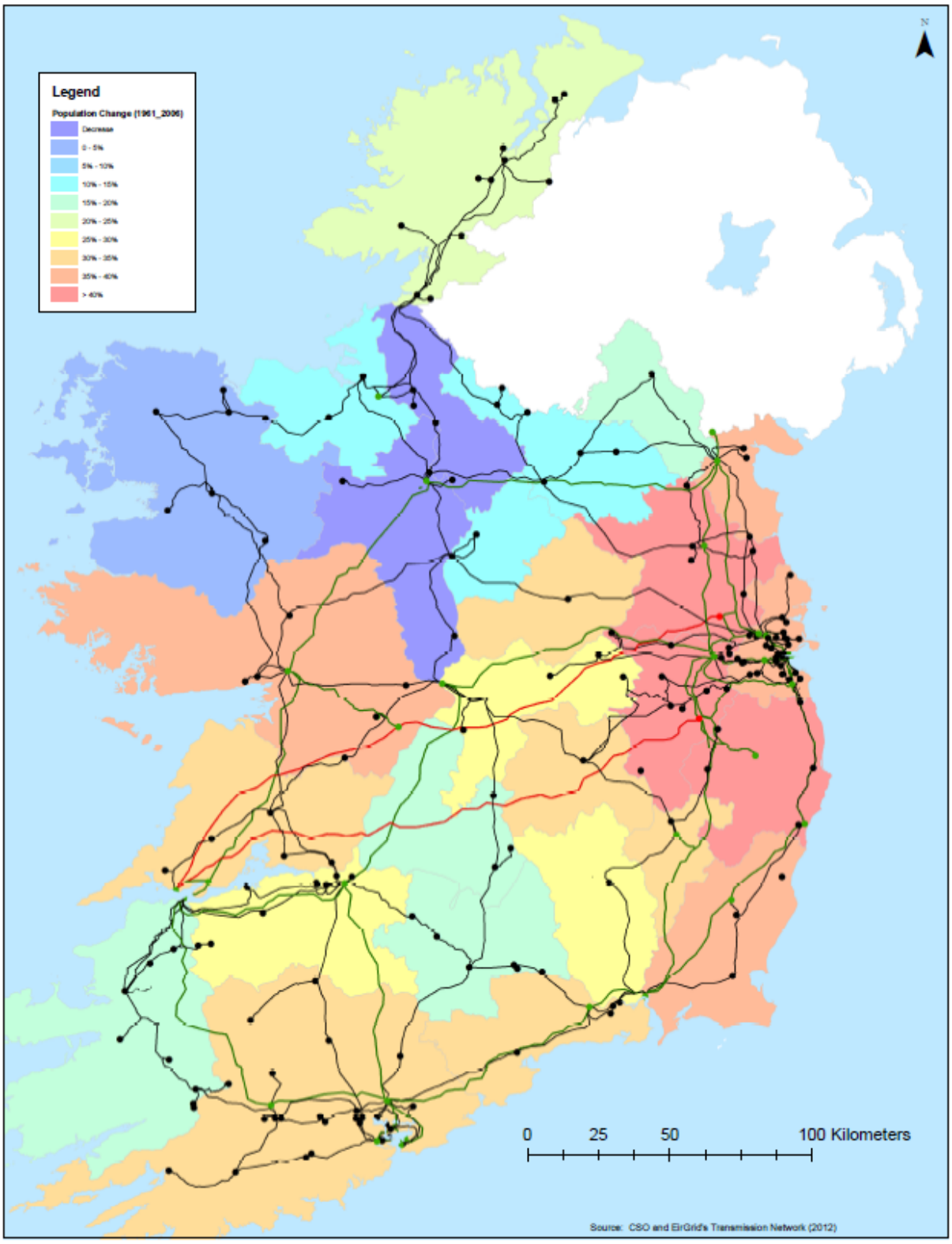


Figure 3.2
Population Change for All Counties in the Period 1961 – 2006

Legend
110kV Substation
220kV Substation
400kV Substation
110kV Network
220kV Network
400kV Network

EirGrid - Evidence Based Guideline Studies

EIRGRID

RPS

Issue Details
D01

Source: CSO and EirGrid's Transmission Network (2012)

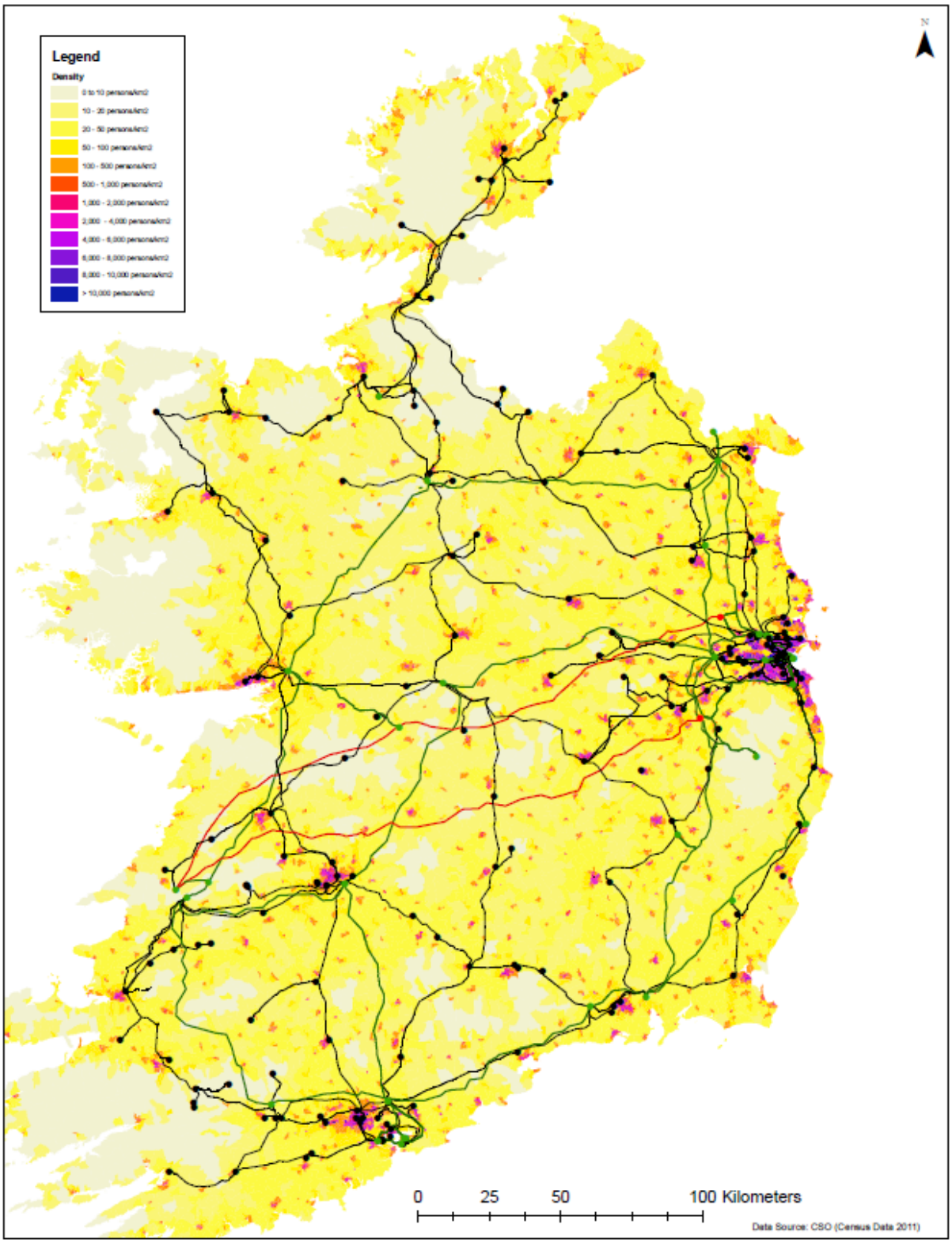


Figure 3.3
Population Density (2011)

Legend
110kV Substation
220kV Substation
400kV Substation
110kV Network
220kV Network
400kV Network

EirGrid - Evidence Based Guideline Studies

RPS

EIRGRID

Issue Details

D01

Source: CSO and EirGrid's Transmission Network (2012)

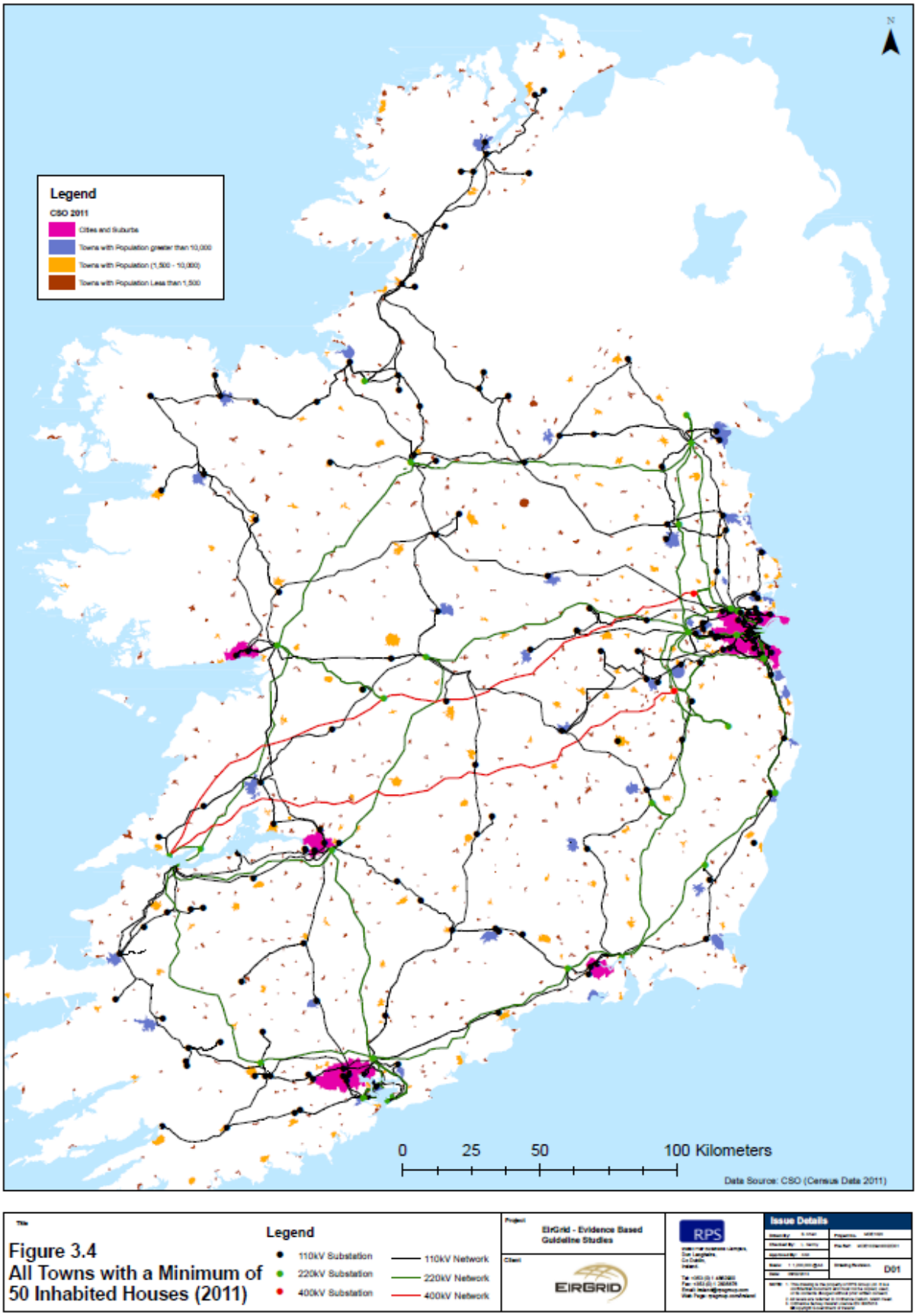


Figure 3.4
All Towns with a Minimum of 50 Inhabited Houses (2011)

Legend
110kV Substation
220kV Substation
400kV Substation
110kV Network
220kV Network
400kV Network

EirGrid - Evidence Based Guideline Studies

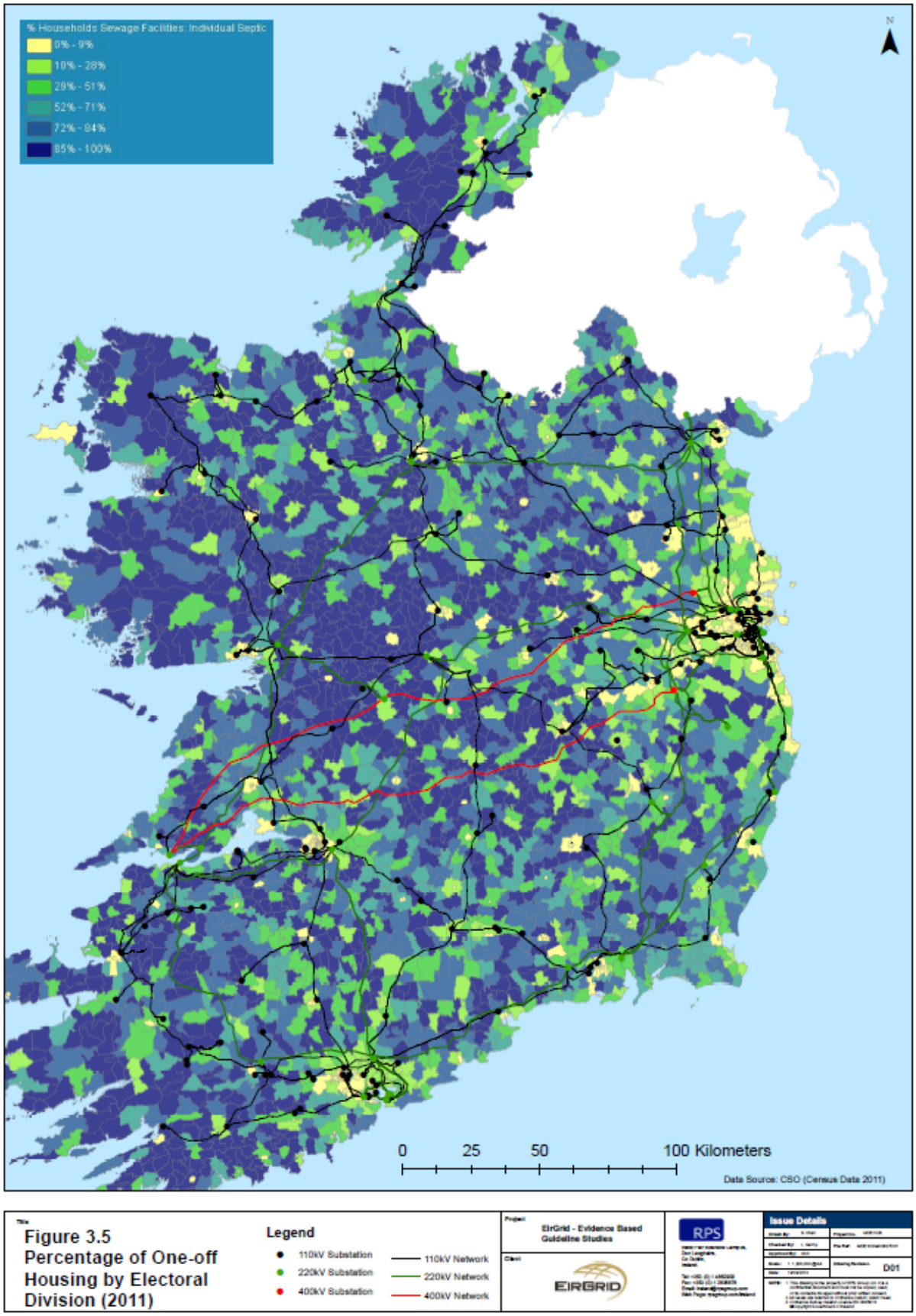
EIRGRID

RPS

Issue Details

D01

Source: CSO and EirGrid's Transmission Network (2012)



Source: CSO and EirGrid's Transmission Network (2012)

Observations on **Figure 3.2, Figure 3.3, Figure 3.4** and **Figure 3.5** are as follows:-

- The high-voltage transmission network avoids or skirts the majority of urban areas in the country. Bulk supply points or "nodes" (i.e., substations) tend to be located remotely from or on the outskirts of towns, where the power is taken onwards into the urban centres on the lower voltage distribution system (see also **Figure 3.7**);

- The greatest interaction between settlements and the high-voltage transmission network is in and around the main urban areas - this is particularly evident for Ireland's larger cities. This may be due to the fact that larger settlements are significant demand centres for the transmission of bulk power; it may also be due to the fact that it may not be possible for transmission infrastructure to entirely avoid these existing settlement areas, for example because of their geographical extent, or the traditional location of sources of generation;

- The strong influence of the main cities (especially Dublin) on adjoining urban and rural areas and particularly those areas and towns within commuting distance (i.e., directly linked by road or rail infrastructure), is evident from the location of highest population change between 1961 and 2011 and the resultant population density for the country (2011);

- Villages and smaller settlements (i.e., below the threshold of a town) are dispersed throughout the country, providing a small range of services for the wider rural population. Much of this rural population is dispersed, living in residential clusters, ribbon development along roads, or one-off housing in the rural hinterland. 26% of all private households in the country are one-off dwellings (i.e., defined as detached houses with individual septic treatment systems);

- 60% of the population lives within 10 km of the coastline.

3.2 LAND USE IN IRELAND

The 2006 CORINE landcover map of Ireland indicates that the landscape is predominantly rural and agricultural, reflecting the settlement pattern outlined in **section 3.1** above, in that:-

- Agriculture is the largest use of land accounting for 66% of the land surface. Most of this land is under grass for pasture, silage or rough grazing;

- Nearly one-fifth of land is categorised as wetland which includes raised bogs, blanket bogs and fens;

- Forested and semi-natural areas account for 10% of land surface; and

- Artificial surfaces account for only 2% of the land surface.

According to the EPA, Ireland has experienced a relatively high rate of land use change since the early 1990's when compared with other European countries. The main changes identified are an increase in the amount of forested land and artificial (or built up areas) and a decrease in the total amount of agricultural land and peatland (Environmental Protection Agency, 2012).

In particular, the EPA highlights the increase since 2000 of the area under artificial surfaces to 2%, representing an overall increase of 15% in 2 years (EPA, 2011)[8]. This is identified as occurring mainly on former agricultural lands on the periphery of existing urban areas, including the suburbanisation of villages close to larger towns and cities. The changing land cover in Ireland between 1990 and 2006 is represented in **Figure 3.6.**

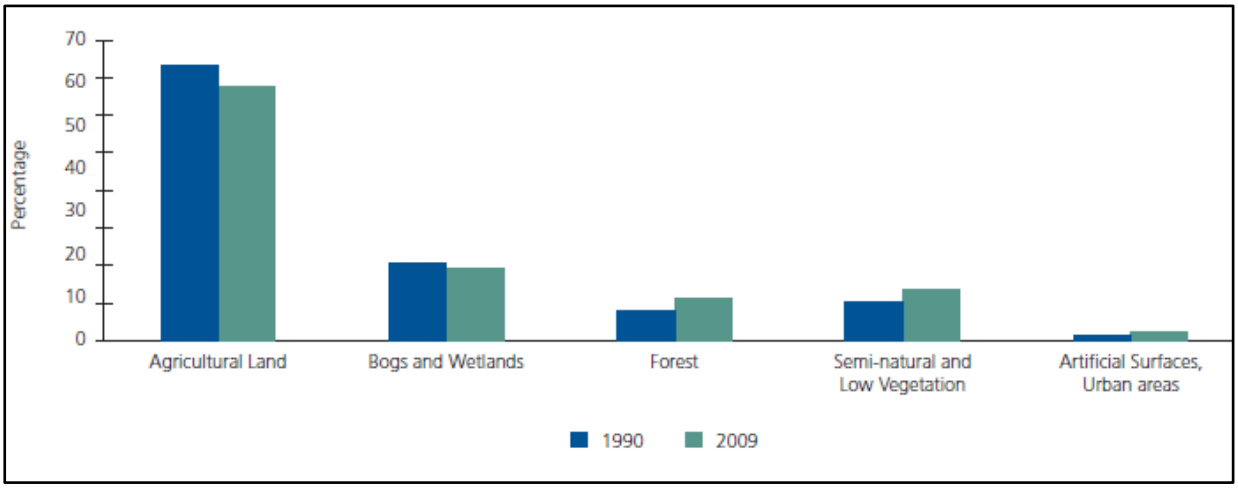


Figure 3.6 Percentage Landcover Change in Ireland 1990 – 2009

Source: EPA Figure 7.2

In terms of the relationship between landcover in Ireland and the transmission grid, **Figure 3.7** shows the 2006 CORINE landcover map of Ireland with the transmission network (2012) overlain.

[8] To put this in context, this represents only half the European average of 4%.

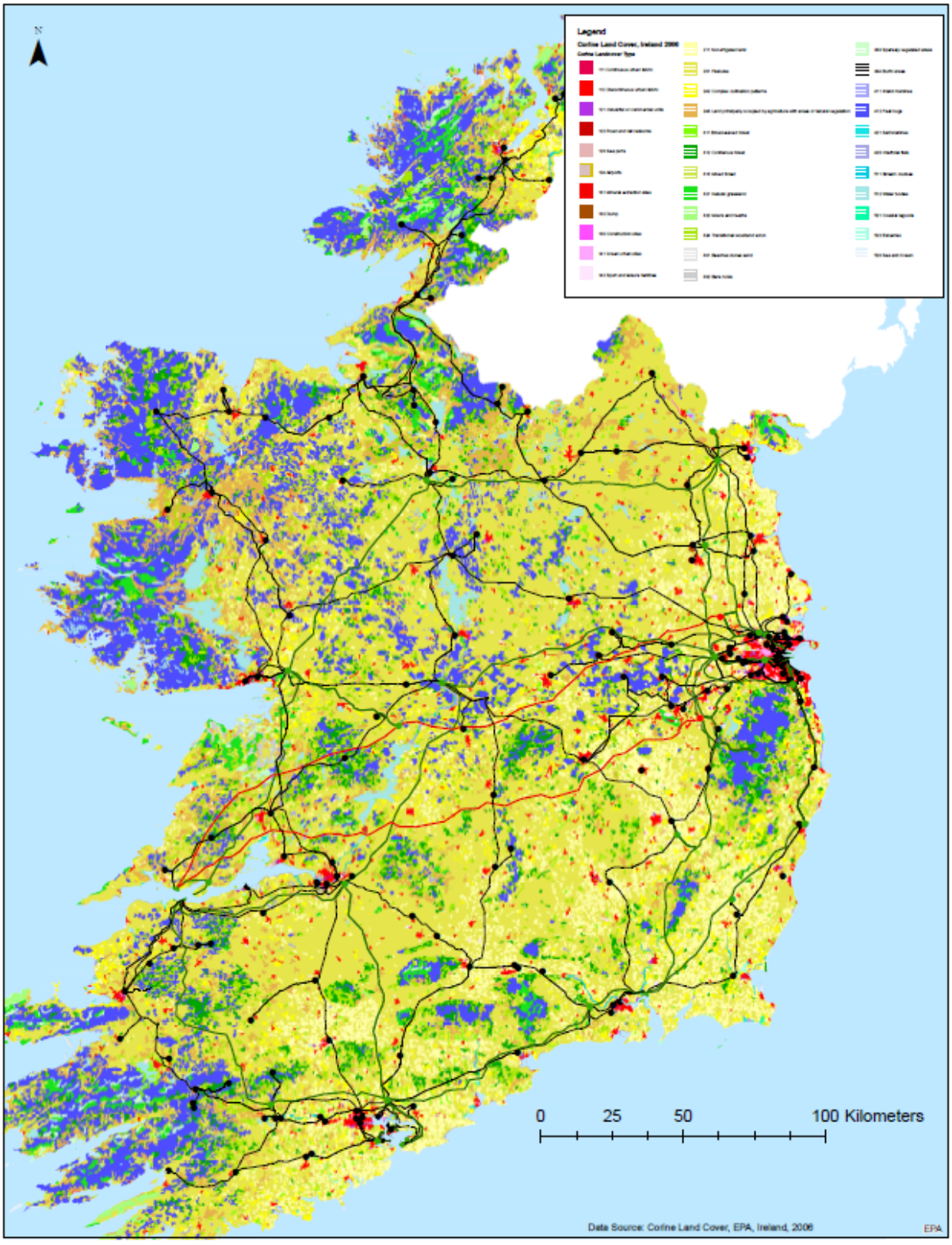


Figure 3.7
2006 CORINE Land Cover/ Land Use Map of Ireland

Legend
110kV Substation
220kV Substation
400kV Substation
110kV Network
220kV Network
400kV Network

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EIRGRID

RPS

Issue Details

D01

Source: CORINE and EirGrid's Transmission Network (2012)

Table 3.1 sets out the percentage of relative lengths of OHL traversing key landcover categories for each high-voltage category. **Table 3.2** summarises the number of substations located in each key land cover category.

Table 3.1 Relative % Length of Existing Overhead Line (OHL) Infrastructure Traversing Key CORINE Land Cover Categories

Voltage	Artificial	Agricultural	Forestry/ Semi Natural	Wetland	Other
110 kV OHL	10.8%	77.2%	6.5%	5.2%	0.3%
220 kV OHL	10.5%	80.2%	4.6%	3.1%	1.6%
400 kV OHL	1.0%	81.1%	12.1%	5.4%	0.4%

Source: EirGrid's Transmission Map and CORINE landcover map of Ireland

Table 3.2 No. of Existing Substations Located in CORINE Land Cover Categories

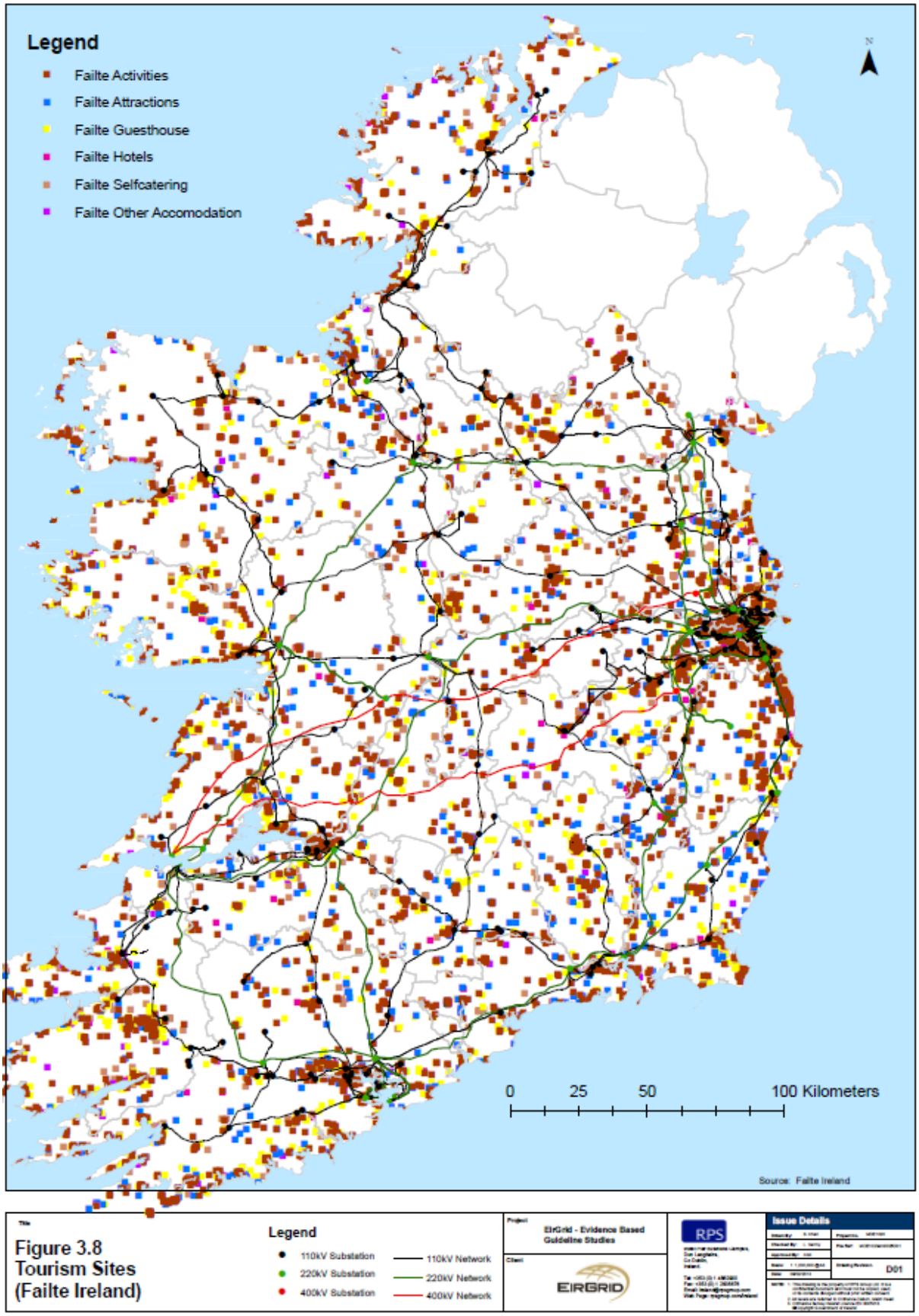
Voltage	Artificial	Agricultural	Forestry/ Semi Natural	Wetland	Other
110 kV substations	70	84	8	7	0
220 kV substations	13	19	1	2	0
400 kV substations	0	2	0	0	0

Source: EirGrid's Transmission Map and CORINE landcover map of Ireland

These figures reflect the established general pattern of routing transmission circuits across agricultural lands, combined with the siting of transmission substations in and around urban settlements.

In terms of providing a strategic overview of the interaction between the high-voltage electricity network and specific land uses in Ireland there are inherent difficulties in collating baseline information. For example amenity related land uses (as defined for this study) tend to be fragmented in nature and consist of a diverse range of components (including schools, sports, leisure, entertainment, tourism and hospitality facilities). They also tend to be spatially diverse, ranging from those contained in specific buildings or associated with specific locations to those which encompass a wide expanse of area (e.g. a national park or scenic driving route). Accordingly it is difficult to discern any particular trends on a national basis. By way of example, **Figure 3.8** overlays the high-voltage transmission network on Failte Ireland's dataset relating to tourism activities, attractions and accommodation. At this macro scale it does not appear that the existing network influences or affects tourism attractions and services. There are a couple of notable gap areas along the 220 kV network (e.g. between Macroom and Tarbert) where no tourism attractions appear to exist; in these areas it is noted that the underlying topography is likely to influence this rather than the transmission infrastructure.

Other uses such as commercial and industrial uses are primarily located in or around urban areas; the most logical way to identify them is through the land use zoning policies of relevant Development Plans (refer to **section 3.3** below).



Source: Failte Ireland and EirGrid's Transmission Network (2012)

3.3 CONTROL OF PATTERNS OF SETTLEMENT AND LAND USE

In Ireland, most land covered by city and town council administrative areas is subject to land use zoning for specific objectives. However, it is not a requirement that all land within a planning authority's functional area be subject to a zoning objective. The extent of zoning varies and relates *inter alia* to the function, size and role of the settlement.

Where zoning objectives are identified on the periphery or outside of city and town boundaries, they tend to relate to green belt, agriculture and other land uses which seek to protect the rural character of an area or provide a landscape / amenity buffer between urban and rural land uses.

However, the majority of land outside urban areas is unzoned. Development activity in such areas tends to be dealt with through the development management process, having regard to relevant objectives and policies in the County Development Plan. Other considerations for development in unzoned rural areas (especially residential development) include the policy framework established in section 5.3.2 of the National Spatial Strategy (NSS) and guidance in the form of Sustainable Rural Housing (DOEHLG, 2006).

Figure 3.9 illustrates the spatial extent of 'zoned land' in the development plan/local area plan framework in Ireland. It is evident that the key interface between zoning objectives and transmission projects is in and around urban areas.

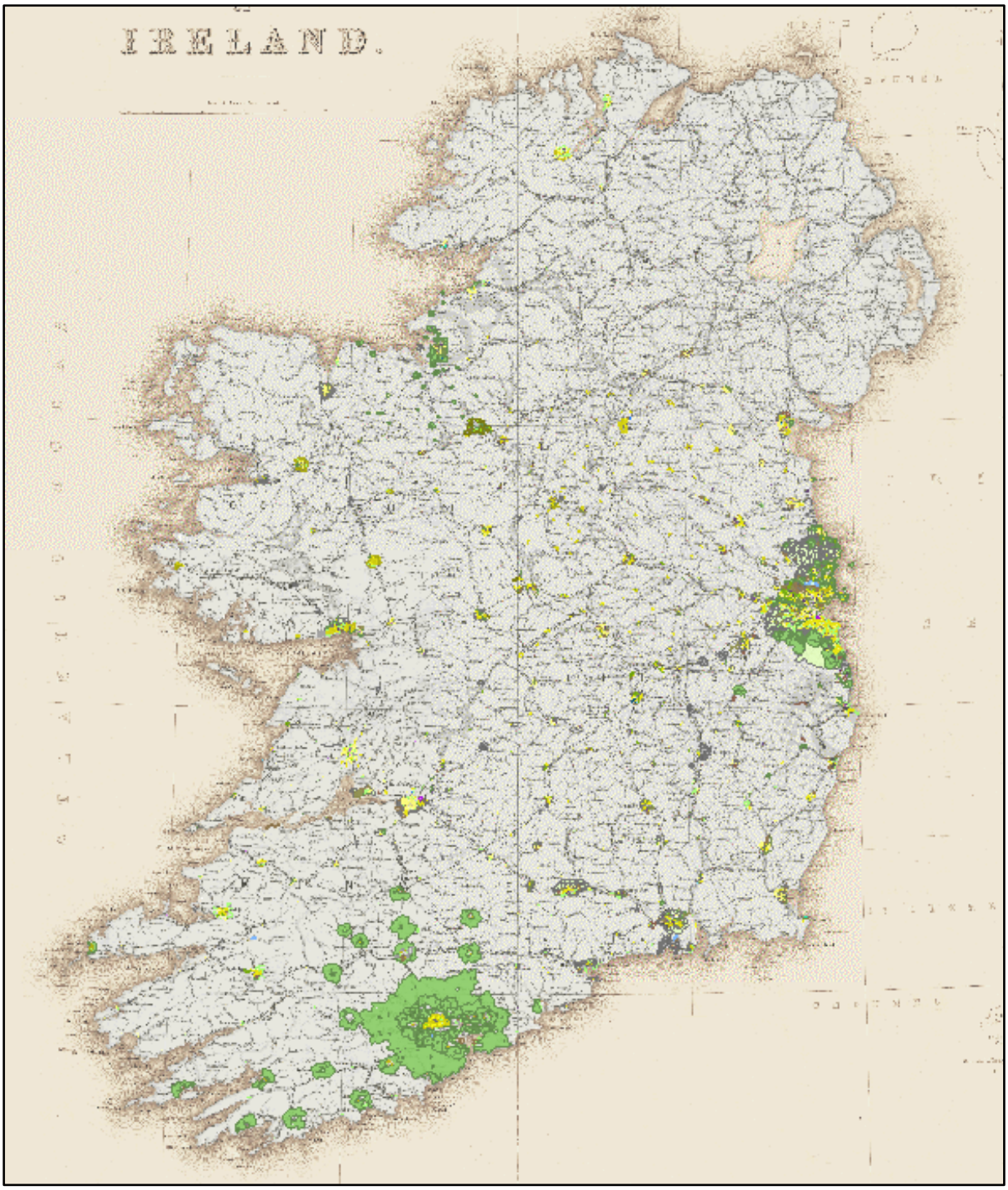


Figure 3.9 The Spatial Extent of Zoned Land in the Development Plan/Local Area Plan Framework in Ireland

Source: myplan.ie - Presented over the Historic 25" Map for Illustrative Purposes

3.4 CONCLUDING COMMENTS

While Ireland remains relatively sparsely populated (with an average of just over 60 persons per square kilometre) it has become increasingly urbanised. 62% of people now live in the urban areas and the majority of these (60%) live within 10 km of the coastline.

The existing high-voltage transmission network avoids or skirts the majority of urban areas in the country; however they clearly interact in and around the main cities and suburbs and along coastal areas, presumed to be due, at least in part, to the function of the transmission grid to carry electricity from where it is generated to where it is required – known as “demand centres”.

Outside of urban areas the effects of rural restructuring, ex-urbanism and urban sprawl are directly influencing patterns of settlement and land use in particular with the distribution of one-off housing. At this scale it is not possible to make any particular observations about how existing transmission infrastructure interacts with rural settlement patterns, except to point out that the strong influence of the main cities (especially Dublin) on adjoining urban and rural areas and particularly those areas and towns within commuting distance, is resulting in more complex settlement patterns in these areas.

In terms of land use, as outlined above, Ireland’s landcover is dominated by agricultural use (accounting for 66%) and the majority of the existing transmission infrastructure is routed/located within such landcover. It is also observed that the key interface between lands zoned for particular uses and transmission projects is in and around the urban areas. However, at this scale it is not possible to make any particular observations about more fragmented and spatially diverse uses (e.g. commercial and amenity related land uses) insofar as they relate to existing transmission infrastructure.

The investigation of the potential impact of transmission infrastructure on patterns of settlement and land use is undertaken on a case study basis. The findings are set out in **Chapters 5 – 9**.

4 METHODOLOGY

4.1 OVERVIEW

A key part of this study is the qualitative examination of case study sites to establish whether existing high-voltage infrastructure has an identifiable influence on patterns of settlement and land use. In order to establish this, it is first necessary to identify relevant indicators with which it is possible to register and monitor change. As highlighted in **Chapter 2**, a detailed investigation of the impact of transmission infrastructure on patterns of settlement land use is best undertaken on a case study basis.

No two sites can be directly comparable (notwithstanding screening measures), and accordingly assessments are not readily quantifiable. Therefore this study focuses on qualitative and descriptive indicators and these will be examined as part of detailed survey work of the case study sites. The indicators identified for the study are:

- Incidence of coexistence or severance of buildings and high-voltage transmission infrastructure over various distances;

- Measureable changes in development density in proximity to existing high-voltage transmission infrastructure (and relative to control sites);

- Changes to planning policy over time (in terms of the number and nature of policies referring to transmission infrastructure);

- Documented evidence of proposed developments being influenced by the presence of existing high-voltage transmission infrastructure (e.g. sourced from planning application material);

- Documented evidence of development proposals being altered by the decision of a planning authority or An Bord Pleanála by reason of proximity to existing high-voltage infrastructure;

- Documented evidence of proposed developments being refused permission by reason of proximity to existing high-voltage transmission infrastructure; and

- Noticeable differences in the number and nature of planning applications between periods prior to and after commencement of construction of high-voltage infrastructure.

In keeping with the subject matter and with the qualitative approach adopted for this study, it should be noted that the use of the terms ‘significance’ or ‘significant’ often relate to subjective rather than scientific concerns. Therefore, outside of any specific discussion on EIA, the terms are used to describe noticeable observations, findings, differences or trends relating to the above indicators.

4.2 SITE SELECTION

As outlined in **section 3.4** of this report, interrelationships between the transmission network and patterns of settlement and land use are often difficult to identify at a strategic level. Case study assessment therefore is a critical element of this evidence based study process.

Case study site selection was based on a nationwide platform using the existing transmission network and was required to reflect three key elements of the transmission network:

- Operational overhead line (OHL) circuits on the national transmission grid;
- Transmission substation sites;
- Construction sites i.e., where construction of transmission infrastructure has recently occurred.

A total of 31 sites were identified for the study comprising 17 OHL sites, 10 substation sites and 4 construction sites. The selected sites also represent a diverse range and combination of settlement and land use characteristics, in order to ensure consideration of a wide range of scenarios and potential interactions. The identified settlement sub-categories are:-

- Rural;
- Rural/urban fringe;
- Urban.

The identified land use sub-categories are:-

- Agricultural;
- Commercial (comprising non-agricultural and retail);
- Amenity (including community/social and recreation, and tourism-related land uses).

Residential use is excluded from analysis under the land use category, given that it is addressed as part of the settlement pattern analysis (and is a defining characteristic for each of its sub-categories).

A number of control sites were also identified. These are sites with no transmission infrastructure.

4.2.1 Screening

The guiding principle behind the selection of case study sites was to isolate, insofar as possible, the effect of high-voltage transmission infrastructure on patterns of settlement and land use from other potentially influencing factors that might inhibit or otherwise influence development and land use. This required a detailed contextual analysis of the existing high-voltage transmission network to identify sites that exhibit the following characteristics:-

- An absence of development constraints;
- Population change;
- Zoning or other planning policies consistent with each sub-category of settlement or land use.

The basis for identifying these particular screening factors for this study is detailed below.

1. An Absence of Development Constraints

For the purpose of this study, constraints were identified that could potentially prevent or affect development associated with settlement and active or productive land use. These constraints could derive from the physical attributes of an area making it unsuitable for human settlement or active land use (e.g. high elevation or peat bogs), or from planning and/or environmental policies restricting development (e.g. national parks). These constraints were identified using the CORINE Landcover Database and with reference to areas designated for environmental protection. The relevance, or otherwise, of physical and environmental screening factors from the CORINE Landcover Database, to particular settlement and land use categories is highlighted in **Table 4.1**.

Table 4.1 Physical and Environmental Screening Factors

	Settlement Categories			**Land Use Categories**	
	R	**URF**	**U**	**A**	**C**
Environmental protection areas area	■	■	■	■	■
Areas above 100 metres	■	■	■	■	■
Slope greater than 20 degrees	■	■	■	■	■
Continuous urban fabric	■	■		■	
Discontinuous urban fabric	■		■	■	
Industrial/commercial	■	■	■	■	
Major transport infrastructure	■			■	
Mineral extraction sites	■	■	■	■	■
Dump sites	■	■	■	■	■
Agricultural land (various)			■		■
Peat bogs, moors and heathland	■	■	■		■
Coastal	■	■	■	■	■
Bare rocks	■	■	■	■	■
Water bodies	■	■	■	■	■
Forest	■	■	■		■

Shading indicates the relevance of the factor to screen out particular sections of the transmission network for the consideration of the different settlement and land use categories

2. Population Change

CSO data and data available from the relevant planning authorities concerning development pressure and demographic change at electoral district (ED) level over the previous three development plan cycles were compiled to help identify those areas in the vicinity of existing transmission infrastructure experiencing consistent development pressure and population growth. It was important to select study sites from such areas because they provide the best opportunity to detect impact arising from the presence of transmission infrastructure.

3. Zoning and Other Planning Policy

Potential case study sites were also screened for applicable planning policy in order to ensure that the uses and settlement categories being assessed are consistent with zoning and other planning objectives. The review of local planning policy also enabled the identification of special or unique conditions, for example special planning designations such as Strategic Development Zones (SDZ's) where land use is prescribed in detail.

Some study sites are wholly identifiable with a particular land use category e.g. agricultural and commercial; while all study sites were screened for instances of dispersed land uses such as community and social and tourism land uses, no sites are wholly identifiable with such uses.

4.2.2 Typical and Worst Case Conditions

In order to consider a full range of study sites and their potential inter-relationship with the construction and existence of transmission infrastructure in Ireland, it was necessary to establish characteristics of both typical and worst case condition for the settlement and land use sub-categories. These are set out in **Table 4.2** and **Table 4.3**. The worst case condition is based on professional experience and contains some of the physical, environmental and other screening factors identified in **Table 4.1** i.e., residential use in elevated areas or close to designated sites where housing would be sparse and sporadic.

Table 4.2: Defining Characteristics of Settlement Pattern

Settlement Patterns (3 Sub-categories Identified)		
Rural	**Typical Condition**	**Worst Case Condition**
	• Population density < 75 persons/km^2 • Dispersed/sparse housing	• Rural areas under development pressure • Convergence of OHL transmission circuits
Rural / Urban Fringe	**Typical Condition**	**Worst Case Condition**
	• Population density > 75 persons/km^2 outside of urban settlements (population $\geq$ 1,500) • Rural areas under strong urban influence (e.g. within commuting distance of a major population centre) • Transportation infrastructure (e.g. road and rail)	• Landscape/heritage designations (e.g. green belt, estates / demesnes (protected or otherwise) etc) • Other significant linear infrastructure such as national roads / inter-urban highways and rail lines • Bounded by areas with development constraints such as unsuitable topography and environmental protection designations • Mix of residential and employment uses • Convergence of overhead transmission infrastructure
Urban	**Typical Condition**	**Worst Case Condition**
	• Urban settlements (population $\geq$ 1,500) • Zoned for residential development and/or protection of residential amenity • Relatively homogenous residential land use • Mix of building type, height (e.g. houses and apartments) • Other significant linear infrastructure such as national roads/inter urban highways and rail lines	• Special planning objectives for future strategic development such as Local Area Plans (LAPs) and Strategic Development Zones (SDZs) • Presence of significant community and social land uses such as schools, community centres, playing pitches, etc. • Special amenity value such as elevated areas and parkland • Environmental protection designations • Convergence of overhead transmission infrastructure

Table 4.3: Defining Characteristics of Land Use

Land use (4 Types Identified)			
Agricultural		**Typical Condition**	**Worst Case Condition**
		• Arable and pastoral farming • Low density population (pop. < 75 persons/km^2)	• Intensive farming (e.g. market gardening) • Specialty agricultural land uses such as horticulture • Crops associated with certain areas due to environmental conditions or proximity to urban market • Agribusiness such as certain food processing activities, abattoirs etc • Rural areas under development pressure • Convergence of overhead transmission infrastructure
Commercial		**Typical Condition**	**Worst Case Condition**
		• Industrial estates and business campuses on the periphery of urban settlements • Emerging employment and enterprise zones outside urban areas with access high quality transport routes	• Development constraints such as national roads, rail corridors and environmental protection designations and/or associated zoning • One-off commercial facilities/factories • Quarries and related processing activities • Convergence of overhead transmission infrastructure
Amenity Related Land Uses	**Community, Social and recreational**	**Typical Condition**	**Worst Case Condition**
		• Sports and recreational facilities including sports clubs and passive open space • Schools • Church/community centre	• Hospitals and care facilities • Sites constrained against further development due to location within built up areas or incompatible planning policy • Convergence of overhead transmission infrastructure
	Tourism	**Typical Condition**	**Worst Case Condition**
		• Hotels and other forms of tourist accommodations • Buildings associated with tourist amenities/visitor attractions such as holiday resorts and interpretive centres	• Concentration of tourism accommodation/amenities and visitor attractions • Buildings or structures of special significance such as historic buildings or unique features of the natural environment • Convergence of overhead transmission infrastructure

4.2.3 Selected Sites

Based on the screening process, a total of 31 study sites were identified for the study comprising 17 OHL sites, 10 substation sites and 4 construction sites. In addition, a number of control sites were identified (4 no.) i.e., sites with no OHL or associated transmission infrastructure. These are detailed in **Tables 4.4**, **Table 4.5** and **Table 4.6.**

It should be noted that these study sites may be used for more than one category of settlement or land use type. For example, Site ID 06L473 – Beggstown, Co. Meath is identified both as a "Rural Study Site" (relating to settlement type) and as an "Agricultural Land Use" (relating to land use). Similarly, Site ID 06L123 – Limerick Substation is identified as both an "Urban Study Site" (settlement type) and a "Community and Social Land Use Study Type (land use).

4.2.3.1 Operational OHL Sites

The 17 selected case study sites are summarised in **Table 4.4**, and are identified in the context of the national grid on a map included in **Appendix A.** The 17 sites represent approximately 93 km of the high-voltage transmission network. They are also identified within **Appendix B.**

4.2.3.2 Operational Substation Sites

The 10 selected operational substation case study sites are summarised in **Table 4.5** and are identified in the context of the national grid on a map included in **Appendix A.** They are also identified individually within **Appendix B.**

4.2.3.3 Construction Sites

The number and selection of study sites to assess the impact of the construction of high-voltage transmission infrastructure has been dictated by the availability of construction projects within the planning application review period 1996-2011.

It was possible to identify only 4 suitable sites (which were subject to the same selection criteria as those on the existing national grid, albeit on a much reduced scope due to the availability of limited construction projects). The finite number of such projects has limited the ability of this study to reach any definitive observations.

These construction sites are set out in **Table 4.6** and are identified on a map included in **Appendix A.** They are also identified individually in **Appendix B.**

Table 4.4 Operational Study Sites (OHL)

Site ID	Study Site	Transmission Infrastructure	Length	Settlement Type	Land use Type	Condition
06L456	Ballyshannon, Co. Kildare	Dunstown - Moneypoint 400 kV OHL	8.5 km	Rural	Agricultural	Typical
06L473	Beggstown, Co. Meath	Moneypoint-Woodland 400 kV OHL	13.6 km	Rural	Agricultural	Worst case (reason: agricultural area under urban development pressure)
06L260	Clara, Co. Offaly	Maynooth-Shannonbridge 220 kV	8.3 km	Rural	Agriculture	Typical
06L241	Ballysimon, Co. Limerick	Killonan - Knockraha 220 kV OHL	4.7 km	Rural/Urban Fringe	-	Typical
06L235	Neilstown, Dublin 22	Inchicore-Maynooth 220 kV OHL	1.2 km	Urban	Residential	Typical
06L234	Clondalkin/Parkwest, Dublin 22	Inchicore-Maynooth 220 kV OHL	3.4 km	-	Commercial	Typical
06S231	Kilternan/Stepaside, Dublin 18	Carrickmines-Maynooth 220 kV OHL	6.7 km	Urban	-	Worst case (reason: convergence of transmission circuits; elevated area)
06L242	Carrigtwohill, Co.Cork	Killonan-Knockraha 220 kV OHL	2.3 km	-	Agricultural, Commercial and Tourism	Worse case (reason: mix of agricultural, commercial and residential development)
06L236	Clonburris, Dublin 24	Inchicore - Maynooth 220 kV OHL	3.8 km	Urban	-	Worst case (reason: areas subject to special planning scheme)
06S227	Cloyne, Co. Cork	Aghada-Knockraha 220 kV OHL	7.1 km	Rural/Urban Fringe	Agricultural	Worst case (reason: sporadic commercial land uses in rural/agricultural area)

Site ID	Study Site	Transmission Infrastructure	Length	Settlement Type	Land use Type	Condition
06L167	Monkstown/Cobh, Co. Cork	Knockraha – Rafeen 220 kV OHL	3.3 km	Rural/Urban fringe	Residential	Worst case (reason: convergence of overhead line circuits)
06L116	Ballyvolane/Mayfield, Cork	Kilbarry-Mayfield 110 kV OHL	2.4 km	Urban	Community and Social	Typical
06L106	Bruree, Co. Limerick	Charleville-Killonan 110 kV OHL	10.1 km	Rural	Agricultural	Typical
06L107	Ballymount, Dublin City	Citywest-Inchicore 110 kV OHL	3.2 km	-	Commercial	Typical
06L174	Painstown, Co. Kildare	Dunstown-Rinawade 110 kV OHL	11.2 km	Rural	Agricultural	Worst case (reason: agricultural area under urban generated development pressure)
06L117	Montenotte, Cork	Kilbarry-Marina 110 kV OHL	0.5 km	Urban	-	Worst case (reason: elevated area)
06L166	Ballynaneashagh, Waterford	Dungarvan-Waterford 110 kV OHL	1.5 km	-	Tourism and Commercial	Worst case (reason: mix of commercial and tourism uses)

Table 4.5 Operational Study Sites (Substations)

Site ID	Study Site	Transmission Infrastructure	Settlement Type	Land use Type	Condition
06S459	Dunstown, Co. Kildare	Dunstown 400/220 kV substation	Rural	Agricultural and Community	Typical
06L250	Gorman, Co. Meath	Gorman 220/110 kV substation	Rural	Agricultural	Typical
06S263	Knockraha, Co. Cork	Knockraha 220/110 kV substation	Rural	-	Typical
06S161	Dunfirth, Co. Kildare	Dunfirth 110/38 kV substation	Rural	Agricultural	Worst case (agricultural area under urban generated development pressure)
06S170	Newbridge, Co. Kildare	Newbridge 110/38 kV substation	Rural/Urban fringe	Agriculture	Worst case (areas bounded by development constraints by elevated ground and environmental protection designations)
06L123	Dooradoyle, Co Limerick	Limerick 110/38 kV substation	Urban	Community and Social	Worst case (educational use on constrained site)
06S269	Finglas, Dublin	Finglas 220/110 kV substation	-	Commercial	Worst case (site adjacent to M50 motorway and quarry)
06L120	Castleview, Co. Cork	Castleview 110/38 kV substation	-	Commercial	Typical
06S124	Trabeg, Cork	Trabeg 110/38 kV substation	Urban	-	Typical
06S165	Kilbarry, Co. Cork	Kilbarry 110/38 kV substation	Rural/Urban fringe	-	Worst case (mix of residential and commercial uses)

Table 4.6 Study Sites (Construction)

Site no.	Study Site	Transmission Infrastructure	Construction Period*	Settlement Type	Land use Type	Condition
06L272	Rush/Ballyboughal Co. Dublin	East-West Interconnector	June 2007 – Oct 2012	Rural/ Urban Fringe and Urban	Agricultural, Commercial and Community and Social	Typical
06L171	Kilberry, Co. Meath	Gorman-Meath Hill 110 kV OHL	June 2005 – Dec 2012	Rural	Agricultural	Typical
06L175	Cavan, Co. Cavan	Arva-Shankill 110 kV OHL	Jan 2006 – Dec 2012	Rural	Agriculture and	Typical
06L176	Cloon, Co. Galway	Cloon – Castlebar 110 kV OHL	2002 - 2004	Rural	Agricultural	Typical

- Public announcement date of project adopted as commencement date for purpose of this study

4.2.3.4 Control Sites

4 no. control sites were identified to compare development density levels in areas with existing transmission infrastructure with sites where there is no such infrastructure exists. The use of control sites aimed to draw comparisons across different settlement patterns and commercial land uses specifically in terms of intensity of development.

The control sites have been selected by reference to the same criteria as the study sites but with the added fact of no high-voltage transmission infrastructure being present. The chosen sites are listed in **Table 4.7** and are identified on a map included in **Appendix A.** Control sites have not been identified for the land use categories of agriculture and amenity related uses because density measurement is not considered to be an appropriate indicator for such uses.

Table 4.7: Study Sites (Control)

Control Site	Study Category	Area
Irishtown, Co. Kildare	Rural Settlement	28 km^2
Cappavilla North, Co. Limerick	Rural/Urban fringe settlement	15.2 km^2
Hansfield, Dublin 15	Urban Settlement	250 hectares
Sandyford Industrial Estate, Dublin 18	Commercial Land use	65 hectares

4.3 COLLECTION OF DATA

In order to compare data across different land use and settlement sub-categories, and to inform various aspects of the study, information was collated for different distance intervals for the various analyses in order to determine any significant differences or trends. These intervals are: 0-15 metres, 0-30 metres; 0–60 metres; 0–125 metres; 0-250 metres and 0-500 metres. The rationale for these intervals and how they are used in the study is detailed in **Table 4.8.**

Table 4.8: Baseline Data Collection Distance Intervals

Distance Interval	Rationale and Use in the Study
0-15, 0-30 and 0-60 metres	For the purposes of this study, a building coexisting with transmission infrastructure is defined as being wholly or partly within 60 metres of transmission infrastructure. Within this:- • 0–15 metres is noted in order to investigate examples of immediate coexistence i.e., buildings located directly under or abutting transmission infrastructure; and • 15-30 and 30-60 metre intervals are specifically intended to cover both the '25 yards' distance from existing OHL circuits within which all planning applications must be referred to the ESB; and the minimum aspirational clearance of 50 metres or greater that EirGrid seeks to maintain between the centre line of a proposed OHL and the closest point of any dwelling. These distance intervals are of relevance to **Chapter 5** (for the coexistence analysis).
0 – 125 metres	In the case study sites, planning applications located wholly or partly within a corridor 125 metres either side of transmission infrastructure were reviewed. This distance interval was also observed to inform the development density analysis. This is of relevance to **Chapters 6 and 8** (for the density and planning application analyses).
0-250 metres	Coexistence for this interval is noted in order to inform the development density analysis. This is of relevance to **Chapter 8**.
0 - 500 metres	Coexistence for this interval is specifically used in relation to tourism related development, in order to capture those activities and attractions which extend, directly or indirectly (including visually) across a wide area. This is of relevance to **Chapter 6.**

4.3.1 Baseline Data - Coexistence and Development Density

Incidences of coexistence and development density are important in establishing the existing baseline condition and relationship between transmission infrastructure and patterns of settlement and land use. Once the baseline is established, other aspects of the study can determine if / how the baseline has been influenced by the existence of transmission infrastructure.

Coexistence: As set out in **Table 4.8** coexistence for the purposes of this study is defined as being a building located wholly or partly within 60 metres of transmission infrastructure.

Incidences of coexistence of buildings with high-voltage transmission infrastructure were observed by a combination of Geographical Information Systems (GIS) analysis and aerial photography. The GIS analysis was carried out using the GeoDirectory, which is the most comprehensive address database for the Republic of Ireland. It sought to calculate the number of residential, commercial and agricultural buildings located on land adjoining or abutting the transmission infrastructure.

While observing for incidences of coexistence, the opportunity was taken also to observe for incidences of severance (i.e., the separation of a single landholding into different areas and a reduction of accessibility between those areas arising from infrastructure). Unlike roads and other more intrusive linear infrastructure however, transmission circuits have less potential for severance of a landholding as physical access is less affected. The possible exception to this is in close proximity to substations where a convergence of overhead line circuits and tower structures may noticeably influence and affect the distribution and layout of particular uses or buildings.

The use of GIS analysis, aerial photography and site visits were also employed for observing different land use categories (specifically agriculture and amenity related land uses) which are not typically manifested by buildings and which are relatively seldom represented in the planning application records reviewed as part of this study. Apart from the associated buildings, such land uses were identified by other man-made arrangements of land (e.g. field / crop patterns for uses such as agricultural and playing field layouts for recreational facilities) as well as observed activities.

The coexistence findings are presented in **Chapter 5**.

Development Density: An exercise to determine any noticeable difference in development density with proximity to existing high-voltage transmission infrastructure relative to identified control sites (i.e. sites with no OHL or other transmission infrastructure) was undertaken as part of the study.

Population density is a measure of settlement intensity which is calculated by dividing total persons by number of hectares. In a similar way, settlement intensity can also be expressed and calculated as dwelling units or commercial units per hectare. All other things being equal, a change in development density in proximity to existing high-voltage transmission infrastructure and relative to the development density of a control site could indicate a potential impact of transmission infrastructure on settlement. The detailed screening and case study site selection process sought to screen out, insofar as

practicable, other potential influences (e.g. land conditions, development plan designations or zonings) which might otherwise influence density levels. Refer to **section 4.2.1** for details of the case study site screening process for this study.

The development density assessment was carried out using Geographical Information Systems (GIS) and data from the GeoDirectory database. Using the GeoDirectory database, residential and commercial development density levels, as appropriate, were calculated for specified distance intervals from the transmission infrastructure for each of the case study sites.

Different distance intervals were used for the study sites representing rural and rural/urban fringe and those representing urban settlement and commercial land use. Distance intervals of 0–250 metres and 250–500 metres either side of the transmission infrastructure have been used to evaluate density levels in the study sites representing rural and rural/urban fringe settlement while intervals of 0–125 metres and 125–250 metres have been used in the study sites representing urban settlement and commercial land use. Given the less intense settlement pattern of rural and rural/urban fringe areas it is considered necessary to extend the survey area to 500 metres either side of the transmission circuit in order to capture sufficient data.

The density levels were then compared for the different relevant settlement and land use sub categories[9]. These were also compared with the average density of control sites in order to determine if any pattern or trends are apparent. This latter comparison (i.e. with a control site) ultimately, however, proves to be an inappropriate method of comparing settlement intensity. The findings are presented in **Chapter 6**.

4.4 METHODOLOGY - PLANNING POLICY REVIEW

In Ireland, local development plan policy is set out in County Development Plans (CDPs) and Local Area Plans (LAPs). These plans must include a number of prescribed objectives, relating for example to land use, amenity and infrastructure.

For this study, the review of planning policy affecting high-voltage transmission infrastructure was carried out by studying relevant development plans affecting each study site. As OHL transmission circuits tend to avoid the centres of towns and cities for the most part (by reference to established routing principles), the majority of development plans studied were CDPs. However the list does contain a number of City Development Plans and largely urban CDPs (e.g. Dun Laoghaire-Rathdown County Council CDP). The intention of the review was to assess the evolution of policy relating to transmission infrastructure over different development plan periods to determine any noticeable trends

[9] The land use categories of agriculture, community and social facilities and tourism were excluded from this analysis of density assessment, as no meaningful results could be extracted from the available address data for these uses

e.g. an increase in related policies, or change in the nature (supportive or not) and the level of detail of such policies. Accordingly both the current and previous two development plans for each of the planning authorities (generally) are included in the review (i.e. covering a period of 12 – 18 years)[10]. This also correlated to the period of the planning application review (refer to **section 4.5** below).

The following Development Plans and development plan periods were examined:

- Dublin City Development Plans: 1999; 2005-2011; 2011-2017
- South Dublin County Development Plans: 1998; 2004-2010; 2010-2016
- Dun Laoghaire-Rathdown County Development Plans: 1998; 2004-2010; 2010-2016
- Fingal County Development Plans: 1999-2004; 2005-2011; 2012-2017
- Cavan County Development Plans: 2003-2009; 2008-2014
- Meath County Development Plans: 1994; 2001; 2007-2013
- Offaly County Development Plans: 1996; 2003-2009; 2009-2015
- Kildare County Development Plans: 1999; 2005-2011; 2011-2017
- Limerick County Development Plans: 2005-2010; 2010-2016
- Cork County Development Plans: 1996; 2003; 2009-2015
- Waterford City Development Plans: 2002-2007; 2007-2013

The findings of this review are detailed in **Chapter 7**.

4.5 METHODOLOGY - PLANNING APPLICATION REVIEW

For this study, a review was undertaken of planning applications located wholly or partly within a corridor of 125 metres either side of the transmission infrastructure. These distances were identified as appropriate following a Pilot Study undertaken in respect of a site at Ballyshannon, Co. Kildare (selected study site ref. 06L456 as per **Table 4.4**). In this pilot study, 102 planning applications on sites up to 1 kilometre from the existing Dunstown – Moneypoint 400 kV overhead line circuit for a distance of 4.2 kilometres were reviewed for reference to that existing transmission infrastructure and to determine whether it had an influence on the siting of a proposed development, or the determination of that development by the Planning Authority.

The pilot study found that only planning applications relating to sites that directly abutted, or were traversed by, the existing circuit contained any reference to the existence of transmission infrastructure. Planning applications on sites at any significant distance from the existing infrastructure made no reference to that infrastructure. On this basis, it was considered reasonable to adopt a

[10] In the case of counties Cavan, Limerick and Waterford only the current development plan and the previous development plan for each of the counties was reviewed as the earlier development plans were unavailable.

corridor of 125 metres either side of such infrastructure within which to review planning applications for development proposals.

The review focuses on proposals for new build projects and physical works. In this regard, undertaking a search that included planning applications for change of use of permitted development or extensions to existing development is considered less likely to yield documented evidence of the impact of transmission infrastructure, as the principle of development has already been established.

The contents of all new build projects and physical works planning applications received by the relevant planning authorities over the period 1996 to 2011 were reviewed. The study period is considered sufficient to enable the detection of the effect of the presence of transmission infrastructure, as it coincides with a period during which there was a high intake of planning applications by planning authorities, and a significant level of construction throughout the country.

In the case of the OHL and substation case study sites, the date of construction of the infrastructure predates the review period as the majority of transmission circuits and substation plant and equipment in Ireland was installed between 1950 and 1996. However, it is considered that the volume of available data during the 1996 to 2011 period is sufficient to register if the existence of transmission infrastructure influenced, or was otherwise considered in planning applications and decisions.

Planning applications were reviewed for the following:

- Documented evidence of proposed developments being influenced by the presence of high-voltage transmission infrastructure (e.g. planning application material);
- Documented evidence of development proposals being altered by the decision of the planning authority (or An Bord Pleanála) by reason of proximity to the high-voltage infrastructure; and
- Incidence of proposed developments being refused permission by reason of proximity to high-voltage transmission infrastructure (by the planning authority (or An Bord Pleanála));

It is the case that the review of planning applications undertaken as part of this study cannot capture the proportion of people who do not want to live near high-voltage transmission infrastructure and who are unlikely to make planning applications within the study areas in the first instance. It is also the case that this study did not seek to determine the motivation behind the decisions of those applicants to lodge planning applications near high-voltage transmission projects. However, it is reasonable to assume that influences over and above the existence of transmission circuits prevailed (e.g. a desire to live on family owned land or beside family members, work or particular facilities / services). This is consistent with some of the findings of the literature review in **Chapter 2**.

The findings of the planning application review are presented in **Chapter 8.**

4.6 METHODOLOGY - PLANNING APPLICATION COUNTS

In order to examine the potential effect of the construction of transmission infrastructure, the review of the planning application history of the case study sites has been supplemented by a comparison of the volume and nature of planning applications between the periods prior to and after the announcement of the project (within the overall planning application review period 1996-2011). The findings are presented in **Chapter 9**.

4.7 SITE VISITS

Site visits were undertaken in order to verify aerial photography particularly in relation coexistence (the number and nature of buildings) or severance and in relation to agriculture, and amenity related uses (i.e., community and social and tourism land uses).

5 FINDINGS OF THE BASELINE ANALYSIS: COEXISTENCE

In line with the methodology set out in **Chapter 4**, case study sites were reviewed to determine levels of coexistence of buildings and land uses within 0–60 metres of transmission infrastructure. While the analysis focused on coexistence between 0-60 metres (and the distance intervals 0-30 and 30-60 metres therein), the number of dwellings and commercial buildings within 0-15 metres of transmission infrastructure was also noted in order to investigate examples of more direct coexistence.

In addition, a wider interval of 0–500 metres was used specifically in relation to tourism related uses.

Incidences of coexistence are important in establishing the existing baseline condition and relationship between transmission infrastructure and patterns of settlement and land use.

The case study sites for the coexistence analysis were drawn from the 27 operational OHL and substation sites identified in **Table 4.4.**

- 21 no. sites were identified as representing the various settlement sub-categories - rural (9 no.), rural/urban fringe (5 no.) and urban (7 no.);
- 17 no. sites were identified as representing various land use sub-categories: agricultural (11 no.) and commercial (6 no.);
- 4 no. sites were identified as representing amenity related land use (often combined with other land uses);
- All 27 operational OHL and substation case study sites were used for the coexistence analysis in relation to tourism.

5.1 SETTLEMENT PATTERNS

5.1.1 Rural

Table 5.1 shows the level of coexistence within the 9 study sites representing the rural settlement category along approximately 51.7 km of OHL transmission circuits and around 4 no. substations.

From the data examined there are 20 no. dwellings located within 0-60 metres of existing OHL transmission infrastructure in the case study sites. The number of dwelling units noticeably reduces within 0-30 metres, with one dwelling unit only recorded - this is located in Painstown, Co Kildare.

There are no incidences of dwellings coexisting with substations (i.e., within 0-60 metres), although a few dwellings are recorded further afield between 125-500 metres.

Table 5.1 Coexistence - Number of Dwellings (Rural Settlement)

Study Site ID	Study Site	Transmission Infrastructure	km	0-15m	0 – 30m	0 – 60m	0-125m	0-250m	0-500m
				Coexistence Analysis			Other Analysis*		
06L456	Ballyshannon, Co. Kildare	400 kV OHL	8.5 km	0	0	0	7	22	61
06L473	Beggstown, Co. Meath	400 kV OHL	13.6 km	0	0	5	17	60	147
06L260	Clara, Co. Offaly	220 kV OHL	8.3 km	0	0	5	19	64	151
06L106	Bruree, Co. Limerick	110 kV OHL	10.1 km	0	0	2	8	19	39
06L174	Painstown, Co. Kildare	110 kV OHL	11.2 km	0	1	8	21	52	109
06S459	Dunstown, Co. Kildare	400/220 kV substation	-	0	0	0	0	0	1
06S263	Knockraha, Co. Cork	220/110 kV substation	-	0	0	0	0	1	5
06L250	Gorman, Co. Meath	220/110 kV substation	-	0	0	0	0	0	1
06S161	Dunfirth, Co. Kildare	110/38 kV substation	-	0	0	0	0	0	4
Total				0	1	20	72	218	518

Source: GeoDirectory

*** Other Analysis refers to coexistence within distance intervals relevant to other parts of this study, namely development density analysis (Chapter 6) and planning application review analysis (Chapter 8).**

5.1.2 Rural/Urban Fringe

Table 5.2 shows the level of coexistence within the 5 study sites representing the rural/urban fringe along approximately 15.1 km of OHL transmission circuits and around 2 no. substations.

Records show that there are 212 no. dwellings located within 0-60 metres of existing OHL transmission infrastructure in the case study sites examined. The number of dwellings reduces to 63 no. within 0-30 metres. Specific instances of direct coexistence (i.e., within 0-15 metres) were identified during the site survey in the Cloyne and Cobh/Monkstown study sites. The Cloyne examples are shown for illustrative purposes on the aerial maps in **Appendix C**.

There is a higher level of coexistence in the rural/urban fringe study sites, relative to the rural study sites and this is likely to reflect the greater residential density and development pressure experienced within these areas - this is particularly evident in the Monkstown/Cobh study site.

There are no instances recorded of coexistence (i.e., within 0-60 metres) in the substation study sites.

Table 5.2 Coexistence - Number of Dwellings (Rural/Urban Fringe Settlement)

Study Site ID	Study Site	Transmission Infrastructure	Km	0-15m	0 – 30m	0 – 60m	0-125m	0-250m	0-500m
				Coexistence Analysis			Other Analysis*		
06S227	Cloyne, Co. Cork	220 kV OHL	7.1 km	2	9	28	58	80	259
06L241	Ballysimon, Co. Limerick	220 kV OHL	4.7 km	0	0	0	1	31	60
06L167	Monkstown/Cobh, Co. Cork	220 kV OHL	3.3 km	4	54	184	510	1495	3081
06S165	Kilbarry, Co. Cork	110/38 kV substation	-	0	0	0	6	16	88
06S170	Newbridge, Co. Kildare	110/38 kV substation	-	0	0	0	0	8	33
Total				6	63	212	575	1630	3521

Source: Geodirectory

*** Other Analysis refers to coexistence within distance intervals relevant to other parts of this study, namely development density analysis (Chapter 7) and planning application review analysis (Chapter 9).**

5.1.3 Urban

Table 5.3 below shows the level of coexistence within the 7 study sites representing the urban settlement category along approximately 14.6 km of OHL transmission circuits and 2 no. substations.

There are 966 no. dwellings located within 0-60 metres of existing OHL transmission infrastructure. The number of dwelling units reduces to 298 within 0-30 metres. This data shows that, in general, there is a significant level of coexistence between residential land use and high-voltage transmission infrastructure within the urban settlement sites relative to the other settlement categories. This may be attributed to patterns of development within urban settlement areas and also the fact that existing transmission infrastructure can generally be incorporated into the design and layout of a scheme, rather than being seen as a constraint to be avoided. This is consistent with the findings of the literature review (as outlined in **Chapter 2**) and is also apparent from the review of planning applications undertaken as part of this study (refer to **Chapter 8** for further details).

The significant level of coexistence in the urban settlement study sites was manifested by a higher incidence of residential properties abutting the overhead transmission infrastructure. Examples of instances of direct coexistence are shown in the aerial maps in **Appendix C** and include Neilstown, Ballyvolane and Stepaside/Kilternan.

There are no instances recorded of coexistence (i.e., within 0-60 metres) in the substation study sites.

Table 5.3 Coexistence - Number of Dwellings (Urban Settlement)

Study Site ID	Study Site	Transmission Infrastructure	Km	0-15m	0-30m	0 – 60m	0-125m	0-250m	0-500m
				Coexistence Analysis			Other Analysis*		
06L235	Neilstown, Dublin	220 kV OHL	1.2 km	14	62	244	568	1041	1582
06L236	Clonburris, Co. Dublin	220 kV OHL	3.8 km	0	18	162	529	1713	3541
06S231	Stepaside/Kilternan, Dublin	220 kV OHL	6.7 n	1	53	176	378	803	1687
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	2.4 km	2	146	351	830	1649	3087
06L117	Montenotte, Cork	110 kV OHL	0.5 km	4	19	33	72	183	496
06S124	Trabeg substation	110/38 kV substation	-	0	0	0	18	169	796
06L123	Dooradoyle, Co Limerick	110/38 kV substation	-	0	0	0	2	101	1093
Total				**21**	**298**	**966**	**2397**	**5659**	**12282**

Source: Geodirectory

*** Other Analysis refers to coexistence within distance intervals relevant to other parts of this study, namely development density analysis (Chapter 6) and planning application review analysis (Chapter 8).**

5.2 LAND USE

5.2.1 Agricultural

Agriculture accounts for approximately 66% of the landcover / land use of the country, and as identified in **section 3.2,** it is the predominant land use encountered by existing overhead line transmission infrastructure; this reflects established principles of route selection for grid infrastructure to avoid settlements to the greatest extent possible or practicable. Coexistence between agricultural land use and transmission infrastructure is therefore significant, and this has been reflected in the survey of the study sites relevant to this land use category.

Apart from the frequent incidence of overhead transmission infrastructure being located on, or traversing, fields under cultivation or being used for livestock grazing, there were isolated instances of coexistence with structures associated with agricultural land use identified during the site survey. This was along approximately 47.5 km of existing OHL transmission circuits, and around 5 no. substations (from 11 of the case study sites). These are identified in **Table 5.4** using GeoDirectory data for agriculture structures (for the purpose of this Study this also included derelict properties).

Table 5.1 outlines the coexistence of dwellings for many of the same sites in order to get a fuller picture of agricultural related settlement.

Table 5.4 Coexistence - Number of Units (Farm Structures including Derelicts)

Study Site ID	Study Site	Infrastructure	km	0-15m	0 – 30m	0 – 60m
06L456	Ballyshannon, Co. Kildare	400 kV OHL	8.5 km	0	0	0
06L260	Clara, Co. Offaly	220 kV OHL	8.3 km	0	0	0
06L106	Bruree, Co. Limerick	110 kV OHL	10.1 km	0	0	1
06L174	Painstown, Co. Kildare	110 kV OHL	11.2 km	0	0	0
06S227	Cloyne, Co. Cork	220 kV OHL	7.1 km	0	0	2
06L242	Carrigtwohill, Co. Cork	220 kV OHL	2.3 km	0	0	0
06S459	Dunstown, Co. Kildare	400/220 kV substation	-	0	0	0
06S263	Knockraha, Co. Cork	220/110 kV substation	-	0	0	1
06L250	Gorman, Co. Meath	220/110 kV substation	-	0	0	0
06S161	Dunfirth, Co. Kildare	110/38 kV substation	-	0	0	0
06S170	Newbridge, Co. Kildare	110/38 kV substation	-	0	0	0
Total				**0**	**0**	**4**

Source: Geodirectory

5.2.2 Commercial

Table 5.5 below shows the level of coexistence within the study sites representing the commercial land use category along approximately 10.4 km of OHL transmission circuits and around 2 no. substations (from 6 of the case study sites). There are 264 no. commercial addresses located within 0-60 metres of the existing transmission infrastructure. The number of commercial addresses reduces to 99 within 0-30 metres of the infrastructure. The results of the address counts shows that, in general, there is a high level of coexistence between commercial land use and OHL transmission circuits, in particular, within the study sites.

Furthermore, there are 33 incidences of commercial units directly coexisting with OHL transmission infrastructure (i.e., within 0-15 metres). This is significantly higher than for other settlement and land use sub-categories.

The difference in the level of coexistence within the Ballymount study site and the Clondalkin/Parkwest study site (particularly within 15-60 metres of the OHL infrastructure) is also of potential interest. Continual development and redevelopment in the former gradually encroaches upon the transmission infrastructure whereas the overhead transmission infrastructure has been incorporated into the internal road layout and overall planned layout of the scheme in the latter.

This distinction is manifested in the incidence of commercial uses abutting the OHL transmission circuits in the established commercial areas, with several instances of commercial buildings being

traversed by OHL circuits, or of commercial sites accommodating OHL structures as shown on the photographic plates in **Appendix C**. This is a matter which is considered in greater detail as part of the planning application review (refer to **Chapter 8** for further detail) as it may exemplify the difference between established industrial areas and planned contemporary commercial campuses.

Other examples of commercial uses abutting high-voltage infrastructure are within the Castleview and Ballymount study sites. These locations are shown on the photographic plates in **Appendix C**. The Finglas study site, which has been characterised as worst case due to the presence of the M50 motorway and proximity of the Huntstown Quarry, exhibits a low level of coexistence, with no significant adjoining commercial uses. However, given the experience encountered in other similar areas, but without such an amalgamation of constraints, it is suggested that it is these surrounding land uses which are likely to have constrained this case study site rather than the existence of transmission infrastructure *per se*.

Table 5.5 Coexistence - Number of Units (Commercial Land Use)

Study Site ID	Study Site	Transmission Infrastructure	Km	0-15m	0–30m	0 –60m	0-125m	0-250m	0-500m
				Coexistence Analysis			Other Analysis*		
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	3.4 km	15	19	98	256	560	1024
06L107	Ballymount, Dublin	110 kV OHL	3.2 km	17	78	155	391	734	1199
06L166	Ballynaneashagh, Waterford	110 kV OHL	1.5 km	1	1	5	7	13	165
06L242	Carrigtwohill, Co. Cork	220 kV OHL	2.3 km	0	0	4	7	15	43
06S269	Finglas, Dublin	220/110 kV substation	-	0	0	1	0	0	26
06L120	Castleview, Cork	110/38 kV substation	-	0	0	1	1	3	58
Total				**33**	**99**	**264**	662	1325	2515

Source: Geodirectory

*** Other Analysis refers to coexistence within distance intervals relevant to other parts of this study, namely development density analysis (Chapter 6) and planning application review analysis (Chapter 8).**

5.2.3 Amenity Related Land Uses

As set out in **Chapter 4** (Methodology), the use of GIS analysis and aerial photography was of particular relevance for observing coexistence of amenity related land uses. These are not always manifested by buildings or GeoDirectory addresses and therefore could not be counted in the same way as the settlement and other land use sub-categories. Apart from the associated buildings, amenity related land uses were identified by other man-made interventions with land as well as observed activities.

Community, Social and Recreation Land Use

The survey of the study sites reveals several examples of coexistence between community and social land uses and high-voltage transmission infrastructure (shown on the photographic plates in **Appendix C**). Instances include Meelick Park (soccer grounds) in the Ballyvolane/Mayfield study site

and Crescent College (secondary school) in the Dooradoyle study site. In the case of Meelick Park, there is an OHL structure along the Kilbarry – Mayfield 110 kV OHL located within the grounds. The grounds of the Crescent College campus are abutted by the Limerick 110/38 kV substation to the west; the playing pitches attached to the school act as a buffer between the school buildings and substation compound. Overall direct coexistence between the transmission infrastructure and community and social uses is evident from the site surveys, with structures being found up to within 10 metres of overhead transmission infrastructure.

Tourism

A modified approach was also adopted for examining coexistence with tourism related land uses due to their dispersed nature. Consideration was not just restricted to this occurring within identified study sites; coexistence between high-voltage infrastructure and tourism land uses was also measured by identifying tourist resource areas within which high-voltage transmission infrastructure is located.

Firstly, all 27 case study sites (excluding the construction sites) were reviewed with reference to Fáilte Ireland point data relating to tourism activities, attractions and accommodation. In addition to the 0–15, 0-30 and 30–60 metre intervals, a 0-500 metre interval from the transmission infrastructure was introduced in order to capture those activities and attractions which extend, directly or indirectly (including visually), across a wider area. **Table 5.6** sets out the level of coexistence within the study sites representing the tourism land use category.

Table 5.6 records 29 incidences of tourism activities, attractions and accommodation coexisting within 0-500 metres of transmission infrastructure from the study sample of 27 sites. There is one example of more direct co-existence (i.e., within 0-60 metres), namely the Ramada Hotel site in the Ballynaneashagh study site which is traversed by the Dungarvan – Waterford 110 kV OHL transmission circuit.

Table 5.6 Coexistence - Number of Tourism Activities, Attractions and Accommodation

Site ID	Study Site	Transmission Infrastructure	Length	0-15m	0 – 30m	0 – 60m	0-500m	0-125m	0-250m
				Coexistence Analysis				Other Analysis*	
06L456	Ballyshannon, Co. Kildare	400 kV OHL	8.5 km	0	0	0	1	0	1
06L473	Beggstown, Co. Meath	400 kV OHL	13.6 km	0	0	0	0	0	0
06L260	Clara, Co. Offaly	220 kV	8.3 km	0	0	0	0	0	0
06L241	Ballysimon, Co. Limerick	220 kV OHL	4.7 km	0	0	0	0	0	0
06L235	Neilstown, Dublin 22	220 kV OHL	1.2 km	0	0	0	0	0	0
06L234	Clondalkin/Parkwest, Dublin 22	220 kV OHL	3.4 km	0	0	0	5	1	4
06S231	Kilternan/Stepaside, Dublin 18	220 kV OHL	6.7 km	0	0	0	3	0	0
06L242	Carrigtwohill, Co.Cork	220 kV OHL	2.3 km	0	0	0	0	0	0
06L236	Clonburris, Dublin 24	220 kV OHL	3.8 km	0	0	0	1	0	0
06S227	Cloyne, Co. Cork	220 kV OHL	7.1 km	0	0	0	2	0	0
06L167	Monkstown/Cobh, Co. Cork	220 kV OHL	3.3 km	0	0	0	5	0	2
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	2.4 km	0	0	0	0	0	0
06L106	Bruree, Co. Limerick	110 kV OHL	10.1 km	0	0	0	0	0	0
06L107	Ballymount, Dublin City	110 kV OHL	3.2 km	0	0	0	7	1	5
06L174	Painstown, Co. Kildare	110 kV OHL	11.2 km	0	0	0	0	0	0
06L117	Montenotte, Cork	110 kV OHL	0.5 km	0	0	0	0	0	0
06L166	Ballynaneashagh, Waterford	110 kV OHL	1.5 km	0	0	1	1	1	1
06S459	Dunstown, Co. Kildare	400/220 kV substation	-	0	0	0	0	0	0

Site ID	Study Site	Transmission Infrastructure	Length	0-15m	0 – 30m	0 – 60m	0-500m	0-125m	0-250m
06L250	Gorman, Co. Meath	220/110 kV substation	-	0	0	0	0	0	0
06S263	Knockraha, Co. Cork	220/110 kV substation	-	0	0	0	0	0	0
06S161	Dunfirth, Co. Kildare	110/38 kV substation	-	0	0	0	0	0	0
06S170	Newbridge, Co. Kildare	110/38 kV substation	-	0	0	0	0	0	0
06L123	Dooradoyle, Co Limerick	110/38 kV substation	-	0	0	0	1	0	1
06S269	Finglas, Dublin	220/110 kV substation	-	0	0	0	0	0	0
06L120	Castleview, Co. Cork	110/38 kV substation	-	0	0	0	0	0	0
06S124	Trabeg, Cork	110/38 kV substation	-	0	0	0	2	1	2
06S165	Kilbarry, Co. Cork	110/38 kV substation	-	0	0	0	1	0	0
Total				**0**	**0**	**1**	**29**	**1**	**16**

Source: Failte Ireland

* Other Analysis refers to coexistence within distance intervals relevant to other parts of this Study, namely development density analysis (Chapter 6) and planning application review analysis (Chapter 8).

Tourist resource areas are identified i.e., those areas characterised by a significant tourist attraction - such as the Hill of Tara or the Burren - or areas in which significant leisure activities take place - such as harbours (e.g. sailing) or mountainous areas (walking trails, etc). Significant tourist attractions are also informed by the list of visitor attractions by Fáilte Ireland and are identified in **Table 5.7.**

Table 5.7 Identified Tourism Resources Areas

Tourism Resource Area	Infrastructure
Brú na Boinne, Co. Meath/Louth	Ballytrasna – Drybridge 110 kV OHL
The Burren National Park, Co Clare	Moneypoint – Woodland 400 kV OHL Cashla – Prospect 220 kV OHL Cashla – Ennis 110 kV OHL
The Wicklow Mountains, Co. Wicklow	Dunstown – Turlough Hill 220 kV OHL
Cork Harbour, Co. Cork	Cow Cross – Rafeen 220 kV OHL

A reasonable level of coexistence between tourism land use and high-voltage transmission infrastructure was discernible, with the OHL transmission circuits prevalent in identified tourism resource areas such as Brú na Boinne, the Wicklow Mountains, the Burren National Park and Cork Harbour. In terms of the coexistence of buildings associated with tourism land use or specific tourist attractions, both the JFK Arboretum in Co. Wexford and the Waterford and Suir Valley Railway in Co. Waterford are located adjacent to high-voltage OHL transmission circuits (Great Island – Wexford 110 kV and Cullenagh – Waterford 110 kV circuits respectively). The Ramada Hotel site (as previously mentioned) in the Ballynaneashagh study site is also traversed by the Dungarvan – Waterford 110 kV OHL transmission circuit.

5.3 CONCLUDING COMMENTS

In terms of settlement pattern, the level of coexistence within the study sites representing the rural settlement category is low, and even then it noticeably reduces within 0-30 metres of the OHL transmission circuit. This is considered to reflect the predominantly dispersed nature of settlement in such areas, and the relative availability of land as alternative locations/sites for siting of transmission infrastructure away from such development.

Unsurprisingly there is a higher level of coexistence in the rural/urban fringe study sites which is considered to reflect the greater residential density and pattern of development experienced within these areas. In the urban settlement sub-category, the data show that there is a significant level of coexistence between residential land use and high-voltage transmission infrastructure (with higher incidence of residential properties actually abutting the infrastructure), which may partly be attributed to the greater intensity of mixed land use development within urban settlement areas.

For all settlement categories, the lower incidence of coexistence within 0-30 metres of the transmission infrastructure may arise from the site layout or design addressing the infrastructure (e.g. incorporation of the transmission corridor as open space within multi-unit development) or simply meeting any clearance distance requirements of the ESB.

In terms of land use, coexistence between agricultural land use and transmission infrastructure is widespread, in particular the incidence of overhead transmission infrastructure being located on, or traversing, fields under cultivation or being used for livestock grazing. There are also isolated instances of coexistence with structures associated with agriculture in the study sample.

Commercial land use in the study sites primarily occurs as either homogenous industrial and commercial areas on the periphery of urban settlements, or in terms of emerging employment and enterprise zones in areas close to major urban areas with access to high quality transport routes. The absence of residential amenity considerations in such areas generally confers a greater capacity to coexist with infrastructural corridors such as major roads and high-voltage transmission corridors. This is reflected in the fact that, with the exception of agriculture, commercial land use was found to be the most common land use coexisting with high-voltage transmission infrastructure.

From the case studies examined, there was minimal evidence of any significant influence of high-voltage transmission infrastructure on community and social amenity related land uses with a reasonable level of coexistence revealed from the site surveys. The majority of the community and land uses registered in the survey of the study sites related to educational and recreational facilities.

A reasonable level of coexistence between tourism land use and high-voltage transmission infrastructure was also discernible having regard to their dispersed nature, with OHL transmission circuits prevalent in identified tourism resource areas such as Brú na Boinne, the Wicklow Mountains, the Burren National Park and Cork Harbour and near other specific tourist attractions. It is perhaps worth noting that while coexistence with tourism resource areas or with significant tourist attractions does occur, it is generally in relation to older OHL infrastructure which might have been sited without such level of regard to tourism resource value as now occurs with the planning and siting of transmission infrastructure.

In this regard, the coexistence analysis undertaken as part of this study simply records fact; it does not consider which came first, the transmission infrastructure or the settlement or particular land use. However, **Chapter 8** specifically looks to see if there is documented evidence of proposed developments (i.e., planning applications) being influenced by the presence of high-voltage transmission infrastructure in order to determine if one indeed affects the other.

Finally, the survey did not find any instances of severance including in close proximity to substations with the sample examined.

6 FINDINGS OF BASELINE ANALYSIS: DEVELOPMENT DENSITY

6.1 OVERVIEW

A change in development density with proximity to existing transmission infrastructure could indicate a potential impact of transmission infrastructure on settlement. Accordingly, in line with the methodology set out in **Chapter 4**, this study looked to examine trends and changes in development density in proximity to high-voltage transmission infrastructure and relative to control sites.

The focus was on the various settlement categories and the commercial land use category only. Land use categories of agriculture, community and social facilities and tourism were excluded from this analysis, as no meaningful results could be extracted from the available address data for such uses.

6.2 SETTLEMENT PATTERN

6.2.1 Rural

Table 6.1 below shows the residential density (measured as dwelling units per hectare) in distance intervals of 0–250 and 250–500 metres from the transmission infrastructure in the study sample (10 no. study sites). With the exception of the Knockraha substation study site, the density level falls with proximity to the transmission infrastructure across all study sites examined.

Table 6.1 Density: Dwelling Units/Hectare (Rural Settlement)

Study Site ID	Study Site	Transmission Infrastructure	Residential Density/sq.km 0 - 250 m	Residential density/sq.km 250 – 500 m
06L106	Bruree, Co. Limerick	110 kV OHL	3.7	3.9
06L473	Beggstown, Co. Meath	400 kV OHL	8.8	12.8
06L260	Clara, Co. Offaly	220 kV OHL	15.5	21.0
06L456	Ballyshannon, Co. Kildare	400 kV OHL	5.2	9.2
06L250	Gorman, Co. Meath	220/110 kV substation	0.0	1.6
06S161	Dunfirth, Co. Kildare	110/38 kV substation	0.0	15.6
06S459	Dunstown, Co. Kildare	400/220 kV substation	1.6	5.5
06S263	Knockraha, Co. Cork	220/110 kV substation	8.6	2.5
06L174	Painstown, Co. Kildare	110 kV OHL	9.3	10.2
Control Site	Irishtown, Co. Kildare	N/A	4.0	

6.2.2 Rural/Urban Fringe

Table 6.2 identifies the residential density in distance intervals 0–250 and 250–500 metres from the transmission infrastructure extracted from the study sample (6 no. study sites). The density level falls with proximity to the transmission infrastructure across all of the study sites with the exception of the Ballysimon study site. The extent of the reduction in residential density between the density bands in the Monkstown/Cobh study site (which is zoned) may be attributable to the convergence of overhead lines in this area, for which reason the study sites have been described as worst case condition; however, the reduction is not considered significant relative to the high density levels which characterise both distance intervals.

Table 6.2 Density: Dwelling Units/Hectare (Rural/Urban Fringe Settlement)

Study Site ID	Study Site	Transmission Infrastructure	Residential Density/sq.km 0 - 250 m	Residential density/sq.km 250 – 500 m
06S227	Cloyne, Co. Cork	220 kV OHL	22.7	50.8
06L241	Ballysimon, Co. Limerick	220 kV OHL	13.2	12.4
06L167	Monkstown/Cobh, Co. Cork	220 kV OHL	892.2	954.9
06S170	Newbridge, Co. Kildare	110/38 kV substation	30.0	39.6
06S165	Kilbarry, Co. Cork	110/38 kV substation	109.4	205.6
Control Site	Cappavilla North, Co. Limerick	N/A	20.6	

6.2.3 Urban

Table 6.3 shows the residential density in distance intervals of 0–250 and 250–500 metres from existing transmission infrastructure in the study sample (7 no. study sites). With the exception of the Ballyvolane/Mayfield and Neilstown study sites, the density level falls with proximity to the transmission infrastructure across all study sites. The increase in density levels nearer the transmission line in the Neilstown study site is particularly notable.

It is worth noting that the residential density between 0–250 m of the transmission circuit in the Clonburris study site may reflect the requirements of the Clonburris SDZ Planning Scheme to maintain a 30 metres development clearance either side of the Inchicore – Maynooth 220 kV overhead line. This is considered further in **Chapter 7** and **Chapter 8**.

Table 6.3 Density: Dwelling Units/Hectare (Urban Settlement)

SITE_ID	Study Site	Infrastructure	Residential Density/sq.km 0 - 250 m	Residential density/sq.km 250 – 500 m
06L116	Ballyvolane/Mayfield, Co. Cork	110 kV OHL	13.7	13.6
06L117	Montenotte, Co. Cork	110 kV OHL	5.8	9.0
06L236	Clonburris, Dublin 24	220 kV OHL	5.6	12.6
06L235	Neilstown, Dublin 22	220 kV OHL	18.3	15.2
06S231	Kilternan /Stepaside, Dublin	220 kV OHL	2.2	2.5
06S124	Trabeg, Co. Cork	110/38 kV substation	4.8	8.1
Control Site	Hansfield, Dublin	N/A	23.5	

6.3 LAND USE

6.3.1 Commercial

Table 6.4 shows the development density (measured in terms of commercial units per hectare) of commercial address units in distance intervals of 0-125 and 125-250 metres from the transmission infrastructure extracted from the study sample (6 no. study sites). It is evident that the density/ha does not significantly change for commercial units with distance from the transmission infrastructure. However, it is worth noting the higher density of units within 0-125 metres at Ballymount, Co Dublin and Ballynaneashagh, Co. Waterford, than exists within 125–250 metres.

Table 6.4 Density: Units per Hectare (Commercial Land-Use)

SITE_ID	Study Site	Infrastructure	Commercial density/ha 0-125m either side	Commercial density/ha 250-125m either side
06L166	Ballynaneashagh, Co. Waterford	110 kV OHL	0.3	0.2
06L242	Carrigtwohill, Co. Cork	220 kV OHL	0.1	0.1
06L107	Ballymount, Dublin	110 kV OHL	4.9	4.3
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	3.0	3.6
06S269	Finglas, Dublin	220/110 kV substation	0.0	0.1
06L120	Castleview, Co. Cork	110/38 kV substation	0.2	0.2
Control Site	Sandyford Industrial Estate	N/A	9.9	

6.4 CONCLUDING COMMENTS

In the majority of the study sites examined, residential density is lower in close proximity to existing transmission infrastructure. This is most pronounced on the fringes of urban settlements (rural/urban fringe) and least evident in urban areas. It is difficult to conclude that the lower density in rural/urban fringe areas is due to the presence of the transmission infrastructure as the human settlement pattern is frequently disrupted by the convergence of other linear infrastructure such as major roads and the high incidence and wide dispersal of incompatible land uses such as industrial uses.

The lower level of density found in rural areas may be indicative of an impact (albeit in the context of very low density levels to begin with). However this may also reflect the route selection rationale for the original transmission corridor, which would have sought to maximise the distance of transmission infrastructure from existing dwellings in the first instance; rural housing policy may have maintained this separation by generally limiting the choice of location for new housing, often to serviced land. In urban areas, where routing options are generally more constrained, more limited impact on residential density is evident, with density increasing in proximity to the transmission infrastructure in 2 out of the 6 study sites in this sub-category.

In terms of land use, the density analysis shows less impact for commercial land use than is evident for the settlement sub-categories. This indicates its potential higher tolerance for coexisting with transmission infrastructure. This is consistent with research and guidelines reviewed in **Chapter 2**.

This study does not find any significant density trends or reduction in development density with proximity to existing high-voltage transmission infrastructure. However, it is considered that density as a potential indicator of the impact of transmission infrastructure on settlement (in terms of intensity of settlement) is not easily indivisible from other more relevant factors such as zoning or development pressure for land, or siting and design requirements and preferences for dwellings.

Furthermore, it is also likely that route planning seeks to minimise potential impact in the first instance by avoiding built up areas or individual buildings. This is clearly evident by the fact that most OHL transmission infrastructure and substations are not actually in urban areas; or if they do exist they are located at the edge of urban areas, which are generally of lower density compared with central urban areas. Refer to **Chapter 3**.

7 FINDINGS - PLANNING POLICY REVIEW

7.1 OVERVIEW

As set out in **section 1.3** and **4.3,** a review of planning policy was undertaken to determine whether any policy shifts have arisen as a result of construction and operation of existing 400 kV, 220 kV, 110 kV transmission projects and, indirectly whether they have already influenced or, have the potential to influence human settlement and land use pattern (and the baseline described in **Chapters 5** and **6**).

As explained in **section 4.3**, development plans affecting each case study site were reviewed for the last three plan periods. For the purposes of comparison, the development plans are considered within the periods mid to late 1990's, early to mid-2000's and mid 2000's to present, based on their year of adoption. For the full review of development plans, refer to **Appendix D**.

7.2 MID TO LATE 1990'S

Within this period, the planning authorities of County Kildare, South Dublin County and Dun Laoghaire-Rathdown County all displayed a relatively high level of awareness of the environmental and other issues concerning the development of high-voltage transmission infrastructure. Differences in priorities and concerns were evident through the policies adopted, between Kildare County Council, which has a primarily rural functional area, and the primarily urban planning authorities of South Dublin and Dun Laoghaire County Councils.

The Kildare County Development Plan 1999-2005 acknowledged that the county is traversed by a relatively extensive network of transmission infrastructure due to its proximity to the metropolitan area of Dublin and that this infrastructure was likely to expand in future years. Reference is made to the intention at the time to link the 400 kV/220 kV substations of Dunstown (Co. Kildare) and Woodland (Co. Meath) among a range of other planned high-voltage transmission lines in the county. With regard to the planning of these projects, the County Development Plan noted that the Council required *'extreme care in planning to avoid deterioration of the rural environment and landscape'* through which the transmission line will pass. Further to this, the planning authority stated that it was prepared to co-operate with the ESB in the provision of these lines, subject to the preservation of amenity. The Plan recognised the strategic importance of transmission infrastructure within the county to the overall national grid network. It also had regard to the local implications of transmission lines. In this regard it stated that development proposals, particularly dwellings, which are in close proximity to high-voltage transmission infrastructure, will be restricted, and that new high tension lines (110 kV and above) will not be permitted adjoining existing dwellings, except where no alternative can be shown to exist.

In comparison with the Kildare Plan, the concerns and issues addressed through the policy of the South Dublin County Development Plan 1998-2004 and the Dun Laoghaire-Rathdown County Development Plan 1998-2003 were much more focussed on local issues and potential local impacts.

These plans did not consider OHL transmission circuits in the context of proposals to expand the national grid. Rather, policy concentrated on minimising the impact of existing transmission circuits by seeking to place them underground. In both these development plans, the rationale for this policy is that high-voltage lines are perceived as posing a health risk due to the potential dangers of electromagnetic radiation, although no evidence for this is provided or sourced.

7.3 EARLY TO MID 2000'S

There was recognition of the requirement to upgrade and expand the national grid in all of the development plans adopted during this period, with the need to secure energy supplies and harness renewable sources of energy cited in many cases. However, policies in support of such upgrading and expansion of the national grid were balanced by policies to protect sensitive landscape and/or residential amenity.

Policies in support of the upgrading and expansion of the national grid in this period ranged from general statements to this effect (e.g. the planning authorities of South Dublin County, Co. Offaly, Co. Cork and Co. Limerick) to more detailed policies that sought to protect the corridors of high-voltage transmission circuits from encroachment by development (Co. Meath and Co. Kildare) and to facilitate connections to renewable energy sources (Co. Kildare). Several development plans identified specific projects to expand or upgrade high-voltage transmission infrastructure.

Reflecting the greater development pressure and expansion of settlements during this period, which resulted in development encroaching upon existing transmission corridors in heavily urbanised planning authorities, there was a greater prevalence of development control policy governing the development of land in proximity to transmission infrastructure.

7.4 MID 2000'S TO PRESENT

Both the Dun Laoghaire-Rathdown County Development Plan 2003-2010 and the Kildare County Development Plan 2005-2011 included reference to specific clearance distances from overhead transmission infrastructure. In both cases, the plans stated that the planning authority would have regard to the following clearance distances as recommended by the ESB:

- 110 kV OHL: 20 metres (23m around a pylon)
- 220 kV OHL: 30 metres.

With regard to proposals to expand or upgrade the national grid, the Fingal County Development Plan 2005-2011 included an objective that required, in the case of all '*large applications for overhead power lines of 132 kV or more'* to submit:

- *A visual presentation of the proposal in the context of the site in order to assist the Council in determining the extent of the visual impact,*
- *A cost/benefit analysis specifying the respective cost of an underground and overhead line,*
- *An EIA where the line is likely to have a significant effect on the environment,*
- *Details of compliance with all internationally recognised standards with regard to proximity to dwellings and other inhabited structures.*

In this period, the adoption of development control policy governing separation distances between transmission infrastructure and buildings continued. South Dublin County Council has adopted the previously cited ESB clearance distances in its 2010-2016 Development Plan and the Cavan County Development Plan 2008-2014 states that the location of new OHLs shall preserve clearance distances from residential and other property in accordance with ESB Guidelines. The Meath County Development Plan 2007-2013 includes a policy to the effect that *'new high tension lines will not be permitted adjoining existing dwellings, except where no other alternative can be shown to exist'*.

This period has also been marked by a growing policy response among planning authorities with extensive rural areas to the potential impact of new transmission infrastructure on scenic and sensitive landscapes. The Meath County Development Plan 2007-2013 identifies from its list of scenic landscapes those that would be vulnerable to overhead transmission lines. The Cork County Development Plan 2009-2015 includes policies to protect areas of recognised landscape importance from the construction of large scale visually intrusive energy transmission infrastructure except where alternative routes are not available. The Limerick County Development Plan 2010-2016 includes an objective to minimise the visual impact and the obtrusion of the transmission network (ESB telecommunications etc) throughout the County especially in areas of high amenity.

The issue of undergrounding emerges as an alternative transmission method in development plans adopted in this period. The Meath County Development Plan raises this as a potential solution should there be no alternative to routing such infrastructure through areas of recognised landscape importance. As part of its list of requirements for planning applications for transmission infrastructure under the Strategic Infrastructure Act 2006, the Cavan County Development Plan requires that the applicant shall include a study by a suitably qualified independent person/body demonstrating whether the proposal is incorporating the most appropriate technology available and method of construction including a comprehensive examination (in the case of transmission lines) of the under-grounding of such services. However, the Cavan County Development Plan recognises that overhead line circuits are faster and easier to repair and not subject to excavating activities; it states that underground cabling will be encouraged in heavily populated areas, if feasible.

With regard to the placing underground or diversion of transmission circuits, a number of planning authorities include a general policy seeking or promoting the placing underground of existing overhead line transmission circuits in order to protect residential amenity or facilitate development. For example, the South Dublin County Development Plan includes a specific policy (Policy EC2) to proactively engage with EirGrid to secure the placing underground of the Inchicore-Maynooth 220 kV OHL between Adamstown and the Dublin City Council boundary in order to facilitate the delivery of the planned development in the Clonburris SDZ. Objectives to place overhead transmission lines underground in order to facilitate development have also been included in the Dun Laoghaire – Rathdown County Development Plan (through the Kilternan/Glenamuck LAP 2007) and the Waterford City Development Plan, affecting the Arklow – Carrickmines 220 kV and the Cullenagh-Waterford and Killoteran-Waterford 110 kV OHL respectively.

A growing number of planning authorities have listed proposed high-voltage transmission projects affecting their functional area in their development plans adopted during this period. These included the Kildare, Meath, Offaly and Cavan County Development Plans. The lists include projects at planning stage to projects under construction. Of these, only the Meath County Development Plan includes an accompanying policy that expressly reserves the proposed route corridor for the development of the transmission infrastructure.

There is an absence of any direct references to the potential negative effects on human health arising from electromagnetic radiation in development plans adopted during this period. However, the Cavan County Development Plan states that *'high-voltage electrical lines must be constructed and monitored in accordance with the 'International Commission on Non-Ionising Radiation Protection (ICNIRP)' and Commission for Energy Regulation (CER)'.*

A matrix of all the reviewed development plans is set out in **Table 7.1.**

Table 7.1 Development Plan Considerations and Policy Matrix

		STRATEGIC ENERGY PROVISION			LANDSCAPE/ VISUAL IMPACT		OTHER POTENTIAL IMPACTS			
		CONSIDERATION	POLICY		CONSIDERATION	POLICY	CONSIDERATION		POLICY	
		To upgrade / expand and develop high voltage transmission infrastructure	Support development of enhanced electricity supply	Encourage renewable energy sources	Potential impacts of transmission OHL on the landscape	Consider the visual impact of high-voltage transmission infrastructure	Potential health risks from OHL transmission lines	Placing electricity cables underground	Seek the placing of electricity cables underground	Implement clearance distances for development in proximity to high-voltage transmission infrastructure
FINGAL	1999-2004	✓			✓		✓	✓		
	2005-2011	✓	✓			✓			✓	
	2012-2017		✓			✓			✓	
DUBLIN CITY	1999							✓		
	2005-2011	✓		✓						
	2011-2017	✓		✓						
SOUTH DUBLIN	1998					✓	✓		✓	
	2004-2010	✓	✓			✓			✓	
	2010-2016	✓	✓						✓	✓
DUN LAOGHAIRE	1998				✓		✓	✓	✓	
	2003-2010	✓			✓				✓	✓
	2010-2016		✓		✓		✓		✓	✓

		STRATEGIC ENERGY PROVISION			LANDSCAPE/ VISUAL IMPACT		OTHER POTENTIAL IMPACTS			
MEATH	1994									
	2001	✓			✓			✓		✓
	2007-2013	✓	✓			✓			✓	✓
OFFALY	1996									
	2003-2009	✓	✓							
	2009-2015	✓	✓							
KILDARE	1999	✓	✓		✓	✓		✓		✓
	2005-2011	✓	✓	✓		✓			✓	✓
	2011-2017	✓	✓	✓		✓			✓	✓
GALWAY	1997-2002									
	2003-2009	✓	✓		✓					
	2009-2015	✓	✓			✓				✓
CORK	1996				✓					
	2003	✓			✓					
	2009	✓	✓		✓	✓		✓	✓	
LIMER-ICK	2005-2011	✓	✓			✓		✓	✓	
	2010-2016	✓	✓			✓			✓	

		STRATEGIC ENERGY PROVISION			LANDSCAPE/ VISUAL IMPACT		OTHER POTENTIAL IMPACTS			
CAVAN	2003-2009									
	2008-2014	✓	✓	✓				✓		✓
WATER-FORD	2002-2007	✓	✓		✓					
	2007-2013	✓	✓							

7.5 LOCAL AREA PLANS (LAPS) AND STRATEGIC DEVELOPMENT ZONES (SDZS)

In areas of high population density and development pressure, there were some significant examples of planning policy directly informing the assessment of planning applications. This was found to be the case particularly in areas that have been the subject of detailed planning frameworks for significant future development such as LAPs and SDZs in the Dublin Metropolitan Area. These are addressed in some detail below.

7.5.1 Clonburris Strategic Development Zone (SDZ)

The Clonburris study site is subject to the provisions of the Clonburris SDZ Planning Scheme 2008. This scheme includes a range of references and policy objectives in respect of the Inchicore – Maynooth 220 kV OHL transmission circuit that traverses it. In general, the Clonburris Planning Scheme identifies the transmission circuit as a development constraint with Section D.8.8 identifying a 70m wide corridor partly within the Plan area as sterilised from development due to the circuit. This corridor has been incorporated as a landscaped strip or 'structure landscape' in the indicative layout plans for the area.

7.5.2 Kilternan/Glenamuck LAP 2007 and Stepaside Action Plan 2000

The Kilternan/Stepaside study site is partly located within the Kilternan/Glenamuck LAP 2007 and the Stepaside Action Plan 2000. The Stepaside Action Plan 2000 incorporates the Carrickmines – Cookstown 110 kV and Carrickmines – Maynooth 220 kV OHL transmission circuits as 'constraint corridors'. Sections of these corridors have been incorporated as linear greenways to serve as services, communications and landscape corridors. The later phases of the Cruagh Manor and Stepaside Park residential developments (register reference nos. D00A/1279, D02A/1227, D03A/1213 and D03A/0871) included this linear park in the overall site layout. In its assessment of these planning applications, the planning authority did not accept the applicant's proposal that the linear park qualified as open space for the purpose of residential amenity and required the applicant to provide additional open space to comply with the relevant development plan standards.

The Kilternan/Glenamuck LAP 2008 includes a policy objective in relation to the placing underground of Carrickmines – Maynooth 220 kV OHL transmission circuit as follows:

> *'**UTL04:** To encourage and/or facilitate the undergrounding of the Arklow-Carrickmines double circuit 220/110kV transmission line and the Carrickmines-Fassoroe 110kV transmission lines Nos. 1 and 2. Where undergrounding is not feasible, to sensitively incorporate the restriction corridors associated with said powerlines into the design of future developments.'*

It is further stated in the Kilternan/Glenamuck LAP that the Council will commission a study on the cost and feasibility of undergrounding the 220 kV double circuit ESB OHL circuit that traverses the LAP area. Consideration will be given to making provision for part funding the cost of this work in any special levy scheme.

7.6 PLANNING POLICY CONCLUSIONS

The review of the development plans shows an expanding policy response over the past 20 years to the existence and future construction of high-voltage transmission infrastructure across the majority of planning authorities whose development plans were reviewed (in terms of more policies and more detailed policies referring to transmission infrastructure). Reference to high-voltage transmission infrastructure in the initial period was limited to development plans for areas with significant OHL infrastructure, particularly where such areas were experiencing significant development pressure. However, by the end of the review period (2012), each of the planning authorities has adopted at least some policy addressing the implications of the existence and future provision of high-voltage transmission infrastructure including policy objectives to maintain defined clearance distances, place existing overhead transmission lines underground or provide for future transmission projects.

Future transmission projects, and in some cases OHL route corridors, are identified in a number of development plans governing primarily rural areas. This trend has been accompanied by formal acknowledgement in many development plans of the importance of transmission infrastructure and the need to extend the national grid in response to forecasted growth in demand for electricity.

In instances where planning policy provides for the strategic expansion of the urban area, the corridors of existing OHL transmission circuits are often incorporated as structure landscapes or ‘green corridors’ in LAPs and strategic planning documents such as SDZs.

Unsurprisingly, policy has been more prevalent in cases where the functional area of a planning authority had a greater presence of high-voltage transmission infrastructure, and particularly where that infrastructure traversed areas of high development pressure.

The study found that in planning policy terms, existing or proposed transmission infrastructure (where known) has the potential to influence land use and settlement pattern i.e. relative to a site where no such infrastructure exists; however, the study found no evidence to suggest that such infrastructure is anything more than a potential physical constraint on the siting, design and layout of a development at a site specific or micro-spatial level, either by vertical restriction on buildings beneath transmission lines or a lateral restriction to ensure access and safety either side of the transmission circuit.

8 FINDINGS - PLANNING APPLICATION REVIEW

In line with the methodology set out in **Chapter 4**, in excess of 300 planning application files were reviewed for applications lodged during the period 1996 – 2011 located wholly or partly within 125 metres either side of the infrastructure for all case study sites in order to examine *inter alia*:-

- Documented evidence of proposed developments being influenced by the presence of high-voltage transmission infrastructure (e.g. in the planning application material);
- Documented evidence of development proposals being altered by the decision of the planning authority (or An Bord Pleanála) by reason of proximity to the high-voltage infrastructure; and
- Incidence of proposed developments being refused permission by reason of proximity to high-voltage transmission infrastructure (by the planning authority (or An Bord Pleanála).

The objective was to determine if transmission infrastructure had influenced patterns of settlement and land use (and the baseline described in Chapter 6 and Chapter 7).

8.1 SETTLEMENT PATTERNS

8.1.1 Rural

91 planning applications were reviewed throughout the rural settlement study sites (9 no.) of which 73 related to residential use. The locations of the planning applications are shown in the study site maps in **Appendix B**. The presence of OHL transmission infrastructure was referred to by the planning authority in the assessment of only 4 of these planning applications, as summarised in **Table 8.1**. These were instances where the infrastructure traversed the actual planning application site.

Reference is also made to **Table 5.1** which shows that 72 no. existing dwellings are located within 0-125 metres of the existing transmission infrastructure in the 9 no. case study sites examined representing the rural settlement category.

The review found no instances where planning permission was refused either partly or wholly ‘in principle’ because of proximity to the existing transmission infrastructure.

The review found no instance where the design or layout of any development proposal was expressly influenced by proximate transmission infrastructure. However, such influences on design or layout may not necessarily be spelled out or highlighted in application documentation. One instance was found of a development proposal that was required to be altered by the planning authority due to transmission infrastructure. In this particular case, Offaly County Council in response to a planning

application for a single dwelling[11], sought an alternative site proposal due to the presence of the Maynooth-Shannonbridge 220 kV OHL transmission circuit. Ensuring the minimum lateral clearance distance of 15m from the OHL stated to be required in that instance by the ESB wasn't feasible. This planning application was subsequently withdrawn.

[11] Register reference no. 97/330

Table 8.1 Planning Application History Review Results (Rural Settlement) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L456	Ballyshannon, Co.Kildare	400 kV OHL	071167	Single storey dwelling	Refused (for reasons other than presence of transmission infrastructure)	Reference in planning officer's report to OHL traversing the site.
06L473	Beggstown, Co. Meath	400 kV OHL	TA50261	8 dwelling units	Granted	Reference in planning officer's report to 400 kV OHL traversing site.
06L260	Clara, Co. Offaly	220 kV OHL	97330	Single dwelling	Withdrawn	Reference in planning officer's report to OHL traversing site. Letter from ESB stating no objections subject to min. lateral clearance of 15m from OHL. Planning authority requires alternative site not affected by OHL as dwelling within clearance distance. Applicant suggested alternative site in order to provide adequate separation between proposed dwelling and OHL. Planning authority requires new planning application.
06L174	Painstown, Co. Kildare	110 kV OHL	072610	Single dwelling	Granted	Reference in planning officer's report to ESB OHL traversing the land to the northwest of the site

8.1.2 Rural/Urban Fringe

There is potential for significant interaction between development and high-voltage transmission infrastructure in rural/urban fringe settlement sites as multiple transmission lines approach substations located on the outskirts of cities and towns. In addition, the rural / urban fringe often accommodates large scale multi-unit developments including apartments and housing estates with a mix of uses.

64 planning applications were reviewed throughout the rural/urban fringe settlement study sites (5 no.) of which 47 related to residential use. The locations of the planning applications are shown on study site maps in **Appendix B.** The presence of overhead transmission infrastructure was referred to by the planning authority in its assessment of 4 planning applications as summarised in **Table 8.2** . These were instances where existing transmission infrastructure traversed the planning application site or was immediately adjacent to it (in the case of the Kilbarry substation site).

Reference is also made to **Table 5.2** which shows that 575 no. dwellings are located within 0-125 metres of the existing transmission infrastructure in the 5 no. case study sites representing the rural/urban fringe settlement category.

The review found no instances where planning permission was refused either partly or wholly 'in principle' because of proximity to the transmission infrastructure.

The review found that, in the case of 2 planning applications for large scale residential development, the OHL transmission corridor was incorporated within the open space of the development proposal.

In the Monkstown/Cobh study site, permission was granted under Cork County Council register reference no. 05/6541 for 243 no. dwelling units plus ancillary community and recreational facilities[12]. In the development as originally proposed by the applicant, the corridors of the Knockraha – Rafeen 220 kV and Aghada – Rafeen 220 kV OHL circuits were incorporated as part of the required quantum of recreational open space. This was not considered acceptable to the planning authority. Conditions were attached to the permission requiring the removal of active open space from the OHL transmission corridors as follows:

> *'Condition no. 20: None of the recreational facilities proposed in order to comply with the Planning Authority's "recreational and Amenity" policy shall be located within 25 metres of overhead high tension power lines. Where recreational facilities are currently indicated as being located within 25 metres of high tension lines they shall be relocated on site to locations acceptable to the P.A. Revised layout shall be submitted to the P.A. for written approval prior to the commencement of any development.*

[12] Cork County Council register reference no. 05/6541

Condition no. 22: Prior to the commencement of any development, the developers shall submit the written agreement of the ESBI or ESB networks, whichever is the responsible body, to the proposed layout.'

It is evident from this application file that the convergence of high-voltage transmission circuits in the Monkstown / Cobh study site, by which reason it has been described as a worst case condition, has had a bearing on the resultant permitted design; however it did not influence the principle of development at this location. It was confirmed by site visit that this development has not commenced.

In the Kilbarry study site, permission was granted for 327 dwellings plus ancillary community facilities on a site adjacent to the Kilbarry substation[13]. The corridors of OHL transmission circuits connecting to the substation were incorporated as open space. While the corridors were considered acceptable for open space in this instance, it is noted that this is due to the fact that the OHL was required to be placed underground

[13] Cork County Council register reference no. 01/25735; appeal reference PL28.131262

Table 8.2 Planning Application History Review Results (Rural/Urban Fringe Settlement) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L167	Monkstown/Cobh, Co. Cork	110/38 kV OHL	086566	Single dwelling	Granted	Reference in the planning officer's report that a 110 kV line lies to the east of the site.
06L167	Monkstown/Cobh, Co. Cork	110/38 kV OHL	77665	Single dwelling	Refused (for reasons other than presence of transmission infrastructure)	Reference in the planning officer's report that a 110 kV line lies to the east of the site.
06L167	Monkstown/Cobh, Co. Cork	110/38 kV OHL	056541	243 dwelling units	Granted	Planning officer's report notes that there are existing and proposed high tension ESB pylons traversing the site in a south west to north east direction and as a result of this substantial portions of the site are effectively sterilized in terms of the location of dwellings. The planning officer considers that the applicant is therefore proposing to locate the majority of the required open space and leisure facilities in this corridor and considers this unacceptable. Applicant required to agree site layout with ESB, to provide a playing pitch in accordance with recreation policy requirements and to maintain a 45m ESB wayleave for the transmission lines. The following planning conditions were applied: • None of the recreational facilities proposed in order to comply with the planning authority's "recreational and Amenity" policy shall be located within 25 metres of overhead high tension power lines. Where recreational facilities are currently indicated as being located within 25 metres of high tension lines they shall be relocated on site to locations acceptable to the planning authority. Revised layout shall be submitted to the planning authority for written approval prior to the commencement of any development.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
						• Prior to the commencement of any development, the developers shall submit the written agreement of the ESBI or ESB networks, whichever is the responsible body, to the proposed layout.
06S165	Kilbarry, Co. Cork	110/38 kV substation	0125735	327 dwelling units	Granted	• Reference in planning officer's report to presence of high-voltage overhead transmission lines. • The appeal inspector notes that the site is adjacent to a large electricity station with its attendant network of electricity pylons. Furthermore the inspector notes that transmission lines cross the site and would need to be undergrounded.

8.1.3 Urban

93 planning applications were reviewed throughout the urban settlement study sites (7 no.) of which 54 related to residential use. The locations of the planning applications are shown on study site maps in **Appendix B**.

The presence of overhead transmission infrastructure was referred to by the planning authority in the assessment of 20 planning applications as summarised in **Table 8.3**. In these instances, the comment of the planning authority case officer fell into three broad categories: (a) the recording of the transmission infrastructure as a feature among other physical characteristics of the site; (b) that the appropriate lateral clearance was potentially breached and that comment be sought from the ESB; and (c) identifying concerns about the quality of open space proposed within the transmission corridor.

Reference is also made to **Table 5.3** which shows that 2397 no. dwellings are located within 0-125 metres of the existing transmission infrastructure in the case study sites representing urban settlement category.

The review found no instances where permission was refused for the entire development wholly because of proximity to the transmission infrastructure. Iin two instances it was found that the presence of overhead transmission infrastructure was a factor in the refusal of planning permission.

In the Kilternan / Stepaside study site, a split decision was issued by Dun Laoghaire-Rathdown County Council[14] which granted permission for an extension to an existing dwelling, and refused permission for the domestic garage that formed part of the development proposal. In this regard, permission for the domestic garage was refused by reason of its location within the restriction corridor for the 220 kV OHL transmission circuit as provided for in the Kilternan / Glenamuck Local Area Plan. In this regard, the Plan provided for both a 110 kV and 220 kV restriction corridor with a policy objective *"To encourage and/or facilitate the undergrounding of the Arklow-Carrickmines double circuit 220/110kV transmission line and the Carrickmines-Fassoroe 110kV transmission lines Nos. 1 and 2. Where undergrounding is not feasible, to sensitively incorporate the restriction corridors associated with said powerlines into the design of future developments*" (Policy UTL04).

Again in the Kilternan / Stepaside study site, the planning authority cited a deficiency of open space as one of four reasons for refusing planning permission for a mixed use development comprising 161 dwelling units[15]. A design approach which provided the open space requirement of the scheme within the corridor of the 220 kV OHL transmission circuit traversing the site was discounted.

[14] Register reference no. D11B/0180
[15] Register reference no. D09A/0471

The review of planning applications found that the existence of high-voltage transmission infrastructure did influence the detailed design and layout of certain specific development proposals, rather than the principle of such development. In most cases, this involved confirmation, either in the initial application or elicited through a further information request by the planning authority, that cognisance had been taken of the overhead transmission infrastructure present and that clearance distances required by the ESB between proposed buildings and the infrastructure had been maintained; supporting correspondence from the ESB accompanying such statements was evident on four planning files.

In the case of large scale, multi-unit development proposals on sites traversed by overhead transmission infrastructure, several instances were found in which the area of the site within the corridor of the infrastructure was used to contribute toward achieving the open space standards of the planning authority, which is typically in the range of 10-15% of the application site area. Such an arrangement was deemed unacceptable as it was considered to result in open space unsuited to recreation and inconsistent with relevant planning policy.

With the exception of the refusal of permission referenced above (D09A/0471), in each of these cases the applicant was required to modify the proposed development to meet the quantitative standard for open space exclusively from land unaffected by the corridor of the overhead transmission infrastructure. In such developments, the overhead transmission corridor remained a landscaped 'green strip' usually contiguous with the standard-compliant open space. This inevitably resulted in a reduction in building site coverage and an impact on residential density as exemplified in planning permissions granted in the Clonburris and Kilternan / Stepaside study sites[16].

In respect of SDO5A/0274, planning permission was granted by South Dublin County Council for 74 dwelling units on a site traversed by the Inchicore – Maynooth 220 kV overhead transmission line. The planning authority attached a condition to the permission requiring the omission of 8 dwelling units and their replacement with public open space in order to offset the area that had been designated within the overhead transmission line corridor in lieu of the open space requirement.

Planning permission was granted by South Dublin County Council[17] for a mixed use development including 973 dwelling units on a site traversed by the Inchicore – Maynooth 220 kV OHL. The proposed development represents the initial phase of the Clonburris Eco District as envisaged in the Clonburris SDZ. In this case, the Clonburris Local Area Plan 2008 and the Clonburris SDZ, which set out detailed guidance on the future layout of the overall area, identified the corridor of the OHL as a 'Structure Landscape'. It was noted that this 'Structure Landscape' was not intended to form part of the calculation of public open space required in residential development proposals. The SDZ Planning

[16] Register reference nos. SD05A/0274; appeal reference 216131; and D96A/0197 respectively
[17] Register reference no. SD09A/0149

Scheme requires that no buildings may be developed within 30 metres of the OHL. The applicant[18] contended that the presence of the OHL had a significant effect on the form and distribution of buildings on the site and that it was necessary to concentrate higher densities in certain parts of the site in order to make up for the absence of development capacity within transmission line corridor and thereby deliver the overall residential density level required by the SDZ Planning Scheme.

Planning permission was sought for 292 dwelling units in the Clonburris study site[19]. This proposal required the diversion of the Inchicore – Maynooth 220 kV overhead transmission line, which was the subject of a concurrent planning application by the ESB. Permission was granted for the transmission line diversion prior to the residential development. Planning permission was granted for this residential development subject to, *inter alia*, the condition that no dwelling unit be occupied prior to the placing underground or diversion of the existing 220 kV OHL.

The Clonburris study site is described as a worst case condition due to the inclusion of the area in the Clonburris SDZ and associated Planning Scheme. The potential conflict between the objectives of these plans to respectively achieve high density residential development and maintain a 30 metre clearance from the Inchicore – Maynooth 220 kV overhead transmission line is exemplified in the planning application under register reference no. SD09A/0149.

[18] Register reference no. SD09A/0148

[19] Register reference no. S01A/0664

Table 8.3 Planning Application History Review Results (Urban Settlement) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D06A/0235	Two storey house	Refused (for reasons other than presence of transmission infrastructure)	Letter appended to application from ESBI (on behalf of ESB) requiring a min. lateral separation of 25m from OHL. Planning officer's report refers to presence of 220 kV line traversing part of the site; Planning officer refers to inconsistency with advice previously given to planning authority by ESB that lateral separation should be 30m. Planning officer considers that the site of the dwelling may have to be amended as a result of the foregoing; permission refused for reasons other than proximity to transmission infrastructure.
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D11B/0180	Extension of, and alteration to, existing dwelling	Split decision	Correspondence from ESBI (on behalf of ESB) confirming that separation of development from OHL is acceptable apart from the proposed garage. Reference by planning authority to 30m clearance distance regarding development either side of high-voltage overhead lines provided for in Development Plan and LAP. Proposed garage considered premature pending exploration of undergrounding objective in LAP. Split decision: Alterations to house granted; permission refused for garage due to location within the OHL restriction corridor and due its scale and visual intrusiveness.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D09A/0471	Mixed use development comprising 161 residential units, 4 retail units, 10 office units and 1 crèche.	Refusal	Reference in planning officer's report to objective of Kilternan LAP to explore option of undergrounding overhead lines and funding this through development contribution scheme. Reference in planning officer's report to location of open space around overhead pylon/line and statement that this cannot be considered to be adequate active recreational space. Applicant required to provide additional open space. In response, applicant proposed to omit a block of development in order to increase amount of open space Co-location of green space and existing pylons raised by third party objector. Deficiency of usable recreational open space given as one of four reasons for refusal by planning authority. Appeal inspector states that the proposed Neighbourhood Framework Plan is not achievable given the OHL restriction corridor in the LAP; inadequacy of open space cited as one of two reasons for refusal by An Bord Pleanála.
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D07A/0447	257 dwelling units	Withdrawn	Applicant stated that cognisance had been taken of the OHL to the east of the site in the design of the proposed development.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D07A/1545	250 dwelling units	Refused (for reasons other than presence of transmission infrastructure)	A third party objector asserted that one of the residential blocks is located within the OHL restriction corridor. Appeal inspector stated that it would have been good practice to refer file to ESB.
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D02A/1227	Construction of 54 no. 2 bed apartments in 8 no. blocks	Granted	Reference in planning officer's report states that public open space located within the OHL corridor
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D03A/0871	Alterations and additions to approved layout Reg. Ref. D02A/1227	Granted	Applicant states that public open space is an extension of the linear park on the OHL corridor permitted as part of initial development. Applicant's engineers make reference to 46m wayleave re: overhead lines and to consultations with the ESB re: the undergrounding of OHL; applicant states that initial development was designed with an excess of open space due to a certain proportion being located in the OHL corridor. Third party observations state that OHL should be put underground before any further development takes place. Planning officer's report describes the OHL as being the most prominent feature of the application site and the pylons as being obtrusive in visual terms; reference to letter from applicant regarding membership of consortium aimed at achieving the undergrounding of the OHL.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D99A/1086	65 dwelling units	Granted	Third party appellant considers that development should not be permitted pending resolution of OHL situation viz-a-vis undergrounding as it poses a health hazard. Planning authority applied condition to permission requiring that development site nos. 43 to 49 inclusive shall not be utilised until OHL undergrounded
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D96A/0197	150 dwelling units	Granted	Reference in planning officer's report refers to overhead lines traversing the site and that open space is proposed underneath and around pylons and cites concern over location of private garden around pylon. Planning authority requires approval by ESB of plans and investigation of feasibility of undergrounding. Appeal inspector makes reference to OHL 'constraint corridor' included in Stepaside Action Plan 2000. Planning condition required, prior to the commencement of development of sites 147 and 150, for the relocation of the pylons from these sites.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D98A/1000	222 dwelling units	Granted	Reference by applicant to increase in open space around 110 kV OHL and suggestion by applicant that the line may be placed underground. Planning officer's report states that indicated possible road connection may be compromised by OHL, and that the proposed open space beneath OHL is unacceptable. Applicant responds that no commitment given regarding undergrounding of 110 kV OHL and that house no. 98 will be omitted pending removal of adjoining pylon. Appellant states that all 110 kV overhead lines should be placed underground. Condition of permission that Block 9 (c. 13 units) be omitted to provide additional usable open space.
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D00A/1279	Amendments to approved plans D96A/0197 and D98A/1000 for residential development: 388 units total	Granted	Reference in planning officer's report to programme for undergrounding / diverting existing overhead lines. Planning condition requires that 50 units of proposed development cannot be constructed until 110 kV OHL is diverted. A planning condition was imposed that agreement be reached on programme and works for undergrounding / rerouting OHL prior to commencement.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D03A/1213	Amendments to previous resulting in approx. 427 units overall	Granted	Reference by applicant to recent decommissioning of 110 kV OHL, which enables proposed development to take place. Appeal inspector agrees that there was no other reason than the former existence of the OHL to omit certain units by previous condition.
06S231	Kilternan/Stepaside, Dublin	220 kV OHL	D04A/0062	Single dwelling	Refusal (for reasons other than presence of transmission infrastructure)	Reference in planning officer's report to OHL traversing southwest corner of site.
06L236	Clonburris/Adamstown	220 kV OHL	SD09A/0149	Mixed use residential, retail, commercial on a 19.5 hectare site comprising 973 dwelling units	Granted	Reference by applicant to inability to achieve required plot ratio in Kishoge Cross area of site due to constraints imposed by the 220 kV OHL and Adamstown Link Road, greater density achieved elsewhere in order to achieve overall density requirement. Third party observation & appeal to the effect that 220 kV OHL should be put underground from elected member. Planning officer's report states open space located within transmission line corridor shall not form part of the open space requirement; Applicant contends that OHL corridor used as location of attenuation ponds. Appeal inspector agrees with applicant that open space beneath OHL determined by LAP as 'Structure Landscapes, and is not intended to be usable open space.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L236	Clonburris/Adamstown	220 kV OHL	SD05A/0274	58 no. 2 storey houses and 16 no. apartment units on site of 2.87 hectares	Granted	Applicant states that OHL corridor incorporated as open space. Planning officer's report states that open space is unsuitable due to location beneath OHL and refers to site area for development being reduced by OHL at eastern end of site; refers to 30m set-back requirement from OHL. Third party observer raised concerns regarding proximity of OHL. Condition attached to planning permission: ▪ 8 units omitted near OHL and open space beneath designated as parkland.
06L236	Clonburris/Adamstown	220 kV OHL	SD04A/0964	Construction of the Adamstown Link Road linking the proposed development of Adamstown in the west with the Outer Ring Road	Granted	Applicant refers to consultation with ESB re separation distances. ESB requires safety standards to be observed.
06L236	Clonburris/Adamstown, Dublin	220 kV OHL	S01A/0664	Development comprising 292 dwellings	Granted	Applicant states that 220 kV line diverted to facilitate development and refers to previous planning permission for this diversion. Condition attached to planning permission: ▪ Prior to the occupation of any dwellings permitted, the existing 220 kV overhead lines shall be placed underground or re-routed over ground.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	0024505	Construct 112 dwellings	Granted	Appeal inspector's report refers to ESB pylon at the north-eastern corner with the transmission lines running along the north-eastern boundary in the description of the site. Condition attached to planning permission: ▪ Layout and clearance levels between the dwellings and the ESB pylons/high tension lines shall be in accordance with the requirements of the ESB.
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	0529688	Single dwelling	Granted	Planning officer's report notes that the subject site is traversed by an overhead ESB line.
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	0631032	Construction of boundary walls and 2 no. access gates	Withdrawn	Reference in planning officer's report states that OHL are located along the strip of land. Planning authority requires confirmation from the ESB that they are satisfied with the proposed easement arrangement.

8.2 LAND USE

In line with the methodology set out in **Chapter 4**, a total of 122 planning application files were reviewed for applications located wholly or partly within 125 metres either side of the infrastructure for all case study sites in order to observe whether the existence of transmission infrastructure influenced land use (and the baseline described in Chapter 5 and Chapter 6).

8.2.1 Agricultural Land Use

24 planning applications were reviewed throughout the agricultural study sites (11 no.). The locations of the planning applications are shown on study site maps in **Appendix B**.

The majority of planning applications reviewed comprised development proposals relating to the typical agricultural uses of pastoral and arable farming and non-standard agricultural uses primarily related to the equine industry; such developments primarily comprised slatted sheds, milking parlours and slurry tanks in the case of the former and stables, sand arenas and tack rooms in the case of the latter. It should be noted that a range of agricultural buildings are exempted under the Planning Acts and Regulations from the requirement to obtain planning permission; therefore the identification of coexistence through direct site survey takes on an added importance with respect to this land use (refer to **section 5.2.1**).

The review found no instances where planning permission was refused either partly or wholly because of proximity to the transmission infrastructure. No instances were found of the design or layout of any development proposal having been expressly influenced by proximate transmission infrastructure.

Of the 24 planning applications reviewed, the presence of overhead transmission infrastructure was considered as part of the assessment of only 2 planning applications (though some applications simply recorded the presence of OHL infrastructure among other physical characteristics of the application site) as summarised in **Table 8.4.** This is illustrated as a percentage in **Figure 8.4.** In the two instances, the planning authority required confirmation that the ESB was satisfied that the proposed development did not cause a negative impact on the OHL infrastructure present.

Table 8.4 Planning Application History Review Results (Agricultural Land Use) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L242	Carrigtwohill, Co. Cork	Killonan – Knockraha 220 kV OHL	041942	Use of fill material to raise level of land for agricultural use.	Granted	The planning officer's report raised concerns in relation to proposal to raise ground in proximity to ESB pylon
06L250	Gorman, Co. Meath	220/38 kV substation	SA800365	Mushroom farm with 5 buildings	Refused (for reasons other than presence of transmission infrastructure)	Applicant states that the site was considered suitable partly due to close proximity of the large ESB substation and pylon farm to the site which would ensure access of power supply and due to increased capacity of area to absorb change arising from disturbance to visual landscape caused by substation. Third party objector stated that the cumulative visual impact of the proposed development and the ESB substation would be very significant. The appeal inspector stated that the most notable non-agricultural use in the vicinity is an ESB transformer facility to the northeast of the site. The inspector's report states that the subject site will be accessed off a lane, which has been identified as a right of way currently shared between the ESB and local farmers. The ESB in their submission highlighted the presence of UGCs in the verges of the lane. An Bord Pleanála considered that the access arrangements had not been satisfactorily resolved.

In the Carrigtwohill study site, Cork County Council decided to grant permission for the use of fill material from a builder's site to raise the level of land for agricultural use[20], having first satisfied itself that there would be no negative impact on the OHL structure present within the site.

In the Gorman study site, planning permission was refused by Meath County Council for a mushroom substrate composting facility[21]. Although none of the reasons for refusal related to the presence of the Gorman 220/110 kV substation, the planning report raised concerns regarding the proposed use of a laneway that was being used by the ESB for access to the substation. With reference to a potential need to widen this laneway to accommodate the mushroom composting facility, ESB International (as technical and environmental consultants for ESB Networks), advised that the proposals may interfere with buried UGCs in the laneway verges. Separately, the applicant stated that the subject site was considered to be the most appropriate on the grounds of its close proximity to the substation, which would 'ensure access of power supply to the facility'. Furthermore, it was contended by the applicant that the visual impact of the proposed compound (8.5 metres high, 2,136m^2 floor area) was lessened by the presence of the substation, which diluted the rural character of the local landscape and enhanced its capacity for absorbing such development.

8.2.2 Commercial Land Use

The review yielded a range of developments which can broadly be categorised as: large scale greenfield and brownfield development projects; the redevelopment of individual sites; and extensions and alterations to existing premises.

67 planning applications for commercial development were reviewed throughout the study sites (6 no.). The locations of the planning applications are shown in the study sites in **Appendix B**. The presence of overhead transmission infrastructure was referred to by the planning authority in its assessment of 15 of these planning applications as summarised in **Table 8.5**. In 14 of these cases, the reference either related to the recording of the transmission infrastructure as a feature among other physical characteristics of the site or its environs, or related to concerns over compliance with the required clearance between buildings and the transmission line that was subsequently confirmed, in some cases with supporting correspondence from the ESB.

Reference is also made to **Table 5.4** which shows that 662 no. commercial units are currently located within 0-125 metres of the existing transmission infrastructure in the case study sites representing the commercial land use category.

[20] Register reference no. 04/1942
[21] Register reference no. SA800365; and appeal reference 229058

Table 8.5 Planning Application History Review Results (Commercial Land Use) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	S99A/0551	Warehouse extension to rear of existing premises	Granted	Correspondence from ESB to the effect that the proposed development lies in path of 220 kV OHL and that max height of 11m pertains to buildings; confirmation that proposed development complies with max height restriction
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	1901/97	Circa 87,000sq.m. floor area of employment development	Granted	Report included in EIS Appendix concludes that extensive studies have been inconclusive regarding health impact from electromagnetic field Applicant states that site layout, including main access corridor, was informed by ESB corridor, which necessitated a wider than usual corridor with heavy emphasis on landscaping (buildings are 56m apart).. ESB has been consulted and has approved the design approach. Planning authority raised concerns in relation to Block 4 due to proximity to OHL. Conditions attached to planning permission: ▪ Block 4 shall not be constructed unless and until any ESB lines affecting it have either been diverted or placed underground.
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	3850/00	Concrete batching plant	Refused (for reasons other than presence of transmission infrastructure)	Planning officer's report referred to ESB pylon on site and to purchase of additional land around substation by applicant from ESB.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	3848/00	Factory building and offices	Granted	Planning officer's report refers to ESB pylon within site and ESB power station to the immediate northeast. Correspondence received from ESB confirming acceptance of proposal subject to no building being within 23m radius of tower legs and that trees planted adjacent to, or under, overhead lines be of dwarf type
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	3899/06	Hard landscaping and drainage of existing disused site for use as storage	Granted	Record in planning officer's report of verbal comment from ESB re OHL. Condition attached to planning permission: ▪ The applicant shall consult with the ESB re 110 kV and 220 kV lines in vicinity and comply with their requirements
06L234	Clondalkin/Parkwest, Dublin	220 kV OHL	2791/05	Construct a two storey storage facility (5112 sq.m)	Granted	Reference in planning officer's report to restricted options on site due to presence of OHL
06L107	Ballymount, Dublin	110 kV OHL	S00A/0746	Construction of light industry/ warehousing with ancillary offices and car parking.	Granted	Correspondence from ESB consenting to car park located beneath 110 kV OHL subject to 13m lateral clearance for truck parking and that ground level not be raised.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L107	Ballymount, Dublin	110 kV OHL	SD03A/0747	Extensions and alterations to the existing premises, consisting of an 805sq.m., single storey extension,	Granted	Letter of consent from ESB re works subject to 10m separation between building and 110 kV line and that no building be located within 23m of pylon leg; ESB letter confirming meeting with applicant. ESB refer to need for prior notice for request for outage necessitated by construction works and that this is usually only possible during summer months and/or weekends. Condition attached to planning permission: ▪ 'Drying room' omitted due to proximity to ESB pylon and therefore not conforming to min. separation distance
06L242	Carrigtwohill, Co. Cork	220 kV OHL	04421	Offices, diagnostics manufacturing facility and ancillary development.	Granted	Reference in planning officer's report that the site adjoins an ESB substation.
06L242	Carrigtwohill, Co. Cork	220 kV OHL	036614	Construction of manufacturing facility	Granted	Reference in planning officer's report that the site is located south of and adjoining the ESB substation
06L166	Ballynaneashagh, Co. Waterford	110 kV OHL	04126	Car showroom	Granted	Correspondence from ESBI with regard to working parameters underneath the 110 kV line including max working height from ground level of 5m. Planning authority's report refers to request for details with respect to proposed alternative route and written agreement of same from ESB. Condition attached to permission: ▪ No work shall commence on the proposed buildings (which include basement) until the existing 110 kV line is relocated.

Study Site ID	Study Site	Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L166	Ballynaneashagh, Co. Waterford	110 kV OHL	03555	Car showroom	Granted	Reference in planning officer's report that the south eastern corner of the site is traversed by a 110 kV OHL.
06S269	Finglas, Dublin	220/110 kV substation	F03A/1430	The continuation of extraction, crushing, screening and processing of rock	Granted	Reference in planning officer's report to the proximity of ESB substation and the need to take cognisance of this important piece of infrastructure. Reference by appeal inspector to ESB 220 kV station complex, from which there are a large number of OHLs radiating in all directions, some of which cross the site.
06S269	Finglas, Dublin	220/110 kV substation	F05A/0543	Industrial/ware house/office park with a total gross floor area of 76,115 sq.m.,	Granted	Correspondence from ESB confirming that no 400 kV, 220 kV or 110 kV lines traverse the site.
06L120	Castleview, Co. Cork	110/38 kV substation	051601	Construction of a two-storey commercial unit	Refused(for reasons other than presence of transmission infrastructure)	Reference in planner's report that ESB pylons traverse the site and that ESB 'antenna' is located in the adjoining site, although it is considered that this is adequately screened by trees.

The review found no instances where planning permission was refused, either partly or wholly, because of proximity to the transmission infrastructure. In several instances, the design and layout of development proposals was either informed by the presence of overhead transmission infrastructure, or was altered for this reason by decision of the planning authority.

The Parkwest business campus in the Clondalkin/Parkwest study site provides an example of where an overhead transmission corridor informed the design and layout of a large scale commercial development proposal; this planning application is addressed in some detail below. Examples of development proposals being altered due to the presence of overhead transmission infrastructure are found in the Ballymount and Ballynaneashagh study sites.

The Parkwest business campus was primarily developed under planning permission register reference nos. 1901/97 and 3499/98 and comprised approximately 103,000m^2 of employment floor area on a site traversed by the Inchicore – Maynooth 220 kV. The content of the planning application reg. ref. no. 1901/97 confirms that the Inchicore – Maynooth 220 kV OHL transmission circuit informed the alignment of the central spine road along either side of which the building blocks were located. The development description in the Environmental Impact Statement accompanying the planning application states that the main access corridor along the ESB corridor is consequently 'wider than usual with heavy emphasis on landscaping' (the buildings either side of the central spine road are 56m apart). The design and layout of this development is also confirmed as having been arrived at in consultation with the ESB.

In the Ballymount study site, South Dublin County Council attached a condition to a planning permission for an extension to an existing commercial facility requiring the omission of an element of the proposed development that breached the clearance distance to the Citywest – Inchicore 110 kV transmission line. The planning authority had based its assessment on a letter of consent to the development from the ESB that stipulated a minimum clearance of 23m between buildings and OHL structures.

In the Ballynaneashagh study site, Waterford City Council granted permission for a motor sales and servicing facility under register reference no. 04/126 subject to a condition that no work commence on the proposed buildings until the existing 110 kV line was relocated.

8.2.3 Amenity Related Land Uses

Community, Social and Recreation Land Use

31 planning applications were reviewed throughout the community, social and recreation land use study sites (4 no.). The locations of the planning applications are shown on the study site maps in **Appendix B.** The majority of the planning applications reviewed within this category were for the development of either school or sports facilities, with instances of such development proposals found in a range of environments including each of the settlement categories of urban, rural/urban fringe and rural.

The review yielded no evidence of impact on the development proposals by the presence of OHL transmission infrastructure. The review found no instances where planning permission was refused either wholly or partly because of proximity to the transmission infrastructure. In the one case where the planning records registered an impact on a development proposal, the effect was to inform the location and layout of the proposed buildings and did not result in the alteration of the development proposal by the decision of the planning authority.

Of the 31 planning applications reviewed, the presence of overhead transmission infrastructure was referred to in the assessments of 12 planning applications as summarised in **Table 8.6**.

The campuses of Crescent College and Gaelscoil An Raithin, which abut the Dooradoyle, Limerick 110/38 kV substation, were the subject of several planning applications for additional classroom space and ancillary facilities during the survey period. In most cases, the planning authority noted the existence of the overhead transmission infrastructure and its distance from the proposed buildings.

In the case of a planning application by Gaelscoil An Raithin[22], the applicant responded to concerns raised by the planning authority over the removal of boundary trees and screening to accommodate additional prefabricated classroom facilities by contending that the location of the buildings was necessary to maintain clearance (10 metres) from the adjacent OHL structure. Limerick County Council accepted this rationale, noting the 'health and safety' concerns of the school in this regard, and granted planning permission. However, while noting the school's concerns it was not identified as an issue of concern by the planning authority itself or by relevant statutory bodies and agencies.

[22] Register reference no. 11/865

Table 8.6 Planning Application History Review Results (Community and Social Land use) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Transmission Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L116	Ballyvolane/Mayfield, Cork	110 kV OHL	0125173	Construct an all weather football pitch	Granted	Letter submitted with the planning application from ESB setting out ESB requirements that will need to be adhered to.
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	97/993	Retention of temporary classrooms and toilet block	Granted	Reference in planning officer's report that site is part of large school site traversed by OHL
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	00/2559	Construction of dining hall and ancillary rooms adjacent to existing sports hall	Granted	Reference in planning officer's report that site is part of large school site traversed by OHL
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	98/1166	Playing pitches	Granted	Reference in planning officer's report that pylons in excess of 20m exist in the vicinity of the ESB substation.
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	99/1788	Retention of existing netting and floodlighting, and erection of new floodlighting	Granted	Appeal inspector's report notes that support structures have been erected to the relevant standards and the process was supervised by an ESB engineer.
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	03/1179	Change of use of corporate boxes for use as Gaelscoil	Granted	Reference in planning officer's report that site is part of large school site traversed by OHL
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	05/732	Prefab site classrooms	Granted	Reference in planning officer's report that site is part of large school site traversed by OHL.

Study Site ID	Study Site	Transmission Infrastructure	Planning Ref.	Brief Description of Development	Decision	Relevant Indicators
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	05/3585	Erection of palisade fence across the southern boundary of property and erection of four high nets in different locations on the boundaries	Granted	Planning officer's report noted that fence runs under power line
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	06/678	Construction of extension over the existing prefabricated unit incorporating temporary classroom accommodation	Granted	Planning authority's report noted that proposed extension to pre-fabs for school located c.60m from OHL
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	06/3811	Erection of 6 No. 21m floodlighting poles to main pitch	Granted	Reference in planning officer's report that site is part of large school site traversed by OHL.– and that proposed lighting posts located c.40m from power line.
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	09/372	6 prefab classrooms	Granted	Planning authority's report noted that proposed development located c.15m from OHL
06L123	Dooradoyle, Limerick	110 kV/38 kV substation	11/865	Extension of existing prefabricated units incorporating 2 no. additional classrooms and ancillary development	Granted	Applicant justified location of proposed classroom extension by necessity of maintaining max. separation distance possible from OHL. Planning officer's report noted that building is located c.10m from OHL

Tourism Land Use

Development proposals relating to tourism land uses identified during the review of planning applications within the study sites are set out in **Table 8.7** (and shown on the relevant study site maps in **Appendix B**). Due to the limited sample of case study sites, all applications reviewed, including where there was no reference to the high-voltage infrastructure on file, are included in **Table 8.7**.

Table 8.7 Planning Review Results (Tourism Land Use) Which Refer to Transmission Infrastructure

Study Site ID	Study Site	Infrastructure	Planning ref.	Brief Description of Development	Decision	Relevant Indicators
06L167	Monkstown/Cobh, Co. Cork	110 kV OHL	03178	Construction of a link corridor from rear of existing hotel.	Granted	None
06L167	Monkstown/Cohn, Co. Cork	110 kV OHL	049225	Demolition of existing hotel & construction of new 78 bedroom hotel	Refused (for reasons other than presence of transmission infrastructure)	None
06L166	Ballynaneashagh, Waterford	110 kV OHL	03275	3-4 storey hotel with 101 bedrooms	Granted	None
06L166	Ballynaneashagh, Waterford	110 kV OHL	09120	A single storey building containing a W.C. cubicle & plantroom facility within hotel site.	Granted	None
06L242	Carrigtwohill, Co. Cork	220 kV OHL	007607	New hotel as part of mixed use development	Granted	Appeal inspector noted that two OHLs traverse the site.

The review of these planning applications revealed no evidence that the presence of OHLs was either a factor in the design and layout of the proposed development or in the assessment and final decision by the planning authority. The only instance of coexistence with tourism land use revealed by the survey of the study sites was the Ramada Hotel in the Ballynaneashagh study site, which is traversed by the Dungarvan – Waterford 110 kV OHL.

8.3 CONCLUDING COMMENTS

The survey of planning application history found no evidence that the presence of high-voltage transmission infrastructure affects patterns of settlement in rural areas. This is considered to be most likely due to the predominantly dispersed nature of settlement in such areas (and restricted rural housing policy limiting the location of such development) combined with the established status of the OHL infrastructure in the case study sites.

The significant expansion of the urban footprint in recent years has resulted in an increased interaction between OHL transmission infrastructure and areas of higher population density, i.e. in rural/urban fringe and urban settlement areas. This is evident by the increased reference to transmission infrastructure in planning applications in these areas. However, the analysis shows no evidence of the presence of such infrastructure influencing the pattern of urban settlement except where applications are required to meet a prescribed design approach to address transmission infrastructure as part of local area plan e.g. a transmission line restriction corridor, or otherwise address such infrastructure as part of the site design process.

The key determinant of whether the presence of transmission infrastructure becomes a factor in the assessment by the planning authority of a planning application is if there is a potential breach in clearance distances recommended by the ESB. These distances relate to public safety – specifically distances of falling structures, rather than for matters of environmental or residential amenity.

The sporadic and dispersed nature of agricultural structures and the fact they are often exempt from the requirement to obtain planning permission, limits the potential to ascertain any direct impact from the planning application history of the relevant study sites.

As with agricultural uses, the sporadic and dispersed nature of structures related to amenity and tourism land use also limits the potential for any direct impact by overhead transmission infrastructure. The review of planning applications revealed limited evidence that the presence of OHL transmission infrastructure was either a factor in the design and layout of the proposed development or in the assessment and final decision by the planning authority.

In summary, the planning application history review found the existence of transmission infrastructure to have no influence on patterns of land use and settlement. However, there is evidence of it being factored into siting and design considerations, such as achieving clearance distances or by incorporating the infrastructure into the overall design of a scheme – either as OHL or UGC.

9 FINDINGS – CONSTRUCTION OF TRANSMISSION INFRASTRUCTURE

9.1 OVERVIEW

Four case studies of transmission infrastructure construction sites were identified, in order to assess the impact of the construction of transmission infrastructure on patterns of settlement and land use. As set out in **Chapter 4** (Methodology), the limited number of such projects has consequently limited the effective interpretation of the data in terms of statistical signficance; however, it is still outlined below, in order to identify common themes.

9.1.1 East-West Interconnector

The East-West Interconnector (EWIC) is a connection between the electricity grids of Ireland and UK, which has been constructed between Rush, Co. Dublin in Ireland and Barkby Beach, North Wales. Within Ireland, the land element of the transmission line runs underground from North Beach, Rush, Co Dublin to the existing 400/220 kV substation at Woodland, Co Meath.

48 planning applications were reviewed along approximately 13.5 kilometres of the EWIC. The study site comprised the entire length of the route through the urban settlement area of Rush and the rural/urban fringe settlement area between Rush and Ballyboughal.

There was an absence of any reference in these planning applications to the provision of, or construction activities associated with, the EWIC, and there was absence of evidence that any of the proposed developments were affected by the construction of, or existence of, the EWIC project.

Table 9.1 below shows a reduction in the average annual intake of planning applications by the planning authority – Fingal County Council – within the EWIC study area after the announcement of the EWIC project (2006). However, when compared with the drop in the annual average intake of planning applications in the functional area of the planning authority as a whole for the same period, it is evident the reduction along the interconnector route is broadly in line with the reduction experienced at the countywide level. This overall trend corresponds with the current period of general contraction in the economy.

Table 9.1 Average Annual No. of Planning Applications (Interconnector)

Area	1996 – 2006	2007 – 2011	% change
East-West Study Site	20	11	- 44.4
Fingal County Council	2079	1166	- 43.9

9.1.2 Gorman-Meath Hill Overhead Transmission Line

The Gorman – Meath Hill 110 kV project involves the construction of a 110 kV single circuit overhead transmission line linking the Gorman 220 kV/110 kV and Meath Hill 110/38 kV substations over a distance of approximately 27 kilometres.

The section of this construction project within the Gorman – Meath Hill study site was substantially in place at the time of the survey. As part of the study of this route, the contents of 19 planning applications were reviewed along approximately 14.8 kilometres of the project route. There was no reference on any application file to the provision of, or construction activities associated with the transmission line, and there was no evidence that any of the proposed developments were affected by the Gorman – Meath Hill project.

Table 9.2 shows the number of planning applications made between the periods before and after the public announcement of the Gorman – Meath Hill project (2004).

Table 9.2 Average Annual No. of Planning Applications (Gorman – Meath Hill)

Area	1996 – 2004	2005 – 2011	% change
Gorman-Meath Hill Study Site	1.3	2.1	+38.5%
Meath County Council	2400	2107	-12.2%

9.1.3 Arva – Shankill 110 kV Overhead Transmission Line

The Arva – Shankill 110 kV Project involves the development of a 110 kV overhead transmission line linking the Arva 110/38 kV substation at Pottle, County Cavan to Shankill 110/38 kV substation, County Cavan over a distance of approximately 24 kilometres. This project is now complete.

As part of the assessment of the construction of this route, 22 planning applications were reviewed. Of these, reference to the adjacent transmission route occurred in only 2 instances. Under planning register reference no. 06/1205, permission was granted for a single dwelling; the planning application was accompanied by a standard letter of consent to the making of the application from the ESB, which confirmed that the stated clearance requirement of 20 metres was complied with and that the provision of a driveway underneath the 110 kV transmission line was acceptable subject to the requirement that the site level not be raised above 0.5 metres.

Planning permission was granted to Killgarry National School[23] for the provision of a new astro turf playing pitch. It is noted on the planning file that the planning application was referred to the ESB, as per the Statutory obligations of the planning authority under Article 28 of the Planning and

[23] Register reference no. 10/240

Development Regulations 2001 (as amended) but that no response was forthcoming. No further reference was found to the Arva – Shankill project in either these or any other of the planning files reviewed and no evidence was found of development proposals being altered or modified due to the presence of the transmission infrastructure.

Table 9.3 shows that the level of planning applications made within the study area fell between the periods before and after the public announcement of the Arva – Shankill project. While the numbers are not statistically significant, nevertheless it is noted that the level of reduction reflects that experienced by the County as a whole.

Table 9.3 Average Annual No. of Planning Applications (Arva – Shankill)

Area	1996 - 2005	2006 - 2011	% change
Arva - Shankill Study Area	4.2	3	-28.6
Cavan County Council	1,758.6	1,333	-24.2

9.1.4 Cloon to Castlebar 110 kV OHL

The development comprised the construction of 57.3km of 110 kV overhead line from Castlebar, Co. Mayo, to Cloon, south-west of Tuam, Co. Galway. The proposal was granted permission in 2000 and was electrified in 2004/5.

The contents of planning applications along approximately 10 kilometers of the route corridor were reviewed. The corridor is partly located within the urban fringe of Tuam which was under significant development pressure particularly for rural housing during the study period (i.e., 1996 – 2011). It is also noted that in some cases multiple applications were made for the same site.

Of the applications reviewed, 11 made reference to the transmission line. It is noticeable that in 2002 a number of applications (9 no.) were made for dwelling houses in the townlands of Lehid, Knocknagur and Cloonfush, on sites through which the OHL line was routed or in the immediate vicinity. Permission was refused for these developments *inter alia* because *"the vicinity of the proposed/granted 110 kV would put the health and safety of the occupants at risk".* The basis of the health and safety risk was not elaborated upon. Since then only one application was refused for a number of reasons including the fact that it was located directly beneath the existing line.

Table 9.4 Average Annual No. of Planning Applications (Cloon - Castlebar)

Area	1996 – 2000	2001 - 2011	% change

Cloon - Castlebar Study Site	9.6	16.45	+71%
Galway County Council	4732.4	4360.2	-7.8%

9.2 CONCLUDING COMMENTS

The survey of the construction areas (Arva – Shankill, Gorman – Meath Hill 110 kV and Cloon - Castlebar overhead lines and the East-West Interconnector) revealed no significant evidence that the construction of transmission infrastructure affected patterns of human settlement or land use.

With the exception of the Cloon to Castlebar study area, the average annual number of planning applications made on land adjacent to the construction sites remained approximately in line with countywide trend in the periods prior to and after the public announcement. It is acknowledged that in 2 of the sites, the negligible number of applications cannot be deemed to be of any statistical significance. The significantly greater number of average applications lodged in the Cloon to Castlebar study area is considered to reflect the particular development pressures of the Tuam urban/fringe location.

Furthermore, the review of the planning application history within these study areas during the construction periods contained limited reference to the construction activities or the future transmission infrastructure. The exceptions are the applications in the Cloon to Castlebar study area and the cluster of applications lodged in 2002 on sites through which the OHL line was routed, or in the immediate vicinity of the OHL. The undeterred submission of planning applications in the transmission route corridor (and even directly below the line) after the public announcement of, or permission being granted for, the project, suggests that there are other considerations that routinely override any concerns individuals might have regarding the siting of dwellings proximate to high voltage transmission infrastructure. This is consistent with the findings of the literature review.

10 CONCLUSIONS AND RECOMMENDATIONS

10.1 EVIDENCE BASED STUDY OBSERVATIONS

This study examines and benchmarks, insofar as is possible, practicable and appropriate, and using a generally qualitative methodology, the actual effects of the construction and operation of high-voltage transmission projects on patterns of settlement and land use where indicators are directly manifested in the environment and which have the potential to be observed. This includes new or changing land uses, land use patterns and intensity of use, changes in the built environment or matters which may directly influence such indicators, for example planning policy or planning decisions which have been specifically informed by the existence of overhead line infrastructure (OHL).

The study includes a qualitative examination of case study sites, planning decisions and policy documents. By its very nature, the subject matter does not best lend itself to a quantitative analysis. Relevant observations and difficulties encountered in undertaking the study include:

- In the context of EIA, the "Human Beings" topic can often be presumed by affected landowners, the general public and other stakeholders, to address any and all potential sensitivities experienced by the human population including those which do not physically manifest as an impact on the environment. This study is restricted to analysing the impact of existing transmission infrastructure on patterns of settlement and land use.

- As set out in **Chapter 2** there is a lack of international, European and national authoritative empirical or evidence based studies which examine the actual effect of high-voltage transmission lines on patterns of settlement and land use. Furthermore, guidance documents provide only general advice for transmission projects and identified potential impacts are also of a general nature. Accordingly, the study has primarily relied upon a qualitative, structured and methodological review of Irish case studies, and based upon collection and interpretation of primary data.

- Interrelationships between the transmission network and patterns of settlement and land use are often difficult to identify at a macro level, particularly where, in the first instance, effective route/site selection has avoided or minimised the potential for significant impact. Case study assessment is a critical element of this overall evidence based study process. However, due to other local site specific influences, sites are not directly comparable (notwithstanding screening measures). As a consequence, this study provides examples of patterns of settlement and land use in and around existing transmission infrastructure and examines qualitative information to draw conclusions.

- The study focuses on the qualitative examination of case study sites, planning decisions and policy documents to determine the influence of existing high-voltage transmission projects on patterns of settlement and land use. It does not investigate the human motivations behind if, why and how

people interact with their environment and the influence which existing transmission infrastructure may have in this process.

In summary, the study found:

- **No evidence of any significant impact arising from the presence of transmission infrastructure on patterns of settlement and land use.** The study sites incorporate areas that have experienced significant demographic growth, including areas into which the urban footprint had recently expanded. In these high growth areas, residential density levels were not found to significantly reduce with proximity to the transmission infrastructure and the presence (or proposed future provision) of transmission infrastructure did not present a barrier to the 'in principle' development of new high density residential schemes (as determined by the planning application review undertaken in the urban area case study sites). This finding is underlined by the relatively high level of coexistence between human settlement and transmission infrastructure found in urban areas (as set out in **Chapter 5**).

  In the case of planning applications for single dwellings (i.e., rural settlement patterns), there was an absence of evidence of impact deriving from existing transmission infrastructure except in cases where the proposed development encroached upon separation distances from the transmission infrastructure stated as being either directly required by the ESB on safety grounds, or comprising an objective of the relevant development plan, (usually incorporating ESB requirements therein). In such cases, the specific design and siting of the proposed development was altered in order to maintain an appropriate separation distance. This lack of impact is considered to be most likely due to the predominantly dispersed nature of settlement in such areas (and restricted rural housing policy limiting the location of such development), combined with the established status of the OHL infrastructure in the case study sites.

  The evidence suggests that any impact on settlement pattern from the presence of transmission infrastructure is restricted to the micro-spatial scale i.e., the way in which the physical components of development are laid out relative to the transmission infrastructure. This includes siting (or re-siting) of structures to avoid, or otherwise facilitate existing or new development and/or adhering to clearance distances. This evidence is also consistent with the findings of the literature review.

- **No evidence of any significant impact arising from the presence of the transmission infrastructure on agricultural land use.** While this use was not strongly represented in the planning application records for related development, it is evident that there is a high level of coexistence with circa 80% of existing OHL infrastructure and 50% of existing substations being sited on agricultural land in Ireland.

- **No evidence of any significant impact arising from the presence of the transmission infrastructure on commercial land use.** Indeed, both in terms of the coexistence of associated buildings and the relative stability in the density of commercial use with increasing proximity to transmission infrastructure, there was found to be a low potential for any impact upon commercial land uses. This is substantially reflected in the planning application records reviewed, with only one instance of a proposed development being altered by the decision of the planning authority in order to maintain separation between buildings and the transmission infrastructure. Again, the evidence suggests that any impact from the presence of transmission infrastructure is restricted to the micro-spatial siting and design level.

- **No evidence of any significant impact arising from the presence of the transmission infrastructure on the pattern of community, social and tourism land uses with levels of coexistence revealed from the site surveys.** The predominant community and social land uses surveyed were recreational and educational uses. Both the planning application records and the site survey showed that the presence, or proposed future presence of transmission infrastructure presented no barrier to intensification of use. Similar findings were evident for tourism related land uses and with reference to tourist resource areas.

- **No evidence of any significant impact arising from the construction of the transmission infrastructure affecting patterns of settlement and land use.** The average annual number of planning applications made on land adjacent to the construction sites remained approximately in line with countywide trends in the periods prior to and after the public announcement. Furthermore, the review of the planning application history within these study areas during the construction periods contained limited reference to the construction activities or the future transmission infrastructure. The exceptions are applications in the Cloon to Castlebar study area which is considered likely to be on account of development pressure given its relative proximitiy to Tuam. The undeterred submission of planning applications in the transmission route corridor (including directly below the line), after the public announcement and construction of the project suggests that there are other considerations that routinely override any concerns individuals might have regarding high voltage transmission infrastructure. This is consistent with the findings of the literature review.

- **An expanding planning policy response in respect of high-voltage transmission infrastructure is evident over the period studied (i.e., mid 1990's to present).** Reference to high voltage transmission infrastructure in the initial period was limited to development plans for areas with significant overhead line infrastructure, particularly where such areas were experiencing significant development pressure. By the end of the overall period, each of the planning authorities had adopted at least some policy addressing the implications of the existence and future provision of high voltage transmission infrastructure including policy objectives to maintain defined clearance distances, place existing overhead transmission lines underground, or provide for future

transmission projects. In instances where planning policy provides for the strategic expansion of the urban area, the corridors of existing overhead transmission lines are incorporated as structure landscapes or 'green corridors' in LAPs and strategic planning documents such as SDZs.

In summary, the study found no evidence to suggest that transmission infrastructure is anything more than a potential physical constraint on development at a site specific or micro-spatial level, either by vertical restriction on buildings beneath transmission lines, or a lateral restriction to ensure access and safety either side of the transmission line or substation.

In addition, the planning history of development adjacent to transmission infrastructure reviewed in this study suggests that far from being deterred by the presence of transmission infrastructure, patterns of settlement and land use has incorporated existing infrastructure into development schemes. Where feasible, UGCs are sought or site development density is increased to compensate for the unavailability of land within the transmission corridor.

10.2 RECOMMENDATIONS

10.2.1 Planning Transmission Infrastructure Projects

The results of this study have established no evidence of any significant impact arising from the construction or existence of transmission infrastructure in terms of patterns of settlement and land use. That is not to say that there is no impact, but that it does not affect the overall pattern of settlement or land use. Where there is an impact it is primarily restricted to the micro-spatial scale i.e., the design and layout of individual developments or buildings, rather than affecting the coexistence of transmission infrastructure with different land uses, and settlement typles.

It is also evident that a key reason for the lack of significant impact is a robust route/site identification and evaluation process for the siting of transmission infrastructure which, in the first instance, seeks to avoid or minimise impacts on settlements and sensitive land uses. This is supported where relevant by the practice of undergrounding transmission infrastructure (for example in urban areas), or by robust planning policy particularly in relation to the siting and design issues (both of which are particularly evident in respect of urban areas).

Effective transmission infrastructure route and site planning therefore remains a key measure to minimise the effect of high-voltage transmission infrastructure on patterns of settlement and land use, including residential, commercial, agricultural and amenity uses. It is important that this is appropriately prioritised during the planning and development phases of all transmission projects, in order to best inform the decision-making process.

10.2.2 Environmental Impact Statements (EISs)

The intention behind the series of evidence based studies, of which this study is part, is to inform the subsequent preparation of Evidence-based Environmental Guidelines and/or good practice to inform future transmission developments, so that the most likely significant potential impacts are targeted at the EIA scoping stage.

In light of the fact that the results of this study have established no evidence of any significant impact arising from the construction or existence of transmission infrastructure on patterns of settlement and land use, and that any impact is primarily restricted to the micro-spatial scale (i.e. the design and layout of individual developments or buildings), it is considered unnecessary to prepare further environmental guidelines in respect of "Human Beings". Rather, it is considered that the focus should be on informing how the route/site selection process and best practice routing/siting techniques seek to avoid, or minimise potential impacts on settlement pattern and land use, in the first instance.

The importance of explaining best practice routing/siting techniques as part of transmission development process is clearly captured in existing initiatives by EirGrid, in particular its SEA and its 'Approach to the Development of Electricity Network' (and specifically the Project Development and Consultation Roadmap outlined therein). This approach should continue to be captured, and enhanced if appropriate, in any subsequent processes and frameworks for grid development.

In terms of addressing patterns of settlement and land use in future feasibility reports and EISs (or environmental and planning reports which accompany future planning applications), it is considered that particular emphasis should be placed on the following:

- The 'Alternatives' and 'Description of Proposed Development' sections should clearly demonstrate *inter alia* how the proposed route/site:
    - Avoids centres of population;
    - Avoids existing residential areas;
    - Avoids and/or does not significantly impact upon areas of established (or potential if appropriate) tourism amenity;
    - Seeks to achieve the maximum separation distance from existing dwellings while also seeking to avoid, or minimise impact, upon other identified technical and environmental constraints (note that this is not associated with the clearing distance requirements of the ESB); and
    - Where relevant, follows a route through, or is sited in agricultural and commercial / industrial land use areas which have shown to have a high tolerance for coexisting with high-voltage transmission infrastructure, and particularly in preference to a more sensitive residential or amenity land use.

- The opening section of the *Human Beings* section of an EIS/environmental report should detail how the route/site selection process and best practice routing/siting techniques have sought to avoid, or minimise the likely potential significant impacts on the population in the area, in the first instance.

- The particular settlement and land uses characteristics of the study area and potential impacts of any proposed transmission infrastructure development thereon should be described. Depending on the particular characteristics of the location this should address the following:

  - **Population:** This should identify all relevant sensitive receptors and the degree to which the most significant (in terms of scale and sensitivity) have been avoided by the route/site selection process. It should go on to describe the remaining population, type and location of persons or communities that will be affected.

  - **Land use:** This should detail the residual impact on land use of the route / site. It is useful to set out the degree to which particular land uses have a higher tolerance for coexisting with high-voltage transmission infrastructure (e.g. agriculture and commercial / industry). Furthermore:

    - In the case of OHL infrastructure in rural / agricultural areas the likely potential impacts should focus on those directly related to the area of the transmission infrastructure and towers, including the permanent land take. In urban and urban / rural fringe locations, reference should also be made to the area under the OHL as it may influence the future use of this land, having regard to the clearance distances required by ESB and general amenity considerations.

    - In the case of substations, given their larger footprint and tendency to be located in or near urban areas, the likely potential impacts may require more detailed consideration of land take, relationship with adjoining uses etc. Mitigation should refer to site specific site layout and design measures.

  - **Zoned land:** Where relevant it should consider the potential implications for existing or future zoned land. Mitigation should refer to the need for application of current best practice guidelines for site layout and design considerations for further development adjoining high-voltage transmission infrastructure.

- **Amenity related uses (community, social and recreation and tourism):** These uses tend to be fragmented in nature, spatially diverse and consist of a range of different components (including sports, leisure, entertainment and hospitality facilities); these are often based on a particular quality or feature of the receiving environment, such as a waterbody, landscape or settlement. These will have to be identified on a project by project basis and the degree to which the most significant (e.g. visitor numbers, national or regional designations. etc)) have been avoided by the route/site selection process should be clearly set out.

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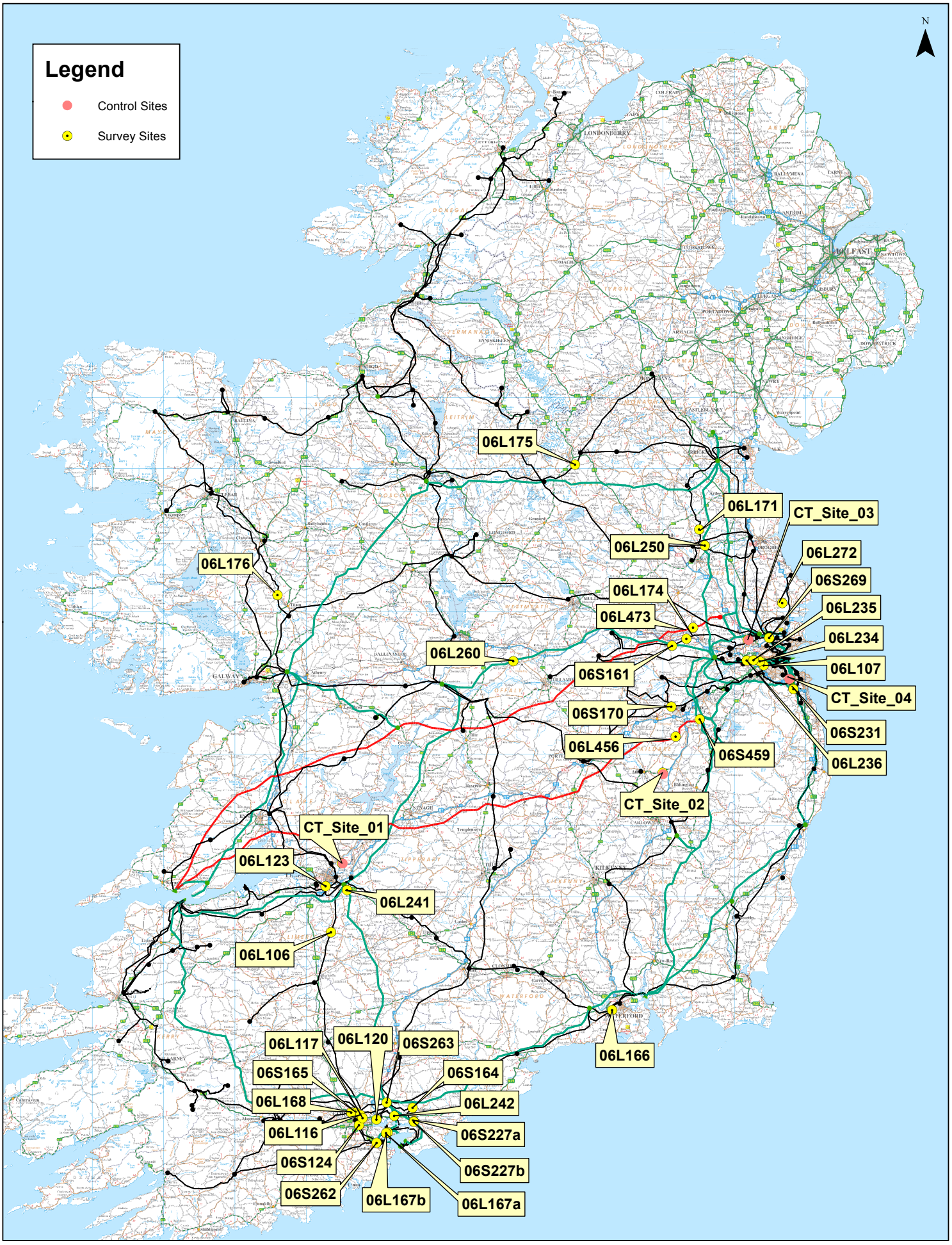
ABBREVIATIONS AND GLOSSARY

ABP	An Bord Pleanála – the Irish Planning Appeals Board
Agricultural	Land use for growing crops, keeping/training/breeding/grazing stock (Planning & Development Act, 2000a).
Amenity	Land use for community, social, recreational and tourism uses/facilities (Planning & Development Act, 2000b).
CDP	County Development Plan
Commercial	Land use on which employment is the main activity.
CORINE	Coordination of Information on the Environment Dataset created from satellite imagery that represents different cover/land use classifications throughout Europe.
CSO	Central Statistics Office
DAHG	Department of Arts Heritage and Gaeltacht
Development Density	Another measure of settlement intensity which is calculated by dividing total dwellings or buildings by number of hectares.
ED	Electoral District
EIA	Environmental Impact Assessment EIA is the process by which the anticipated effects on the environment of a proposed development or project are measured as required under Directive (85/337/EEC) as amended.
EirGrid	The statutory electricity Transmission System Operator (TSO)
EIS	Environmental Impact Statement. This is the output from the EIA process.
EMF	Electro-Magnetic Field
ER	Environmental Report
ESB	The Electricity Supply Board; statutory electricity Distribution System Operator (DSO) in Ireland
ESB International	Technical and environmental consultants for ESB Networks
EU	European Union
Geo-directory Data	Dataset which provides spatial and attribute information of the location of all buildings in the Republic of Ireland
GIS	Geographic Information System A geographic information system captures, stores, analyses, manages, and presents data that is linked to location.
Grid	A meshed network of high-voltage lines and cables (400 kV, 220 kV and 110 kV) for the transmission of bulk electricity supplies around Ireland.
Human Settlement	Comprises (a) physical components of shelter and infrastructure; and (b) services to which the physical elements provide support i.e. community services such as education, health, culture, welfare, recreation and nutrition. It is the places where people live, at any scale from a hamlet to a city.
IP	Implementation Programme
kV	Kilovolt (One thousand volts) – a unit of electric potential

Land Cover	A description of the surface of a landmass.
Land Use	Characterised by the arrangements, activities and inputs people undertake in a certain land cover type to produce, change or maintain it (UNEP, 1999). It is the functional dimension of land for different human purposes or economic activities. Typical categories are residential, industrial, transport, recreational and nature conservation areas (OECD, 2007).
LAP	Local Area Plan
Natura 2000	Natura 2000 sites are part of a coherent European ecological network of Special Areas of Conservation (SAC) designated under Article 3 of the Habitats Directive (92/43/EEC) and include SACs and Special Protection Areas (SPAs).
NGR	National Grid Reference
NIS	Natura Impact Statement The output from the Appropriate Assessment process, required under the EU Habitats Directive 92/43/EEC
OECD	Organisation for Economic Co-operation and Development
OHL	Overhead Line
Population Density	A measure of settlement intensity which is calculated by dividing total persons by number of hectares.
Residential	Land use for dwellings
Rural Area	An Aggregate Rural Area as defined by the CSO which refers to the population outside Aggregate Town Areas and includes the population of towns with a population of less than 1,500 people. A rural area can still include a human settlement. The OECD defines a rural area based on population density i.e. below 150 inhabitants per square kilometer. In CORINE, it is an area typically characterized by rural land cover types (agriculture, forest and natural areas).
SDZ	Strategic Development Zone
SEA	Strategic Environmental Assessment
Settlement Pattern	This is the distinctive way in which human settlements are distributed in an area. Typical terms used to describe settlement patters include dispersed, concentrated, nucleated, linear and scattered. At a more localized level it can also refer to the distinctive way in which the physical components of human settlements are laid out in a particular place.
UGC	Underground cables
UNEP	United Nations Environment Programme
Urban Area	An Aggregate Town Area as defined by the CSO refers to towns (including environs of legal towns) with a total population of 1,500. In CORINE it is typically characterized by artificial surfaces (urban, fabric, industrial, commercial and transport units).
Urban/Rural Fringe Area	A transitional area where there are abrupt changes in density between the urban areas, its envelope and areas of scattered dwellings. These areas often exhibit evidence of significant development pressure. Certain types of land use, in addition to residential, are characteristic of this zone; these are often extensive in nature and include industrial areas, garden centres, country parks, equestrian centres, golf-courses, sewage works and airports, and are neither wholly urban nor wholly rural uses.

APPENDIX A

OVERALL STUDY SITES MAP



Title

Human Beings Survey Sites

Legend

- 110kV Station
- 220kV Station
- 400kV Station
- 110kV Network
- 220kV Network
- 400kV Network

Project: EirGrid - Evidence Based Guideline Studies

Client: EIRGRID

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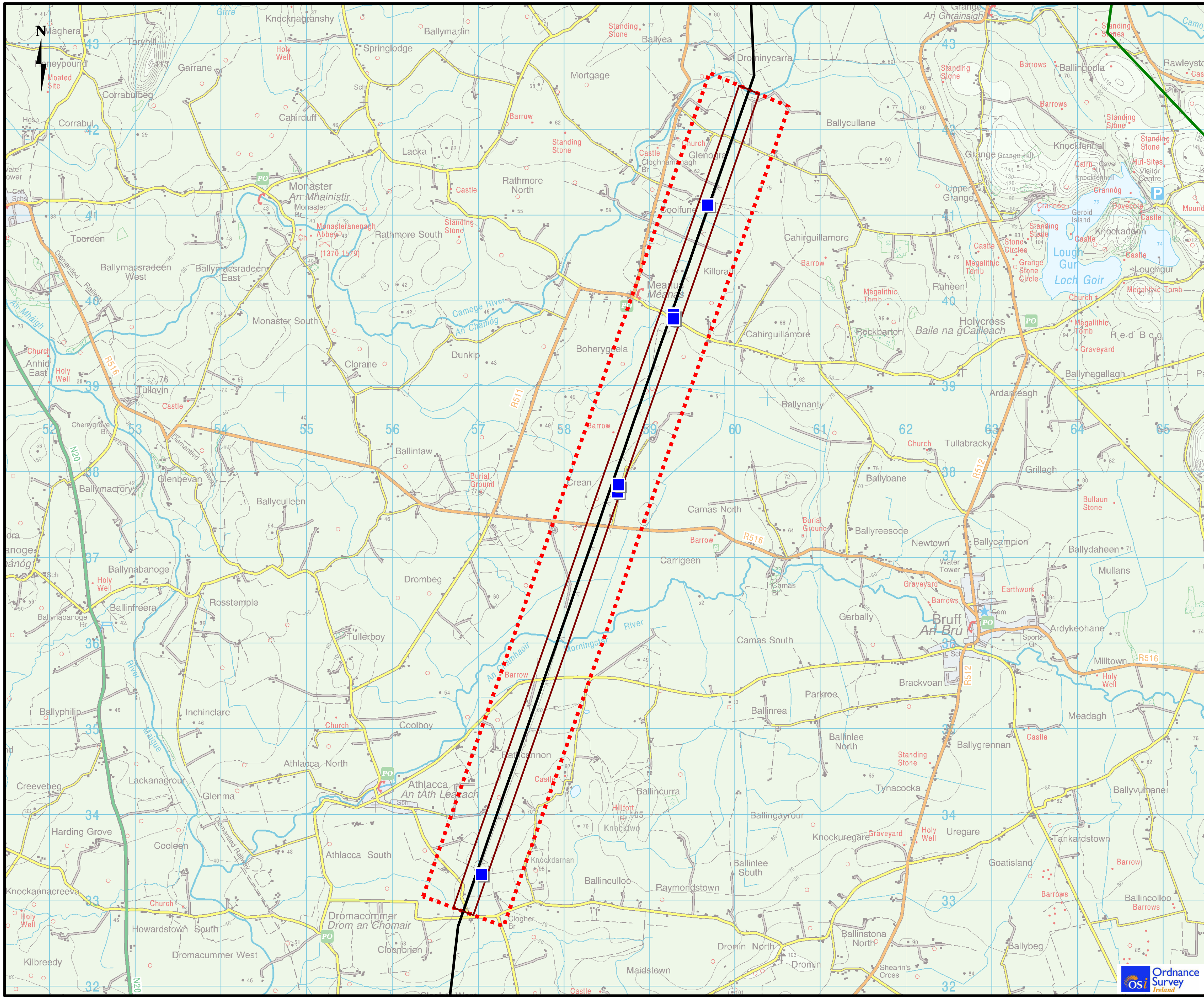
APPENDIX B

INDIVIDUAL STUDY SITES

APPENDIX B(i)

RURAL STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

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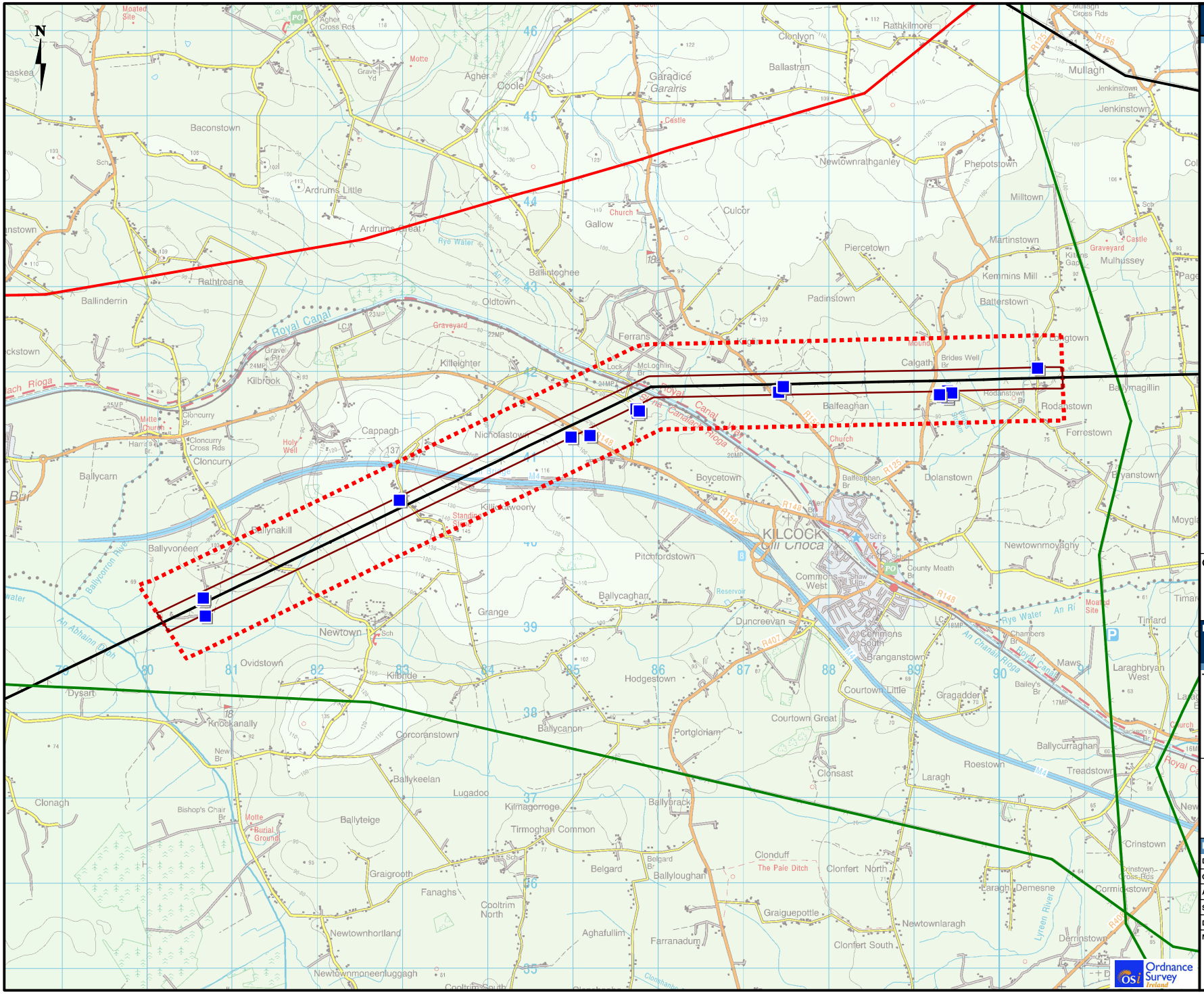

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- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
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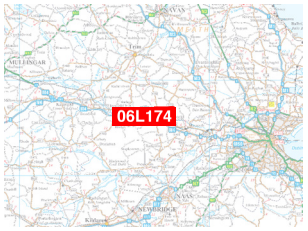

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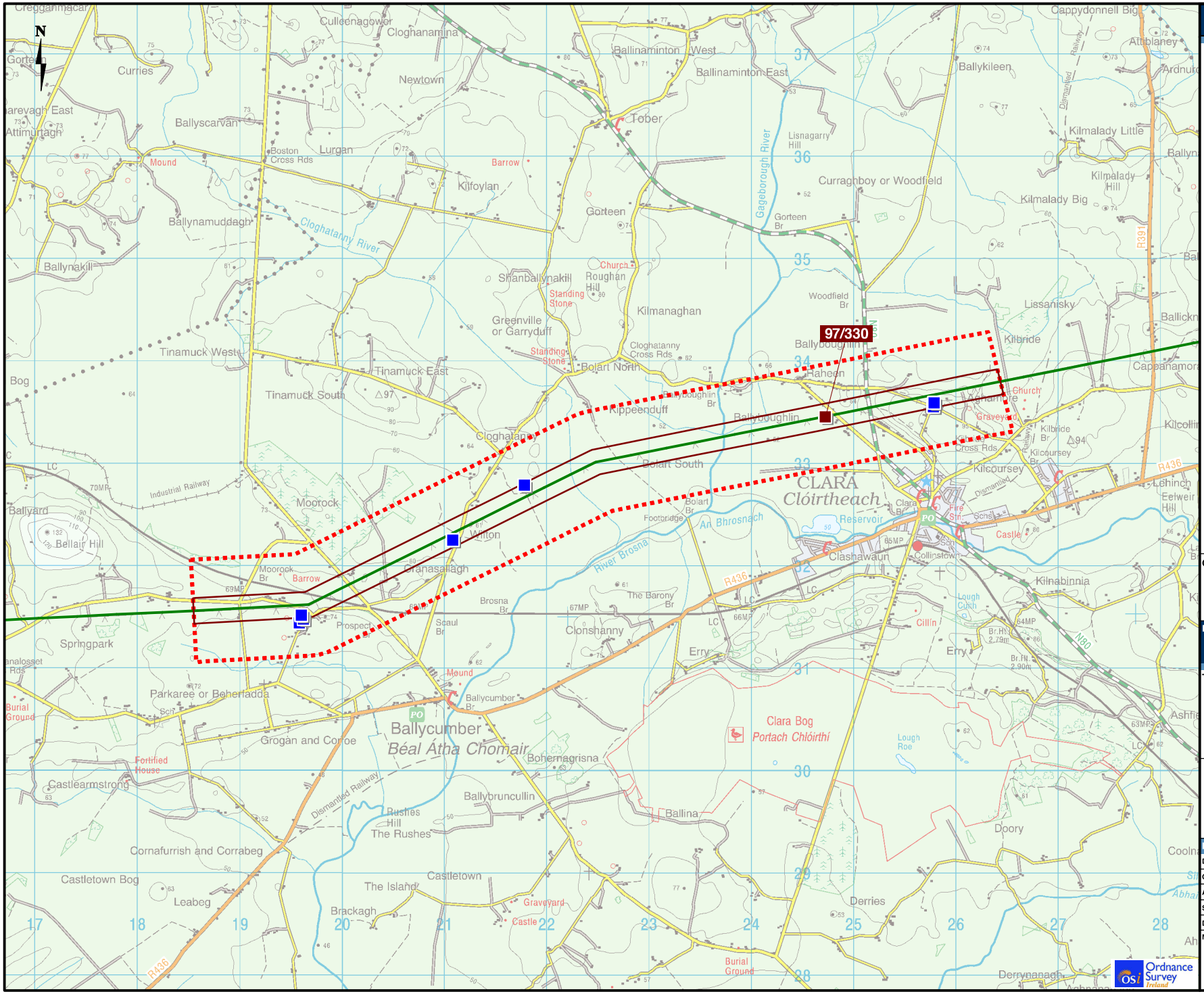

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

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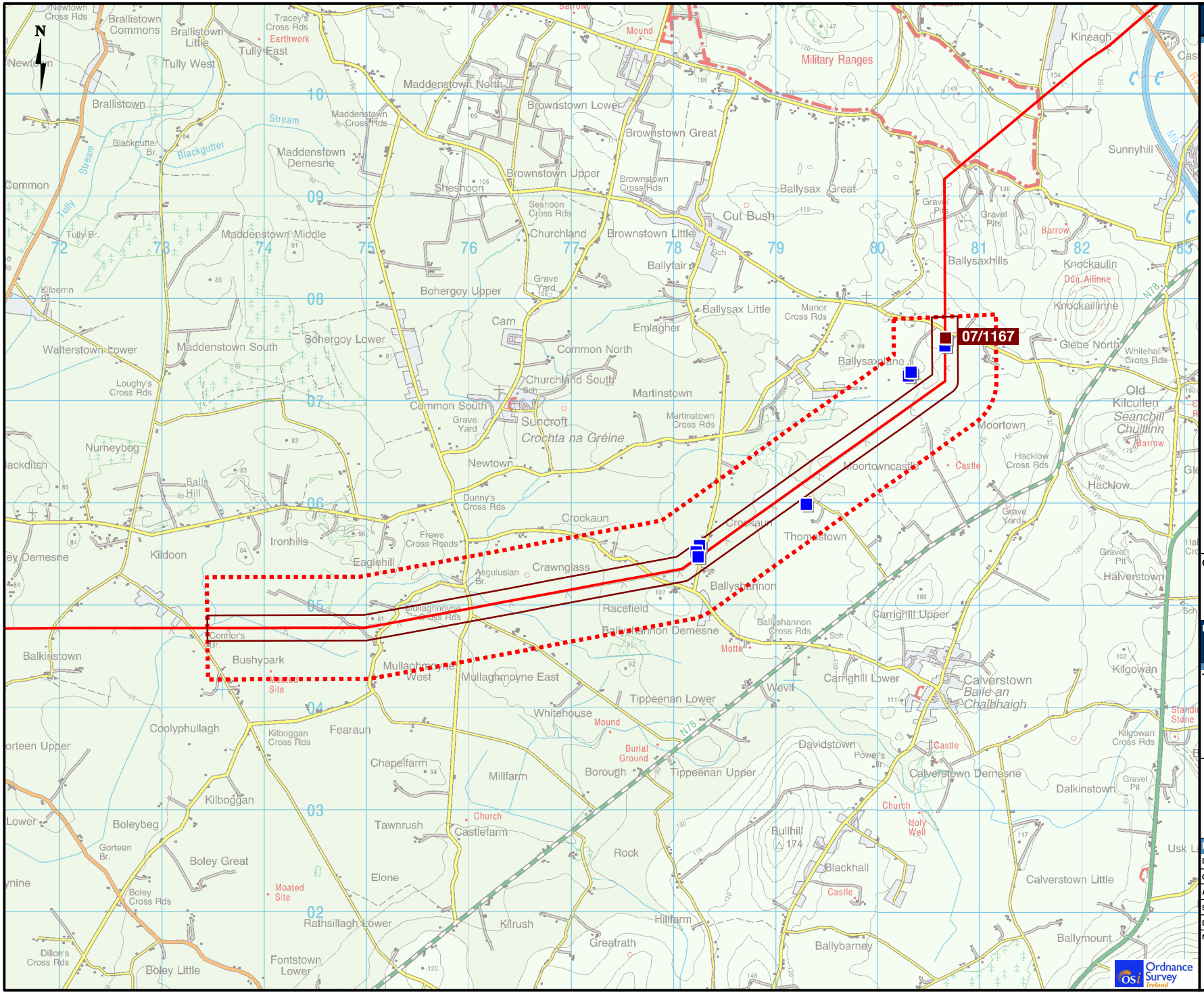

Legend

- Density Study Boundary
- Planning Application Boundary
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- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
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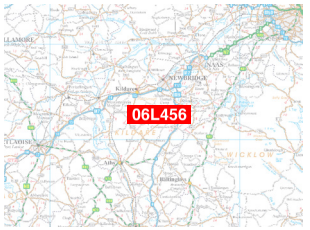

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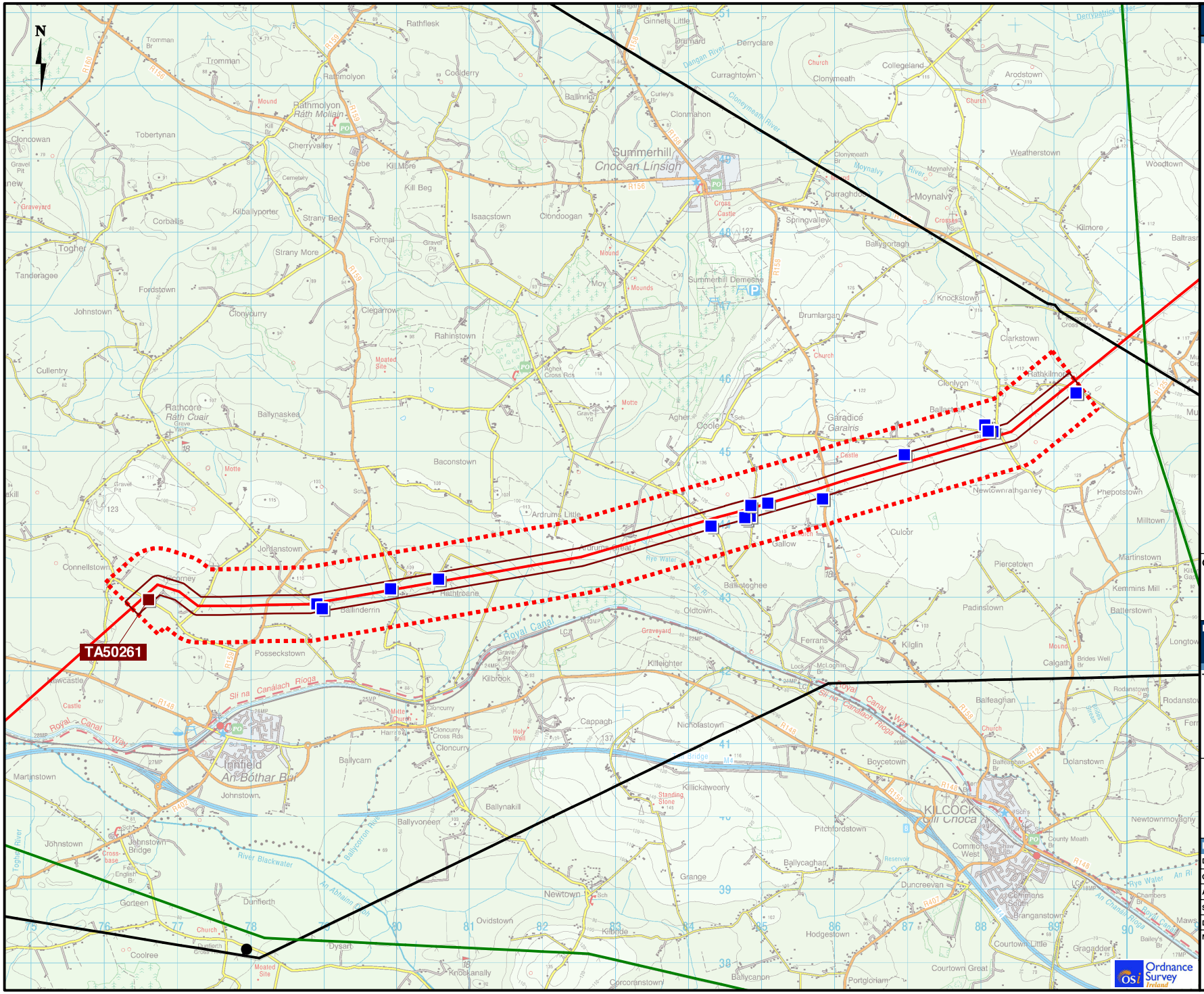

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

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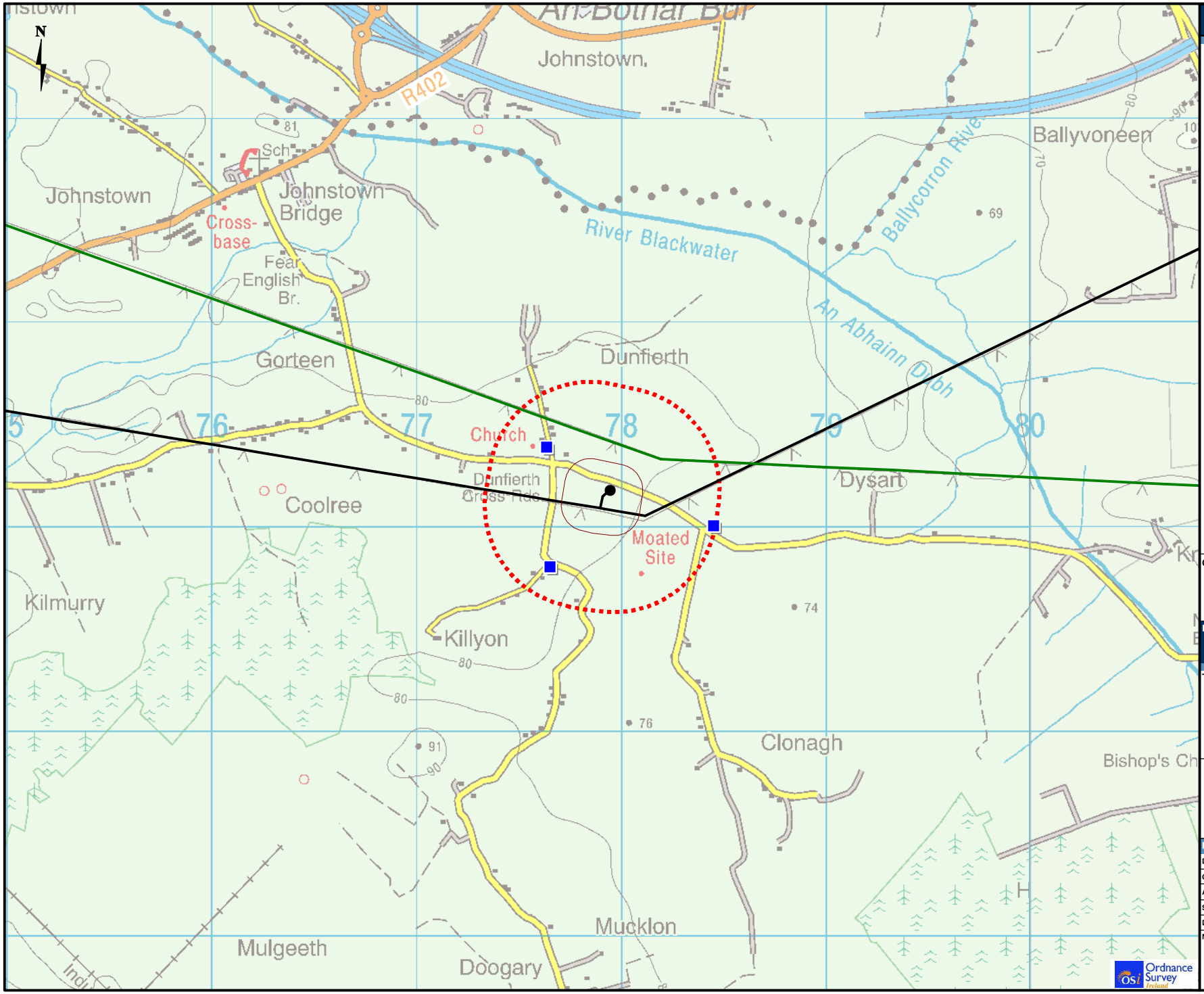
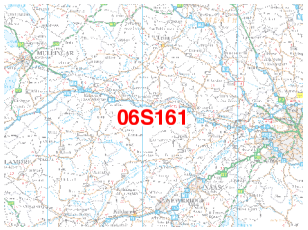


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Dunfirth Substation (110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020MI0052D02
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	MI052	D02

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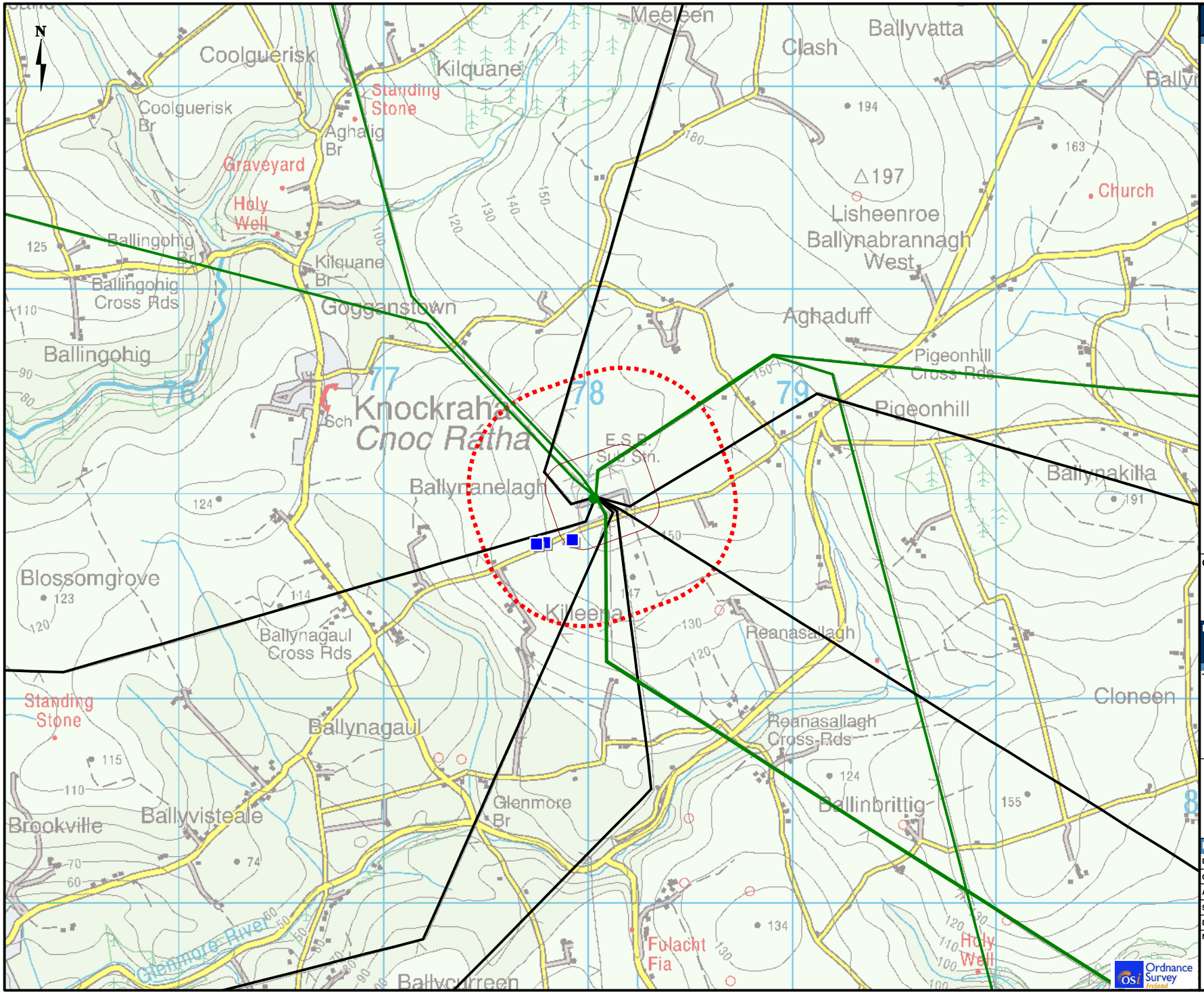

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Knockraha Substation (220kV)**

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0059D02
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi059	D02

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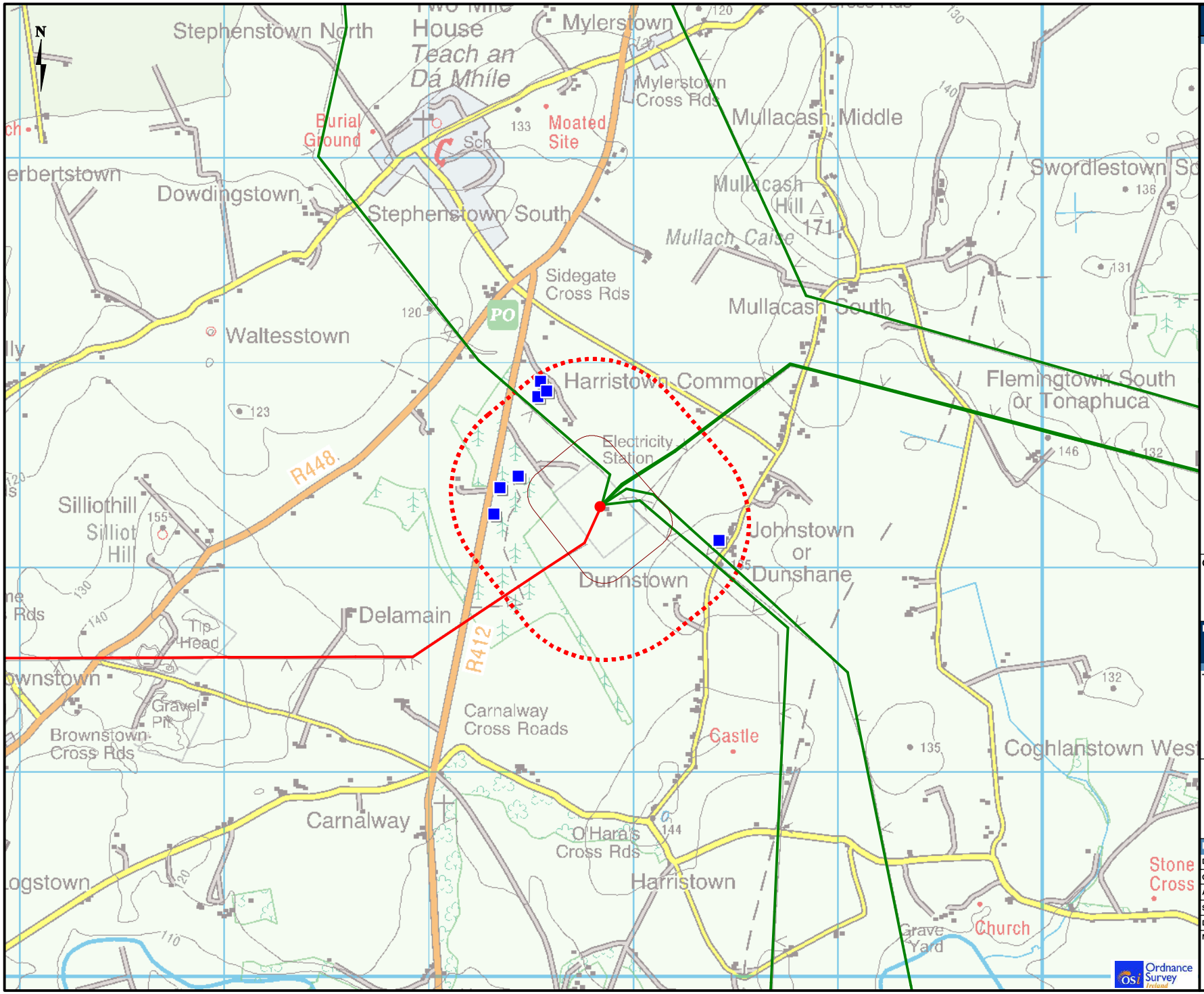
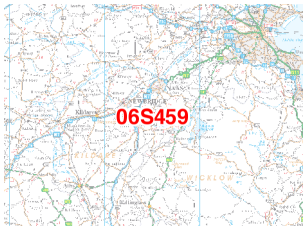


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Dunstown Substation (400kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0061D02
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi0061	D02

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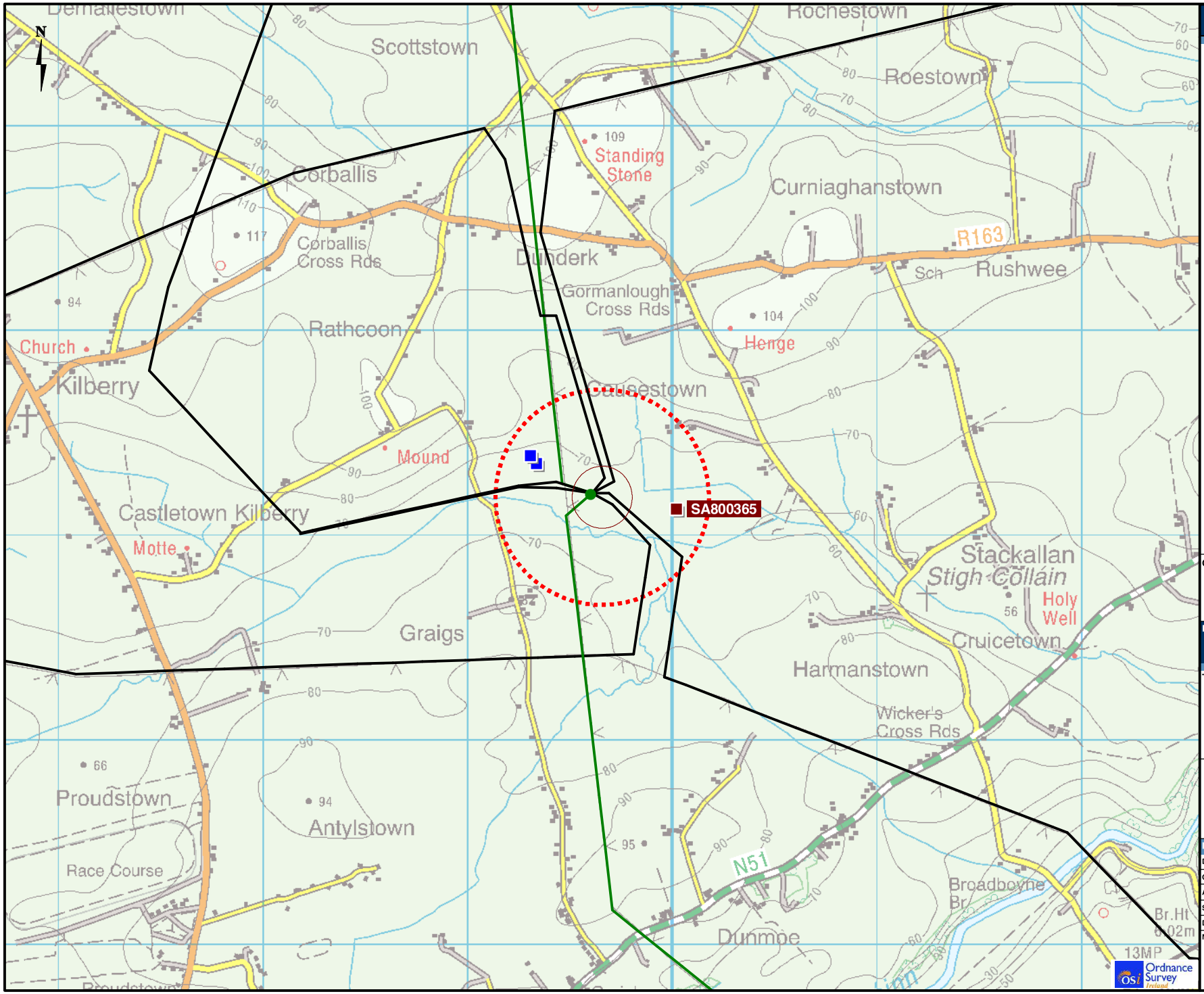
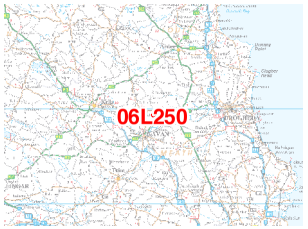


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EirGrid

Project: EirGrid - Evidence Based Guideline Studies

Title: **Gorman Substation (220kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0046D02
Approved by:	xxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi046	D02

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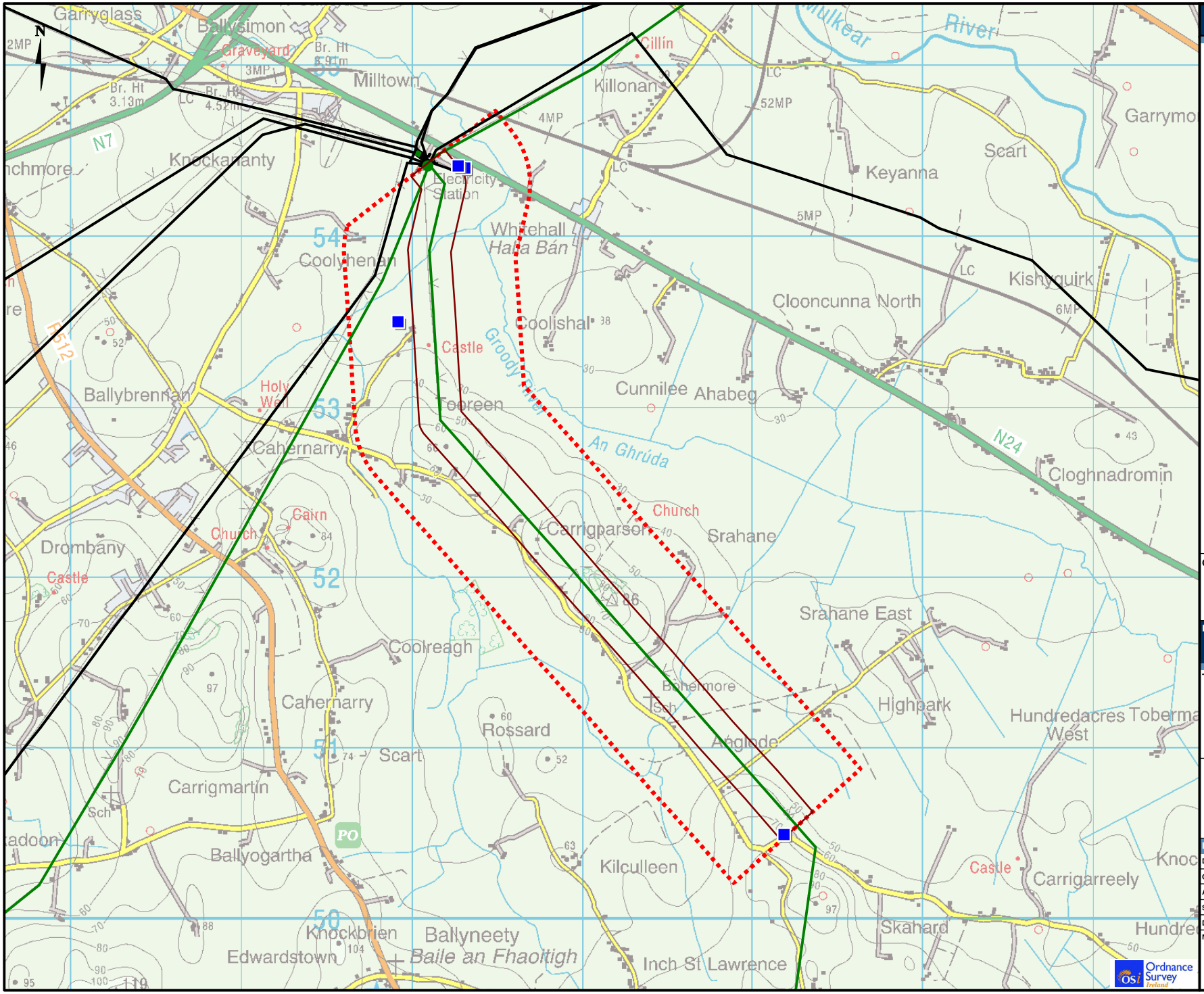
APPENDIX B(ii)

RURAL / URBAN FRINGE STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Ballysimon, Co. Limerick (Killonan-Knockraha 220kV)**

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Issue Details			
Drawn by: S. Khan		Project No. MDE1020	
Checked by: P. Hickey		File Ref. MDE1020MI0044D01	
Approved by: xxxx			
Scale: 1:30,000 (A4)		Drawing No. MI0044	Rev. D01
Date: 06/09/2012			

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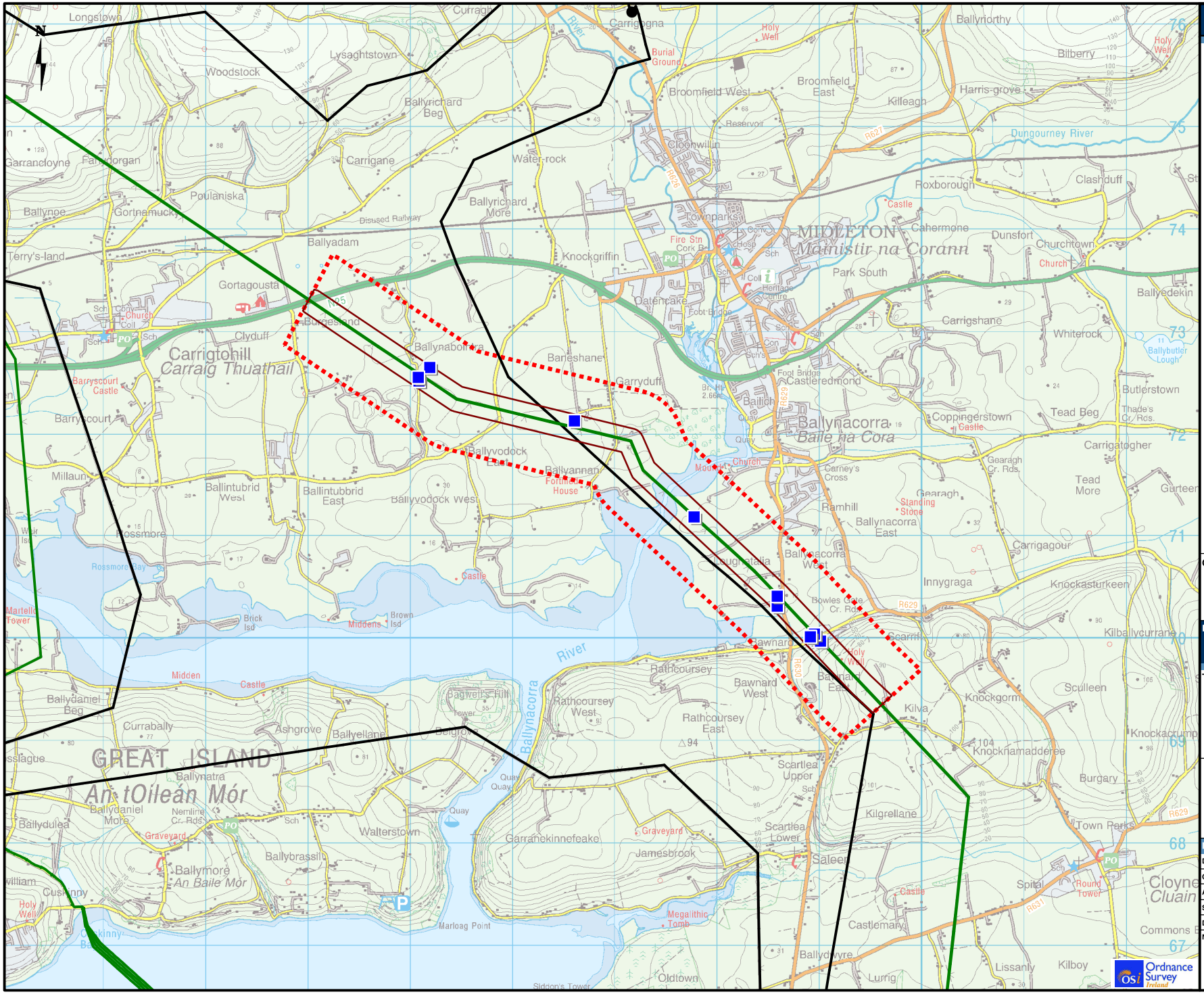

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Cloyne, Co. Cork (Aghada-Knockraha 220kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0056D01
Approved by:	xxxx		
Scale:	1:50,000 (A4)	Drawing No.	Mi0056
Date:	06/09/2012	Rev.	D01

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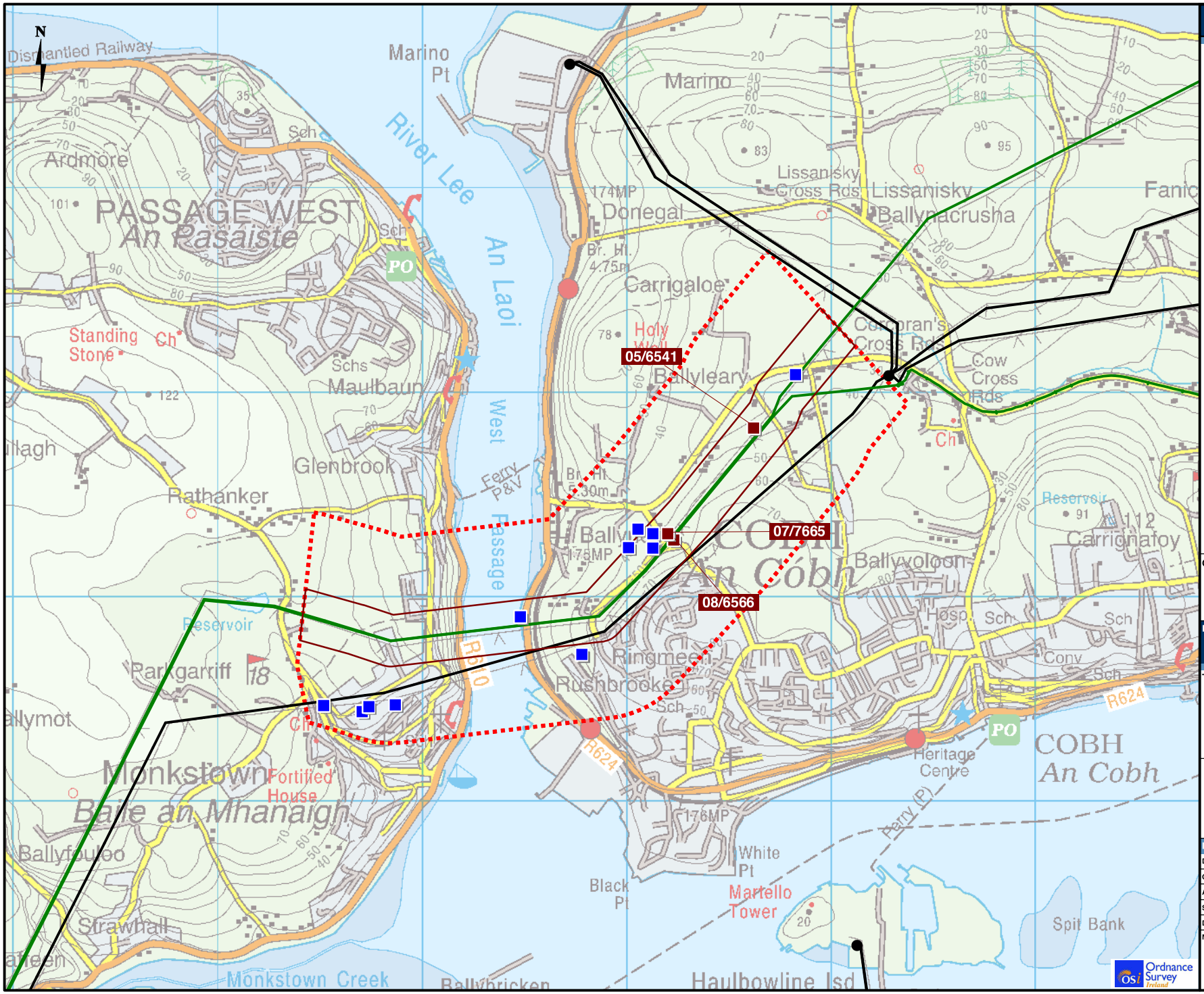

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EirGrid

Project: EirGrid - Evidence Based Guideline Studies

Title: **Monkstown/Cobh, Co. Cork (Cow Cross-Rafeen 220kV)**

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0066D01
Approved by:	xxxx		
Scale:	1:60,000 (A4)	Drawing No.	Mi0066
Date:	11/09/2012	Rev.	D01

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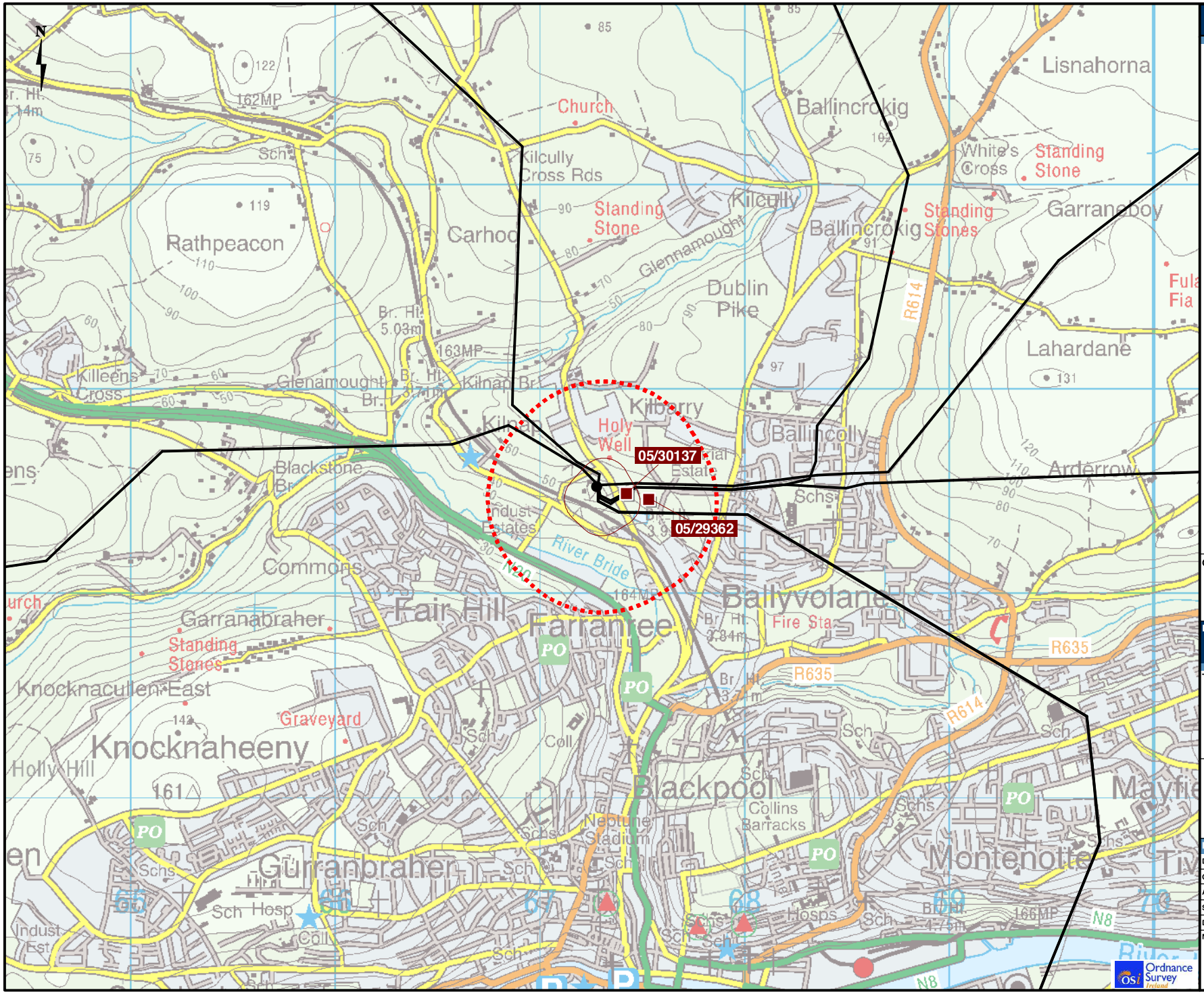

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Kilbarry Substation (110kV)

RPS

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0054D02
Approved by:	xxx		
Scale:	1:25,000 (A4)	Drawing No.	Mi054
Date:	01/11/2012	Rev.	D02

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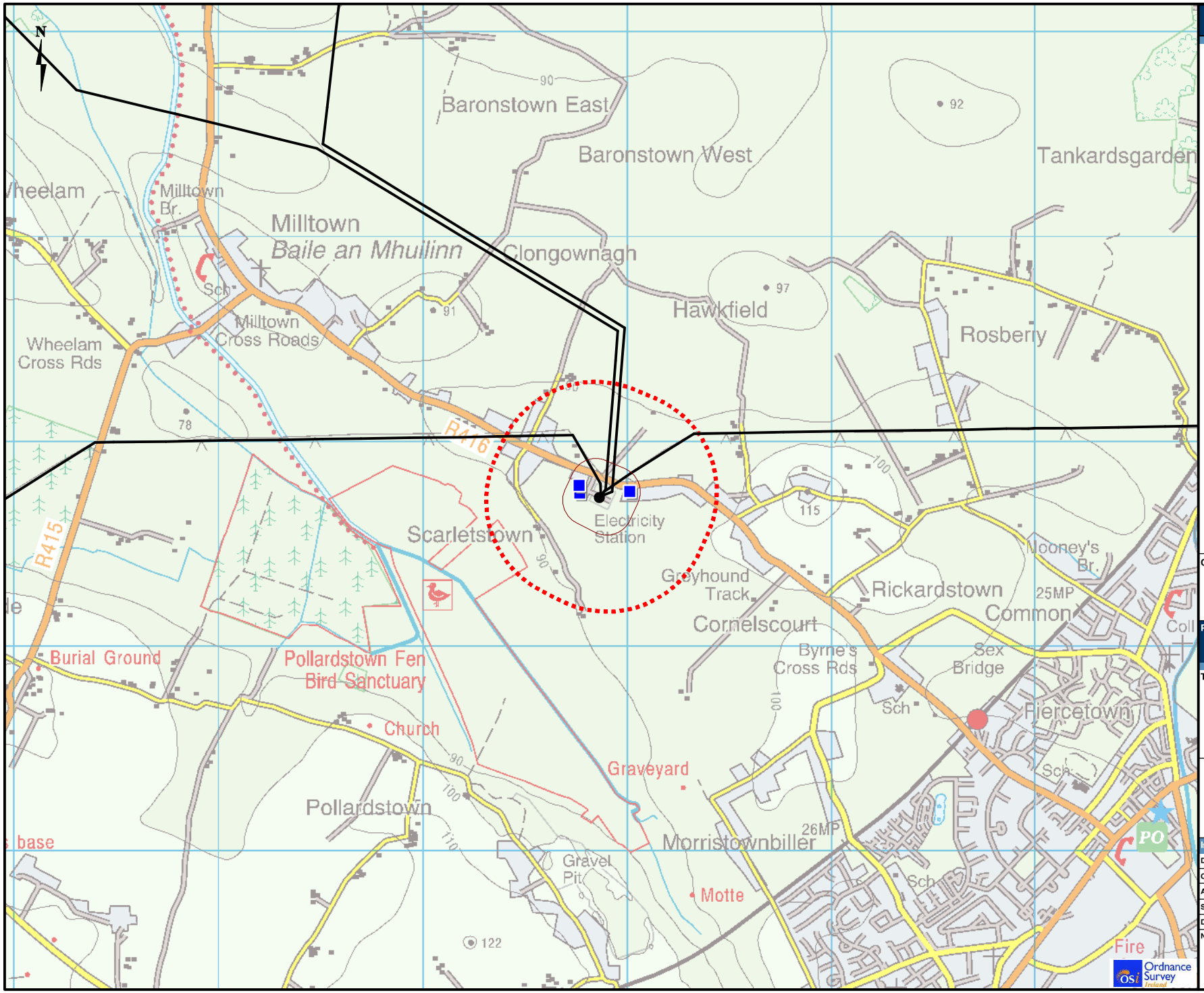
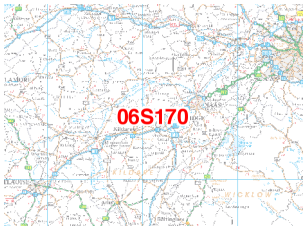


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Newbridge Substation (110kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0055D02
Approved by:	xxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi055	D02

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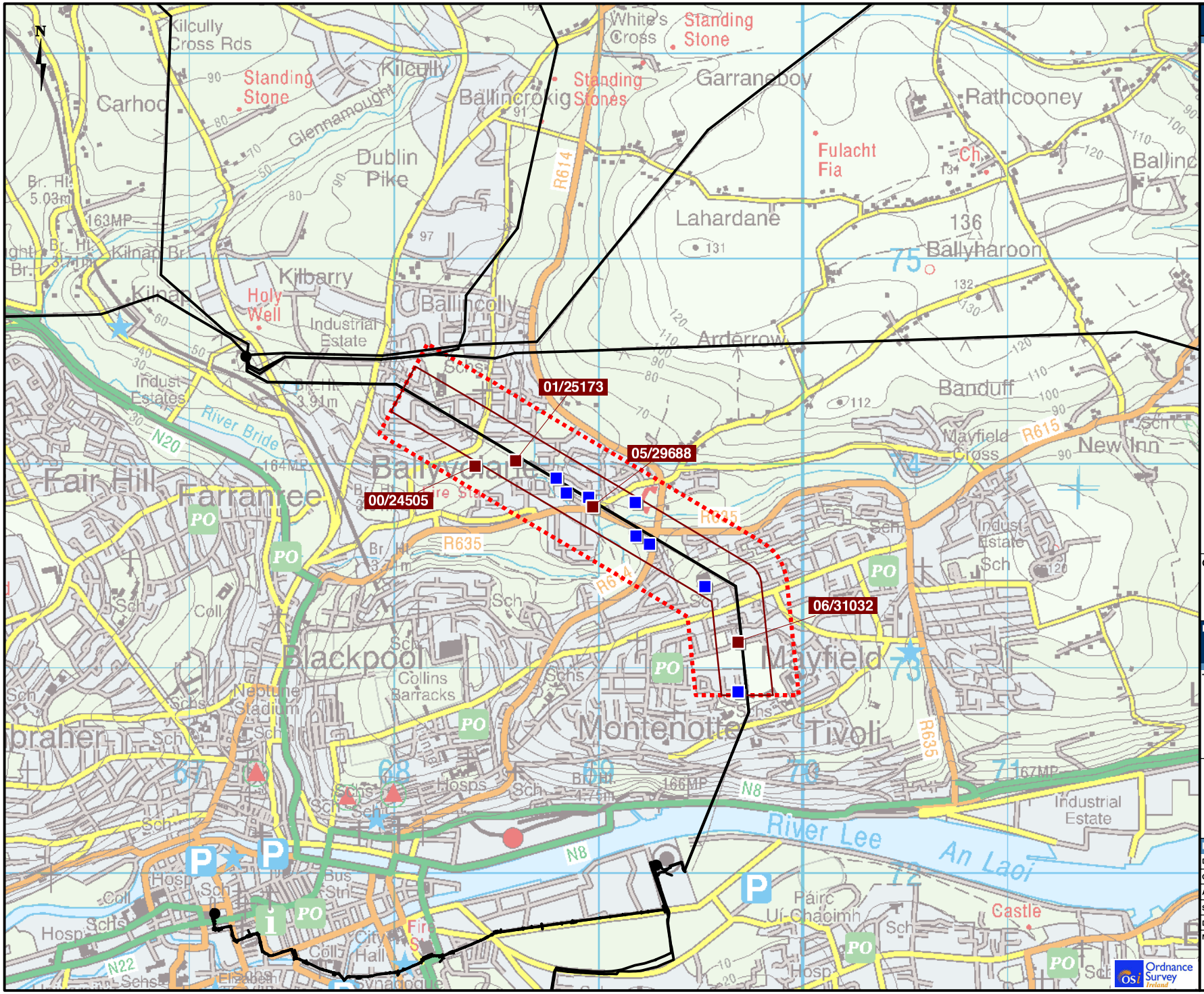
APPENDIX B(iii)

URBAN STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Ballyvolane/Mayfield, Cork (Kilbarry-Mayfield 110kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0031D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Mi0031
Date:	06/09/2012	Rev.	D01

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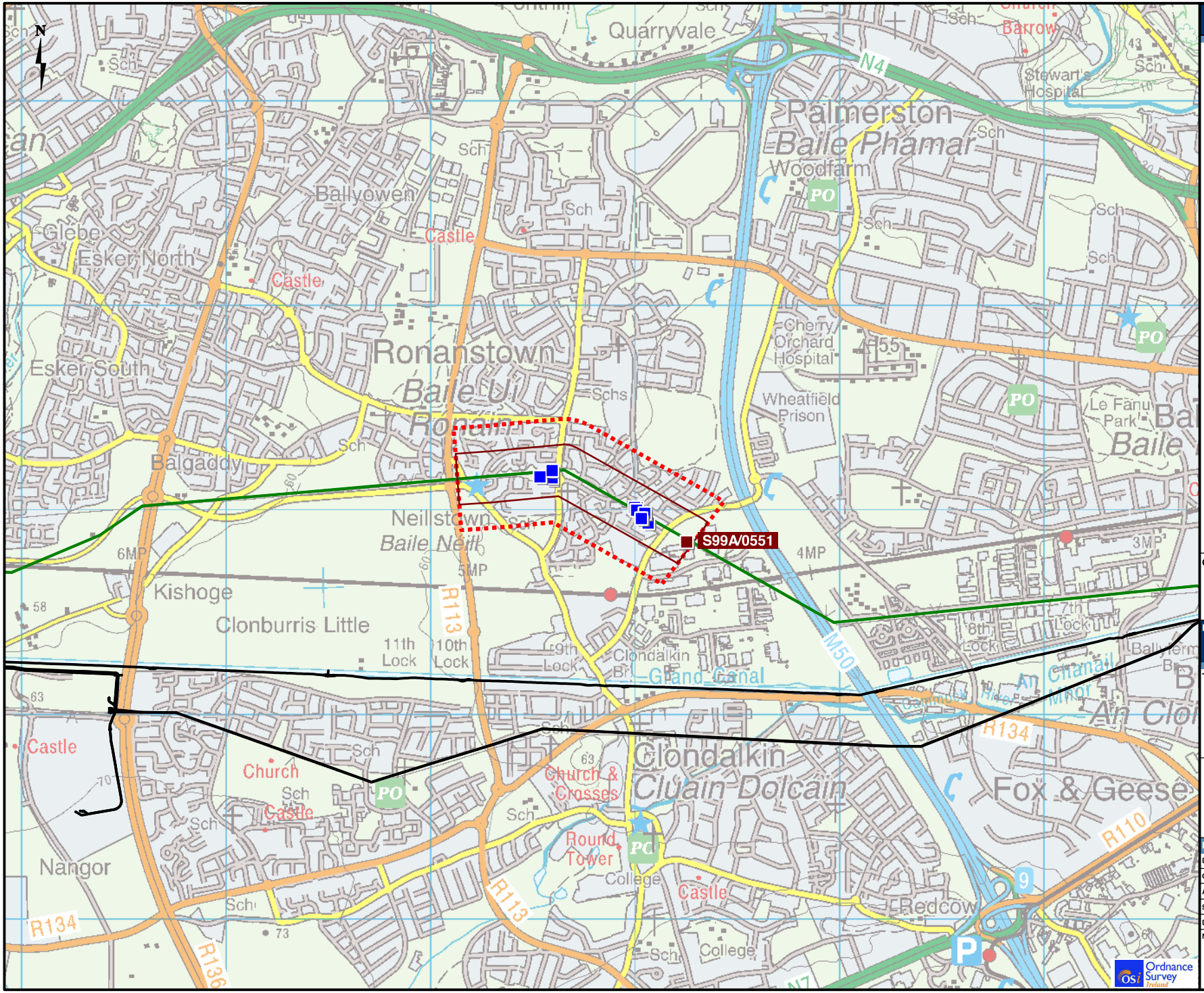

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Neilstown, Dublin (Inchicore-Maynooth 220kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0042D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0042	D01

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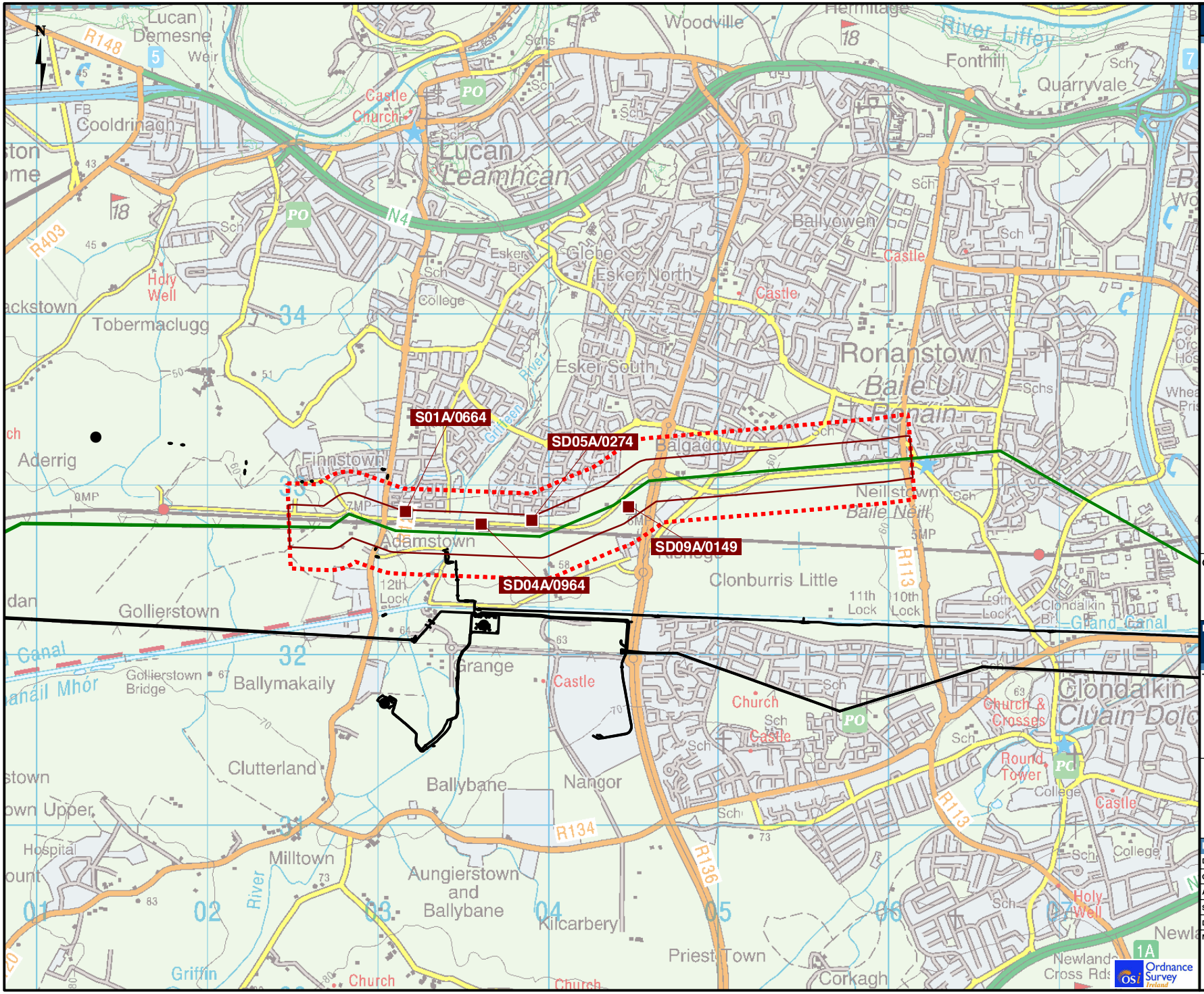

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Clonburris, Co. Dublin (Inchicore-Maynooth 220kV)

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0043D01
Approved by:	xxxx		
Scale:	1:30,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0043	D01

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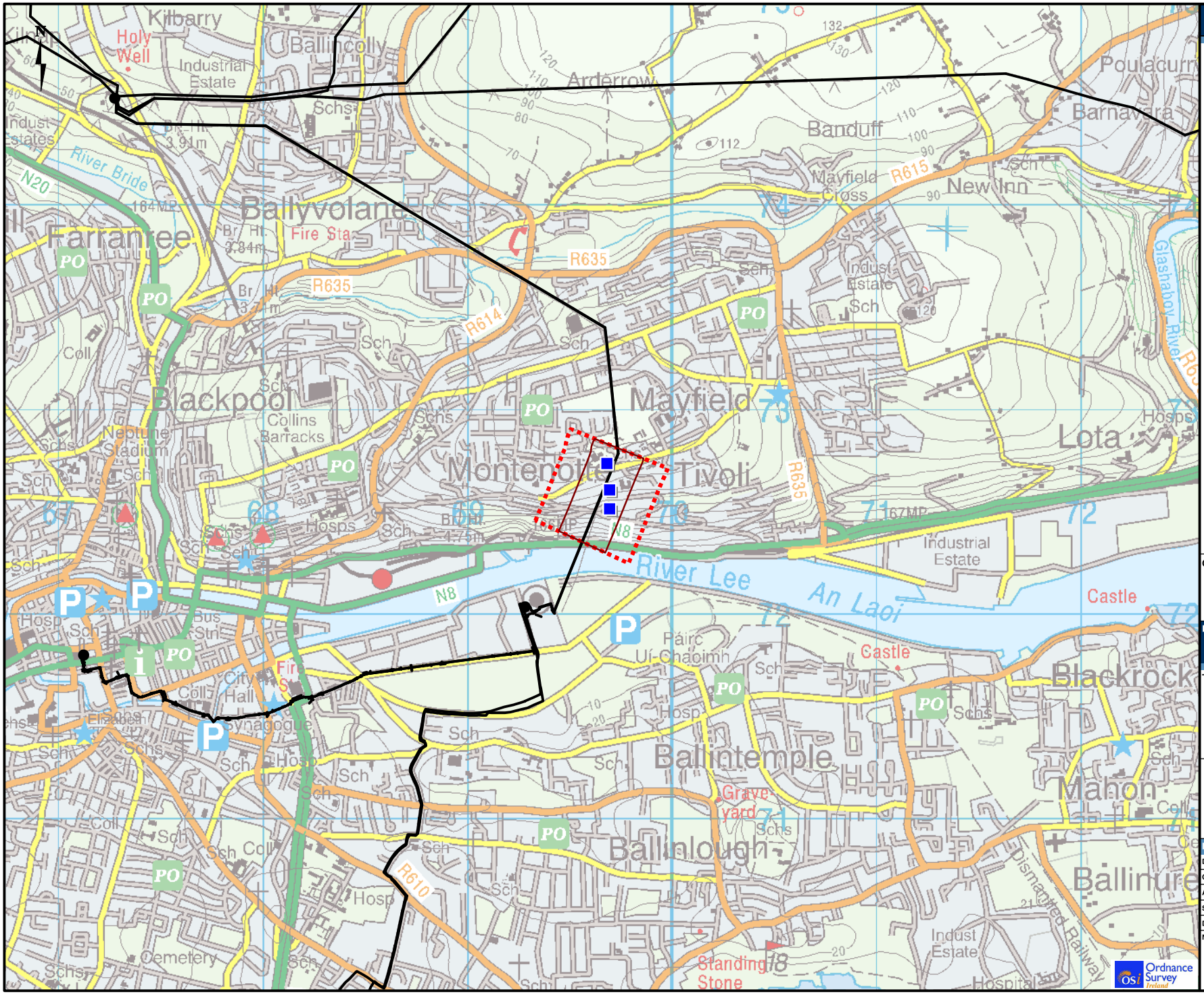

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Montenotte, Cork (Kilbarry-Marina 110kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0032D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0032	D01

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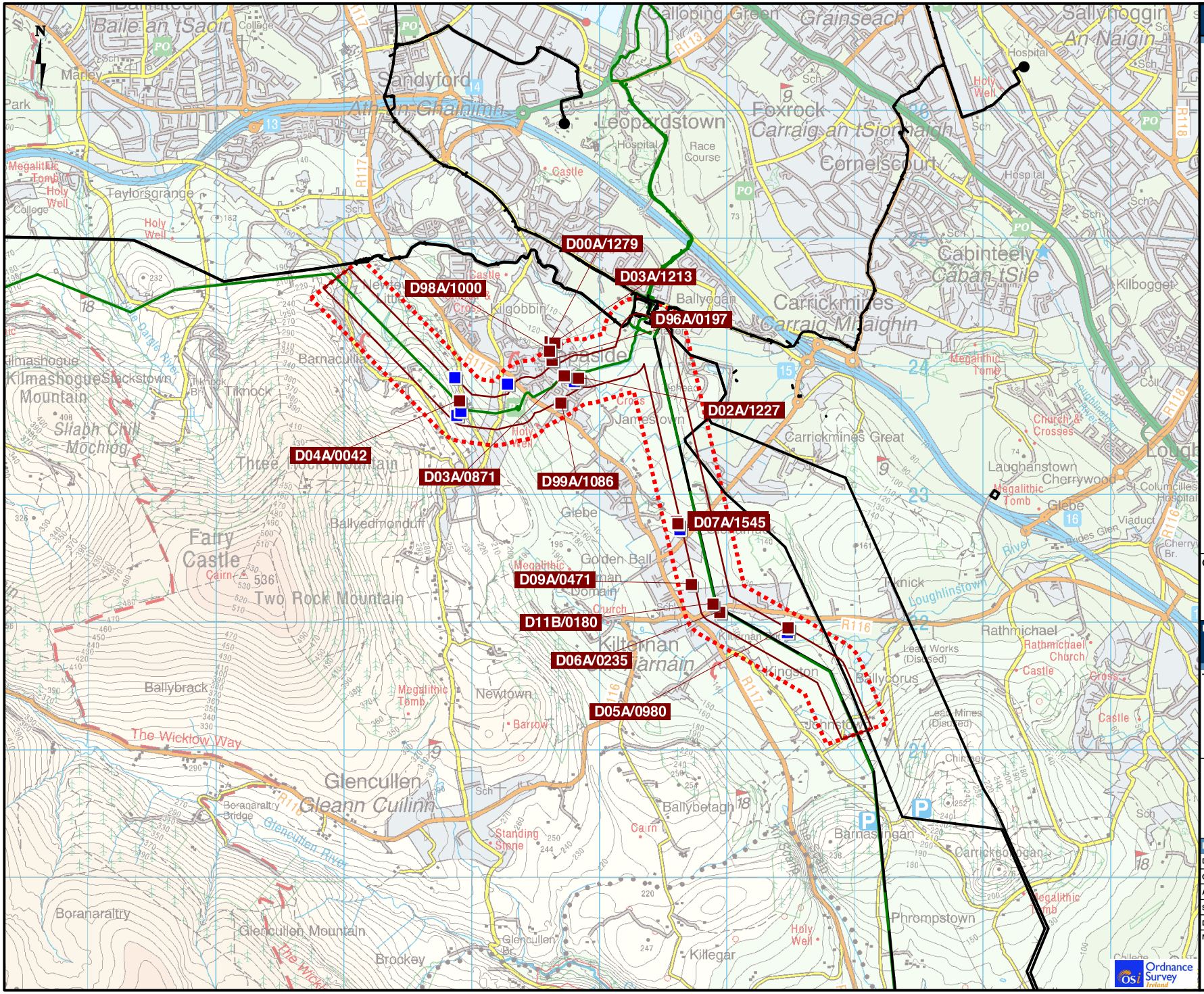

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Stepaside/Kilternan, Dublin (Carrickmine-Maynooth 220kV)

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0057D01
Approved by:	xxxx		
Scale:	1:40,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0057	D01

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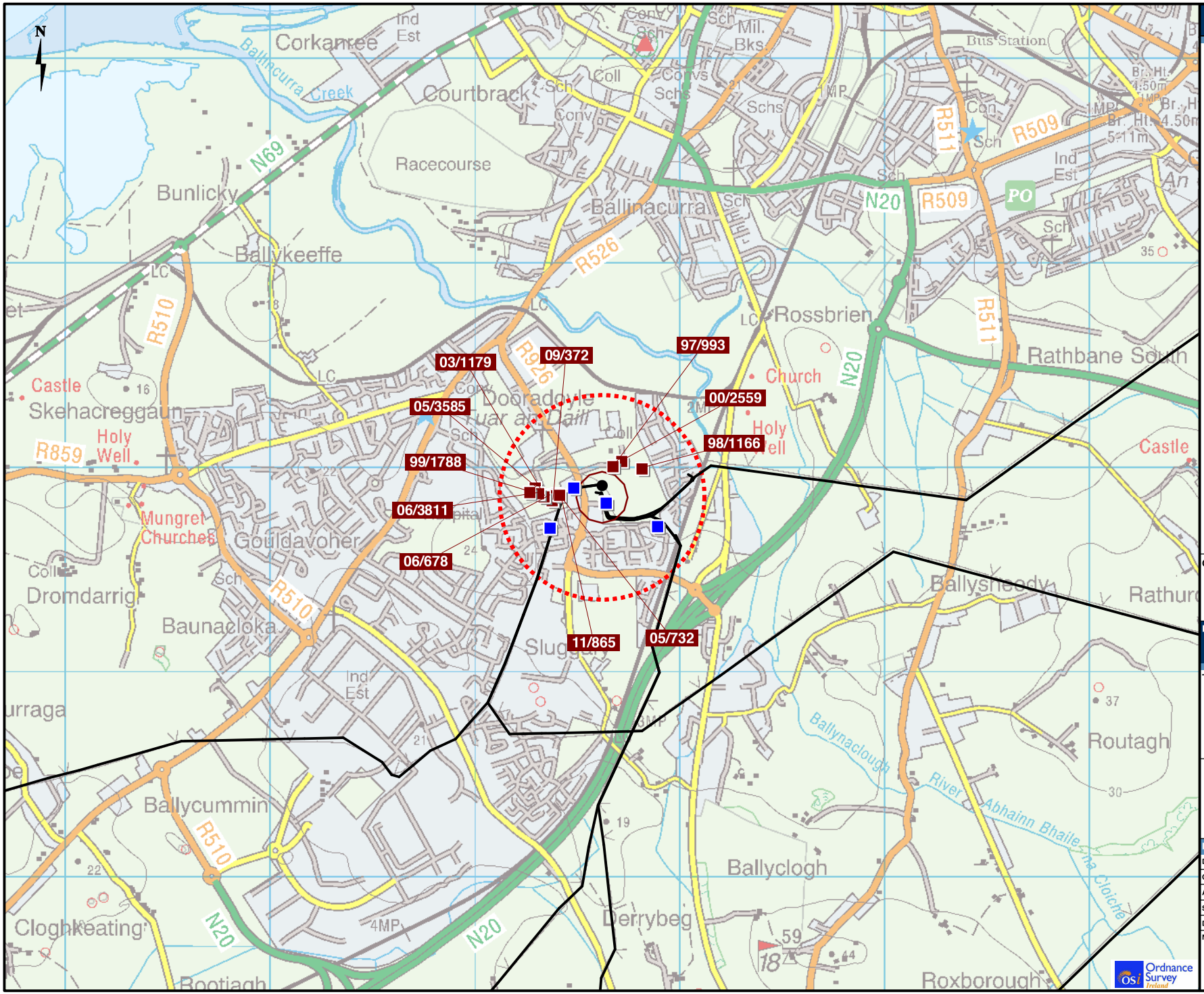
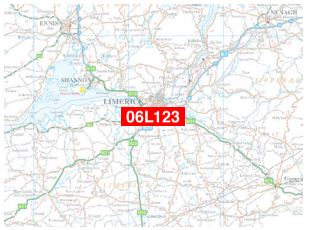


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Limerick Substation (110kV)**

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Issue Details			
Drawn by: S. Khan		Project No. MDE1020	
Checked by: P. Hickey		File Ref. MDE1020Mi0034D01	
Approved by: xxxx			
Scale: 1:25,000 (A4)		Drawing No. Mi0034	Rev. D01
Date: 06/09/2012			

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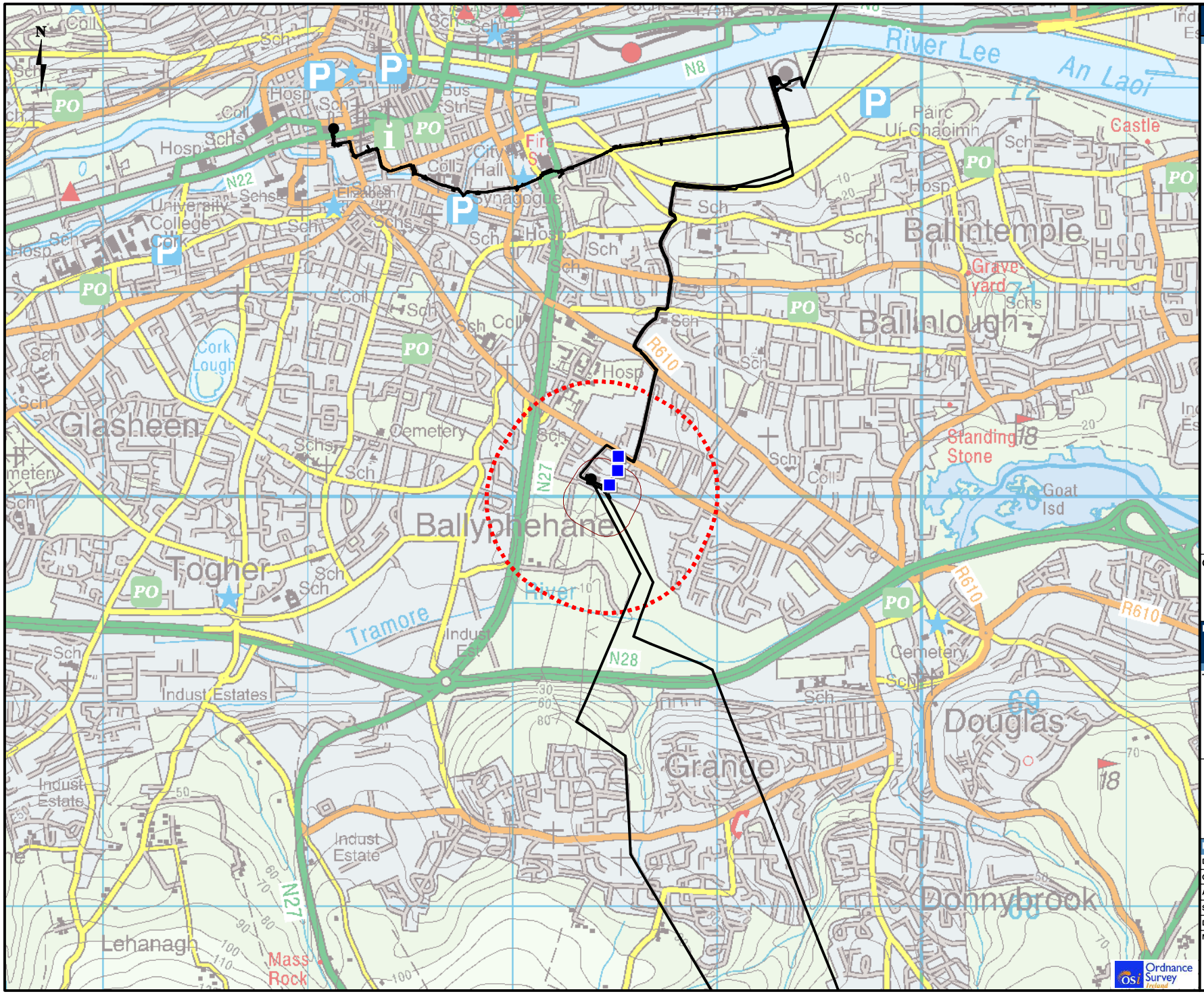

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Trabeg Substation (110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0051D02
Approved by:	xxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi051	D02

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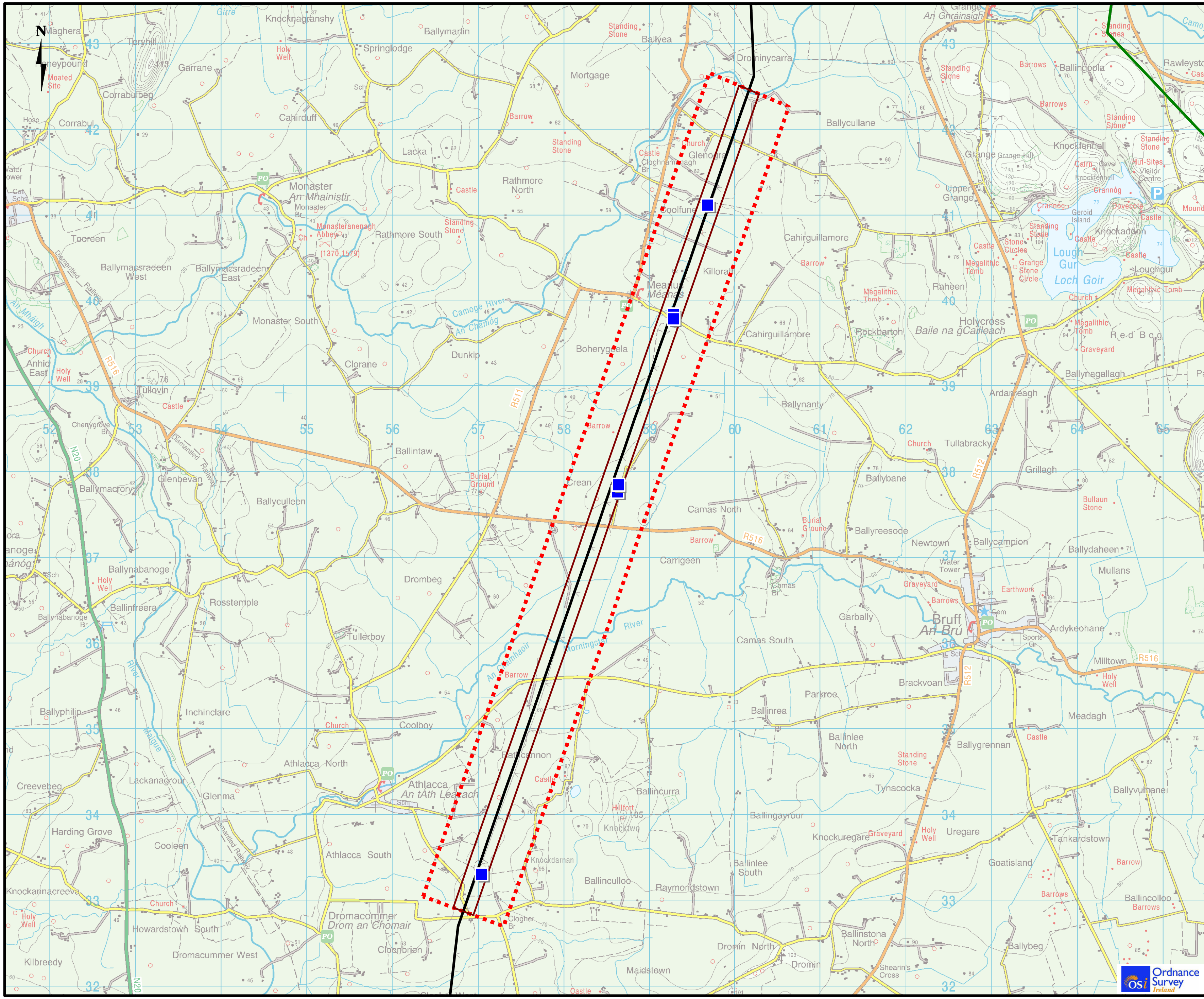
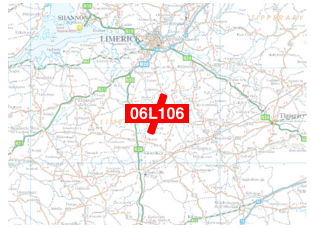
APPENDIX B(iv)

AGRICULTURAL LAND-USE STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Bruree, Co. Limerick (Charleville-Killonan 110kV)

RPS

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Issue Details

Drawn by: S. Khan		**Project No.** MDE1020	
Checked by: P. Hickey		**File Ref.** MDE1020Mi0029D01	
Approved by: xxxx			
Scale: 1:60,000 (A4)		**Drawing No.** Mi0029	**Rev.** D01
Date: 06/09/2012			

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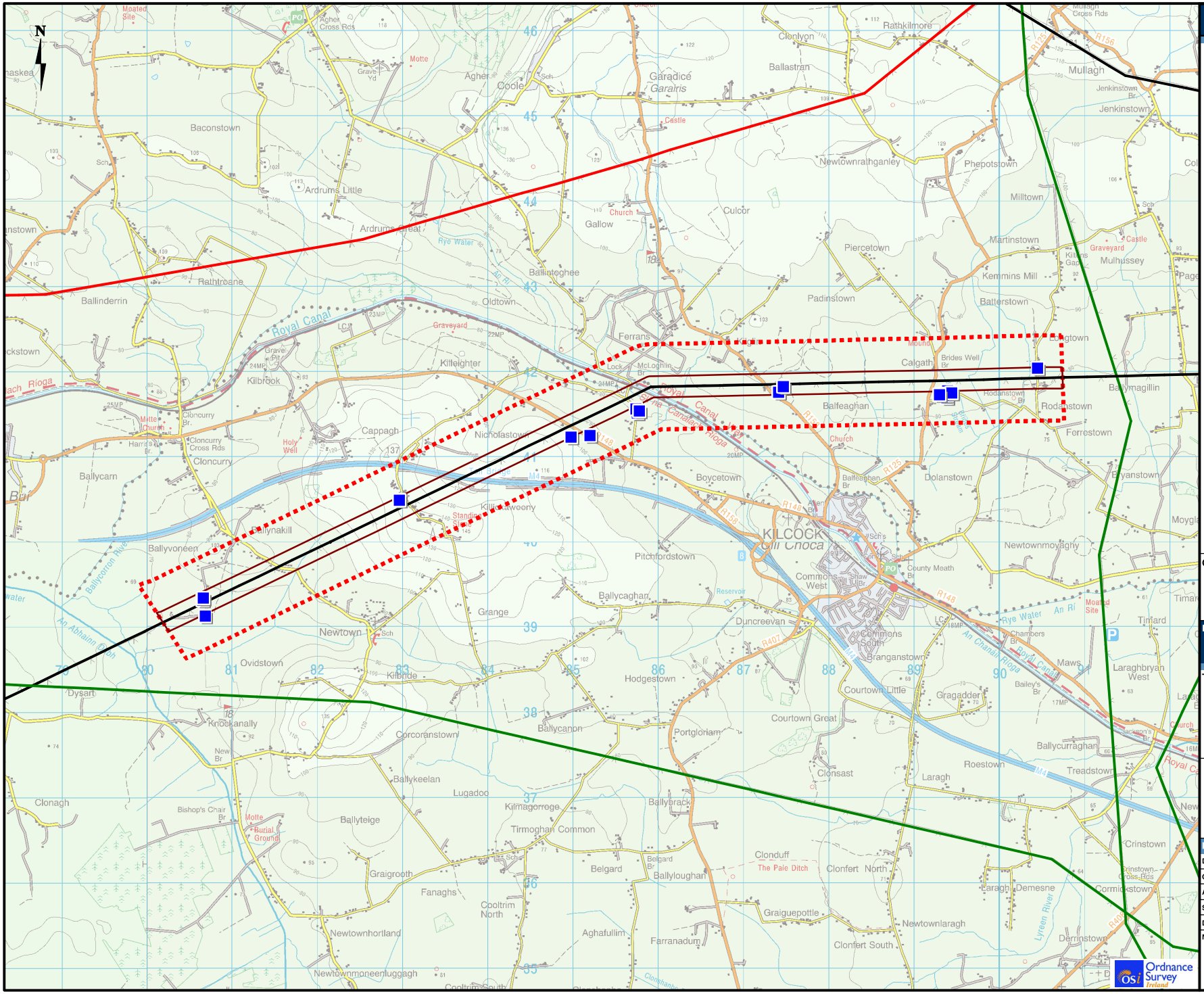
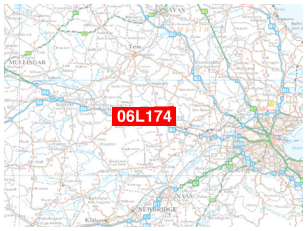


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Painstown, Co. Kildare (Dunfirth-Rinawade 110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0039D01
Approved by:	xxxx		
Scale:	1:60,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0039	D01

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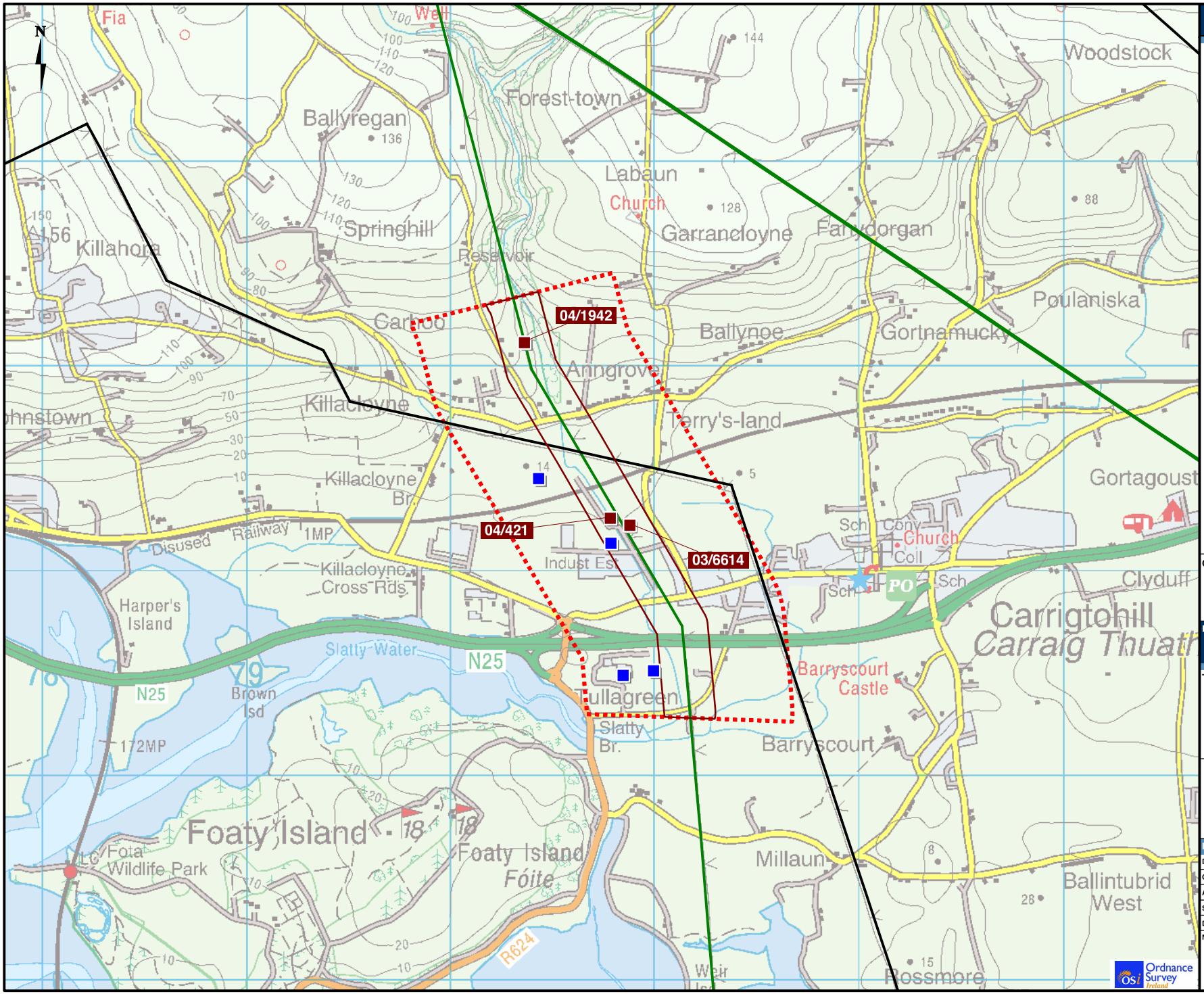

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Carrigtwohill, Co. Cork (Killonan-Knockraha 220kV)**

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0045D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0045	D01

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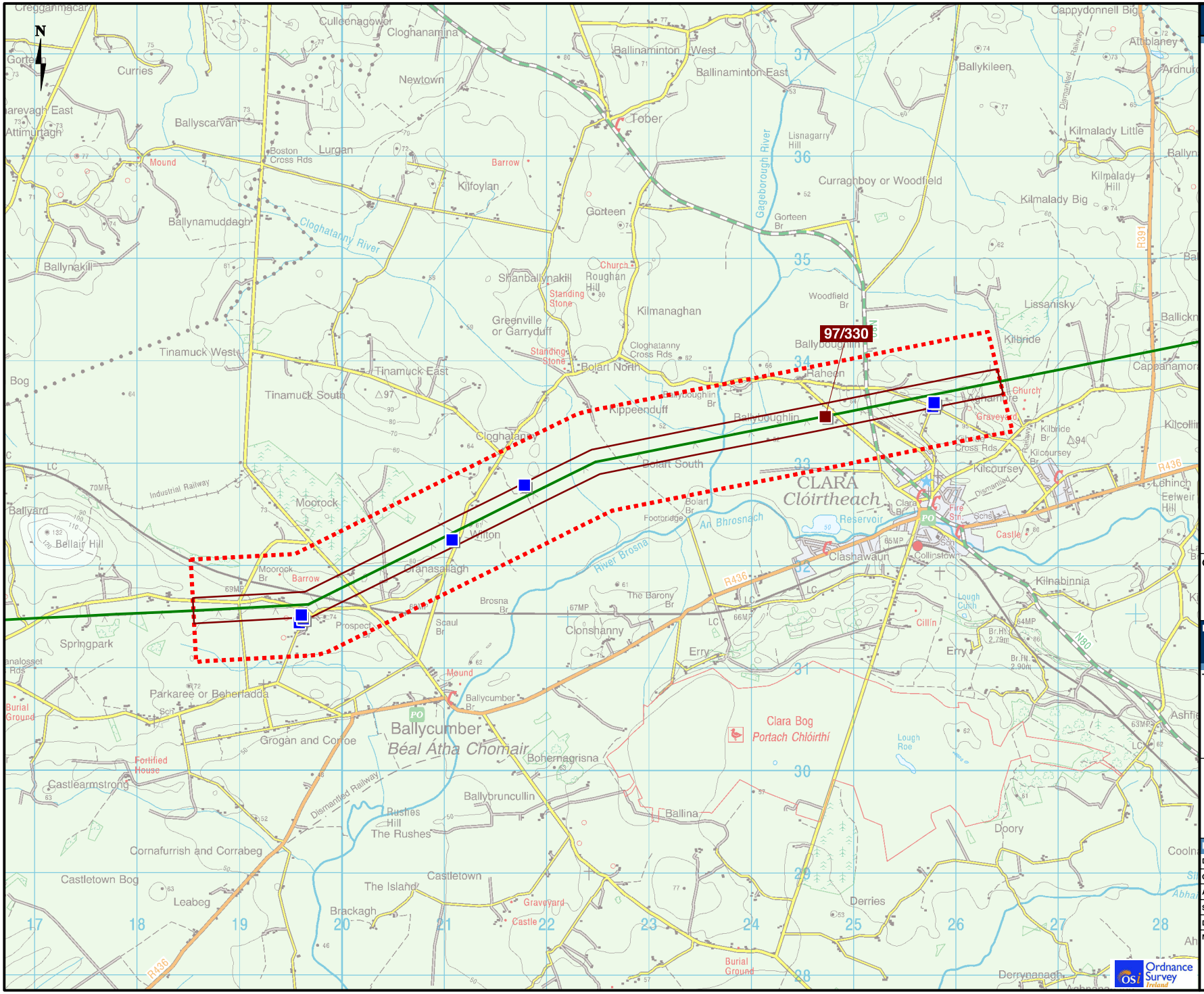

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Co. Offaly (Maynooth - Shannonbridge 220kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0047D01
Approved by:	xxxx		
Scale:	1:50,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0047	D01

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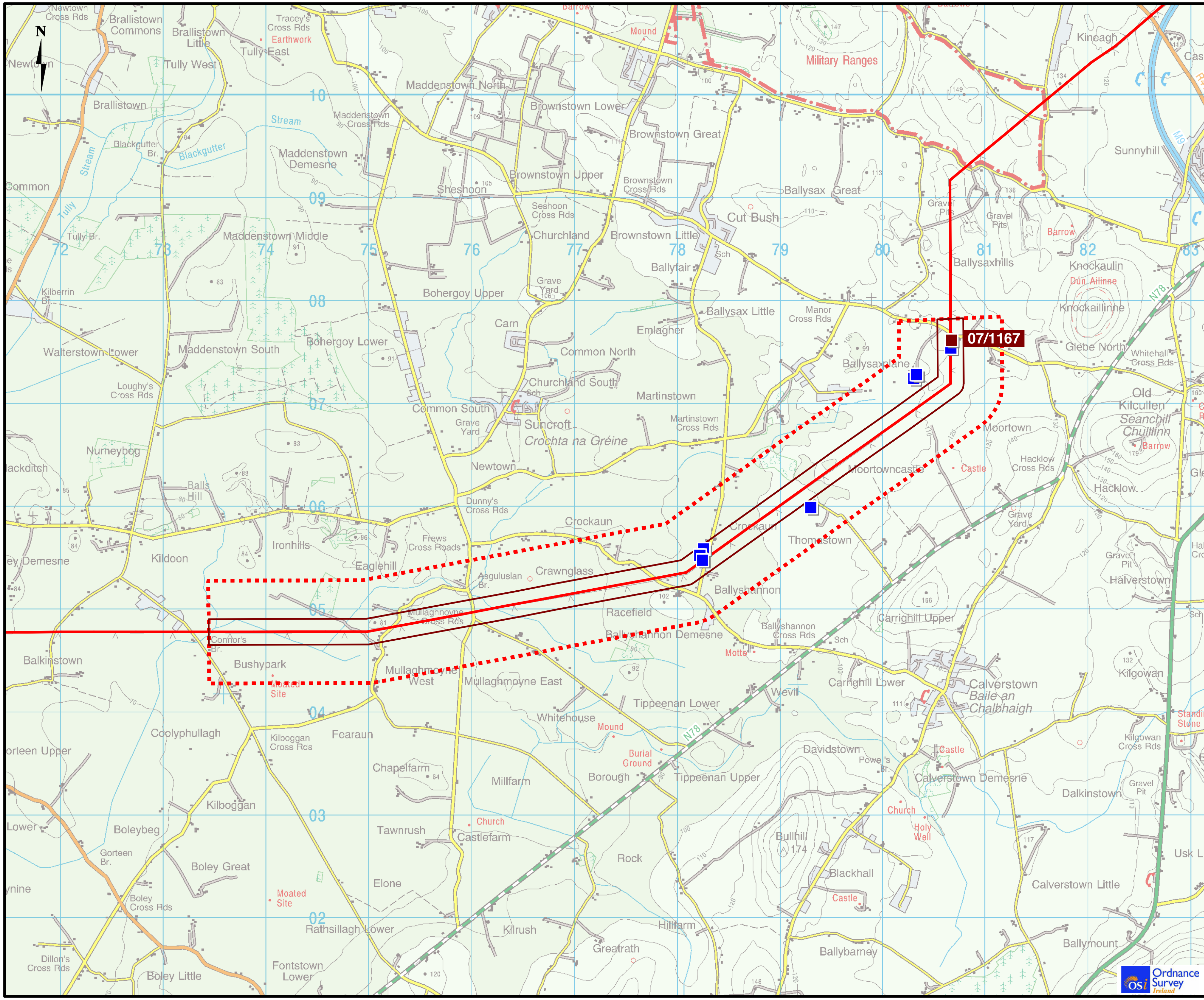
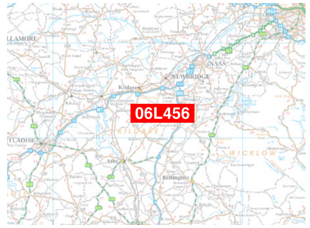


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Ballyshannon, Co. Kildare (Dunstown-Moneypoint 400kV)

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020	
Checked by:	P. Hickey	File Ref.		
Approved by:	xxxx		MDE1020Mi0049D01	
Scale:	1:50,000 (A4)	Drawing No.		Rev.
Date:	06/09/2012	Mi0049		D01

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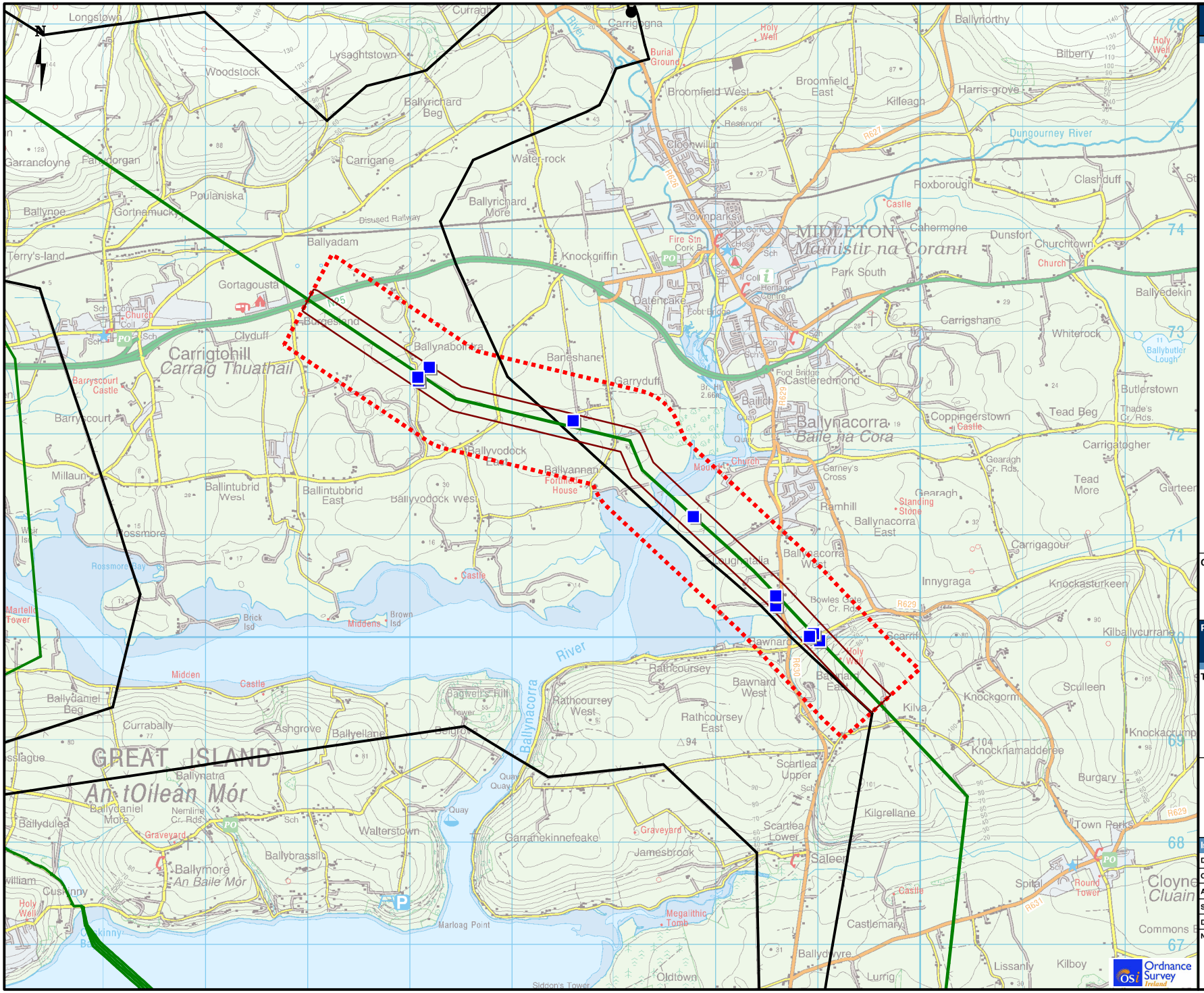

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Cloyne, Co. Cork (Aghada-Knockraha 220kV)

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0056D01
Approved by:	xxxx		
Scale:	1:50,000 (A4)	Drawing No.	Mi0056
Date:	06/09/2012	Rev.	D01

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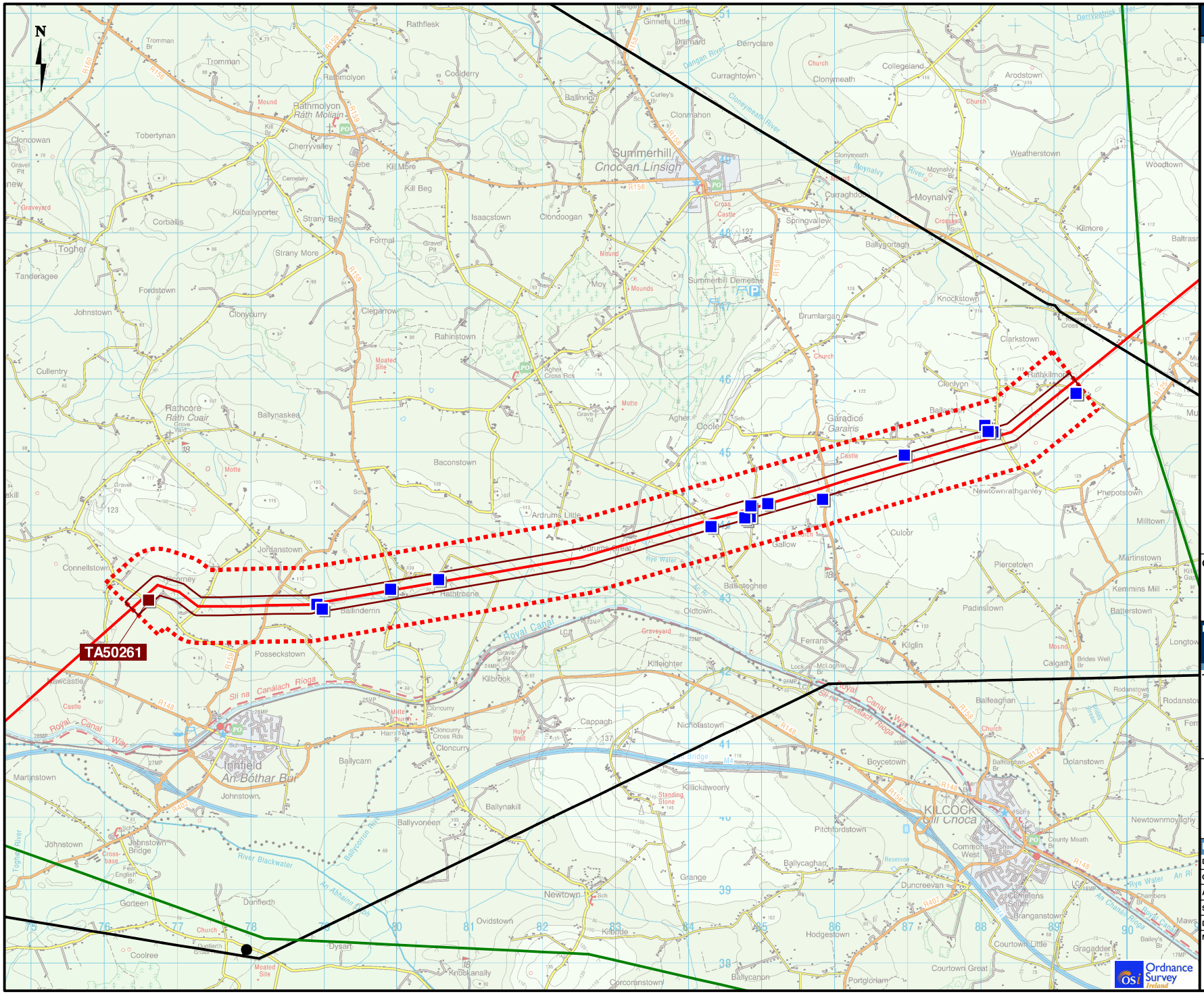

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Beggstown, Co. Meath (Moneypoint-Woodland 400kV)

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0050D01
Approved by:	xxxx		
Scale:	1:70,000 (A4)	Drawing No.	Mi0050
Date:	06/09/2012	Rev.	D01

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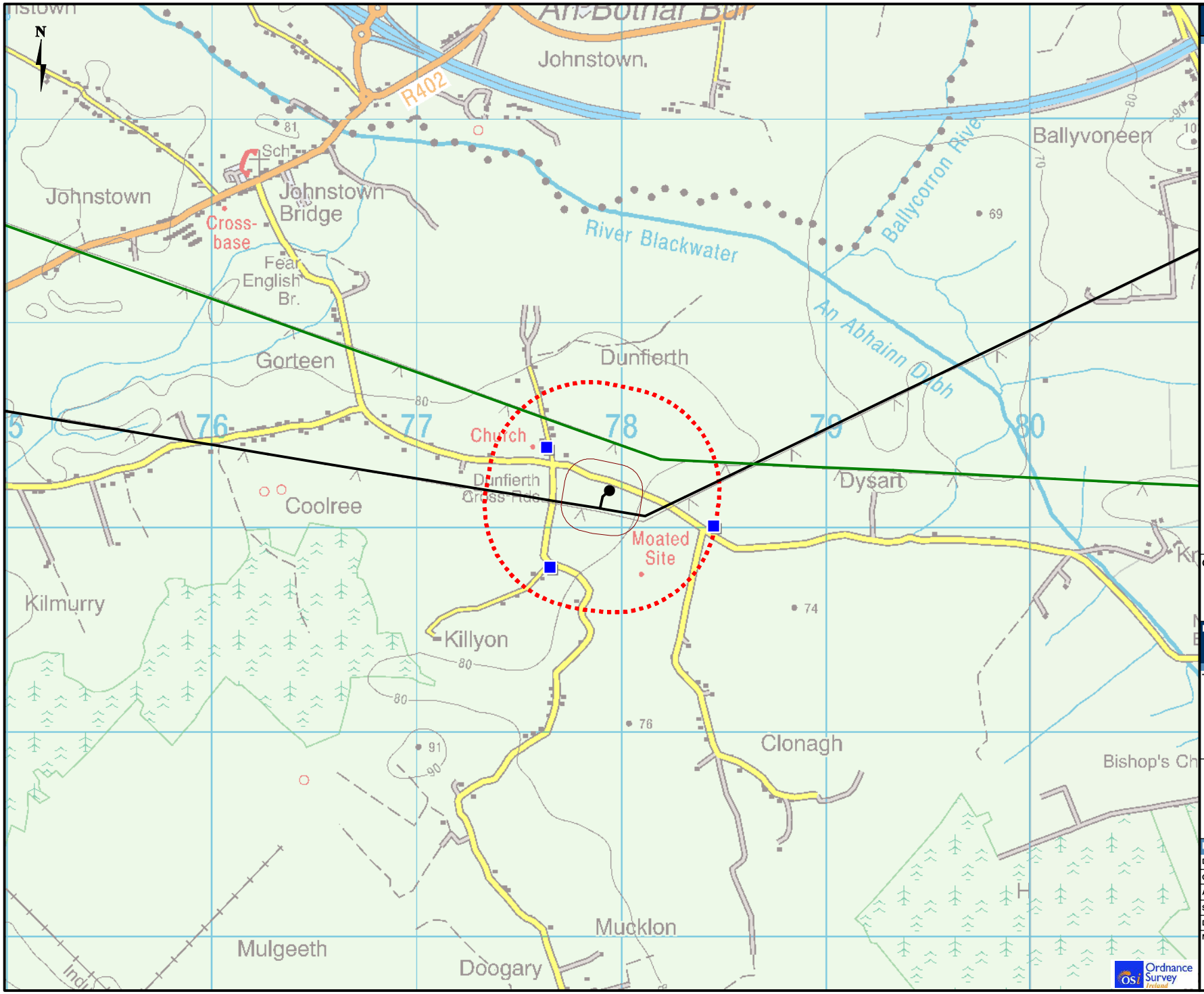
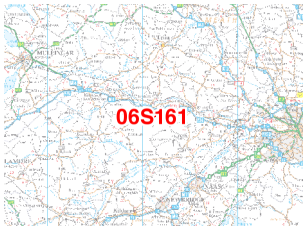


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Dunfirth Substation (110kV)**

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Issue Details			
Drawn by: S. Khan		Project No. MDE1020	
Checked by: P. Hickey		File Ref. MDE1020Mi0052D02	
Approved by: xxxx			
Scale: 1:25,000 (A4)		Drawing No. Mi052	Rev. D02
Date: 01/11/2012			

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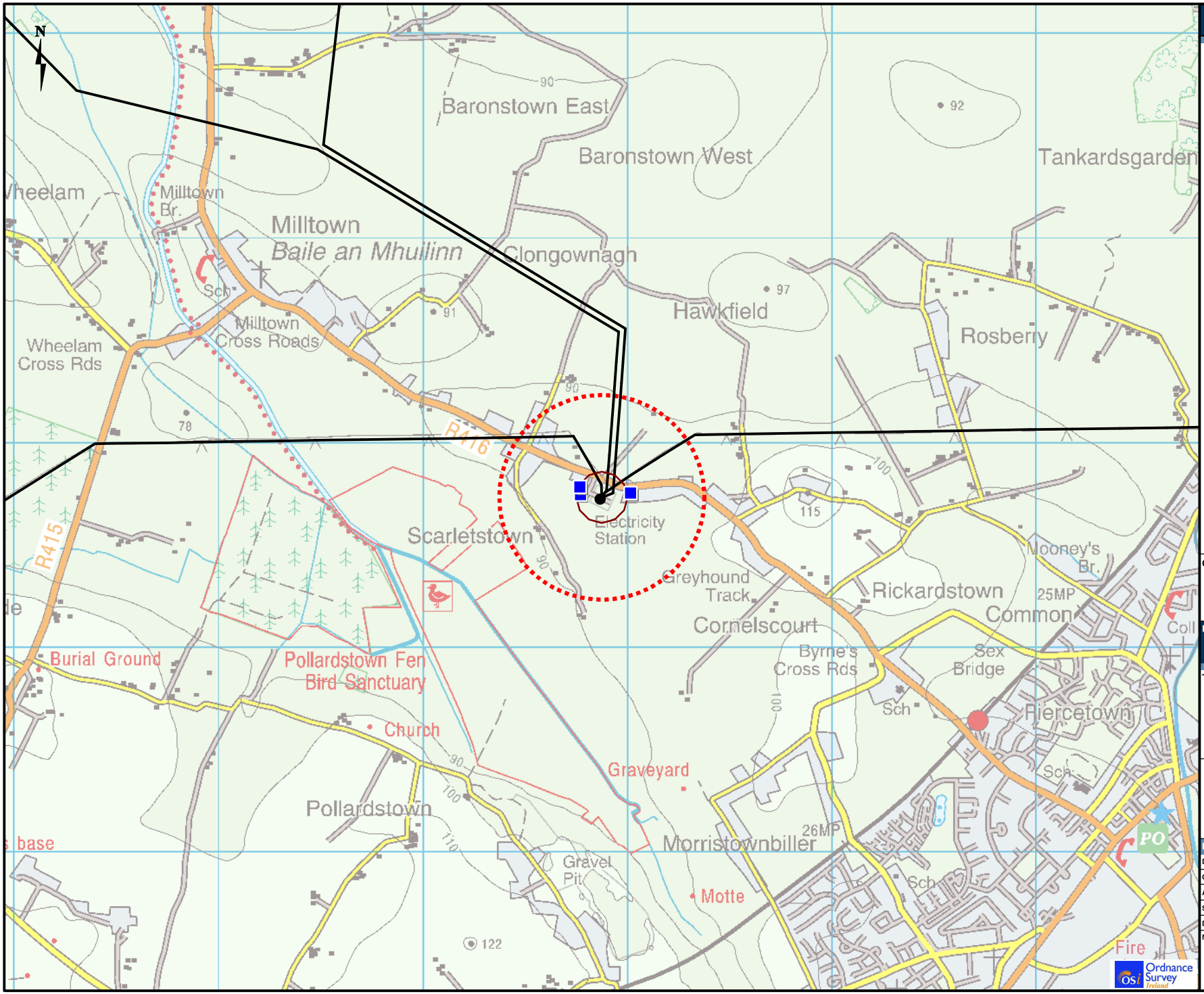

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Newbridge Substation (110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0055D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Mi0055
Date:	06/09/2012	Rev.	D01

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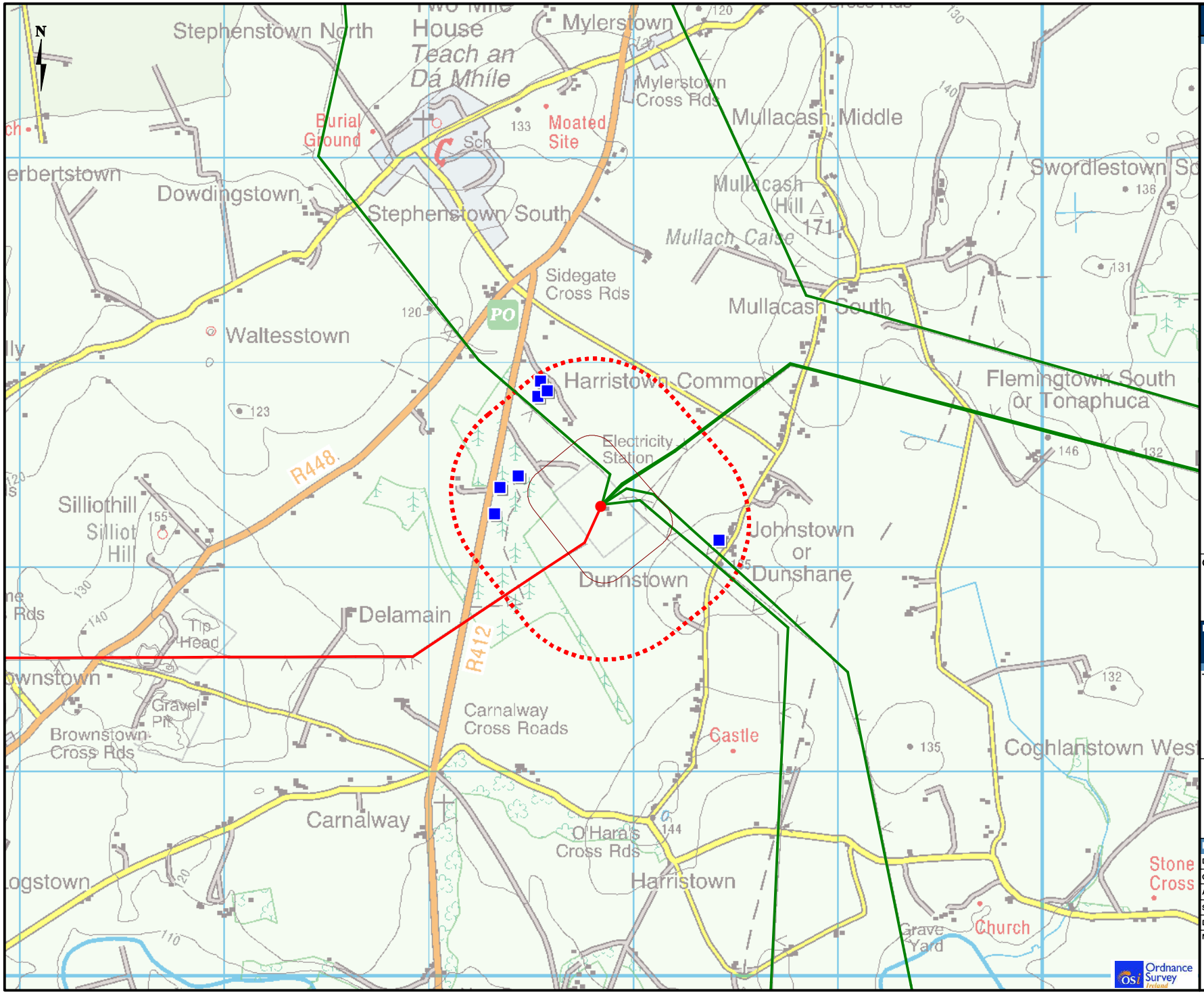

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Dunstown Substation (400kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0061D02
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi0061	D02

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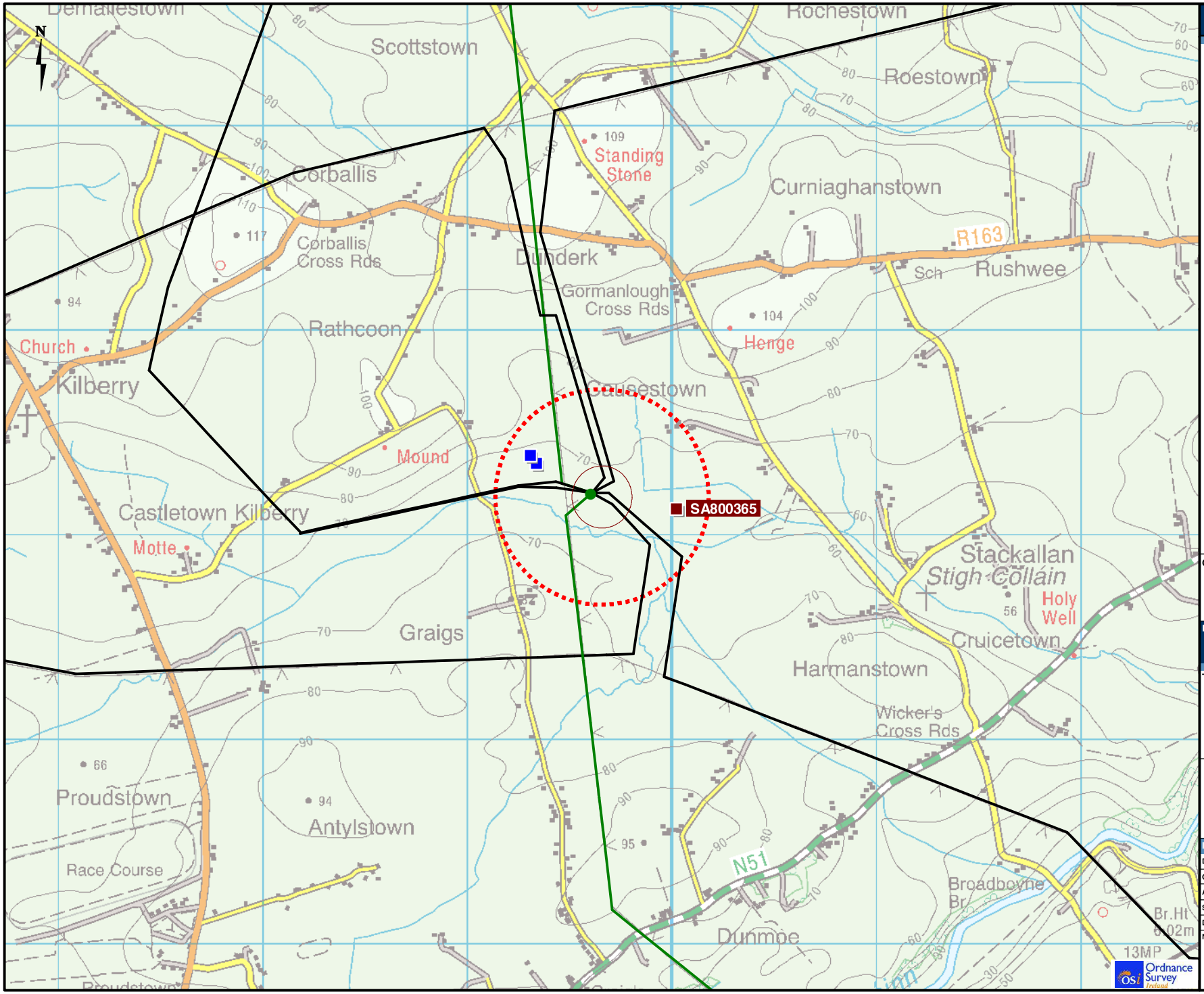
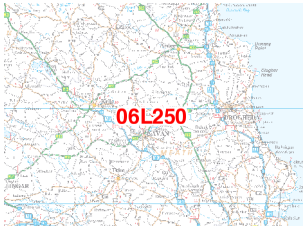


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EirGrid

Project: EirGrid - Evidence Based Guideline Studies

Title: **Gorman Substation (220kV)**

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0046D02
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi046	D02

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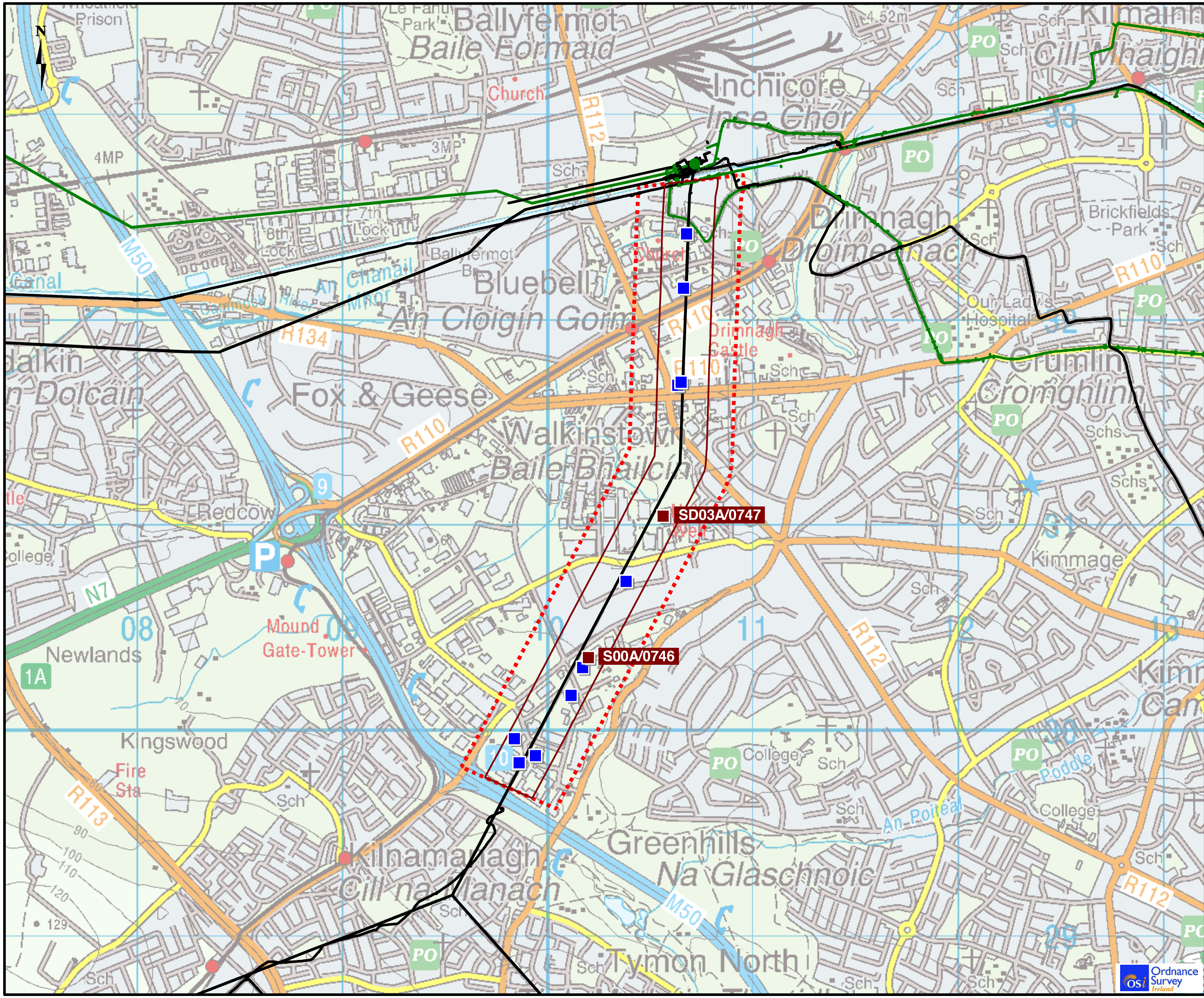
APPENDIX B(v)

COMMERCIAL LAND-USE STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Ballymount, Dublin (Citywest-Inchicore 110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	
Approved by:	xxxx	MDE1020Mi0030D01	
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0030	D01

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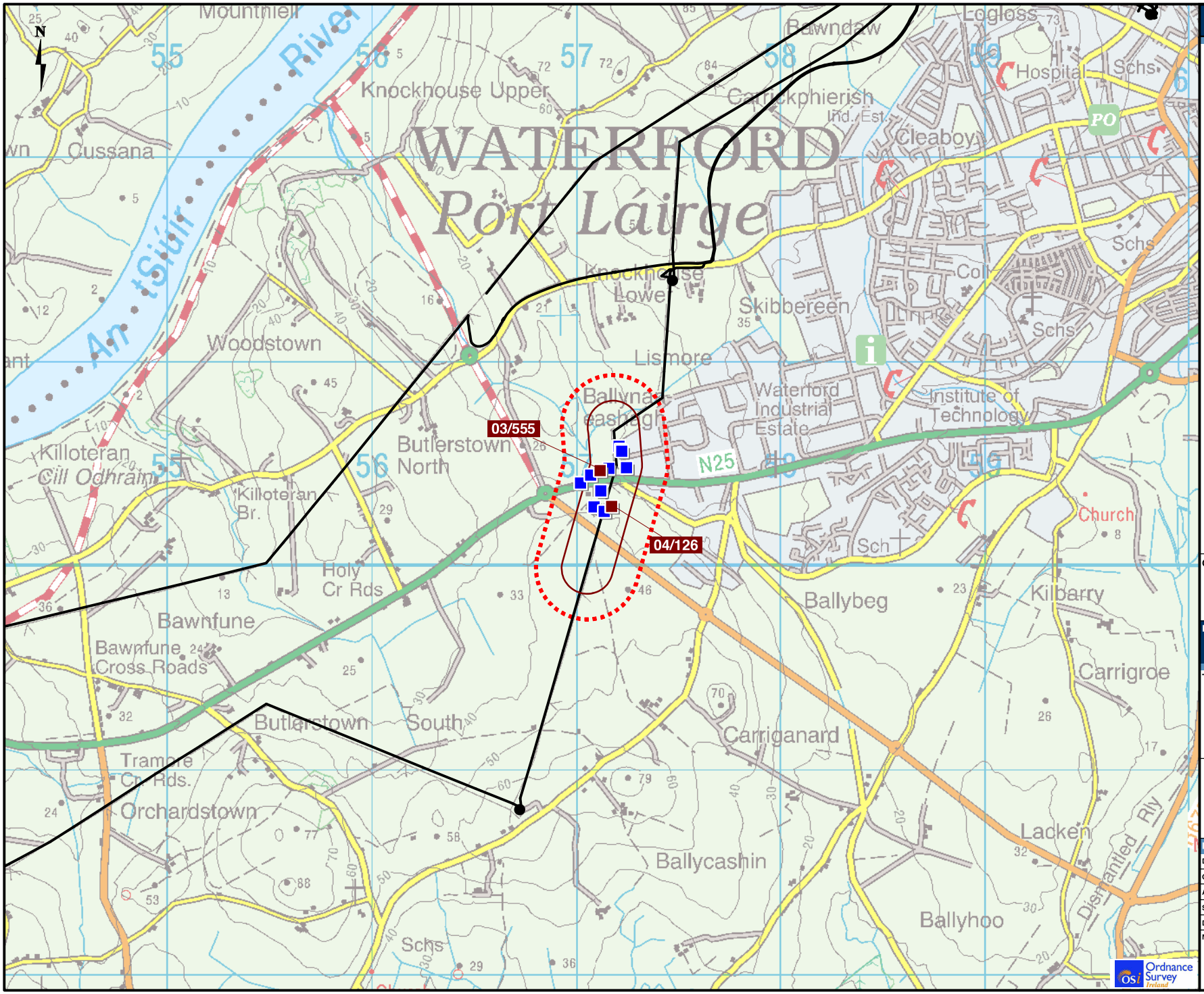

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Ballynaneashagh, Waterford (Dungarvan-Waterford 110kV)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0035D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Mi0035
Date:	06/09/2012	Rev.	D01

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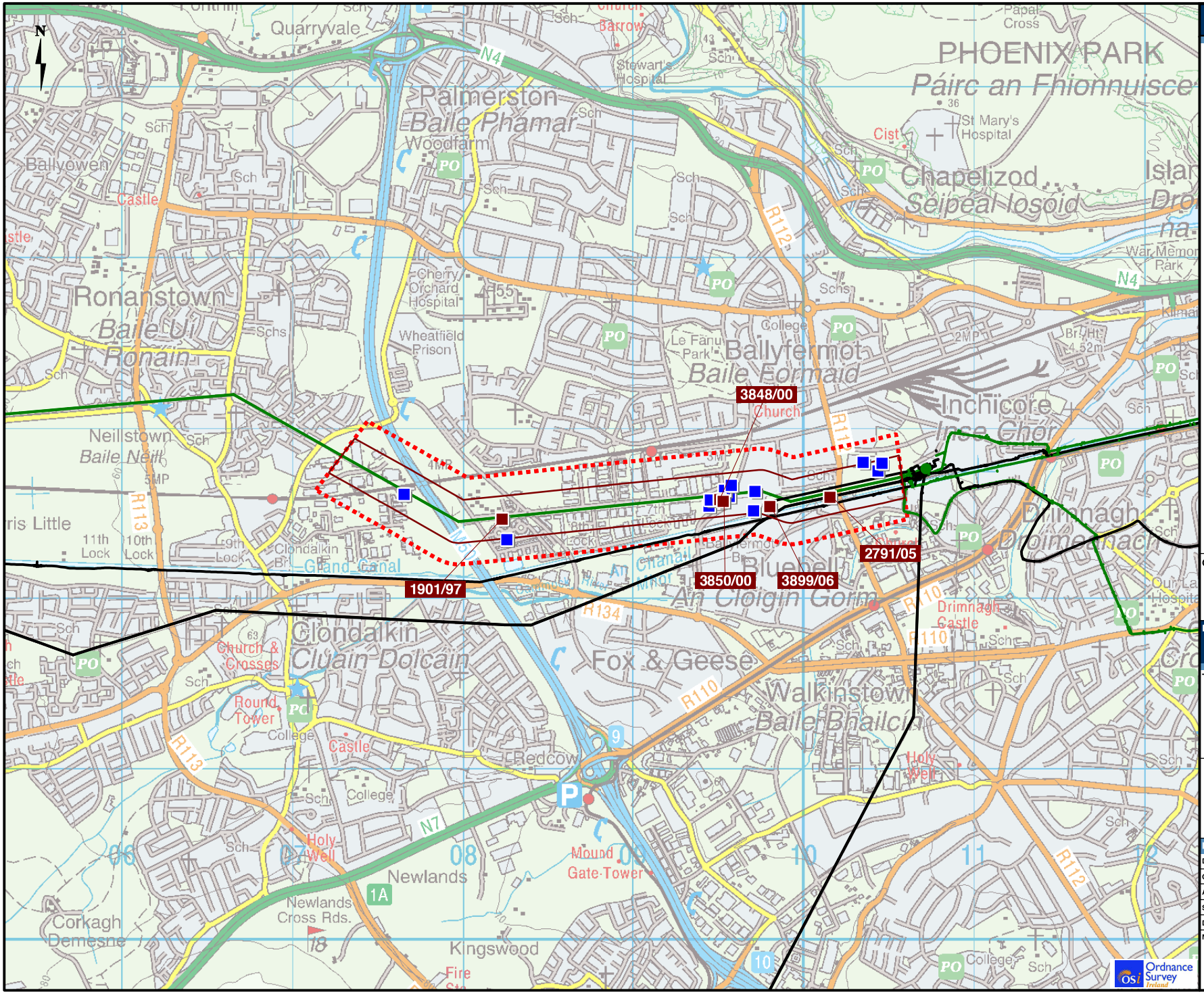

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Clondalkin/Parkwest, Dublin (Inchicore-Maynooth 220kV)

RPS

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Dun Laoghaire,
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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020MI0041D01
Approved by:	xxxx		
Scale:	1:30,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	MI0041	D01

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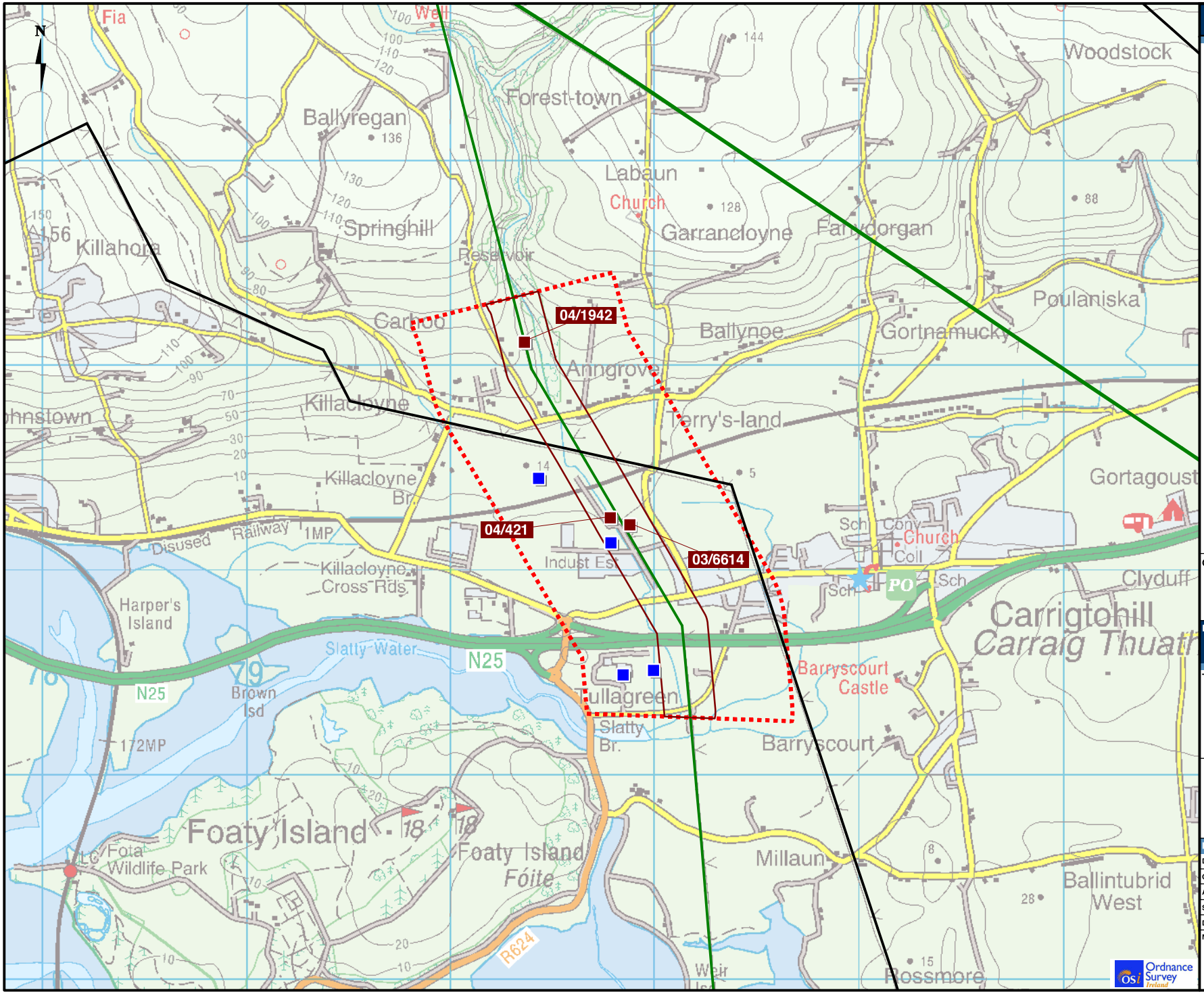

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Carrigtwohill, Co. Cork (Killonan-Knockraha 220kV)**

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0045D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0045	D01

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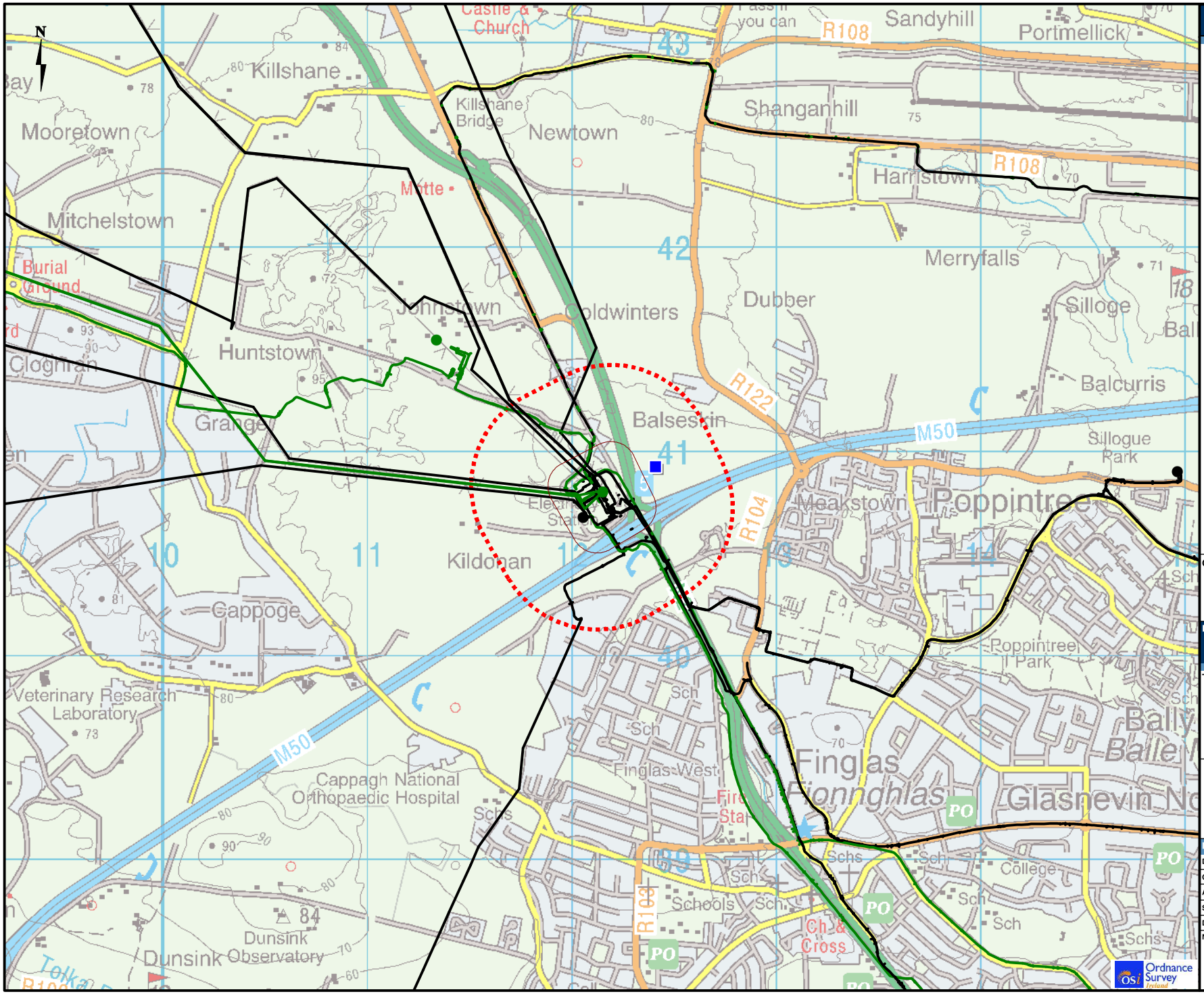

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Finglas Substation (220kV)

RPS

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Issue Details			
Drawn by: S. Khan		Project No. MDE1020	
Checked by: P. Hickey		File Ref. MDE1020Mi0060D02	
Approved by: xxxx			
Scale: 1:25,000 (A4)		Drawing No. Mi060	Rev. D02
Date: 01/11/2012			

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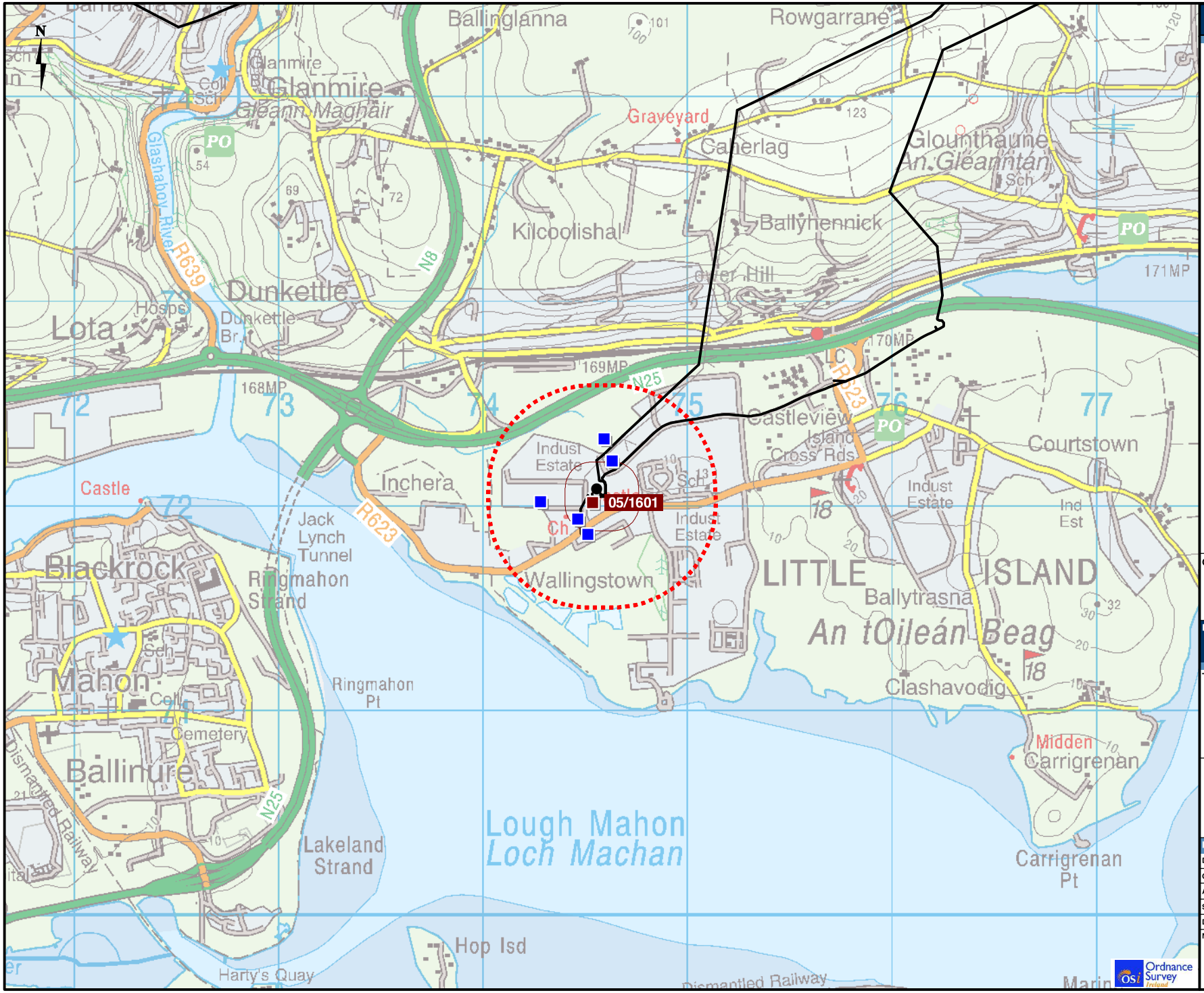

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Castleview Substation (110kV)**

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Issue Details			
Drawn by: S. Khan		Project No. MDE1020	
Checked by: P. Hickey		File Ref. MDE1020Mi0033D02	
Approved by: xxxx			
Scale: 1:25,000 (A4)		Drawing No. Mi033	Rev. D02
Date: 01/11/2012			

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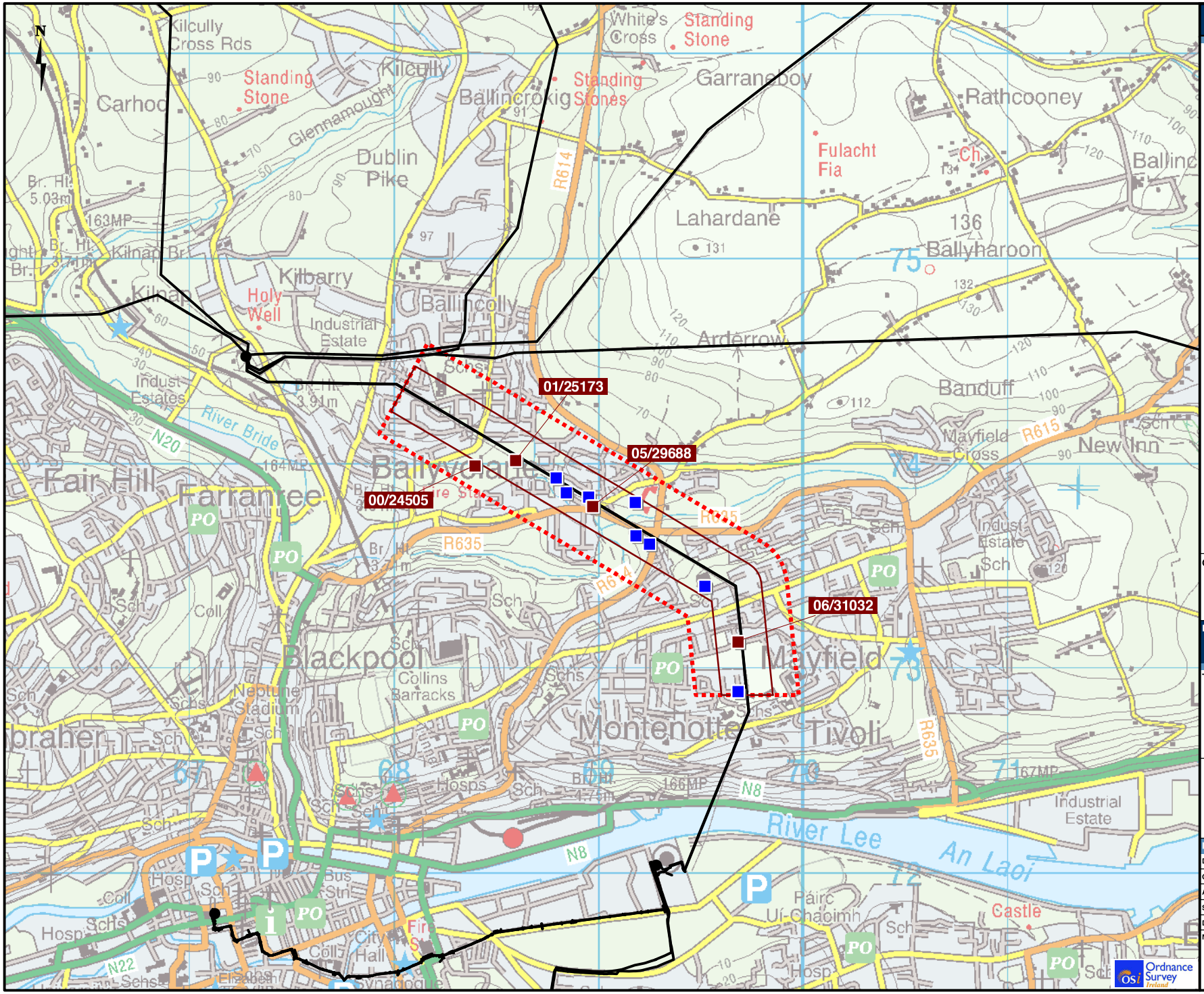
APPENDIX B(vi)

COMMUNITY AND SOCIAL LAND-USE STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Ballyvolane/Mayfield, Cork (Kilbarry-Mayfield 110kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0031D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Mi0031
Date:	06/09/2012	Rev.	D01

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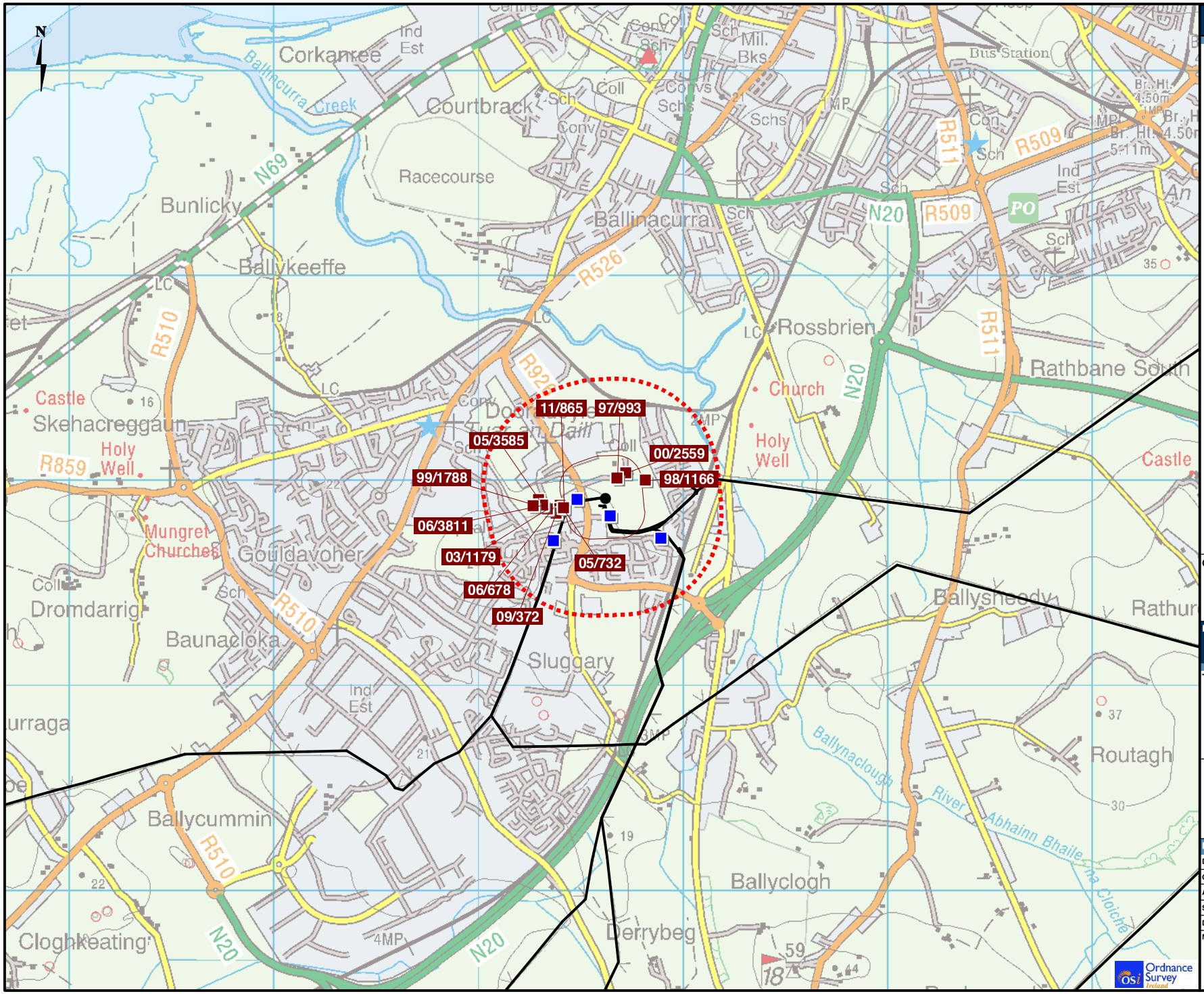
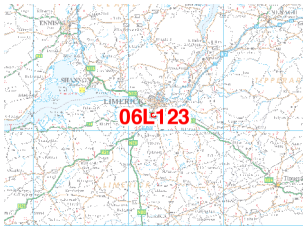


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Limerick Substation (110kV)**

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Issue Details			
Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0034D02
Approved by:	xxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	01/11/2012	Mi034	D02

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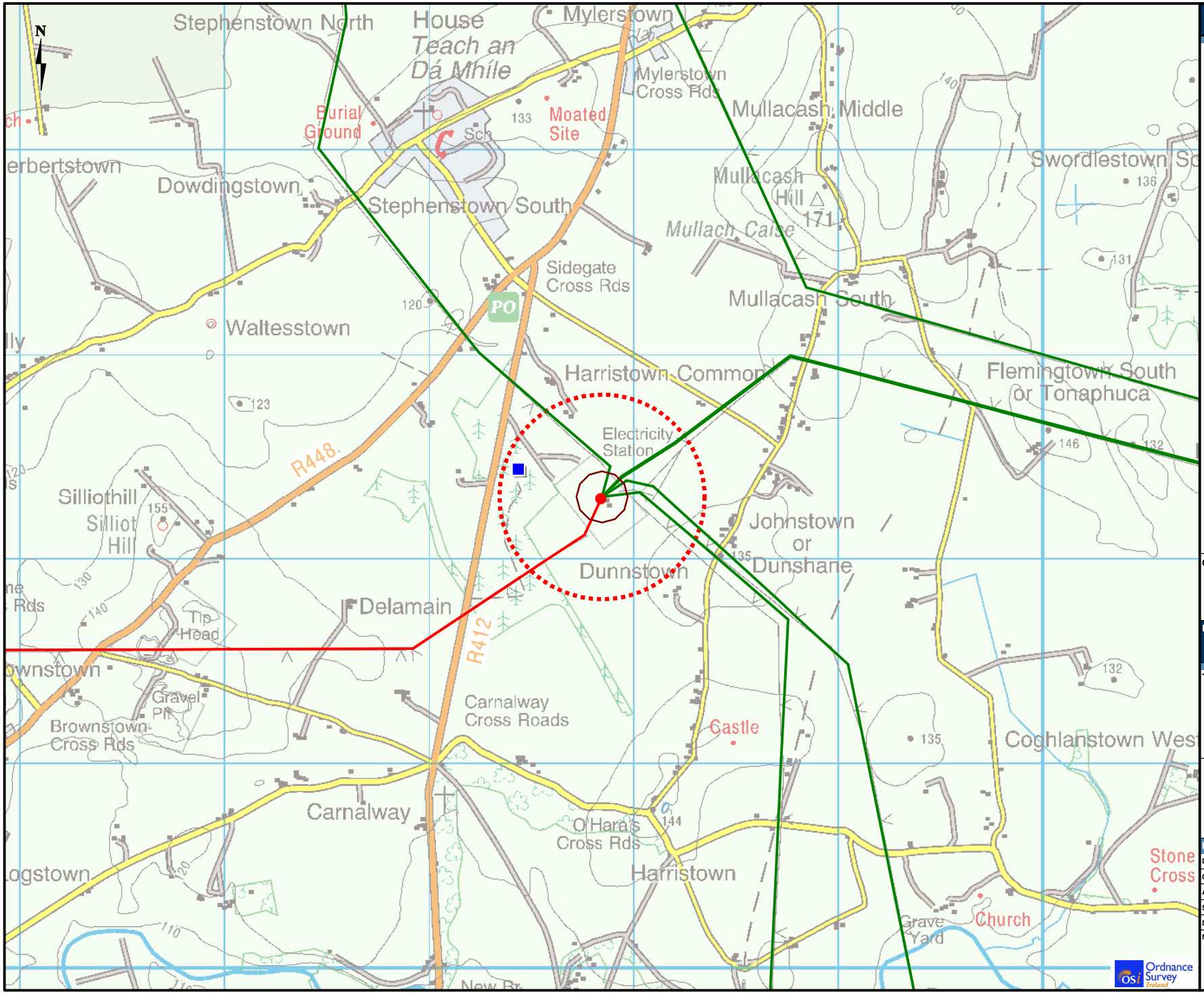
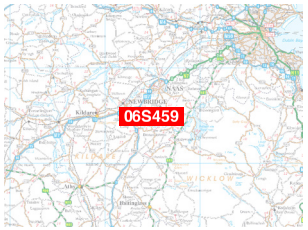


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client: EirGrid

Project: EirGrid - Evidence Based Guideline Studies

Title: **Dunstown Substation (400kV)**

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Checked by: P. Hickey		File Ref. MDE1020Mi0061D01	
Approved by: xxxx			
Scale: 1:25,000 (A4)		Drawing No. Mi0061	Rev. D01
Date: 06/09/2012			

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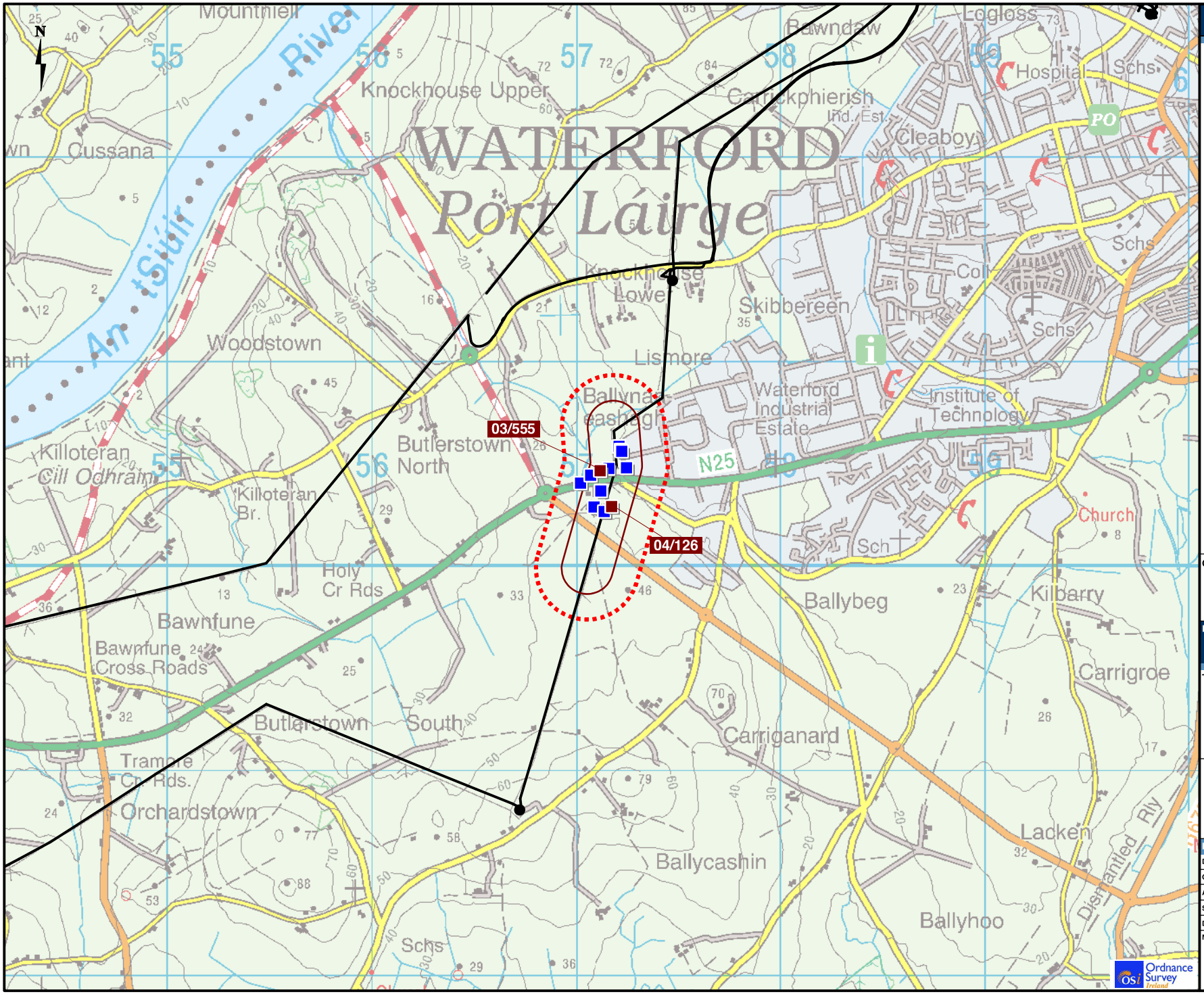
APPENDIX B(vii)

TOURISM LAND-USE STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client: EIRGRID

Project: EirGrid - Evidence Based Guideline Studies

Title: **Ballynaneashagh, Waterford (Dungarvan-Waterford 110kV)**

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Checked by:	P. Hickey	File Ref.	MDE1020Mi0035D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0035	D01

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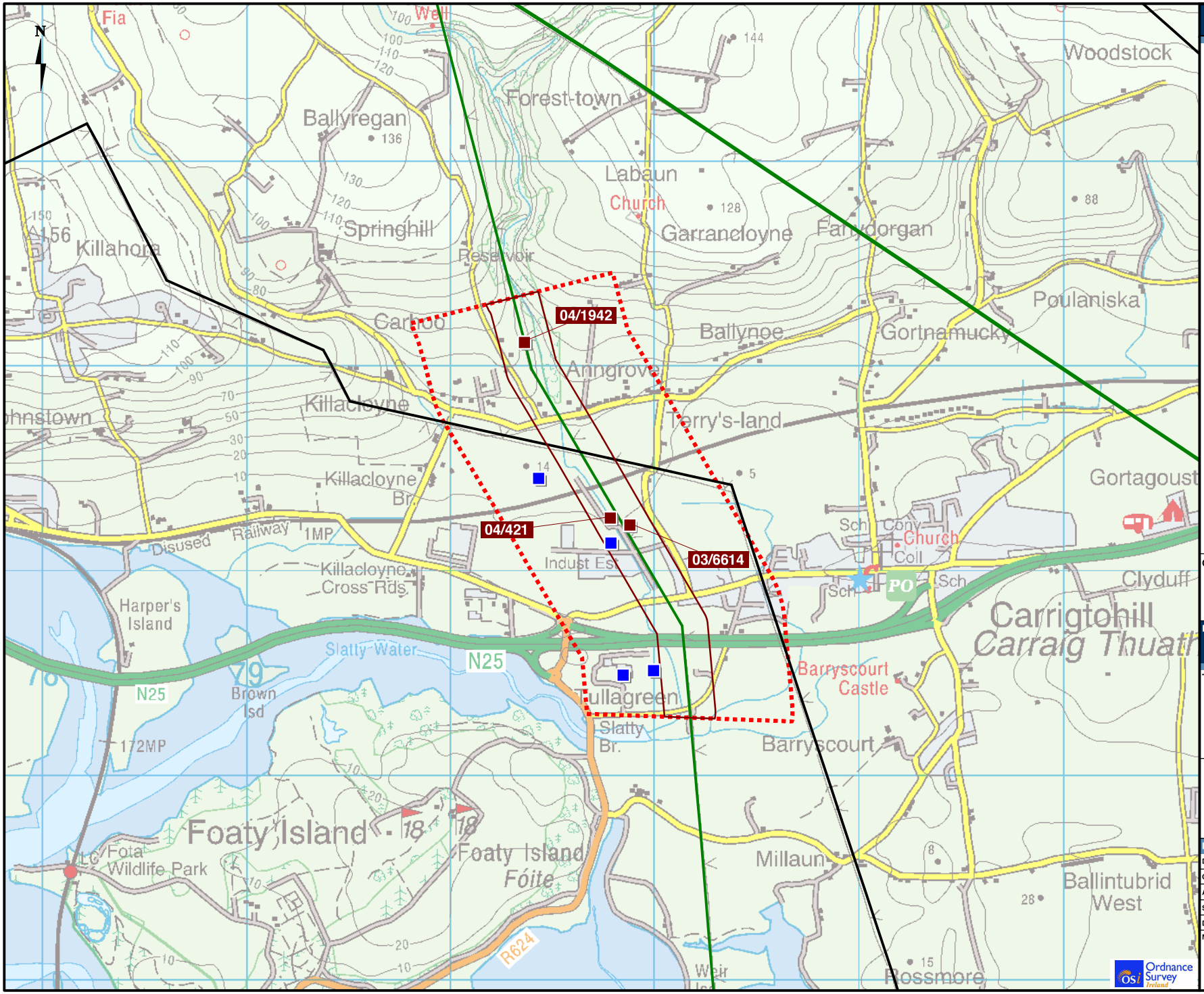

Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Carrigtwohill, Co. Cork (Killonan-Knockraha 220kV)

RPS

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Issue Details

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Checked by:	P. Hickey	File Ref.	MDE1020MI0045D01
Approved by:	xxxx		
Scale:	1:25,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	MI0045	D01

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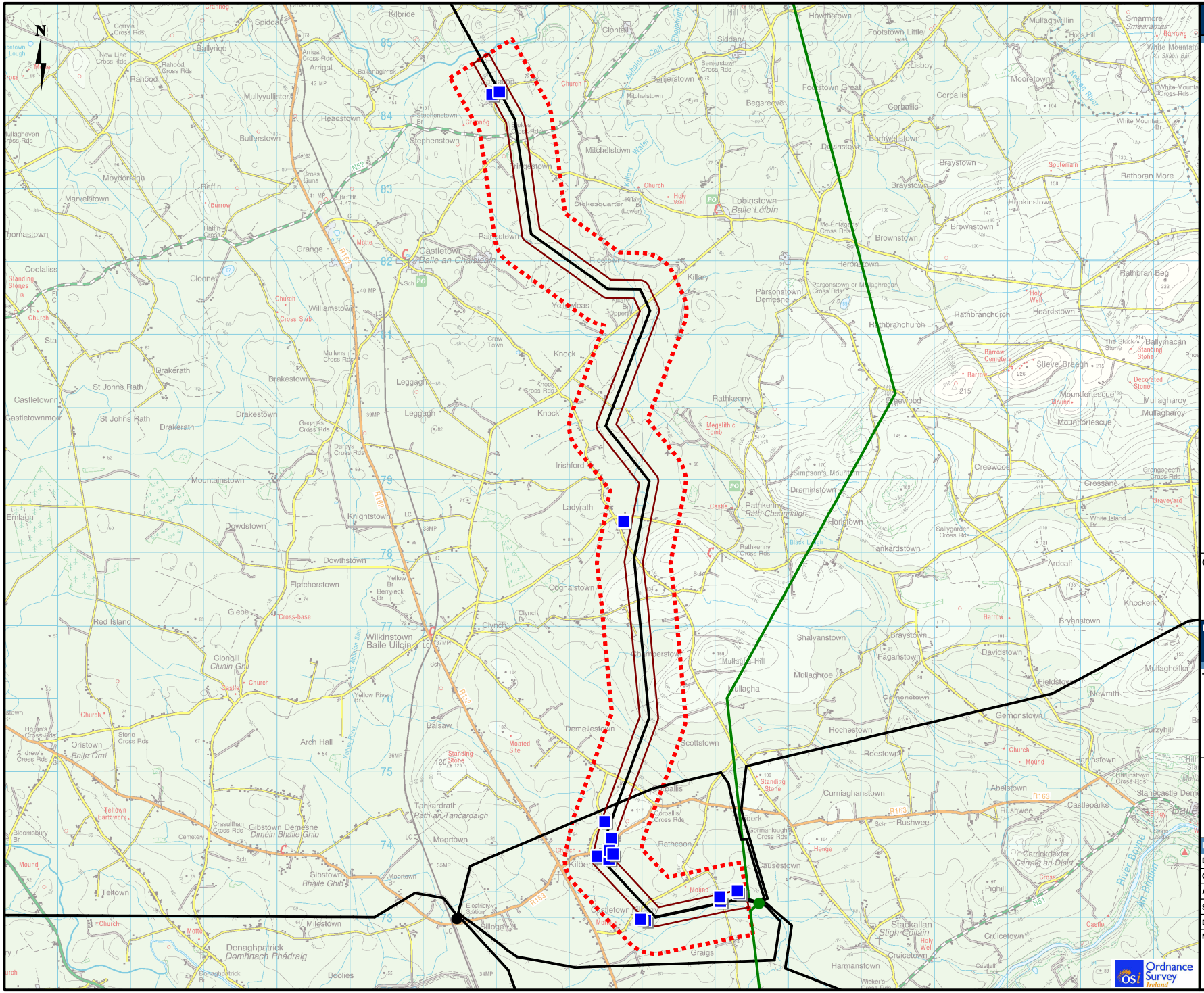
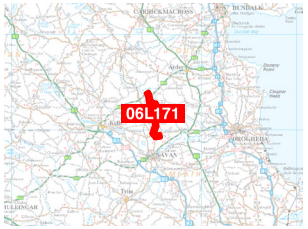
APPENDIX B(viii)

CONSTRUCTION STUDY SITES



Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Kilberry, Co. Meath (Gorman-Meath Hill 110kV)

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0038D01
Approved by:	xxxx		
Scale:	1:70,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0038	D01

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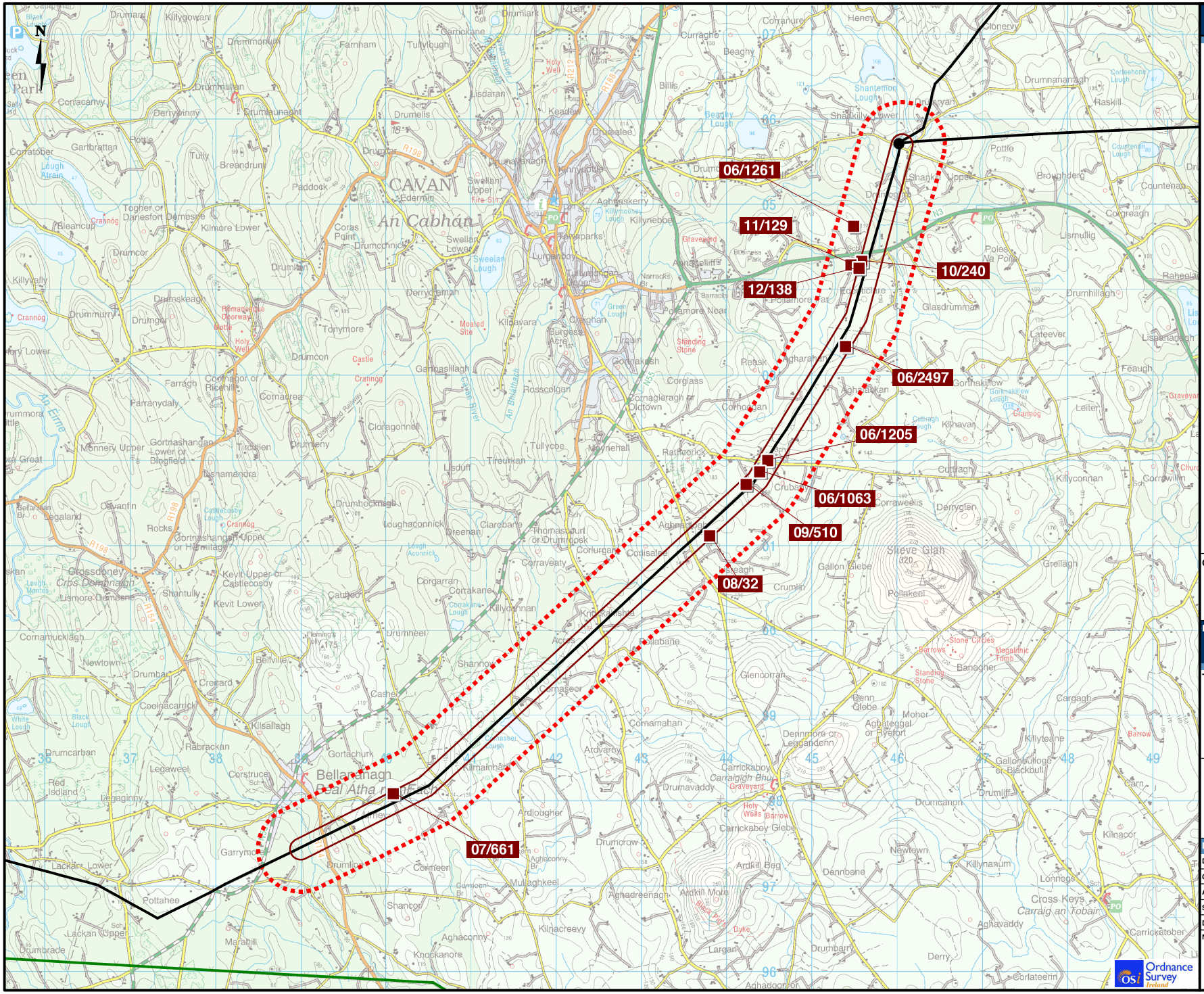
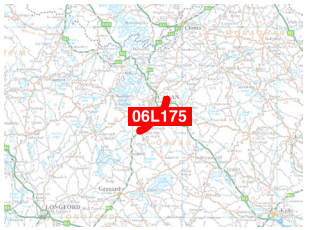


Legend

- Density Study Boundary
- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Co. Cavan (Arva-Shankill 110kV)

RPS

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Drawn by:	S. Khan	Project No.	MDE1020
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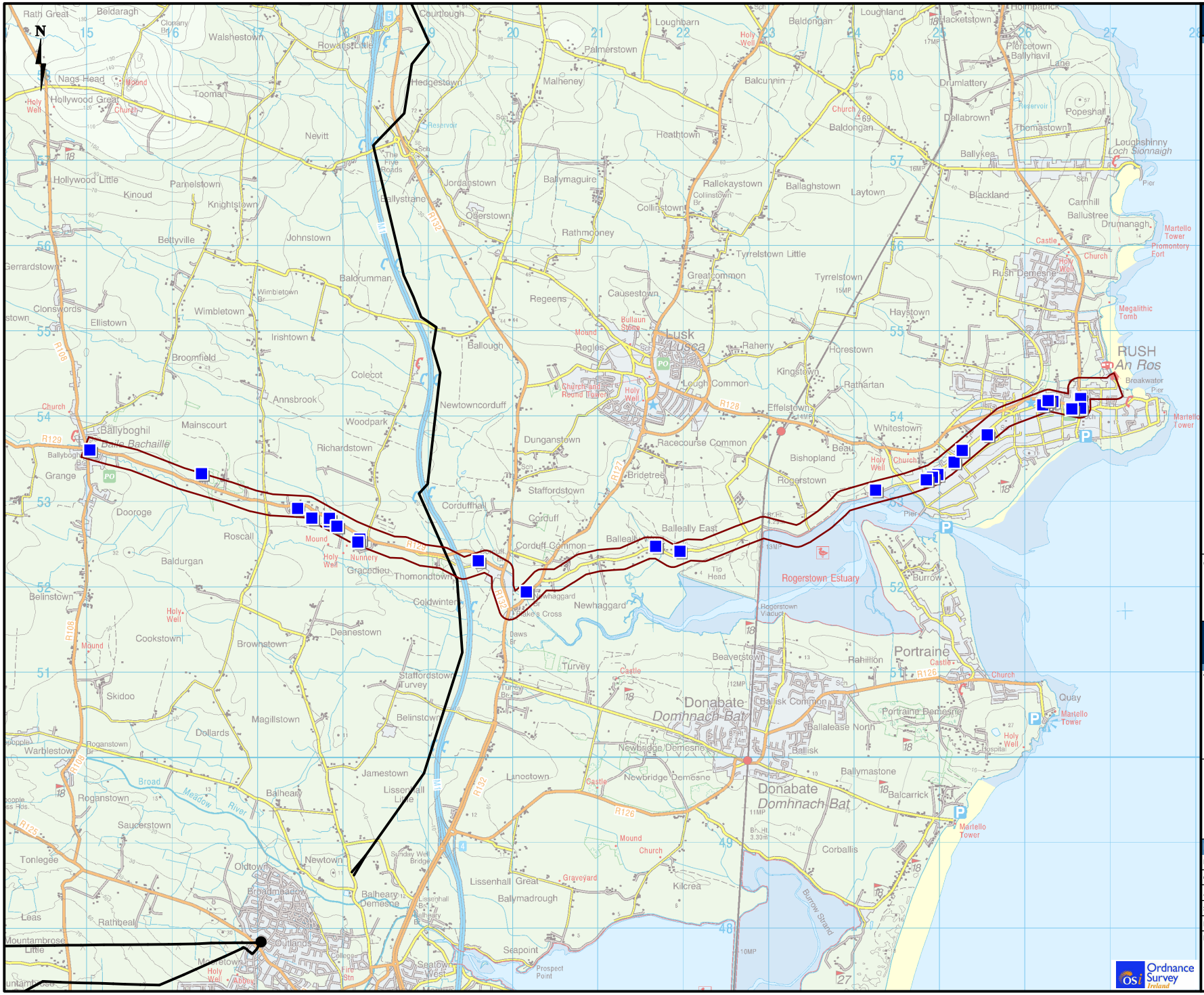

Legend

- Planning Application Boundary
- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Referenced Planning Application
- Other Planning Application

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Rush, Co. Dublin (East-West Interconnector 220kV)

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0048D01
Approved by:	xxxx		
Scale:	1:60,000 (A4)	Drawing No.	Rev.
Date:	06/09/2012	Mi0048	D01

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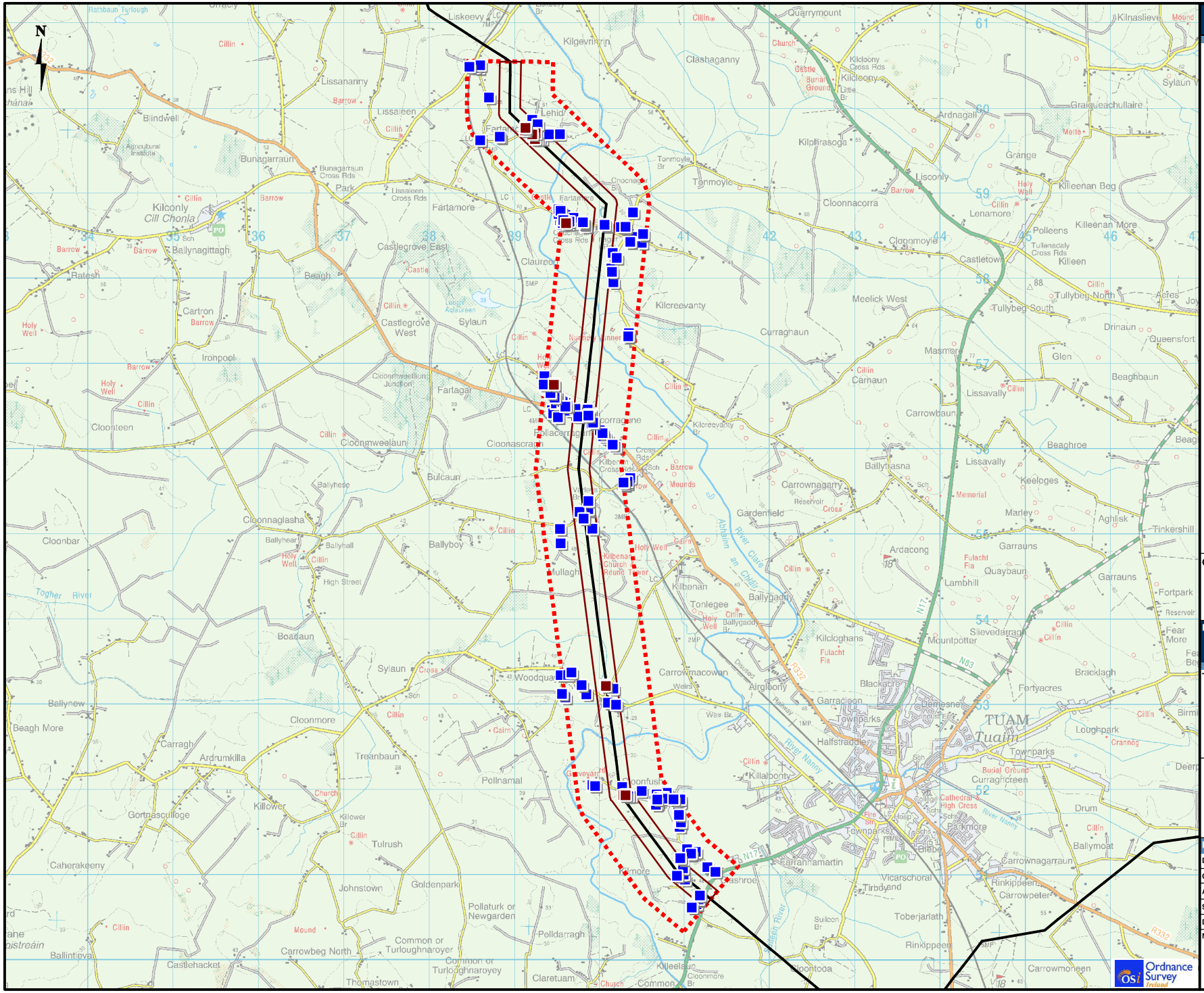
N
Legend
Density Study Boundary
Planning Application Boundary
110kV Line
220kV Line
400kV Line
110kV Sub Station
220kV Sub Station
400kV Sub Station
Referenced Planning Application
Other Planning Application
06L176
Client
EIRGRID
Project
EirGrid - Evidence Based Guideline Studies
Title
Co. Galway
(Cloon - Castlebar 110kV)
RPS
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Dun Laoghaire,
Co. Dublin
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Issue Details
Drawn by: N. O'Neill
Project No. MDE1020
Checked by: L. Kenny
File Ref. MDE1020Mi0123D02
Approved by: xxxx
Scale: 1:60,000 (A4)
Drawing No. Mi0123
Rev. D02
Date: 15/11/2013
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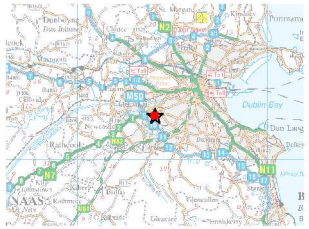
APPENDIX C

COEXISTENCE AERIAL MAPS

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Ballymount Study Site: Ballymount Drive (Commercial Coexistence)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0103D01
Approved by:	xxxx		
Scale:	1:4,000 (A4)	Drawing No.	Rev.
Date:	24/10/2012	Mi0103	D01

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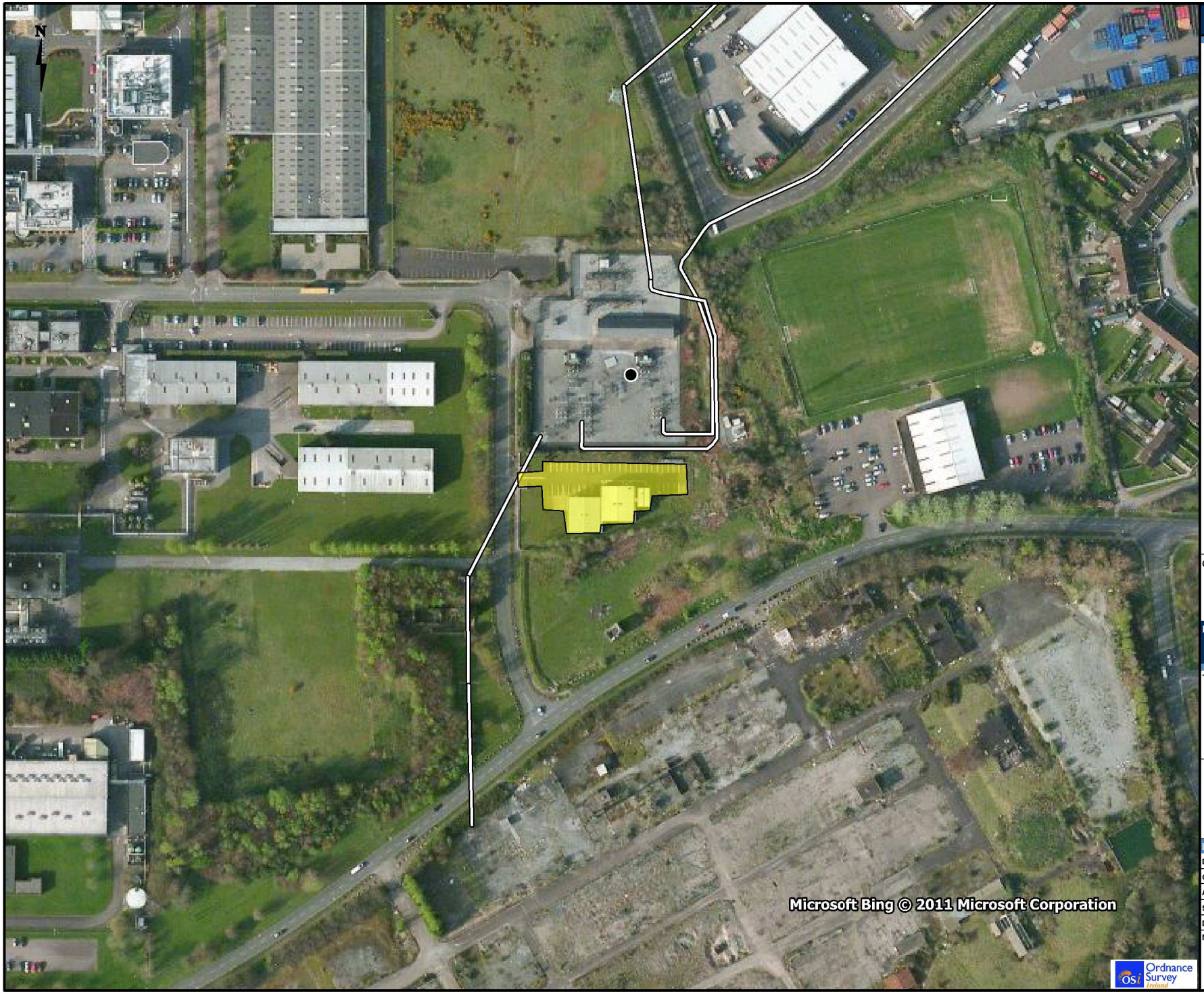

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Castleview Study Site: Castleview (Commercial Coexistence)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0104D01
Approved by:	xxxx		
Scale:	1:2,500 (A4)	Drawing No.	Rev.
Date:	25/10/2012	Mi0104	D01

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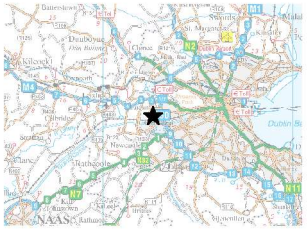
Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure



Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Neilstown Study Site: Neilstown Road (Residential Coexistence)

RPS

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Issue Details

Drawn by:	S. Khan	Project No.	MDE1020
Checked by:	P. Hickey	File Ref.	MDE1020Mi0105D01
Approved by:	xxxx		
Scale:	1:2,500 (A4)	Drawing No.	Rev.
Date:	25/10/2012	Mi0105	D01

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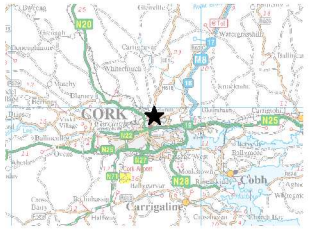
Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure



Client

EIRGRID

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EirGrid - Evidence Based Guideline Studies

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Date: 25/10/2012			

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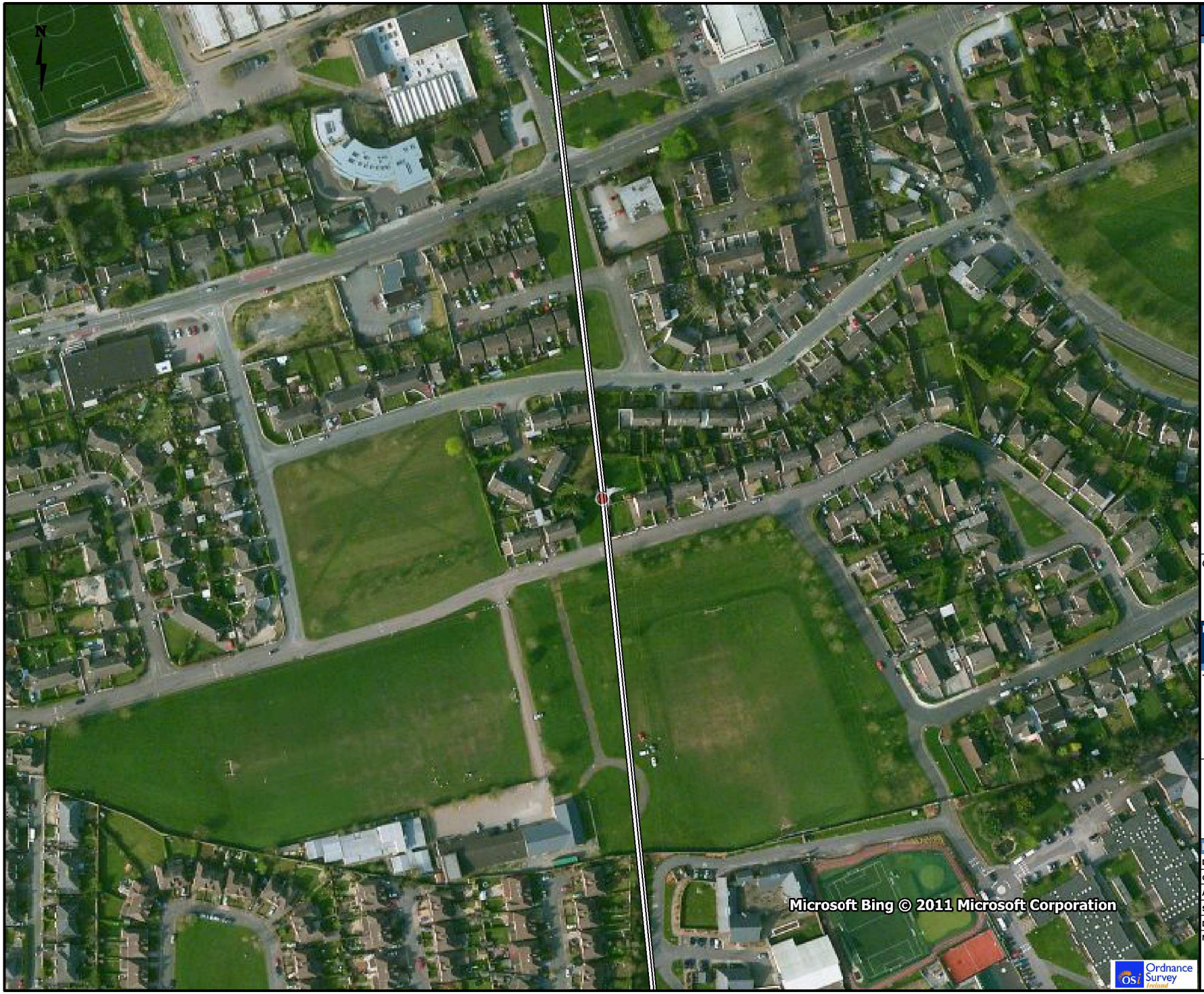

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

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Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

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Date:	25/10/2012	Mi0108	D01

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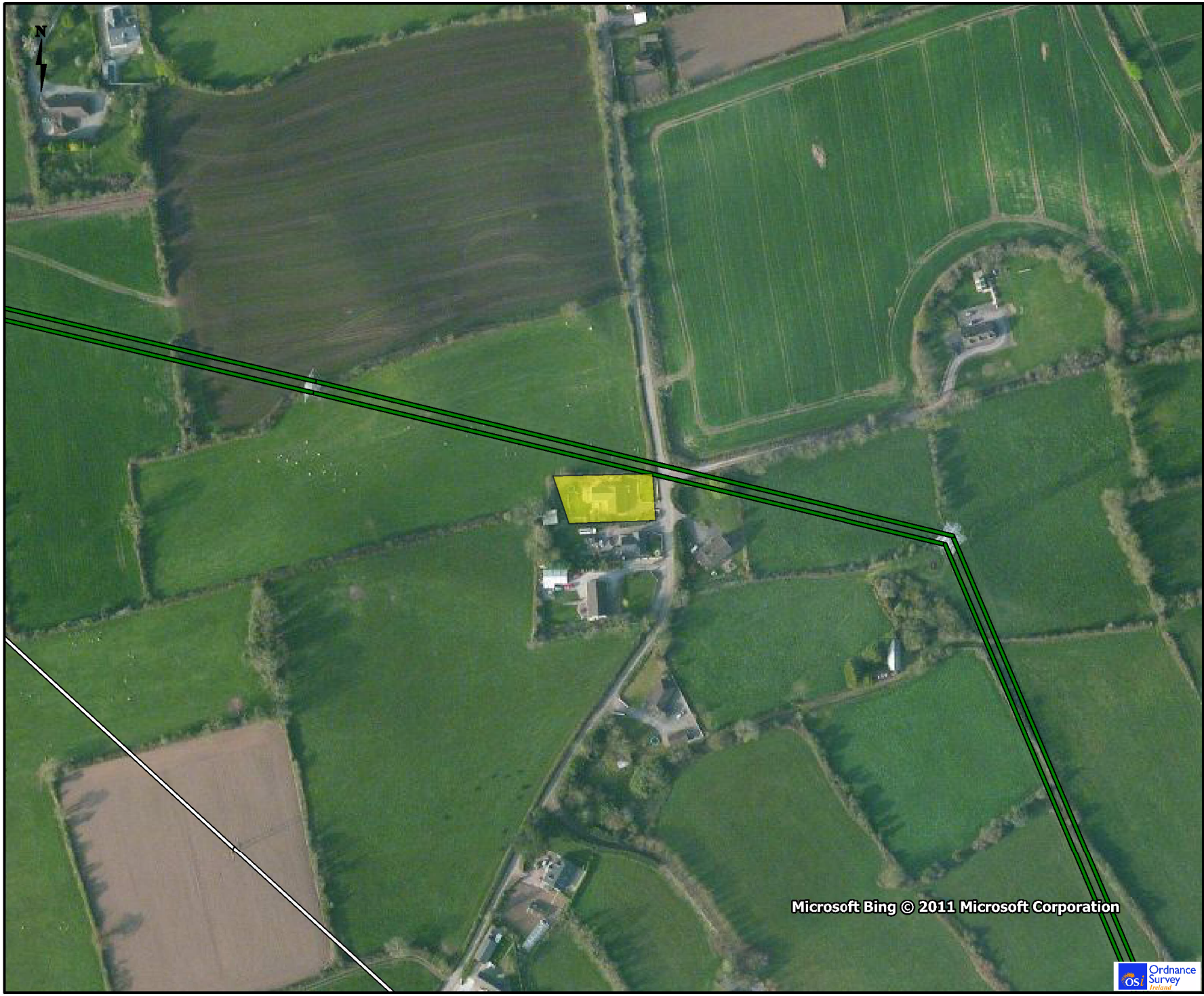

Legend

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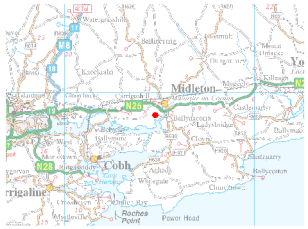
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure



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Approved by:	xxxx		
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Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

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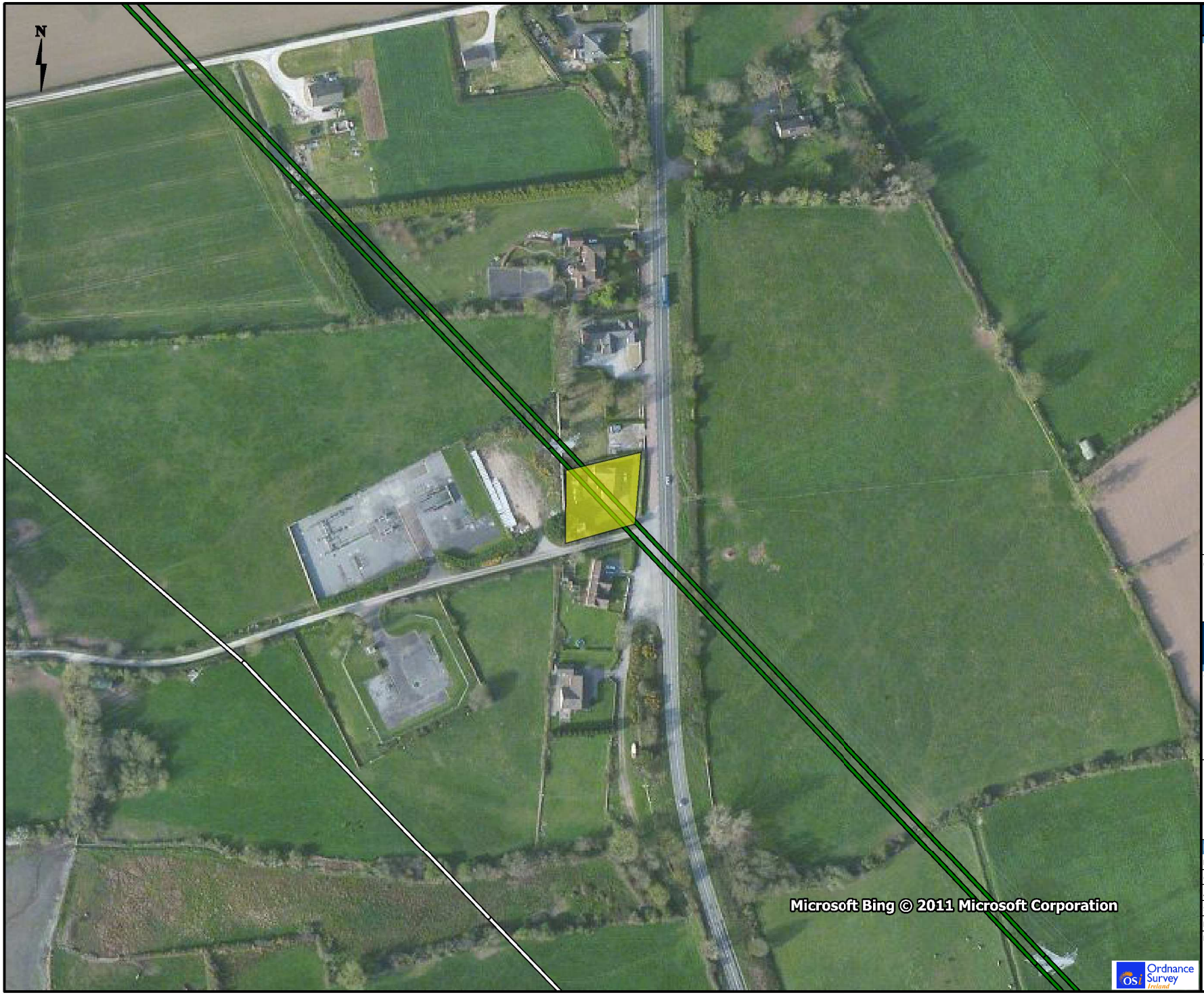

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

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Approved by:	xxxx		
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Date:	25/10/2012	Mi0111	D01

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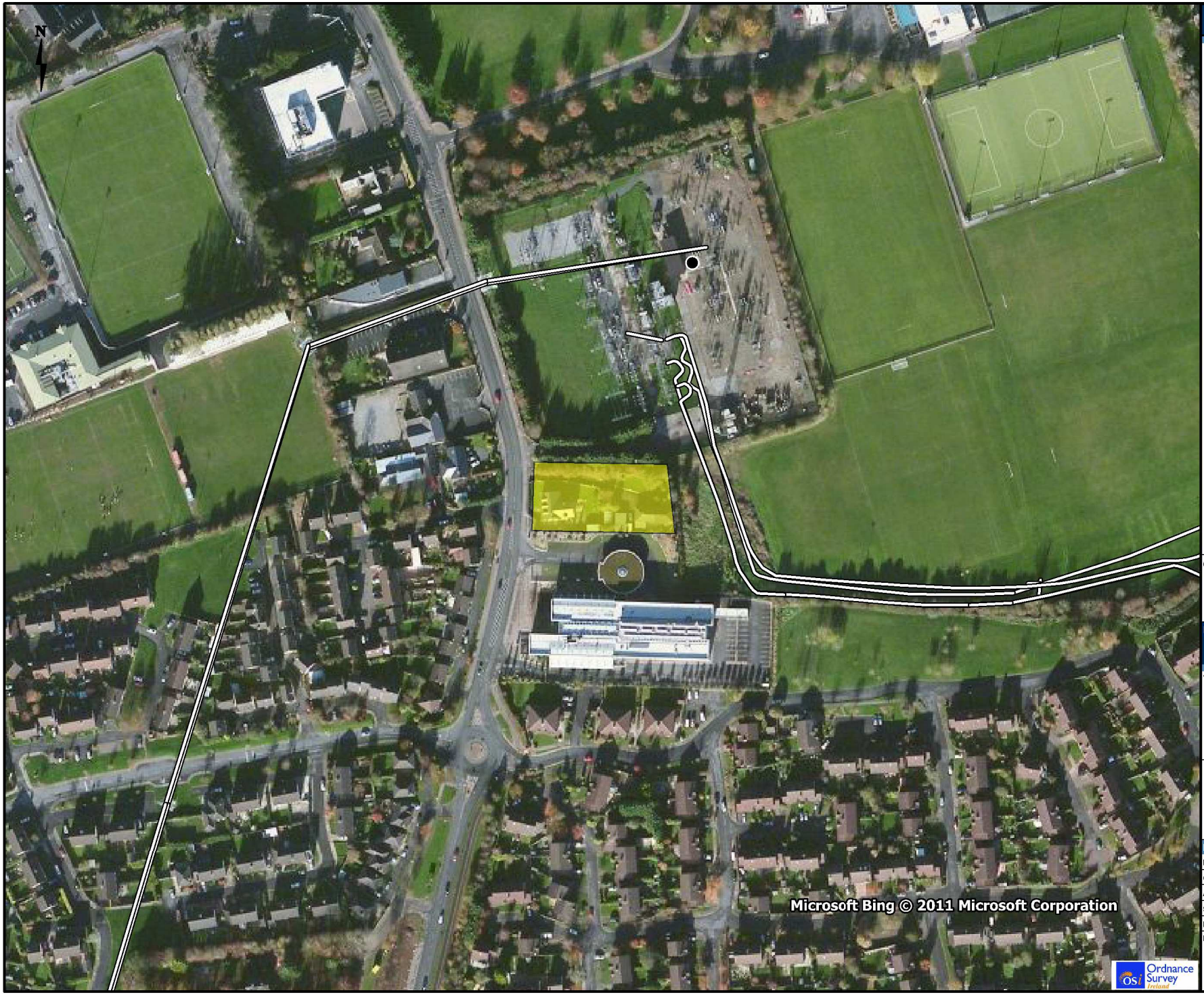

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

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Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

Title

Kilternan/Stepaside Study Site: Ballycorus Rd (Residential Coexistence)

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Date:	25/10/2012	Mi0113	D01

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Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

Project

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Approved by:	xxxx		
Scale:	1:5,000 (A4)	**Drawing No.**	Mi0114
Rev.	D01		
Date:	31/10/2012		

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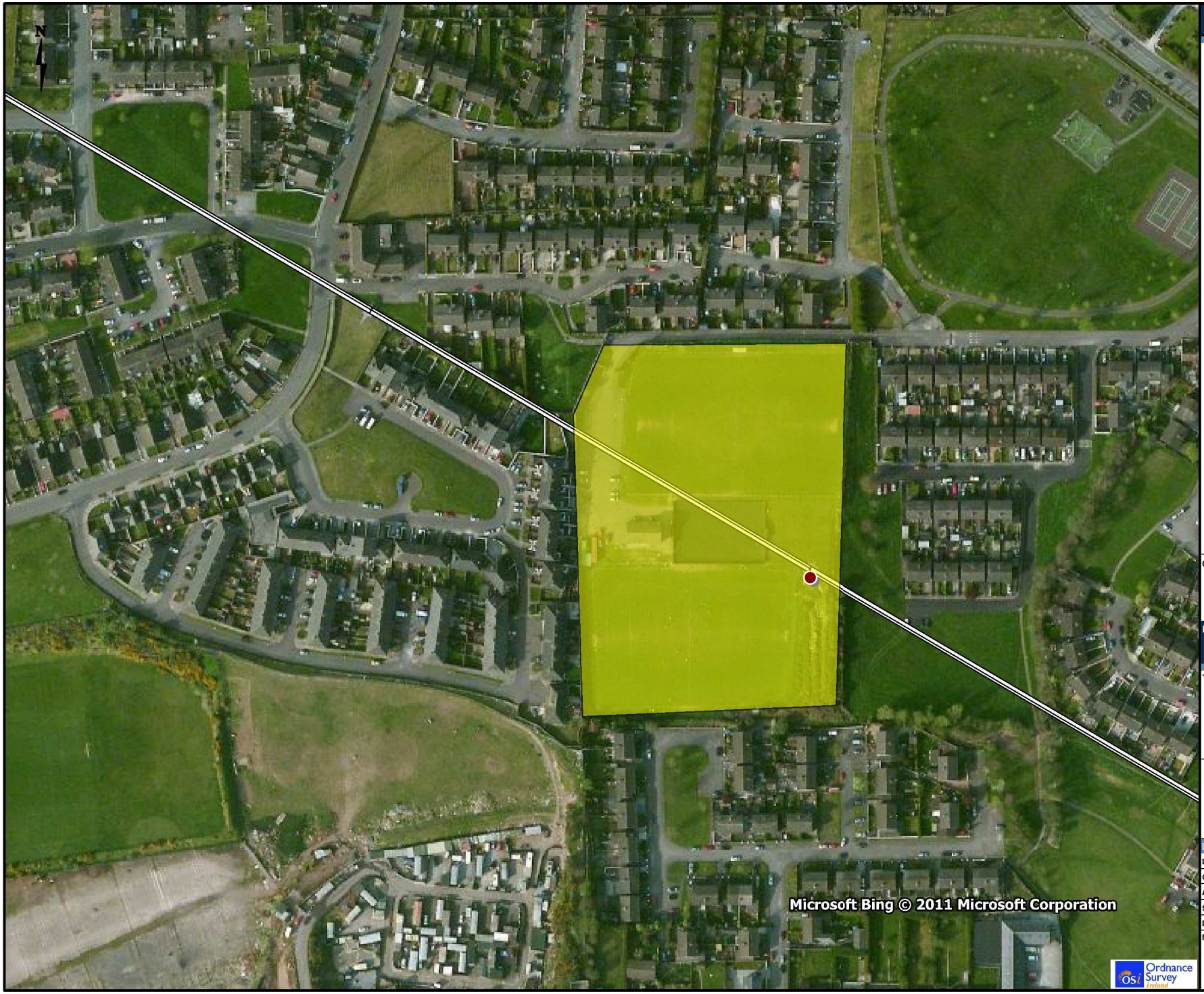

Legend

- 110kV Line
- 220kV Line
- 400kV Line
- 110kV Sub Station
- 220kV Sub Station
- 400kV Sub Station
- Building traversed by OHL
- OHL Structure

Client

EIRGRID

Project

EirGrid - Evidence Based Guideline Studies

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APPENDIX D

PLANNING POLICY REVIEW

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
Fingal County Development Plan 1999-2004	Social and Physical Infrastructure Provision There is an urgent need for the provision of new and improved social and physical infrastructure.	Social and Physical Infrastructure Policy *5.5.3 Overhead Cables* It is the policy of the Council to seek the placing underground of all electricity, telephone and TV cables wherever possible, in the interest of visual amenity and public health. It is the intention of the Council to cooperate with other agencies as appropriate, and to use its development control powers in the implementation of this policy. Overhead cables detract from visual amenity and have been perceived as posing a health risk due to the potential dangers associated with electromagnetic radiation.	Specific Objective *3.4.2.Blanchardstown/ Castleknock* To improve the existing physical character of the historic Castleknock village including undergrounding of overhead cables, street lighting, paving, street furniture etc., with a view to enhancing the historic nature of the village.			
Fingal County Development Plan 2005-2011	Utilities The quality of the utilities available within the County is important in determining the quality of life for its citizens is vital to the economy of the area and is an important aid to the achievement of sustainable development. The availability and provision of utility services has a significant influence on the scale, location and timing of new development. The	Policy RP11 To ensure that narrow strips of land, road-junction sight-lines, leftover plots beside houses and areas of unsupervised land with limited road frontage will not be accepted as Open Space and cannot be included within the calculation of Open Space Requirement as defined in this Plan. Likewise, ESB sub-stations or gas	Policy UTP51 To support and facilitate the development of enhanced electricity and gas supplies to the County and to cooperate and liaise with statutory and other energy providers in relation to power generation in order to ensure adequate power capacity for the future needs of the County.			

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
	continued development of Fingal as one of the leading business and residential centres in the country depends upon the satisfactory and timely provision of diverse services and utilities by a variety of private and public bodies. Water, sewerage, waste management, electricity, telecommunications and gas services provide essential infrastructure to meet business and residential needs.	installations cannot be located in Open Space areas.				
	Overhead Cables Overhead lines and ancillary development can frequently detract from the visual amenity of both urban and rural areas.	Policy UTP57 To seek the placing underground of all electricity, telephone and TV cables where ever possible, in the interest of visual amenity and public health. It is the intention of the Council to co-operate with other agencies as appropriate, and to use its development control powers in the implementation of this policy.	Objective ENO2 To require applicants to submit, in the case of all large applications for overhead power lines of 132kV or more: / A visual presentation of the proposal in the context of the site in order to assist the Council in determining the extent of the visual impact, / A cost/benefit analysis specifying the respective cost of an underground and overhead line, / An Environmental Impact Assessment where the line is likely to have a significant effect on the environment, / Details of compliance with all internationally recognised standards with regard to proximity to dwellings and other inhabited structures.	Objective BLANCHARDSTOWN 9 To upgrade the visual environment of Blanchardstown Village by (i) The removal of unauthorised signs. (ii) The replacement of overhead cables and wires by underground services. (iii) The rationalisation of public car parking. (iv) The introduction of appropriate landscaping, and paving.		

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
Fingal County Development Plan 2012-2017	Energy Background 4.3 Energy consumption is unavoidable. Modern societies consume huge amounts of energy to heat homes and offices, fuel transport systems, power industry and generate electricity. Whilst Ireland is no exception, it suffers a number of marked disadvantages insofar as energy is concerned, due to its small size and island location. This isolation from the European energy infrastructure accentuates the need for security of energy supplies, efficient energy infrastructure, and for development of indigenous resources to the maximum extent possible. Managing our demand for energy in a sustainable way will therefore be extremely important. Using energy more efficiently, producing cleaner energy and using energy sources which minimise damage to the environment are sustainable energy policy aims. Overhead Cables 4.3 Overhead lines and ancillary development can frequently detract from the visual amenity of both urban and rural areas	Statement of Policy 4.3 Support and facilitate the development of enhanced energy supplies to the County, with an emphasis on renewable energy supplies, and cooperate and liaise with statutory and other energy providers in relation to power generation in order to ensure adequate power capacity for the future needs of the County.	Objective EN12 Seek the placing underground of all electricity, telephone and TV cables in urban areas. It is the intention of the Council to co-operate with other agencies as appropriate, and to use its Development Management powers in the implementation of this policy.	Objective EN13 Require that, in all new developments, multiple services be accommodated in shared strips and that access covers be shared whenever possible	Objective EN14 Require applicants to submit, in the case of all large applications for overhead cables of 110kV or more: (i) a visual presentation of the proposal in the context of the route in order to assist the Council in determining the extent of the visual impact. (ii) details of compliance with all internationally recognised standards with regard to proximity to dwellings and other inhabited structures.	

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
Dublin City Development Plan 1999-2005	14.1.16 All services should be provided underground in the interest of amenity.					
Dublin City Development Plan 2005-2011	Infrastructure 12.0 Other infrastructural requirements and issues relating to energy supply and communications; while not the direct remit of Dublin City Council, nevertheless, have significant implications for planning and development. These requirements are also included as objectives in this Plan. Dublin City Development Board's Greener City and Safe City strategies seek to reinforce the city's environmental and safety agendas. Energy Supply 12.5 Significant increase in energy consumption over recent years has occurred due to increases in population, households and employment, particularly the expansion of energy intensive industries such as telesales/call centres and science and technology based industries. Dublin City Development Board's "Connected and Informed Strategy" seeks to develop Dublin as a city where everyone will	POLICY U44 It is the policy of Dublin City Council to support a wide range of energy solutions to meet consumption needs, including encouraging renewable energy sources. In this respect energy recovery could play an increasingly important role.				

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
	have access to manageable information and have the means and ability to communicate with each other. Deregulation of the energy sector has taken place such that the ESB monopoly on energy production no longer exists. Private sector companies will in future be seeking to develop fossil and renewable forms of energy. The Government has established targets to add substantial renewable energy.					
Dublin City Development Plan 2011-2017	Water, Drainage, Waste, Energy And Telecommunications Infrastructure 5.2.0 Infrastructural requirements and issues relating to energy supply and telecommunications, while not the direct remit of Dublin City Council have implications for planning and development. The Strategic Approach 5.2.3 Providing necessary infrastructure and the securing of corridors for utility infrastructure to match the compact spatial pattern of development Energy Supply 5.2.4.15 The development of a secure and reliable energy network is recognised as	Policy SI60 To support a wide range of energy solutions to meet consumption needs, with a particular emphasis on renewable energy sources to secure a low carbon electricity supply (see also sections 5.2.4.2, 5.2.4.15, 5.2.4.16, and 8.4.6)	Objective SIO89 To support the government targets of having 40% of electricity consumption generated from renewable energy sources by the year 2020 (see also section 5.2.4.2) .			

	Energy, Utilities and Physical Infrastructure	Planning Policy/Objective	Planning Policy/Objective	Planning Policies/Objectives		
	an important element for not only supporting economic development but also to provide for the needs of every sectoral interest in the city. Dublin City Council will support a wide range of energy supply solutions to meet future demand, with particular emphasis on renewable energy sources and those which are less carbon intensive. Dublin City Council is cognisant of the future requirements of the service providers in relation to enhancing and upgrading existing facilities or networks. Where possible, Dublin City Council will support the statutory providers of national grid infrastructure by safeguarding strategic corridors where identified from other developments which might inhibit the provision of energy supply networks <u>Appendix 29 – Land-Use Definitions</u> Public Service Installation A building, or part thereof, a roadway or land used for the provision of public services. Public services include all service installations necessary for electricity, gas, telephone, radio, telecommunications, television, data transmission, drainage, including waste water treatment plant and other					

	Energy, Utilities and Physical Infrastructure	**Planning Policy/Objective**	**Planning Policy/Objective**	**Planning Policies/Objectives**		
	statutory undertakers: bring centres, green waste composting centres, public libraries, public lavatories, public telephone boxes, bus shelters, etc but does not include incinerators/waste to energy plants. The offices of such undertakers and companies involved in service installations are not included in this definition.					

APPENDIX E

OVERVIEW OF ELECTRICITY TRANSMISSION INFRASTRUCTURE, INCLUDING TYPICAL CONSTRUCTION METHODOLOGY

E1 Description of Typical Electricity Transmission Project Designs

The transmission network in Ireland comprises structures and overhead lines, underground cables and substations. When the need for a new circuit is identified in Ireland, EirGrid will consider all available solutions for the new circuit. This will include overhead line and underground cable solutions, considering both High Voltage Alternating Current (HVAC) and High Voltage Direct Current (HVDC) technology, as appropriate.

Factors which will influence the solution decision include technical, economic and environmental considerations. It is important to note that each project is different and EirGrid will determine potential technology solutions on a project-by-project basis. EirGrid will continue to keep technology developments under review and will consider new technologies as appropriate.

E1.1 Overhead Lines (OHL)

Transmission lines are generally supported on either wooden pole sets or steel lattice towers. Towers along a straight of the alignment are known as intermediate towers. Angle towers are used where a line changes direction and conductors are held under tension.

The type and height of structures required will vary according to the voltage of the overhead line, and the location and type of environment and terrain in which they are placed.

E1.2 Structure Design

For all new electricity transmission projects, efficient, appropriately placed and optimally designed structures are carefully considered and proposed. The design employed depends on the local environment, topography and technologies involved, and will vary from 110 kV, 220 kV or 400 kV, depending on the specific transmission need identified.

The spacing between structures depends on technical limitations and on the topography, particularly to ensure that conductors maintain a specific minimum clearance above the ground at all times.

Steel Lattice Tower Structures

The weight of conductors and characteristics of 220 kV and 400 kV lines require that they be supported exclusively on lattice steel structures (this also applies to angle towers along a 110 kV line). The three phases (conductors) of a circuit are carried in a horizontal plane.

Table A1: Key Design Features: Single Circuit 220 kV and 400 kV overhead line structures

Key Design Features	220 kV Indicative Range	400 kV Indicative Range
Height range	Depends on technical details of individual projects but generally between 20-40m	Depends on technical details of individual projects but generally between 20m -52m
Maximum range of width at ground level	6m to 12m	7m to 12m
Number of foundations per structure	4	4
Average span between towers	Approx. 320m (dependent on local topography)	Approx. 350 (dependent on local topography)

Example of a 400 kV intermediate tower design along the Dunstown-Moneypoint overhead line, Co Clare

Example of a 220 kV intermediate tower design along the Cashla – Flagford overhead line, Co Roscommon

Single Circuit 110 kV Overhead Lines

A 110 kV single circuit overhead line requires that conductors (and earth wires[1]) are supported on a combination of steel lattice angle towers and double wood intermediate polesets.

The average span between polesets for a 110 kV single circuit alignment is approximately 180m; however, the actual span achievable depends on local topography. Again, the three phases of the circuit are carried in a horizontal plane.

Table A2: Key Design Features of Single Circuit 110 kV overhead line support structures

Key Design Features	110 kV Indicative Range
Height range (double wood polesets)	16m to 23m (incl. buried depth normally 2.3m)
Pole centres	5m
Number of foundations	2
Height range (steel angle towers)	18m to 24m
Maximum width at ground level	4m to 9.8m
Average span	180m

Example of a typical 110kV single-circuit double wood polesets with earthwire (Co Sligo)

On an alignment there may arise a very slight change in direction, and this may necessitate, in the case of a 110 kV single-circuit line, the use of a braced wood poleset, wherein the space between the polesets is reinforced with steel members.

[1] Lines running above the conductors which protect the conductors from lightning strike.

Braced double wood poleset

Double Circuit Overhead Lines

Overhead alignments can be configured as single circuit or double circuit (two separate circuits supported on a single structure). This generally only occurs where two single circuit lines are in close proximity (for example on approach to a substation), or where space is at a premium.

Double circuit alignments, including 110 kV overhead lines, always require to be supported by lattice steel towers. The average number of structures on a line is 3-4 per km depending on topography. In addition, the structures are higher, as each circuit must be carried in a vertical plane.

Typical 110 kV double circuit structures

E1.3 Construction of Overhead Lines

Overhead line construction typically follows a standard sequence of events comprising:

- Prepare access;
- Install tower foundations/Excavation;
- Erect towers or wood poles;
- Stringing of conductors;
- Reinstate tower sites and remove temporary accesses.

Prepare Access
It is preferable to have vehicular access to every tower site for foundation excavation, concrete delivery and a crane to erect towers. With wood pole construction, (on 110 kV single circuits) a crane is not usually required, as these are normally erected with a digger using a lifting arm.

Access can take various forms and is dependent on ground conditions. In poorer conditions, more complex access works are required which can vary from the laying of bog mats, or laying temporary wooden matting, to installing crushed stone roads. Some of this work may entail removal of topsoil.

Access routes may require to be constructed for both the construction and maintenance of the transmission line, and may be temporary or permanent.

Every effort is made to cause least disturbance to landowners and local residents, and to cause the least potential environmental impact during construction. As a result, the most direct access route to a tower installation may not always be the most appropriate.

Example of a newly built access route for a transmission project, Co. Donegal

Install Tower Foundations/Excavation

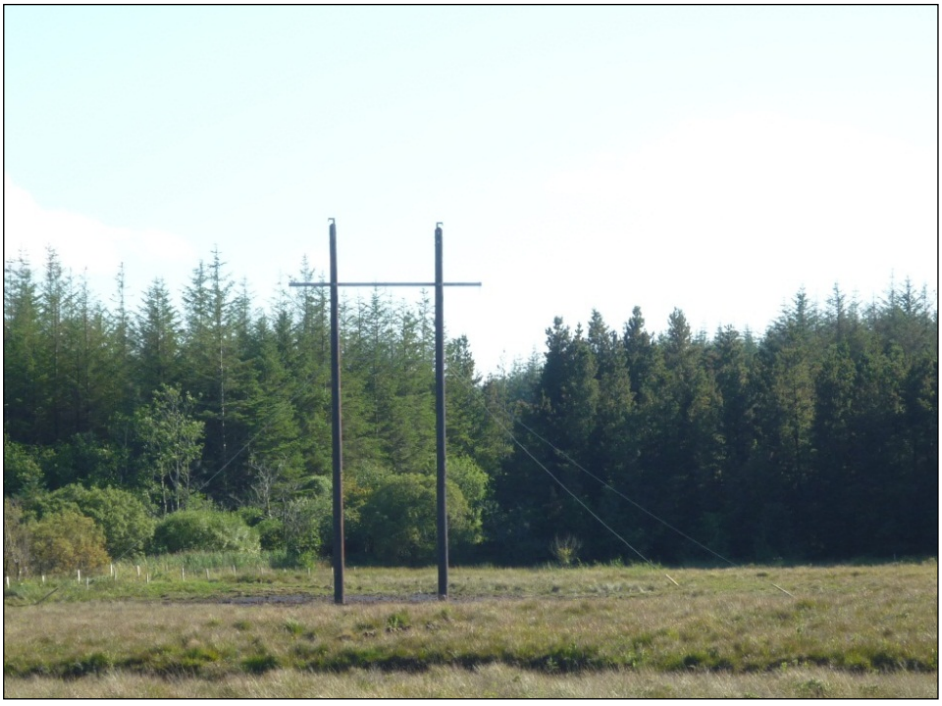
Tower foundations are typically 2–4m deep with excavation carried out by mechanical excavator. Excavations are set out specifically for the type of tower and the type of foundation required for each specific site.

A larger footing may be required in the case of weak soils. Pile foundations may be required in the case of deep bog. In the case of rock being encountered at shallow depths, reduced footing size foundations may be required.

Prior to excavation, the foundations for each tower site will be securely fenced off to ensure the safety of members of the public and livestock. Tower stubs (the lower part of the tower leg) are concreted into the ground. Once the concrete has been poured and cured, the excavation is back-filled using the original material in layers. Surplus material is removed from site.

The excavation required for a wooden poleset is typically 1.5m-2m x 3m x 2.3m deep; no concrete foundations are required for polesets in normal ground conditions. Installation time is approximately two per day. The average foundation size for a braced poleset is 9.3m x 3.1m x 3.2m deep.

In addition to the excavation required for the poleset itself, where ground conditions dictate, stay lines may be required. This generally involves excavation of four trenches (approximately 2m x 2m x 1.8–2m deep) at a distance from the poleset. The installation of stay wires expands the area of disturbance associated with the erecting a poleset.



Stay lines in place, Donegal 110 kV Project

Concrete foundations are required for all steel towers. Foundation size and type is dependent on ground conditions and tower type, but is typically 4m x 4m x 3.1m for each foundation pad. The base installation time is approximately one week.

110kV angle towers at Srananagh Station with exposed substructures

For all transmission lines with earth wires, there is a requirement to install an earth ring or mat at the base of the structure to ground the structure for safety reasons. The ground around the base of structures is excavated after conductors and earthwires are in place and the earth ring is installed.

Earth ring on Donegal 110kV Project

Erect Towers or Wood Poles

Materials required for construction are transported around the site by general purpose cross country vehicles with a lifting device. Excavators are generally of the tracked type to reduce likely damage to and compaction of the ground. In addition a temporary hard standing may be required for machinery and this may require the removal of topsoil. Materials are delivered to site storage/assembly areas by conventional road transport and then transferred to sites.

Tower erection can generally commence two weeks after the foundations have been cast. Tower steelwork is usually delivered to site and assembled on site.

Installation of tower using a derrick pole at the base

Construction of wooden poleset support structure for Donegal 110 kV Project (Binbane – Letterkenny)

Stringing of conductors

Once angle towers are erected, conductor stringing can commence, installing conductors from angle tower to angle tower via the line intermediate structures. Conductor drums are set up at one end of the straight with special conductor stringing machinery, and pulled from one end to the other.

Stringing Machine

Conductor stringing equipment

Reinstate tower sites and remove temporary accesses

The disturbed ground around a tower or poleset location is made good, and all temporary access materials generally removed.

E1.4 Line Uprating and Refurbishment

In general a transmission line requires little maintenance. It is periodically inspected to identify any unacceptable deterioration of components so that they can be replaced as necessary. A more detailed condition assessment on a line is usually carried out when it is approximately 35 years old.

The majority of the existing transmission grid was constructed after 1960; the majority of those lines constructed prior to 1960 have already been refurbished. There is an on-going programme of line refurbishment concentrating on older lines.

Refurbishment projects are condition based, and once a line has been identified for refurbishment, consideration is given to the potential opportunity to upgrade its carrying capacity or thermal rating. This might involve replacing existing conductors with modern conductors which, while having effectively the same diameter, can carry significantly greater amounts of electricity.

Often the additional weight of these replacement conductors means associated replacement of support structures with stronger structures. Where structures require replacement during a line upgrade or refurbishment, additional excavation may be required particularly where angle towers or structures require replacement. In general they are replaced within the footprint of the original structure.

Insulators and conductors are normally replaced after about 40 years, and towers are painted every 15-20 years or as necessary.

E1.5 Underground Cabling (UGC)

High voltage (HV) circuits can only be laid underground using special HV cables designed specifically for underground use. The conductors in underground HV cables must be heavily insulated to avoid a short circuit between the conductor and the ground around the cable.

Table A3: Key Design Features: Underground Cabling

Key Design Features	HV Cable (typical dimensions)
Cable Trenches	c.0.6m wide-1.25m deep for a 110 kV trench, c. 1.1m wide x 1.25m deep for 220 kV and 400 kV for a single cable
Joint Bays	6m long, 2.5m wide and 1.8m deep
Excavation trench for Joint Bay	7m long, 3m wide and 2m deep
Average span between joint bays	500m–700m
Directional Drill entry and exit pits	1m x 1m x 2m

The cable is installed directly into the ground in an excavated trench. The majority of high voltage cable routes are located along public roads and open spaces. It is very unusual for a cable route to cross private open ground but this may be the case on occasion. The civil contractor will scan the ground using a cable avoidance tool (CAT), carry out a visual inspection of existing services and compare the information with the utility service records which they will have obtained from the various service providers in advance. If any previously unidentified services are discovered the site engineer will adjust the cable route accordingly.

Typical 110kV Trench Excavation (Ducts in Trefoil Formation)

The overall installation of a cable route over a large distance is broken down into sections of cable that are connected using a cable joint. Cable joints are installed in joint bays which are typically concrete structures buried underground, occurring generally every 500–700m along an alignment, and ranging in size up to 6m long, 2.5m wide and 1.8m deep.

Typical Joint Bay Construction Adjacent to Public Road

If the cable was installed directly in the ground the entire trench from joint bay to joint bay must be fully excavated. The advantage with installing cable in pre-laid ducts is that only a short section of cable trench, up to 100m is open at any time. This helps to minimise the impact on the local residents and minimise traffic impact at any given time.

Typical HV Cable Installation

Once installed, the road surface is reinstated. Where a cable route is in an open area, it is returned to agricultural/grassland use. Where a cable passes through forested land the route is not replanted with trees to prevent any damage to the cable by tree root growth.

Re-growth following underground cable construction on agricultural land

E1.6 Substations

Substations connect two or more transmission lines; they take the electricity from the transmission lines and transform high to low voltage, or vice versa. They contain various electrical equipment, including voltage switches, transformers, protection equipment, and associated lines and cabling.

The siting of a substation depends on topography; the ground must be suitable to meet technical standards. With regard to earthing requirements and soil stability, substations are usually constructed on reasonably level ground, in areas that are not liable to flooding or crossed by significant watercourses.

A substation site is normally future proofed with the capability to be extended if the need arises.

Substations can take two forms:

An Air Insulated Switchgear (AIS) substation is where the electrical equipment infrastructure is primarily installed outdoors, with the use of natural air as an insulation between circuits. This option requires a relatively large compound footprint.

Srananagh 220kV/110kV substation, Co Sligo, example of a typical outdoor AIS substation

A Gas Insulated Switchgear (GIS) substation, is where gas (Sulphur Hexafluoride – SF6) is used as the insulation between circuits. This requires the electrical equipment to be contained internally, in buildings of some 11–13m over ground. This allows for a significantly smaller substation footprint.

Both options require the associated provision of access roads off and onto the public road network and the provision of associated electrical equipment and infrastructure (including underground cables), as well as ancillary waste water treatment facilities and other site development and landscaping works. Both are therefore significant civil engineering projects.

Example of a typical indoor GIS substation, Co Limerick