Laois-Kilkenny Reinforcement Project

Assessment of Alternative 400/110kV Substation Study Areas

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1 Introduction

1.1 Purpose of this Report

This report details the findings of a study carried out by ESBI on behalf of EirGrid in order to assess the suitability of potential 400/110kV substation study areas for the Laois-Kilkenny Reinforcement Project. In the interests of a robust and comprehensive analysis of potential substation study area locations, alongside the initial study area identified by the project team (at the intersection of the existing Carlow-Portlaoise 110kV and Moneypoint-Dunstown 400kV overhead lines), it was decided to include a study area centred on Cullenagh Mountain as suggested by the local community and two other alternative substation study areas located at direction change points on the existing 400kV line. The report therefore subjects each of the four potential study areas to examination under both technical and environmental criteria to determine the optimum study area within which to locate the required substation. A separate report will be prepared to determine the optimum location of a substation within whichever study area is found to be appropriate on foot of this current report.

1.2 Background

A newspaper notice advising of the proposed Laois-Kilkenny Reinforcement Project was placed in various regional newspapers the week commencing 26th October 2009. This advertisement also included a map showing the proposed project study area and substation study area. A copy of this newspaper notice is included in Appendix 1.

Upon publication of this notice, numerous queries were received from members of the public and a meeting was held with interested parties in the local area.

During this meeting it was suggested that an alternative location / study area for the substation be assessed. The location suggested as an alternative location was on Cullenagh Mountain, approximately 7km south west of the EirGrid Substation Study Area.

1.3 Study Areas Examined

Arising from these consultations it was decided to also assess other possible substation study area locations including those arising directly from the consultation process. The two additional areas selected were chosen at angle tower locations (changes of direction) along the Dunstown-Moneypoint 400 kV overhead line. To ensure consistency the study area size is the same for each area, namely 4km diameter (12.5 km sq.)

There are therefore four substation study areas assessed in this report as follows:

1. **Portlaoise Study Area** - Located to the southeast of Portlaoise at the intersection of the existing Carlow-Portlaoise 110kV and Moneypoint-Dunstown 400kV overhead lines.
2. **Cullenagh Substation Study Area** - Located on the south slopes of Cullenagh Mountain, as suggested by the local community group.
3. **Abbeyleix Substation Study Area** - Located along a change in direction of the 400kV overhead line, near Abbeyleix, Co. Laois.

4. **Cashel Substation Study Area** - Located along a change in direction of the 400kV overhead line, near Cashel, Co. Laois.[1]

Figure 1.1 shows these locations and a full A4 map showing these study areas can be found in Appendix 2

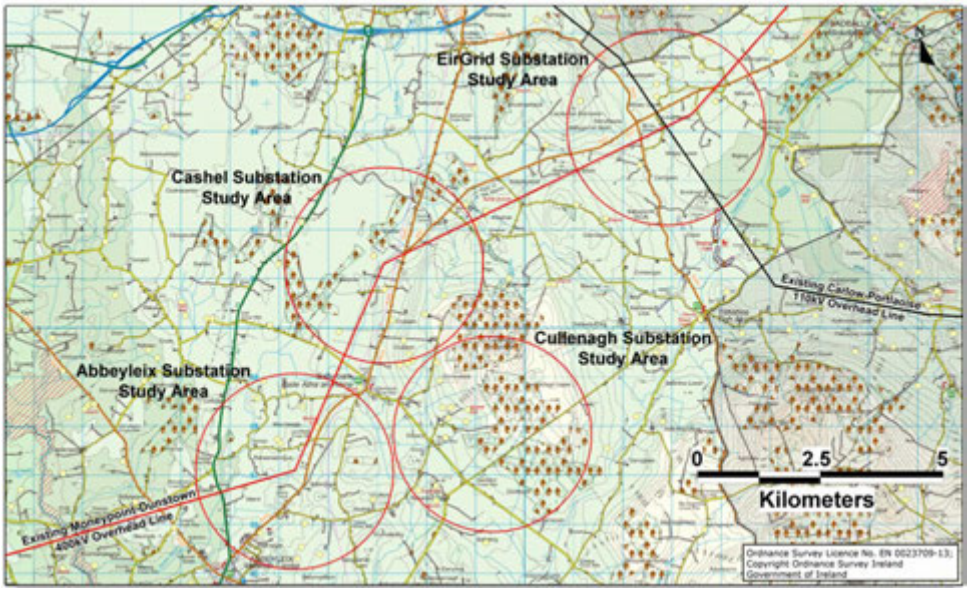


Figure 1.1: Alternative Substation Study Areas

Note: All study areas will require a connection to the proposed Ballyragget 110kV substation which is proposed to be built beside the existing Ballyragget 38kV substation. The possible route of this connection will be the subject of a separate report.

[1] The sole purpose of the names used for particular study areas in this report is to clearly identify and differentiate between study areas. The names should be considered as general placeholders at his juncture. The Portlaoise Study Area, as used in this report, refers to the substation study area location originally proposed by EirGrid (also referred to as the Eirgrid Study Area in this report). The Cullenagh Study Area refers to an alternative study area suggested by members of the public. The Abbeyleix and Cashel substation Study Areas refer to areas identified by the project team as other possible alternative locations.

2 Electrical Configuration

EirGrid is statutorily obliged to develop, operate and maintain a safe, secure, reliable, efficient and economic transmission system while having due regard to the environment.

As described in chapter 1, four configurations have been considered, namely:

- The 'Portlaoise Study Area', as originally proposed by EirGrid, requires the connection of the existing Dunstown - Moneypoint 400kV and Carlow - Portlaoise 110kV overhead lines into a new 400/110kV substation. These lines pass over each other at the centre point of this Study Area. In addition a new 110kV circuit is also required from this new substation to a new 110kV substation in Ballyragget, Co. Kilkenny which will be an extension of the existing Ballyragget 38kV substation.
- The second configuration, referred to as 'Cullenagh Study Area', involves locating the 400/110kV substation in the Cullenagh highlands area. Both the EirGrid and the Cullenagh options perform the same from an electrical point of view, in that they both involve the looping in of the existing Dunstown – Moneypoint 400kV and Carlow-Portlaoise 110kV overhead lines.
- The third configuration, referred to as the 'Abbeyleix Study Area', involves establishing a 400/110kV substation further to the west close to Abbeyleix.
- The fourth configuration, referred to as the 'Cashel Study Area', involves establishing a 400/110kV substation in the townland of Cashel.

A slightly different configuration would be required for the Abbeyleix and Cashel options. The Dunstown - Moneypoint 400kV overhead line would still connect into the new substation, however the Carlow-Portlaoise 110kV overhead line would not. Instead a new 110kV circuit from the new 400kV substation to the existing Portlaoise 110kV substation is required.

Four maps of each of these options showing the connections required vis-à-vis indicative line route corridors are contained in Appendices 7, 8, 9 & 10.

In considering the four configurations presented it is a requirement that the solution performs appropriately technically / electrically, in order to meet the required standards of the transmission system. On examination of the Abbeyleix and Cashel configurations it was found that they were less robust compared to the Portlaoise and Cullenagh configurations (which are electrically identical).

With the Abbeyleix and Cashel configurations, despite having to construct several kilometres of new 110kV circuit, the configuration achieves a lower security of supply than that achieved by the first and second options. This is because the new substation would only have two 110kV circuits coming to it (Substation-Portlaoise and Substation-Ballyragget), whereas the first and second proposals would have three 110kV connections coming to them (two connections from the Carlow-Portlaoise overhead line and one from Substation-Ballyragget) and are therefore more secure as the loss of any of the 110kV circuits would mean that the substation would still be supplied by the two remaining 110kV circuits.

If we are to ensure that the security of supply of all four options being considered is equal it would be necessary to construct an additional 110kV circuit (possibly a double circuit construction) from 'Abbeyleix' and 'Cashel' to Portlaoise station. (Note Portlaoise substation is an existing substation and should not be confused with 'Portlaoise Substation Study Area'

as used in this report.) This additional circuit would compound the visual, environmental, and financial implications associated with the single circuit connection which are considered in detail in sections 3.3 and 3.4.

The remainder of this report, chapters 3 and 4 inclusive, considers the four configurations as presented in section 1.3.

3 Substation Study Area Assessment

The 'Constraints Map' and 'Description of Project Constraints' issued in October 2010 and available on www.eirgridprojects.com identified the natural and human constraints which exist within the wider project study area. From an analysis of the constraints it has been possible to identify criteria by which the environmental and social impact potentially attached to the location of each of the identified candidate study areas may be assessed and evaluated in an objective and rigorous manner.

The following section describes each substation study area and then assesses each of them under the following technical, environmental and other relevant criteria:

- Vehicular Access
- Study Area Topography
- Study Area Flooding history / Drainage
- Existing planning permissions in Study Area
- Study Area Settlement pattern including population
- Existing infrastructure within Study Area
- Environmental constraints
- Transmission system connection potential of study area
- Cost[2]

Once each candidate study area is evaluated, a scoring system will be applied to determine which potential study area would involve the minimum impact on the receiving environment and achieve the maximum efficiency in terms of technical performance and value for money. This information is displayed in a matrix format in Table 4.1 below.

3.1 Portlaoise Substation Study Area

The Portlaoise Substation Study Area, shown in Figure 3.1, is located approximately 5km south west of Stradbally, Co. Laois and 7km south east of Portlaoise, Co. Laois. The circular study area is 4km in diameter and 12.5 km sq in area with the centre point located on the intersection point of the existing 400kV and 110kV overhead lines in the townland of Money Lower (see Appendix 3).

[2] In the case of cost, the cost of the proposed 400/110kV substation is omitted as this would be a common cost for all proposed substation locations. Therefore all costs are based on the overhead line connections to any potential substation. For each of the configurations, the most up to date ESB Standard Transmission costs are considered. This report assumes all electrical connections are by overhead line.

This substation study area is located in a relatively low lying area bounded to the east by the Timahoe and Bauteogue Rivers, to the south east by Ballymore/Ballyprior Hills, to the west by the R425 regional road, to the south by Timahoe village and to the north by Hewson Hill, Grange Upper and the N80 Portlaoise-Carlow national road.

Figure 3.1: Portlaoise Substation Study Area
(Arrow shows direction of view from photo in Fig 3.2)

Figure 3.2: View towards Hewson Hill facing north from minor road in townland of Powelstown

3.1.1 Vehicular Access

In this study area the existing 400kV and 110kV overhead lines are closely paralleled by the R427 and R426 regional roads respectively offering excellent potential for access to a potential substation site within the study area. There is also a network of smaller local rural roads joining these regional roads at various points offering good penetration for access throughout the whole study area.

3.1.2 Study Area Topography

This substation study area is rural and agricultural in nature. Tillage, dairying/livestock and sheep farming are the main agricultural activities. Fields on the whole are large and the boundaries for the most part are high hedgerows.

Figure 3.3: Residence and trees in the study area

The land under the intersection of the 400kV and 110kV line is flat and bounded by existing mature hedgerows and some trees.

There is also evidence of eskers and drumlins in the area. The Timahoe Esker Nature Reserve and Proposed Natural Heritage Area (pNHA)[3], located 1km north east of Timahoe village encroaches by 50m into the study area.

3.1.3 Study Area Flooding history / Drainage

According to the Office of Public Works, Natural Flood Hazard Mapping[4], there is no documented history of significant flooding directly around the intersection of the Dunstown - Moneypoint 400kV and Carlow - Portlaoise 110kV overhead lines.

[3] National Parks and Wildlife Service (NPWS) Site Code 0004211

[4] http://www.floodmaps.ie (Website visited in April 2010)

3.1.4 Existing planning permissions in Study Area

Planning permission was investigated in April 2010 using the online planning search facility provided by Laois County Council. No planning applications were found that would impinge upon the potential construction of the proposed 400/110kV substation within this substation study area at this time (i.e. major developmental, excavation, infrastructural, etc. projects).

A Special Area of Developmental Control (SADC) encroaches into the north of the study area. An SADC is an area in need of special protection due to its sensitive character. In general SADC overlap with Natural Heritage Area (NHA) and Special Area of Conservation (SAC) designation, however, some of the areas lie outside of these designations and therefore warrant special consideration due to their visual amenity. It is the policy of county councils to prohibit visually obtrusive development in Special Areas of Developmental Control.

3.1.5 Study Area Settlement pattern including population

Areas of concentrated rural housing exist in the townland of Ballygormill South and Ratheniska. Ratheniska, the main settlement in the study area, is a rural settlement consisting of a School, Roman Catholic Church, GAA Grounds and ancillary buildings and is situated at the foothills of Hewson Hill and Grange Upper to the north of this substation study area.

There are 87 postal addresses within the 4km diameter circle that is the substation study area.[5]

[5] Source – An Post Geo-directory April 2010.

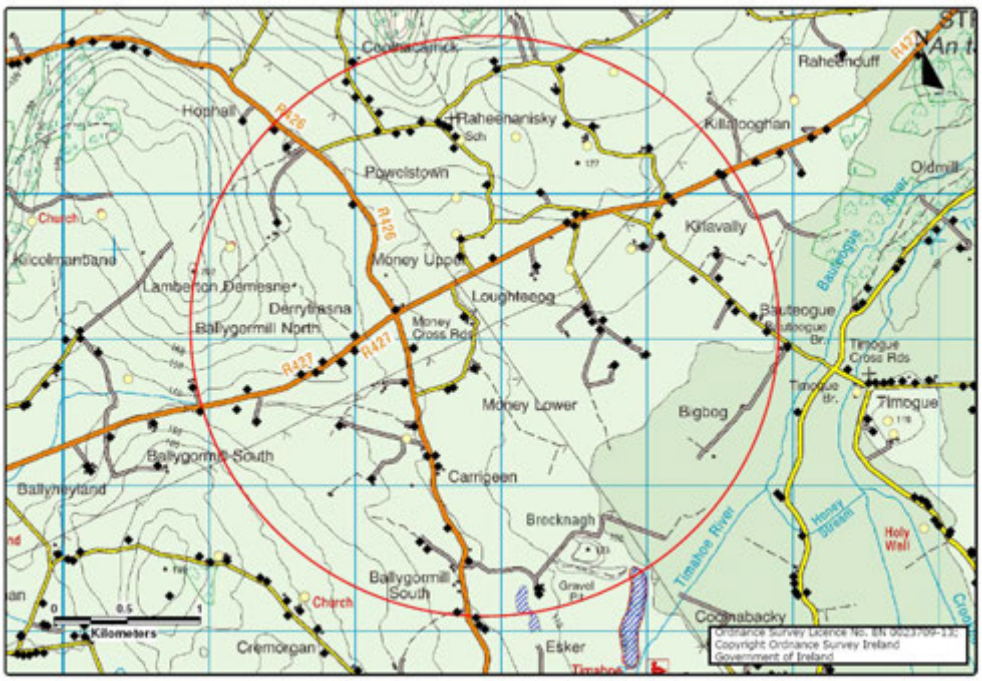


Figure 3.4: Population Map for Portlaoise Substation Study Area

3.1.6 Existing infrastructure within Study Area

3.1.6.1 Roads & Railways

There are a number of regional roads in this substation study area. These comprise of the R427 Stradbally to Abbeyleix and the R426 Castlecomer to Portlaoise roads. There are numerous minor roads and cul de sacs that service 21 townlands either totally or partially in the study area. The following is a list of these townlands:

Ballygormill North, Ballygormill South, Bauteogue, Bigbog, Carrigeen (E.D. Timogue), Coolnabacky, Coolnacarrick, Cremorgan, Derrytrasna, Dysart, Esker, Hophall, Killalooghan, Killavally, Lamberton Demesne, Loughakeo, Portlaoise, Money Lower, Money Upper, Powelstown, Raheenanisky.

There were no new roads planned in the area at the time of this study.

There are no railways in this substation study area.

3.1.6.2 Airports, Quarries & Forestry

There are no airports in this substation study area.

There are a number of existing gravel quarries and eskers in the townlands of Esker and Coolnabacky.

3.1.6.3 Existing Electricity Infrastructure

The electricity infrastructure consists of the Dunstown - Moneypoint 400kV overhead line, the Carlow-Portlaoise 110kV overhead line and an obsolete 110kV double circuit tower in the townland of Portlaoise. There are smaller lower voltage lines servicing houses and farms in the area.

Figure 3.5: The intersection of the existing 110kV and 400kV overhead lines crossing in the townland of Money Lower looking south east from the R427

3.1.6.4 Bord Gais Eireann (BGE) Infrastructure

There are no Bord Gais Eireann pipelines within this substation study area at present.[6]

3.1.7 Environmental Constraints

3.1.7.1 Ecology

Special Area of Conservation (SAC), Natural Heritage Area (NHA) and proposed Natural Heritage Area (pNHA) data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the "Constraints Map" and described in the associated "Description of Constraints Report"[7], both of which can be found in the Laois-Kilkenny Reinforcement Project section of the EirGrid website[8].

There are no marked Special Areas of Conservation within this substation study area.

Timahoe Esker (NPWS Site Code 00042) encroaches into this substation study area by approximately 50m. This pNHA and Nature Reserve is divided into four sections and is located around Timahoe Village in Co. Laois. Eskers are raised ridges of sand and gravel that were deposited under the ice mass, during the last period of glaciation. The esker

[6] http://www.bordgais.ie/networks (Website visited April 2010)

[7] There are no Special Protection Areas (SPA's) within the whole study Area.

[8] EirGrid: Laois-Kilkenny Reinforcement Project:

http://www.eirgridprojects.com/projects/laoiskilkenny/projectactivity

ridges at this site support broad-leaved woodland dominated by multistemmed Hazel (Corylus avellana). The Timahoe Esker is important as it is among the best of the few intact eskers remaining in Co. Laois and Ireland.

3.1.7.2 Geological Sites of Interest

There are no Geological Sites of Interest within the substation study area. The area is underlain by Grey Brown Podzolics (subsoil) and Shales (bedrock).

3.1.7.3 Archaeology

There are 10 sites of archaeological interest in this substation study area. The majority of these lie to the north and east of the study area. All major sites and monuments are shown on the "Constraints Map".

Recorded Archaeological Monuments:

As stated, ten recorded archaeological monuments exist within this substation study area. These monuments are listed in Table 3.1 shown following.

COUNTY	TOWNLAND	SMR NO.	SITE TYPE
LAOIS	RAHEENANISKY	LA018-004	ENCLOSURE SITE
LAOIS	POWELSTOWN	LA018-005	ENCLOSURE SITE
LAOIS	POWELSTOWN	LA018-006	ENCLOSURE SITE
LAOIS	RAHEENANISKY	LA018-007	ENCLOSURE SITE
LAOIS	RAHEENANISKY	LA018-008	RINGFORT SITE
LAOIS	RAHEENANISKY	LA018-009	ENCLOSURE
LAOIS	LOUGHTEEOG	LA018-013	ENCLOSURE SITE
LAOIS	BALLYGORMILL SOUTH	LA018-014	WATERMILL - HORIZONTAL SITE
LAOIS	LOUGHTEEOG	LA018-049/01	CASTLE - PROSPECT HOUSE
LAOIS	LAMBERTON DEMESNE	LA018-011	RINGFORT

Table 3.1: Recorded Archaeological Monuments Located in the Study Area

Four different monument types are represented and are as follows:

Enclosures (6), ringforts (2), a horizontal watermill (1) and a castle (1). The ringfort at Lamberton Demesne (LA018-011) also has a preservation order (No. 197).

Architecturally Significant Buildings/Structures:

A nineteenth century gate lodge originally associated with Lamberton Demesne House is located at the west side of the study area for the new 400/110kV substation. The gate lodge is described in the National Inventory of Architectural Heritage (NIAH) (Reg. No.12801803) (NGR 251463/194802) and is also included in the Record of Protected Structures (RPS) for County Laois (Ref. 617).

3.1.7.4 Views & Prospects

There are no marked or protected views or prospects within this substation study area[9].

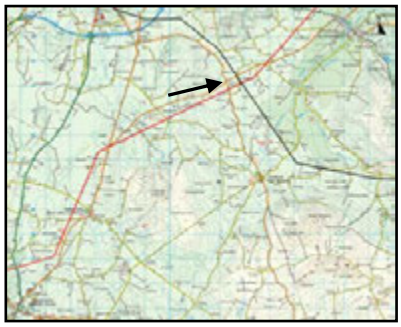


Figure 3.6: Photo taken from R426 near junction of R427 facing north-easterly

3.1.7.5 Waterways, Rivers & Canals

There are no canals in this substation study area. The nearest canal is the Grand Canal, lying approximately seven kilometres north-east of the study area.

There are a number of rivers evident just outside the study area. These include the Bauteogue/Timahoe River and Honey Stream and Crooked River. These flow from south to north-east towards the Grand Canal located 7km north-east of the study area and eventually the River Barrow.

3.1.8 Transmission system connection potential of study area

The study area provides excellent opportunity for connecting to the national grid with minimum requirement for new overhead lines due to the existence of the Dunstown-Moneypoint 400kV and the Carlow-Portlaoise 110kV overhead lines. Overhead line feasibility into this substation study area was investigated both on desktop and by driving along potential overhead line routes and it was found that there were no environmental constraints that would impede connection to a proposed substation (see Appendix 7 for indicative line route corridors).

[9] http://www.mountainviews.ie & http://www.laoistourism.ie (Websites visited April 2010)

400kV Connection

A section of 400kV Double Circuit (or two 400kV Single Circuit) line(s) will be necessary to connect to the existing Dunstown - Moneypoint 400kV overhead line to adhere to the requirements of a looped connection to the transmission system as required by EirGrid. The final lengths, route and connection method will be dependent on the final substation site location.

110kV Connection

A section of 110kV Double Circuit (or two 110kV Single Circuit) line(s) will be necessary to connect to the existing Carlow-Portlaoise 110kV overhead line. The final lengths, route and connection method will be dependent on the final substation site location within this study area.

3.1.9 Cost

For the purposes of all cost estimates in this report a hypothetical substation site located at the centre point of the substation study area is considered:

- 1km of 400kV Double Circuit is assumed to be required to facilitate connection to the existing 400kV overhead line. **(€1,650,000)**
- 1km of 110kV Single Circuit[10] is assumed to be required to facilitate connection to the existing 110kV overhead line. **(€310,000)**
- 24km of 110kV Single Circuit is assumed to be required to connect the proposed 400/110kV substation to the proposed 110kV substation at Ballyragget. **(€7,440,000)**

Total Cost = €9,400,000[11]

[10] Costs are derived from the Commission for Energy Regulation 2011 Standard Transmission Charges Report dated 25th December 2010 located at http://www.cer.ie/en/electricity-transmission-network-overview.aspx?article=e7c35fda-0f20-43b8-8358-16e819874f1b

[11] This cost does not include the substation costs as this will be similar for all study areas

3.2 Cullenagh Substation Study Area

During the course of the consultation process within the local community it was suggested that the proposed 400/110kV substation would be better located south of Cullenagh Mountain, as shown in Figure 3.7. As with the Portlaoise Substation Study Area, this substation study area is approximately 12.5km^2 in area. The centre of the 4km diameter study area is located approximately 1km northeast of Blandsfort crossroads (see Appendix 4).

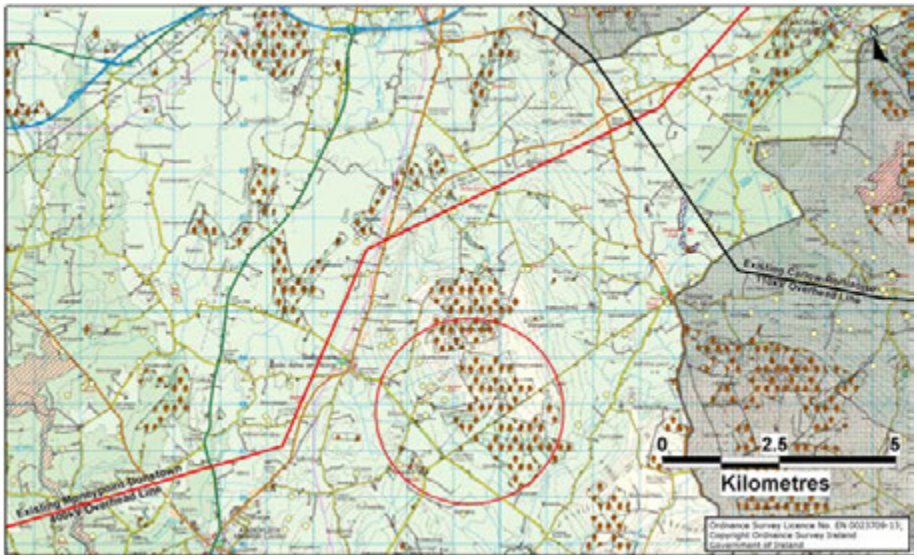


Figure 3.7: Suggested alternative substation study area south of Cullenagh Mountain

Figure 3.8: Looking northerly from Blandsfort crossroads

Figure 3.9: View from Cullenagh Mountain

3.2.1 Vehicular Access

Access to this substation study area would be obtained by tertiary roads from the R425 regional road or via a northerly route from the R430 regional road. From preliminary desktop analysis and site visits the road infrastructure in the study area would appear to be substandard for access and development requirements of the proposed 400/110 kV substation. Road widening / improvement may be required.

3.2.2 Study Area Topography

Generally this substation study area is located in an upland area of Cullenagh Mountain. South and southwest of this upland area the land profile descends to the plains of Abbeyleix, Ballyroan and beyond to Durrow. The main soil types in the Cullenagh region are surface water gley and small pockets of shallow peat.

3.2.3 Study Area Flooding History / Drainage

According to the Office of Public Works, Natural Flood Hazard Mapping, there is no documented history of significant flooding directly around Cullenagh Mountain.

3.2.4 Existing Planning Permission within study area

Planning permission was investigated in April 2010 using the online planning search facility provided by Laois County Council[12]. No planning applications were found that were of a

[12] Laois County Council Planning: http://www.laois.ie/planning (Website visited in April 2010)

category sufficient to impede the construction of the proposed 400/110kV substation within this substation study area at this time (i.e. major developmental, excavation, infrastructural, etc. projects).

3.2.5 Study Area Settlement pattern including population

The Cullenagh Substation Study Area, shown in Figure 3.10, is centred on the south west foothills of the Cullenagh Mountains. The area is sparsely populated with the housing scattered along the two regional roads traversing the study area. Abbeyleix and Ballyroan are just outside the study area.

There are 54 postal addresses within this substation study area. Consideration must also be given to the required connections to the 400kV and 110kV overhead lines. These connections would impact on local population along their route corridors. For the purposes of this report a connection corridor of 1km in width was assumed to be wide enough to allow for an optimum line route resulting in a further 120 addresses, giving a total count of 174 postal addresses potentially impacted.

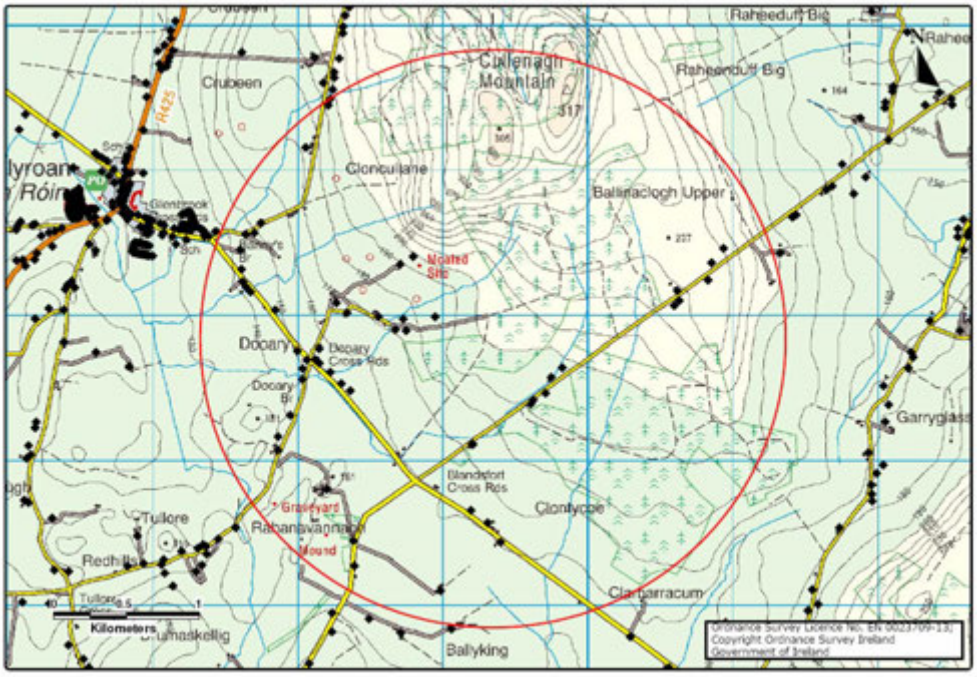


Figure 3.10: Population Map for Cullenagh Substation Study Area

3.2.6 Existing infrastructure within Study Area

3.2.6.1 Roads & Railways

The regional roads of R425 and R430 are within 2.5km and 3km respectively of this study area. The R425 links Portlaoise to Ballyroan and Abbeyleix, while the R430 links the towns of Abbeyleix and Carlow. There are numerous minor roads and cul de sacs in this study area that service 14 townlands either totally or partially in the study area. These townlands are listed below:

Ballinaclogh Upper, Ballyglass, Ballyking, Ballyroan, Clarbarracum, Cloncullane, Clontycoe, Crubeen, Cullenagh, Derryfore, Dooary, Rahanavannagh, Raheenduff Big, Tullore

There are no new roads planned in the area at the time of this study.

There are no railways in this study area.

3.2.6.2 Airports, Quarries & Forestry

Cullenagh Mountain has a significant amount of commercial forestry under Coillte management[13]. Trees that are planted are mainly Sitka Spruce and broad leaved (Beech, Ash and Alder).

Some areas of the forestry are classified as 'Old Woodland', meaning there has been continuous forest cover in the area since the 1830's including blocks of mature Beech in the Cullenagh study area (3 hectares approximately).

There is also a mobile phone mast located at the highest point (317m contour level) of Cullenagh Mountain.

There are no airports/airstrips in the study area.

There are some small quarries in the area but none of significance that would affect a proposal to locate a substation in the area.

Figure 3.11: Cullenagh Mountain Forestry

3.2.6.3 Existing Electricity Infrastructure

There is no high voltage infrastructure in the area of the proposed substation but there is a 38kV line in the Abbeyleix area which would require crossing by the 400kV Double Circuit overhead line. There are smaller lower voltage lines servicing houses and farms in the area.

[13] Coillte: Government private limited company registered under and subject to the Companies Acts 1963-86. Please see: http://www.coillte.ie

3.2.6.4 Bord Gais Eireann (BGE) Infrastructure

There are no Bord Gais Eireann pipelines in this substation study area at present.

3.2.7 Environmental Constraints

3.2.7.1 Ecology

Special Areas of Conservation (SAC)

SAC data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project.

There are no marked Special Areas of Conservation in this study area.

Natural Heritage Areas (NHA)

NHA and pNHA data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project. There are no NHA's or pNHA's within the Cullenagh Study Area.[14]

3.2.7.2 Geological Sites of Interest

There are no Geological Sites of Interest within the substation study area. The main soil types in this substation study area are surface water gley and small pockets of shallow peat.

3.2.7.3 Archaeology

There are 11 marked areas of archaeological interest in this substation study area. These sites are all located on the eastern side of the study area. All major Sites and Monuments Records (SMR's) are shown on the Constraints Map. For the purposes of this study all overhead line route corridor options avoided SMR's.

Timahoe Round Tower:

It should be noted that Timahoe Round Tower should be taken into consideration for any connection to the Carlow-Portlaoise 110kV overhead line.

This tower is situated equidistant southeast from Portlaoise, and northeast of Abbeyleix. Timahoe village is approximately 10 km southeast of Portlaoise along the R426 regional road. The round tower stands in a park-like setting across a footbridge that crosses the Bauteogue River in the centre of the village.

[14] There are no Special Protection Areas (SPA's) within the whole study Area.

3.2.7.4 Views & Prospects

There are no marked or protected views or prospects in this substation study area.[15] Generally the substation site is located in an upland area to the south of Cullenagh Mountain. South and south west of this upland area the land profile descends to the plains of Abbeyleix, Ballyroan and beyond to Durrow.

Cullenagh Mountain is crossed by a series of roads primarily used by Coillte. The area is used as an amenity area for walking as shown by Heritage Week 2009, Cullenagh Heritage Walk. Walks include the 'Cullenagh Heritage Walk'. As such its amenity value is high and the location of a substation within this potential study area may have an adverse impact of the current level of amenity value attached to the area.

Figure 3.12: Substation study area looking north from Blandsfort Crossroads

With regards to views and prospects, the visual impact on the landscape of tower heights should be considered. Details of 400kV Double Circuit, 110kV Double Circuit and 110kV Single Circuit towers are given in Appendix 11.

3.2.7.5 Waterways, Rivers & Canals

The Triogue River rises in Cullenagh Mountain flowing north.

This substation study area is located 2km to the north and north-west of the Rivers Bauteogue, Timahoe and Timogue.

[15] Source: Chapter 8 Natural Heritage in Laois County Development Plan 2006-2012.

3.2.8 Transmission system connection potential of study area

Overhead line feasibility into this substation study area was investigated both on desktop and by 'driving' potential overhead line routes.

It was found that the study area is not ideal for connecting to the national grid. A 400kV connection is constrained by ribbon development along the R425 regional road and all overhead line connections are likely to be prominent on the landscape due to the elevation of this study area relative to the other study areas under assessment.

<u>400kV Connection</u>

A section of 400kV Double Circuit (or two 400kV Single Circuit) lines will be necessary to connect to the existing Dunstown-Moneypoint 400kV overhead line to adhere to the requirements of a looped connection to the transmission system as set out by EirGrid.

The final lengths, route and connection method will be dependent on the final substation site location, however for the purpose of this study it is considered that an additional 4.2km of 400kV Double Circuit line (all steel mast line) is required to connect to the Dunstown - Moneypoint 400kV line from a westerly direction of the proposed substation study area. It is considered that this connection would be made in the townland of Raheenabrogue where one additional angle structure would be required for this connection.

The existing line turns west here to avoid Abbeyleix town heading west to Moneypoint, Co. Clare. The existing line is prominent on the landscape and can be seen on approach roads in and out of Abbeyleix (see Figure 3.13).

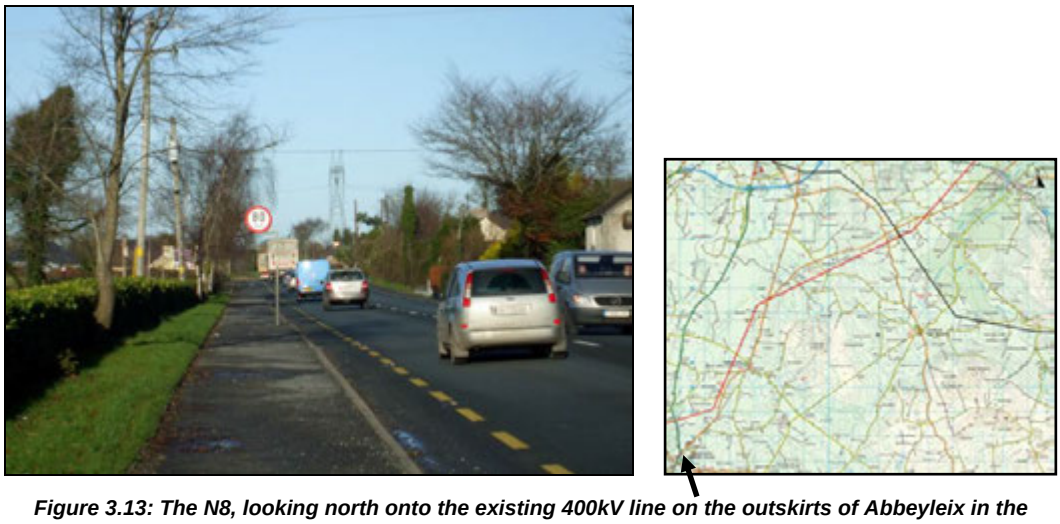


Figure 3.13: The N8, looking north onto the existing 400kV line on the outskirts of Abbeyleix in the townland of Island.

In routing to the existing line, the new 400kV Double Circuit route would have to cross four minor roads and the R425. The route taken by the 400kV Double Circuit line would cross open country with little natural screening, as shown in Figure 3.14 above (see Appendix 8 for indicative line route corridors).

110kV Connection

A section of 110kV Double Circuit (or two 110kV Single Circuit) line(s) will be necessary to connect to the existing Carlow-Portlaoise 110kV overhead line. This new connection may be made from a north easterly direction of the Cullenagh substation study area. The final lengths, route and connection method will be dependent on the final substation site location. However, for the purpose of this study it is considered that 6.7km of 110kV Double Circuit overhead line will be required to make this connection which is speculated to be connected in Orchard Lower, north east of Timahoe village. Orchard Lower is situated in a Special Area of Development Control [16]. Also, as a requirement of the Laois-Kilkenny Reinforcement Project the substation will be required to connect to a new 110kV substation adjacent to ESB Ballyragget 38kV substation via a newly constructed 110kV Single Circuit. The length of this 110kV Single Circuit connection to Ballyragget substation would be approximately 16.3km.

3.2.9 Cost

With respect to the possibility of locating the proposed substation at the Cullenagh Mountain site, the following is considered:

- 4.2km of 400kV Double Circuit is assumed to be required to connect the proposed 400/110kV substation to the existing Dunstown – Moneypoint 400kV line. **(€6,930,000)**
- 6.7km of 110kV Double Circuit is assumed to be required to connect the proposed 400/110kV substation to the existing Carlow-Portlaoise 110kV overhead line.**(€2,077,000)**
- 16.3km of 110kV Single Circuit is assumed to be required to connect the proposed 400/110kV substation to the proposed 110kV substation at Ballyragget.**(€5,053,000)**

Total Cost = €14,060,000[17]

[16] Special Areas of Development Control: Areas in need of special protection due to their sensitive character and visual amenity.

[17] This cost does not include the substation costs as this will be similar for all study areas

3.3 Abbeyleix Substation Study Area

The proposed Abbeyleix Substation Study Area, shown in Figure 3.14, is located to the north east of Abbeyleix, Co. Laois. The town of Portlaoise, Co. Laois, is located approximately 11.5km to the north. As with the alternative substation study areas, this substation study area is approximately 12.5km^2 in area. The centre of the 4km diameter study area is located at the existing tower near the Abbeyleix Graveyard – Fig 3.15 (see Appendix 5).

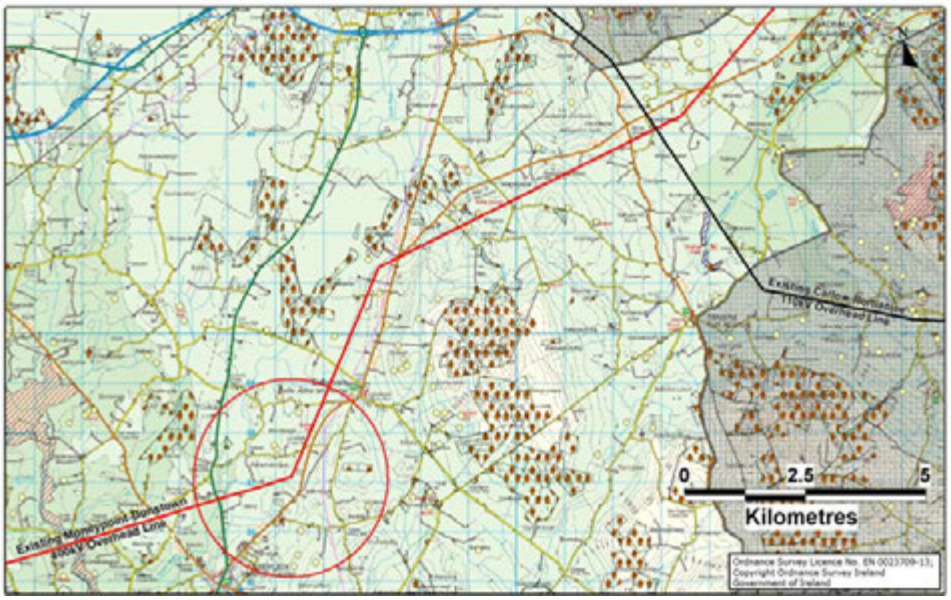


Figure 3.14: Abbeyleix Substation Study Area

Figure 3.15: 400kV Angle Tower from grave yard at R425

This substation study area is bounded to the west by the N8 national road, formerly the main Dublin-Cork road, and to the south by the R430 regional road. It is located in a relatively low lying region to the south west of Cullenagh Mountain.

3.3.1 Vehicular Access

The location of the angle mast (shown on Figure 3.14) would benefit from relatively good access provided by the R425 regional road. Access to potential substation sites around this substation study area would be from this regional road or local rural roads.

3.3.2 Study Area Topography

The study area is rural and agricultural in nature, lying on the outskirts of Abbeyleix town. Tillage, dairying/livestock and sheep farming are the main agricultural activities. Fields on the whole are large and the boundaries for the most part are high hedgerows with native species grown.

The land surrounding the existing 400kV tower at the centre of the study area is undulating and is bounded by existing mature hedgerows and some trees.

3.3.3 Study Area Flooding History / Drainage

According to the Office of Public Works, Natural Flood Hazard Mapping, there is no documented history of significant flooding in the vicinity of this substation study area.

3.3.4 Existing planning permissions in Study Area

Planning permission was investigated in April 2010 using the online planning search facility provided by Laois County Council[18]. No planning applications were found that were of a category sufficient to impede the construction of the proposed 400/110kV substation within this substation study area at this time (i.e. major developmental, excavation, infrastructural, etc. projects).

3.3.5 Study Area Settlement pattern including population

The study area includes part of Abbeyleix and Ballyroan. There is significant ribbon development, one off houses and farmsteads in the area.

There are 392 postal addresses within the substation study area. However the connection corridors required to the existing transmission lines which are outside the study area will add an extra circa 302 postal addresses to the study area meaning the total postal addresses affected is circa 694. For the purposes of this report the connection study corridor was assumed to be 1km wide.

[18] Laois County Council Planning: http://www.laois.ie/planning (Website visited in April 2010)

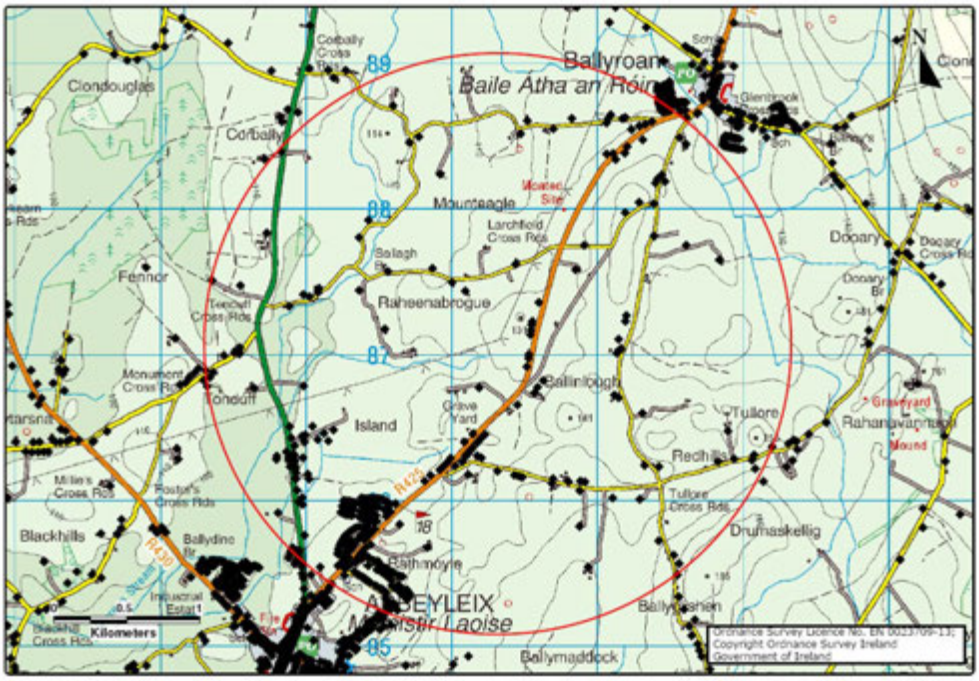


Figure 3.16: Population Map for Abbeyleix Substation Study Area

3.3.6 Existing infrastructure within Study Area

3.3.6.1 Roads & Railways

The regional road R425 which links Ballyroan and Abbeyleix runs in a north-south direction and roughly bisects the Study Area. There are numerous minor roads and cul de sacs in this study area that service the 13 townlands either totally or partially in the study area. These townlands are listed below:

Ballinlough, Ballyglishen, Ballymaddock, Ballyroan, Corbally, Dooary, Drumashellig, Island, Mounteagle, Tonduff, Tullore, Rathmoyle, Redhills.

There are no new roads planned in the area at the time of this study.

There are no railways in this study area.

3.3.6.2 Airports, Quarries & Forestry

There are no significant commercial forestry operations within the Study Area.

There are no airports/airstrips in the study area.

There are some small quarries in the area but none of significance that would affect a proposal to locate a substation in the area.

3.3.6.3 Existing Electricity Infrastructure

There is no high voltage infrastructure in the area of the proposed substation but there is a 38kV line in the Abbeyleix area which would require crossing by the 400kV Double Circuit overhead line. There are smaller lower voltage lines servicing houses and farms in the area.

3.3.6.4 Bord Gais Eireann (BGE) Infrastructure

There are no Bord Gais Eireann pipelines in this substation study area at present.

3.3.7 Environmental Constraints

3.3.7.1 Ecology

Special Areas of Conservation (SAC)

SAC data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project.

There are no marked Special Areas of Conservation in this study area.

Natural Heritage Areas (NHA)

NHA and pNHA data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project.

There are no NHA and pNHAs indicated in this study area.[19]

3.3.7.2 Geological Sites of Interest

There are no Geological Sites of Interest within the substation study area. The main soil types in this substation study area are surface water gley and small pockets of shallow peat.

3.3.7.3 Archaeology

There are 13 marked areas of archaeological interest in this substation study area. All major Sites and Monuments Records (SMR's) are shown on the Constraints Map.

3.3.7.4 Views & Prospects

There are no marked or protected views or prospects in this substation study area.[20]

With regards to views and prospects, the visual impact on the landscape of tower heights should be considered. Details of 400kV Double Circuit, 110kV Double Circuit and 110kV Single Circuit towers are given in Appendix 11.

3.3.7.5 Waterways, Rivers & Canals

The Gloreen Stream flows south through the study area.

[19] There are no Special Protection Areas (SPA's) within the whole study Area.

[20] Source: Chapter 8 Natural Heritage in Laois County Development Plan 2006-2012.

3.3.8 Transmission system connection potential of study area

See Appendix 9 for indicative line route corridors.

400kV Connection

A section of 400kV Double Circuit (or two 400kV Single Circuit) line(s) will be necessary to connect to the existing Dunstown - Moneypoint 400kV overhead line to adhere to the requirements of a looped connection to the transmission system as set out by EirGrid.

The final lengths, route and connection method will be dependent on the final substation site location, however for the purpose of this study it is considered that an additional 1km of 400kV Double Circuit line (all steel mast line) is required to connect to the Dunstown-Moneypoint 400kV line in the area at the centre of the study area.

110kV Connection

A section of 110kV Single Circuit line would be necessary to connect to the existing substation at Portlaoise. An indicative line length required for this connection was envisaged to be 10.6km. An additional section of 110kV Single Circuit line would be necessary to connect to the existing substation at Ballyragget. This line would be approximately 15.2km in length.

3.3.9 Cost

With regard to the required connection to the Abbeyleix substation study area, the following is considered:

- 1km of 400kV Double Circuit is assumed to be required to facilitate connection to the existing 400kV overhead line. **(€1,650,000)**
- 10.6km of 110kV Double Circuit is assumed to be required to connect the proposed 400/110kV substation to the existing 110kV substation at Portlaoise. **(€9,184,900)**[21]
- 15.2 km of 110kV Single Circuit is assumed to be required to connect the proposed 400/110kV substation to the proposed 110kV substation at Ballyragget. **(€4,712,000)**

Total Cost = €15,546,900[22]

[21] Costs for 110kV Double Circuit lines is estimated from the most up to date ESB Standard Transmission costs.

[22] This cost does not include the substation costs as this will be similar for all study areas

3.4 Cashel Substation Study Area

The Cashel Substation Study Area, shown in Figure 3.17, is located approximately 13km south west of Stradbally, Co. Laois, while the town of Portlaoise, Co. Laois, is located approximately 7km to the north. This substation study area is approximately 12.5km^2 in area and is bounded to the west by the N8 national road, formerly the main Dublin-Cork road. The study area is located in a relatively low lying region to the north west of Cullenagh Mountain (see Appendix 6).

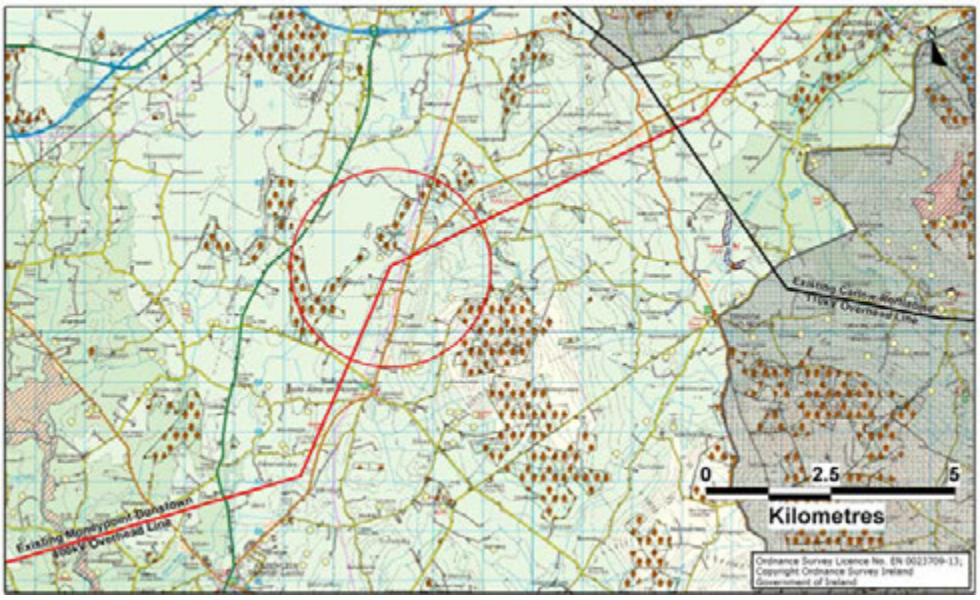


Figure 3.17: Cashel Substation Study Area

Figure 3.18: View looking north at centre of Cashel Substation Study Area

3.4.1 Vehicular Access

The location of the 400kV angle tower (change in line direction) shown on Figure 3.18 would be the location for the centre of the substation study area and this benefits from reasonable access provided by both the R425 and R427 regional roads. Access to potential sites around the study area would be from these regional roads or local regional roads in the vicinity.

3.4.2 Study Area Topography

The study area is rural and agricultural in nature. Tillage, dairying/livestock and sheep farming are the main agricultural activities. Fields on the whole are large and the boundaries for the most part are high hedgerows with native species grown. The land surrounding the existing angle mast is level and is bounded by existing mature hedgerows and some trees. A large bog is located within the extent of the substation study area.

3.4.3 Study Area Flooding History / Drainage

According to the Office of Public Works, Natural Flood Hazard Mapping, there is no documented history of significant flooding in the vicinity of this study area.

3.4.4 Existing planning permissions in Study Area

Planning permission was investigated in April 2010 using the online planning search facility provided by Laois County Council[23]. No planning applications were found that were of a category sufficient to impede the construction of the proposed 400/110kV substation within this substation study area at this time (i.e. major developmental, excavation, infrastructural, etc. projects).

3.4.5 Study Area Settlement pattern including population

Settlement patterns are dominated by ribbon development through the middle of the study area along the R245 and R427. There are some cul de sac roads leading to one off housing and farmsteads. Bog lands west of the study area and high ground east of the study area limit the opportunity for one off housing.

There are 86 postal addresses within the substation study area however the connection corridors required to the existing transmission lines will add an extra circa 237 postal addresses meaning the total postal addresses affected is circa 323. For the purposes of this report the connection study corridor was assumed to be 1km wide.

[23] Laois County Council Planning: http://www.laois.ie/planning (Website visited in April 2010)

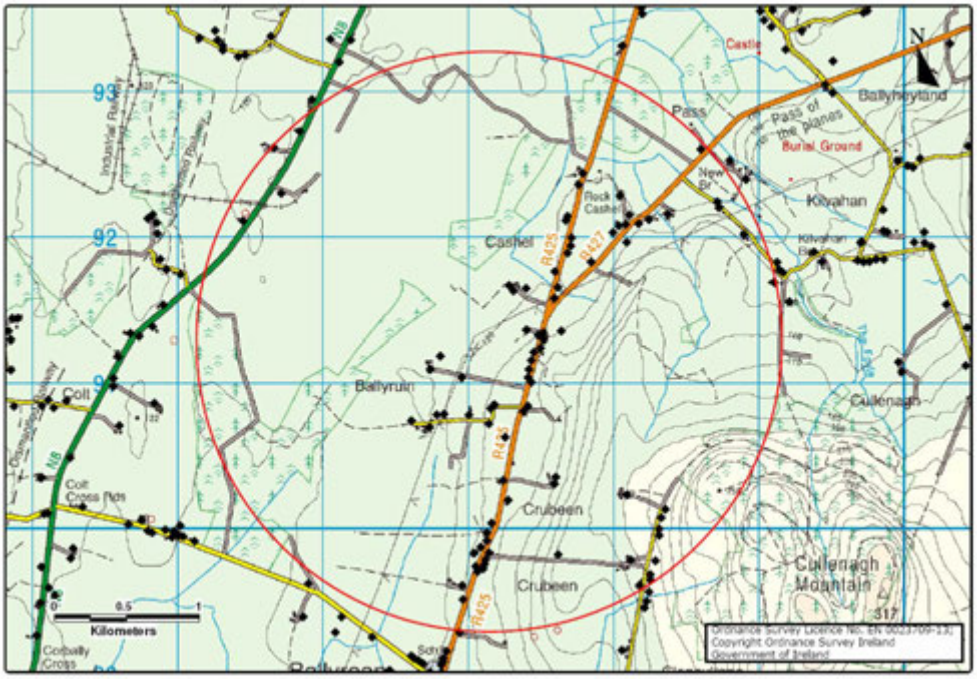


Figure 3.19: Population Map for Cashel Substation Study Area

3.4.6 Existing infrastructure within Study Area

3.4.6.1 Roads & Railways

The regional road R425 runs in a north-south direction through this study area with the R427 forking off in the north-ast sector of the study area. There are numerous minor roads and cul de sacs in this study area that service 8 townlands either totally or partially in the study area. These townlands are listed below:

Ballycarnan, Ballyroan, Ballyruin, Cashel, Clonaddadoran, Crubeen, Cullenagh, Pass.

There are no new roads planned in the area at the time of this study.

There are no railways in this study area.

3.4.6.2 Airports, Quarries & Forestry

There is a significant amount of forestry within the study area running in a south-west to north-east direction.

There are no airports/airstrips in the study area.

There are some small quarries in the area but none of significance that would affect a proposal to locate a substation in the area.

3.4.6.3 Existing Electricity Infrastructure

There is no high voltage infrastructure in the area of the proposed substation but there is a 38kV line in the Abbeyleix area which would require crossing by the 400kV Double Circuit overhead line. There are smaller lower voltage lines servicing houses and farms in the area.

3.4.6.4 Bord Gais Eireann (BGE) Infrastructure

There are no Bord Gais Eireann pipelines in this substation study area at present.

3.4.7 Environmental Constraints

3.4.7.1 Ecology

Special Areas of Conservation (SAC)

SAC data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project.

There are no marked Special Areas of Conservation in this study area.

Natural Heritage Areas (NHA)

NHA and pNHA data from the Department of the Environment, Heritage and Local Government (DoEHLG) records are shown on the Constraints Map located in the EirGrid website for the Laois-Kilkenny Reinforcement Project.

There are no NHA sor pNHAs indicated within this study area.[24]

3.4.7.2 Geological Sites of Interest

There is one Geological Site of Interest within the substation study area located immediately north of the intersection of the R425 and the R427.

3.4.7.3 Archaeology

There are 9 marked areas of archaeological interest in this substation study area. These sites are mostly located on the south-eastern side of the study area. All major Sites and Monuments Records (SMR's) are shown on the Constraints Map.

3.4.7.4 Views & Prospects

There are no marked or protected views or prospects in this substation study area.[25]

With regards to views and prospects, the visual impact on the landscape of tower heights should be considered. Details of 400kV Double Circuit, 110kV Double Circuit and 110kV Single Circuit towers are given in Appendix 11.

3.4.7.5 Waterways, Rivers & Canals

The Foyle River rises in Cullenagh Mountain and flows in a north-west direction.

[24] There are no Special Protection Areas (SPA's) within the whole study Area.

[25] Source: Chapter 8 Natural Heritage in Laois County Development Plan 2006-2012.

3.4.8 Transmission system connection potential of study area

See appendix 10 for indicative line route corridors.

400kV Connection

A section of 400kV Double Circuit (or two 400kV Single Circuits) will be necessary to connect to the existing Dunstown-Moneypoint 400kV overhead line to meet the transmission planning requirements.

The final lengths, route and connection method will be dependent on the final substation site location, however for the purpose of this study it is considered that an additional 1km of 400kV Double Circuit line is required to connect to the Dunstown - Moneypoint 400kV line in the area at the centre of the study area.

110kV Connection

A section of 110kV Single Circuit line would be necessary to connect to the existing substation at Portlaoise. An indicative line length required for this connection was envisaged to be 6.3km in length. An additional section of 110kV Single Circuit line would be necessary to connect to the existing substation at Ballyragget. This line would be approximately 19.3km in length.

3.4.9 Cost

With regard to the required connection to the Cashel Substation Study Area, the following is considered:

- 1km of 400kV Double Circuit is assumed to be required to facilitate connection to the existing 400kV overhead line. **(€1,650,000)**
- 6.3km of 110kV Double Circuit is assumed to be required to connect the proposed 400/110kV substation to the existing 110kV substation at Portlaoise. **(€5,458,950)**
- 19.3km of 110kV Single Circuit is assumed to be required to connect the proposed 400/110kV substation to the proposed 110kV substation at Ballyragget. **(€5,983,000)**

Total Cost = €13,091,950[26]

[26] This cost does not include the substation costs as this will be similar for all study areas

4 Substation Study Area Comparison

In comparing the four potential substation study areas, a range of technical, environmental and cost criteria were utilised to assist in the assessment of the relative positives and negatives associated with each study area. These criteria were outlined in Section 3 above and are summarised in Table 4.1 below.

For comparison purposes a rating is given to each study area for each of the 9 headings and is indicated by the use of different colour codes to indicate rating.

The rating colour coding is as follows:

- The Preferred Study Area is coloured dark green.
- The Acceptable Study Area is coloured light green.
- The Less Preferred Study Area is coloured orange.
- The Least Preferred Study Area is coloured red.

For example, if the Cashel Substation Study Area is best placed in terms of vehicular access it would be coloured dark green in Table 4.1 below. It this study area is the least accessible in vehicular terms then it would be coloured red. The study area with the best cumulative rating (most dark greens and least amount of reds) is the study area that, on balance, would be best suited to accommodate a substation.

	Portlaoise Substation Study Area	Cullenagh Substation Study Area	Abbeyleix Substation Study Area	Cashel Substation Study Area
Vehicular access	R426 and R427 roads traverses the study area	Third class road network	R425 road runs through study area	Contains the R425 and R427 roads
Study Area Topography	Good Screening Potential	High Ground	Close to Abbeyleix Town	Screening Potential
Study Area Flooding history / Drainage	Minimal risk – High Ground	Least risk (High Ground)	Minimal risk – High Ground.	Highest Risk - Contains Bog Areas
Existing planning permissions in Study Area	No significant permissions extant	No significant planning history	Potential for significant planning consents extant due to proximity to Abbeyleix	Moderate potential for permissions in area due to proximity to Abbeyleix
Study Area Settlement pattern including population.	Approximately 87 addresses	Approximately 174 addresses	Approximately 694 addresses	Approximately 323 addresses
Existing infrastructure within Study Area	Good infrastructural locally	Poor infrastructural locally	Good infrastructural locally	Reasonable infrastructural locally
Environmental Constraints	Timahoe Esker on periphery	High amenity & nature value of forestry	No significant environmental constraints	Geological site within area
Transmission system Connection potential of study area	Closest proximity to both 400 and 110kV lines	Problematic connectivity due to distances from 400 and 110kV lines	Requires significant 110kV connections	Requires significant 110kV connections
Cost	€9.40m	€14.06m	€15.55m	€13.09m

Table 4.1: Comparison of potential study areas.

It can be seen from Table 4.1 above that the Portlaoise study area rates significantly higher than the other three potential study areas considered in this report.

5 Conclusion

Following consultations arising out of a public notice in relation to the Laois-Kilkenny Reinforcement Project, EirGrid were asked to consider an alternative location for the proposed substation study area. This is referred to as 'Cullenagh'.

Two other substation study areas were also considered by EirGrid and these are known as 'Abbeyleix' and 'Cashel'.

Having regard to the above sections of this report, the four potential study areas evaluated display a clear and unambiguous frontrunner in terms of suitability to accommodate a substation site. The Portlaoise Study Area rates highest in 6 of the 9 evaluation criteria and second highest in the other 3 categories.

Access by vehicles, the presence of existing infrastructure, ease of connectivity with the transmission system and cost factors indicate that the Portlaoise Study Area would most readily satisfy substation site requirements and this is confirmed by the lack of environmental constraints or other planning, topographical or flooding concerns associated with this area.

The Cashel Study Area and Cullenagh Study Area did not approach the Portlaoise Study Area in terms of rating against the evaluation criteria set down in Table 4.1 above. These areas were seen to be deficient primarily with respect to environmental constraints.

Cullenagh was originally suggested as it is a more remote, sparsely populated location and it was felt that it would therefore be more appropriate to site such a substation there. While this is a correct assumption for the substation in isolation it neglects to consider the additional impacts associated with the extra overhead lines to the substation. These overhead lines would lead to a significant increased visual impact to the local population living along the line routes. It is estimated that there would be a total affected population of approximately 87 addresses in the Portlaoise Study Area, approximately 174 addresses in the Cullenagh Study Area approximately 694 addresses in the Abbeyleix Study Area and approximately 323 addresses in the Cashel Study Area. These counts are comprised of the population count within the particular study area and also population counts within any additional overhead line corridors that may be required. The corridors are 1km wide.

In addition, there would also be a significant cost implication by building the additional lines. Locating the substation under, or in close proximity to, the existing overhead lines minimises the lengths of loop in required. It is estimated that the Cullenagh option would cost approximately €4.66m more than the Portlaoise Study Area proposal.

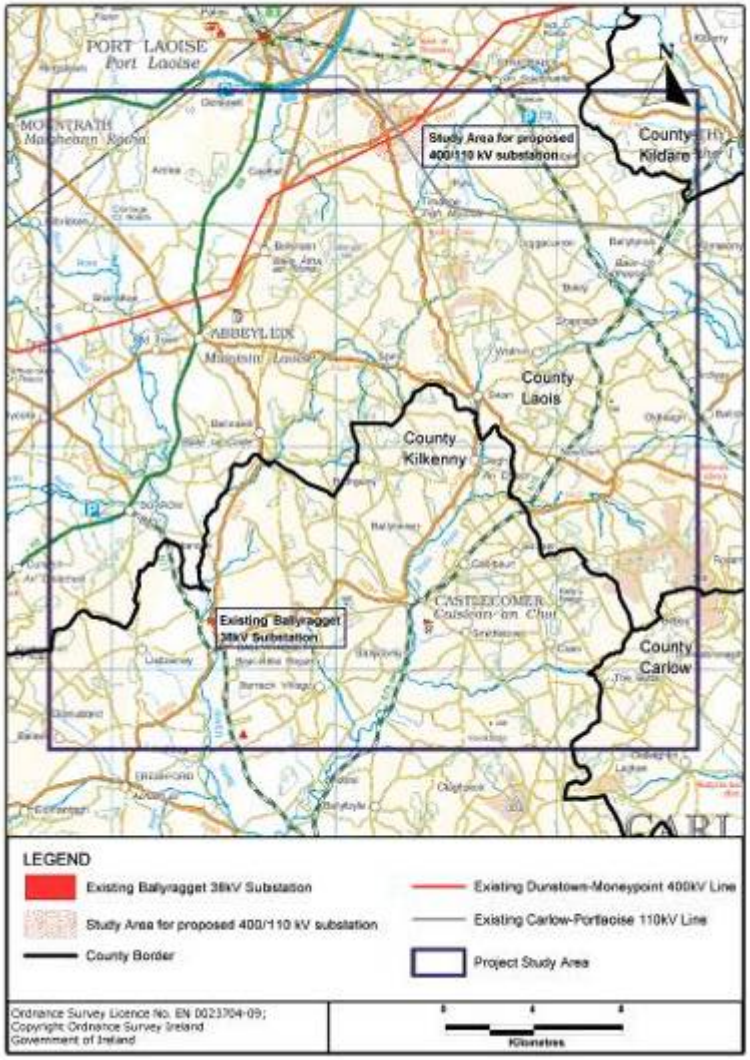
Abbeyleix Study Area rated lowest against the evaluation criteria largely due to settlement patterns and associated planning implications.

The investigations found that the alternative suggestion from the public for the location for the 400/110 kV substation (Cullenagh Study Area) was not viable as:

1. It would result in an increased environmental impact
2. It would result in an increased visual impact
3. It would result in an increased cost
4. It would place a greater amount of infrastructure in proximity to residences
5. It would represent the movement of part of the project from one area and group of affected people to another without any good reason.

In summary, this report recommends the Portlaoise Study Area proposal as the most suitable location for the substation study area having regard to physical, environmental, technical and social factors associated with the type of development proposed and the inherent suitability of the receiving environment to accommodate same.

PROPOSED LAOIS–KILKENNY ELECTRICITY REINFORCEMENT SCHEME
PUBLIC CONSULTATION ON A CONSTRAINTS STUDY AREA



EirGrid is the state-owned independent electricity Transmission System Operator and Market Operator in Ireland. It is EirGrid's role to deliver quality connection, transmission and market services to electricity generators, suppliers and customers utilising the high voltage electricity system.

It is in this capacity that EirGrid are proposing this Laois-Kilkenny electricity reinforcement.

Demand in the greater Kilkenny area has placed continuing pressure on the transmission network with the result that the existing 110 kV network is approaching its technical limit and additional reinforcement is now required.

The proposed new transmission infrastructure will consist of the following:

- A 400/110 kV substation situated to the south east of Portlaoise. Location to be determined.
- A 110 kV substation located adjacent to the existing 38 kV electricity substation at Ballyragget, County Kilkenny.
- A 110 kV circuit between the proposed 400/110 kV substation and the proposed 110 kV substation

This stage in the planning process is to identify any existing constraints within the study area that could affect route selection. This will result in a 'Constraints Map'. We are now seeking public input into this stage by way of comments, information, submissions or queries. The input into the constraints map will allow us to proceed to the next stage in the process which is to identify potential route corridors within the study area.

It is anticipated that a planning application will be lodged with the relevant planning authority in late 2010.

You are now invited to view the study area provided and any submissions, comments, information or queries on the stage 1 constraints consultation should be made through the following communications channels before 5pm on Friday the 27th November 2009:

Post: Project Manager
Laois-Kilkenny Reinforcement
EirGrid
The Oval
160 Shelbourne Rd
Ballsbridge
Dublin 4

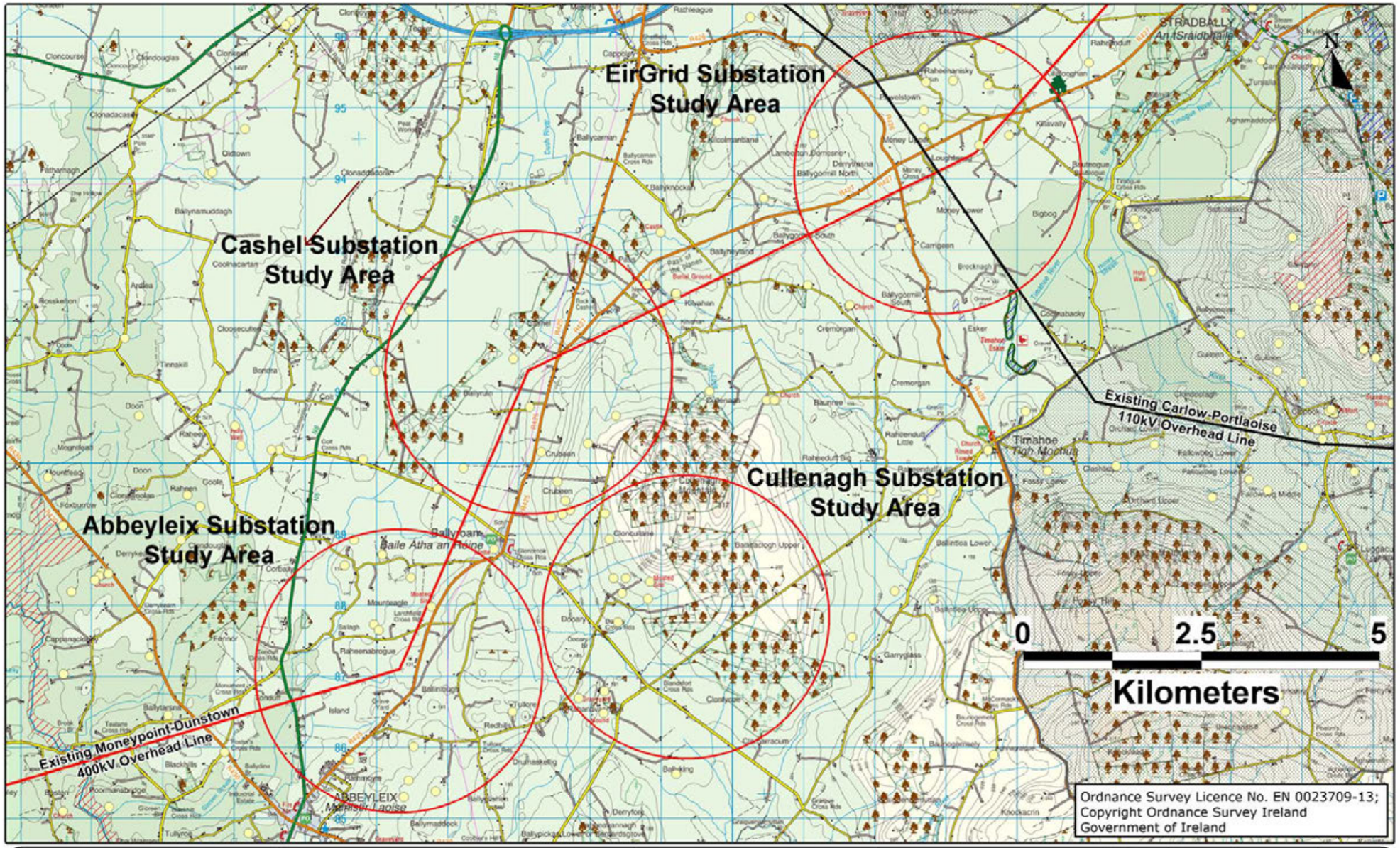
Email: laoiskilkennyreinforcement@eirgrid.com

Web: http://www.eirgrid.com/transmission/laois-kilkenny

Telephone: 01 677 1700

EIRGRID

Appendix 2 – Location of Substation Study Areas



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Email: marketing@esbi.ie Web: www.esbi.ie
ESBI Engineering Solutions is a trading name of ESBI Engineering & Facility Management Limited.
Registered Office: as above Registered in Ireland No. 155249

CLIENT: EirGrid

PROJECT: Laois-Kilkenny Reinforcement Project

DRAWING TITLE: Alternative Substation Study: Four Alternative Substation Study Areas

REVISION DESCRIPTION:

DRAWN	CHECKED	APPROVED	APPD DATE
CMD	AH	TK	15/11/2010

CLIENT REF	No. of Shts	SIZE	SCALE
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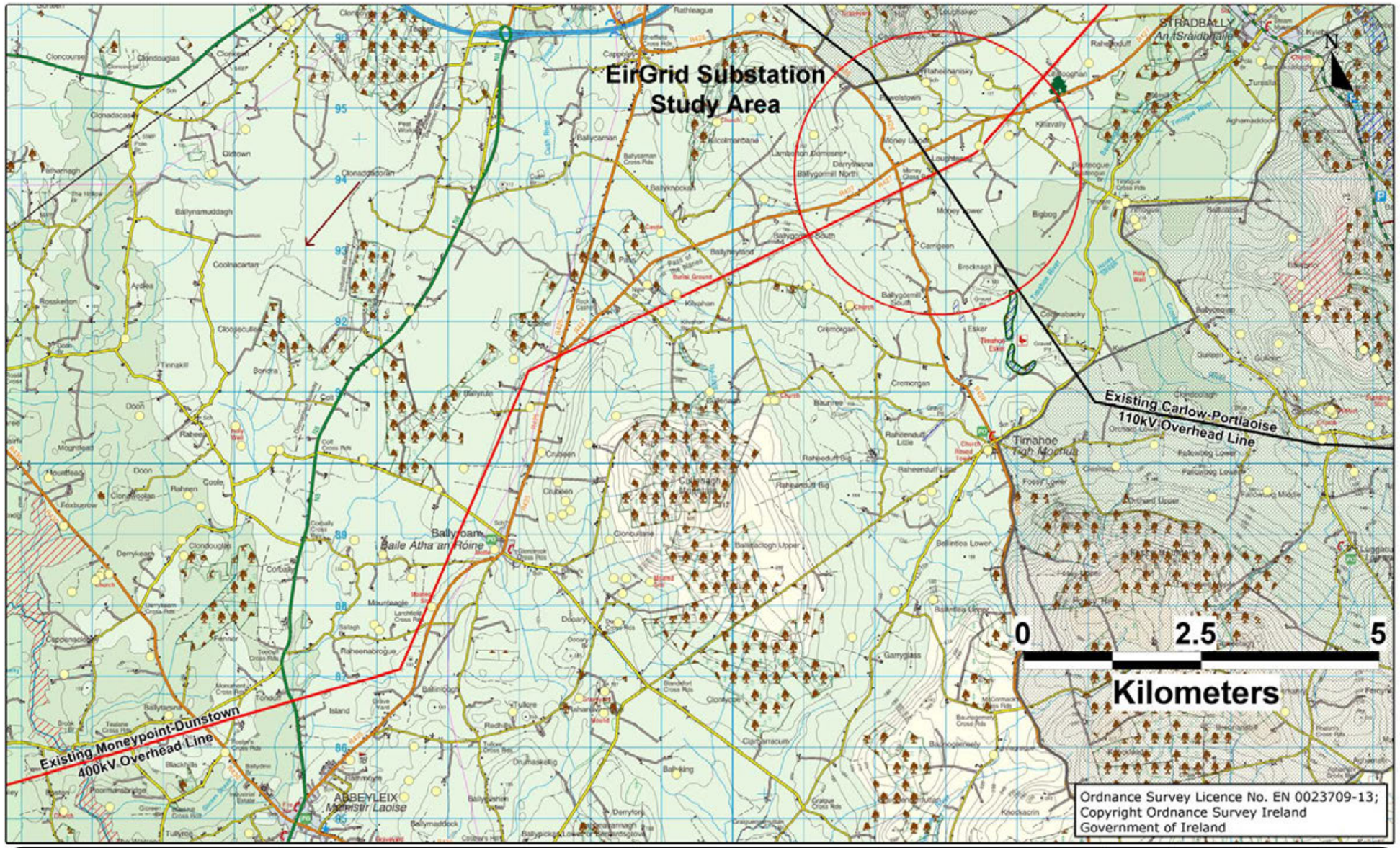
DRAWING NUMBER: PE687-D261-004-001-000 (SHEET REV)

Appendix 3 – Location of Portlaoise Substation Study Area



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CLIENT: EirGrid

PROJECT: Laois-Kilkenny Reinforcement Project

DRAWING TITLE: Alternative Substation Study: EirGrid Substation Study Area

REVISION DESCRIPTION:

DRAWN	CHECKED	APPROVED	APPD DATE
CMD	AH	TK	15/11/2010

CLIENT REF	No. of Shts	SIZE	SCALE
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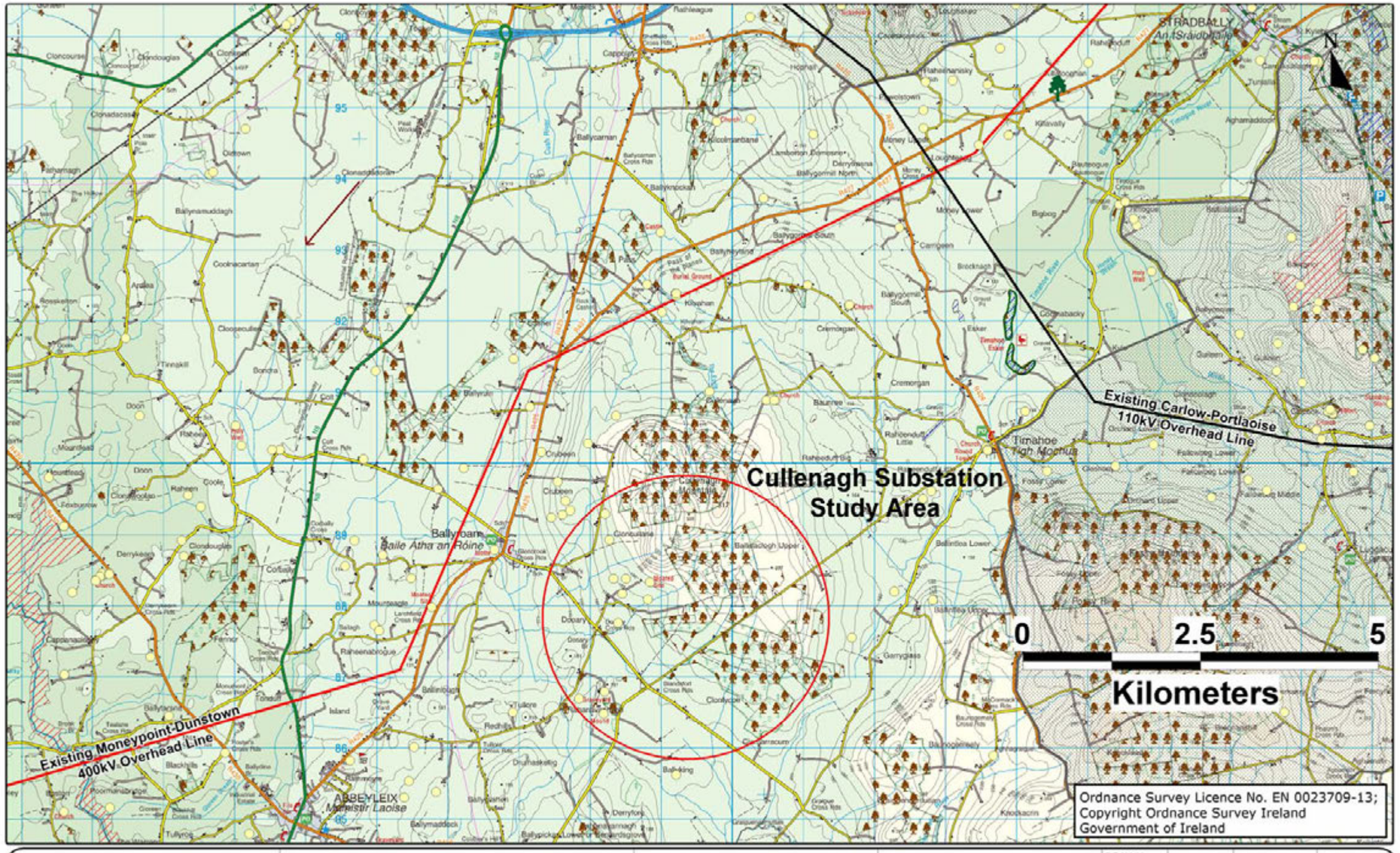
DRAWING NUMBER / SHEET REV: PE687-D261-004-002-000

Appendix 4 – Location of Cullenagh Substation Study Area



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CLIENT: EirGrid	DRAWING TITLE: Alternative Substation Study: Cullenagh Substation Study Area	DRAWN: CMD	CHECKED: AH	APPROVED: TK	APPD DATE: 15/11/2010
PROJECT: Laois-Kilkenny Reinforcement Project		CLIENT REF	No. of Shts: 1	SIZE: A3	SCALE: 1:50000
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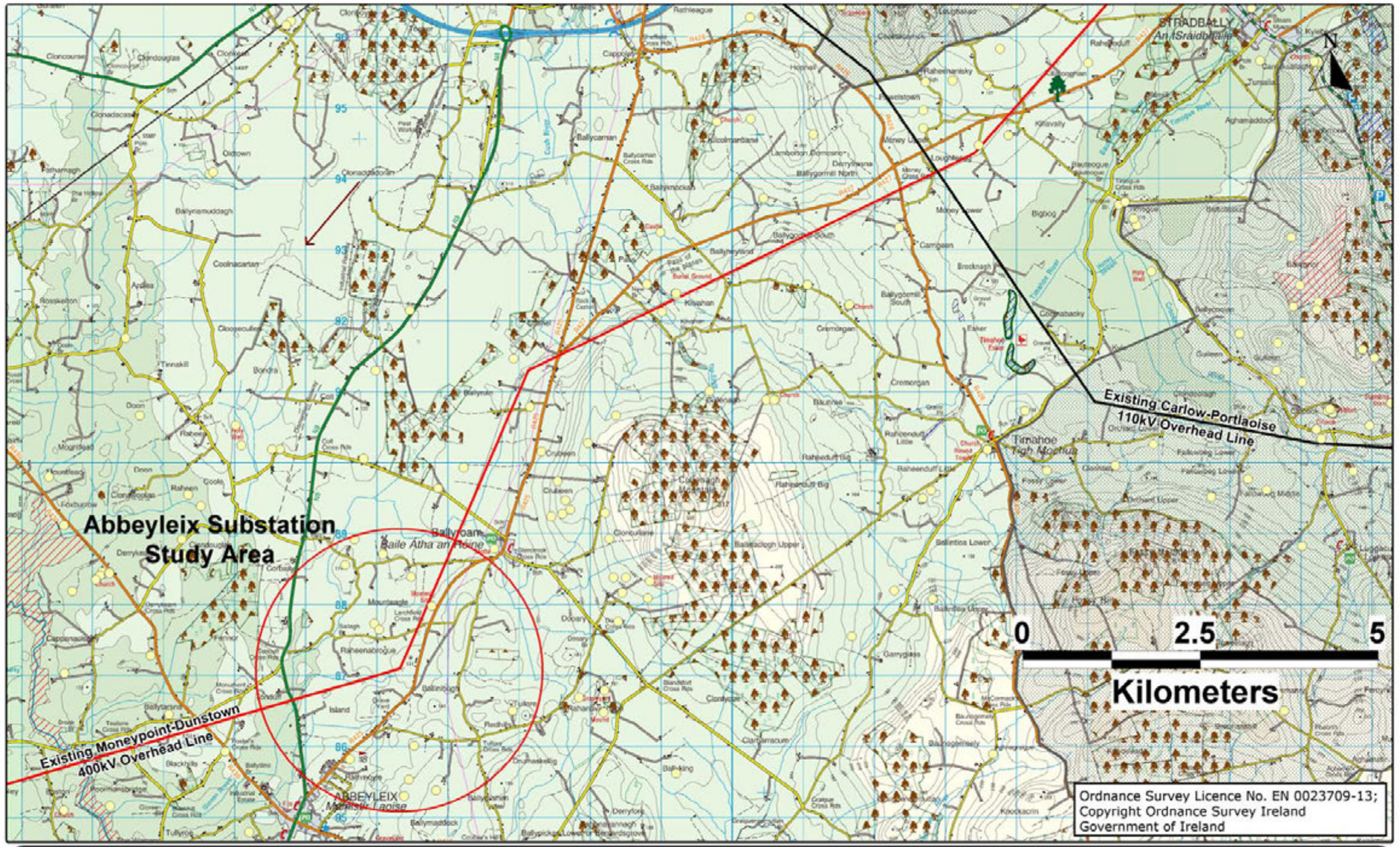
Appendix 5 – Location of Abbeyleix Substation Study Area



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CLIENT: EirGrid

PROJECT: Laois-Kilkenny Reinforcement Project

DRAWING TITLE: Alternative Substation Study: Abbeyleix Substation Study Area

REVISION DESCRIPTION:

DRAWN	CHECKED	APPROVED	APPD DATE
CMD	AH	TK	15/11/2010

CLIENT REF	No. of Shts	SIZE	SCALE
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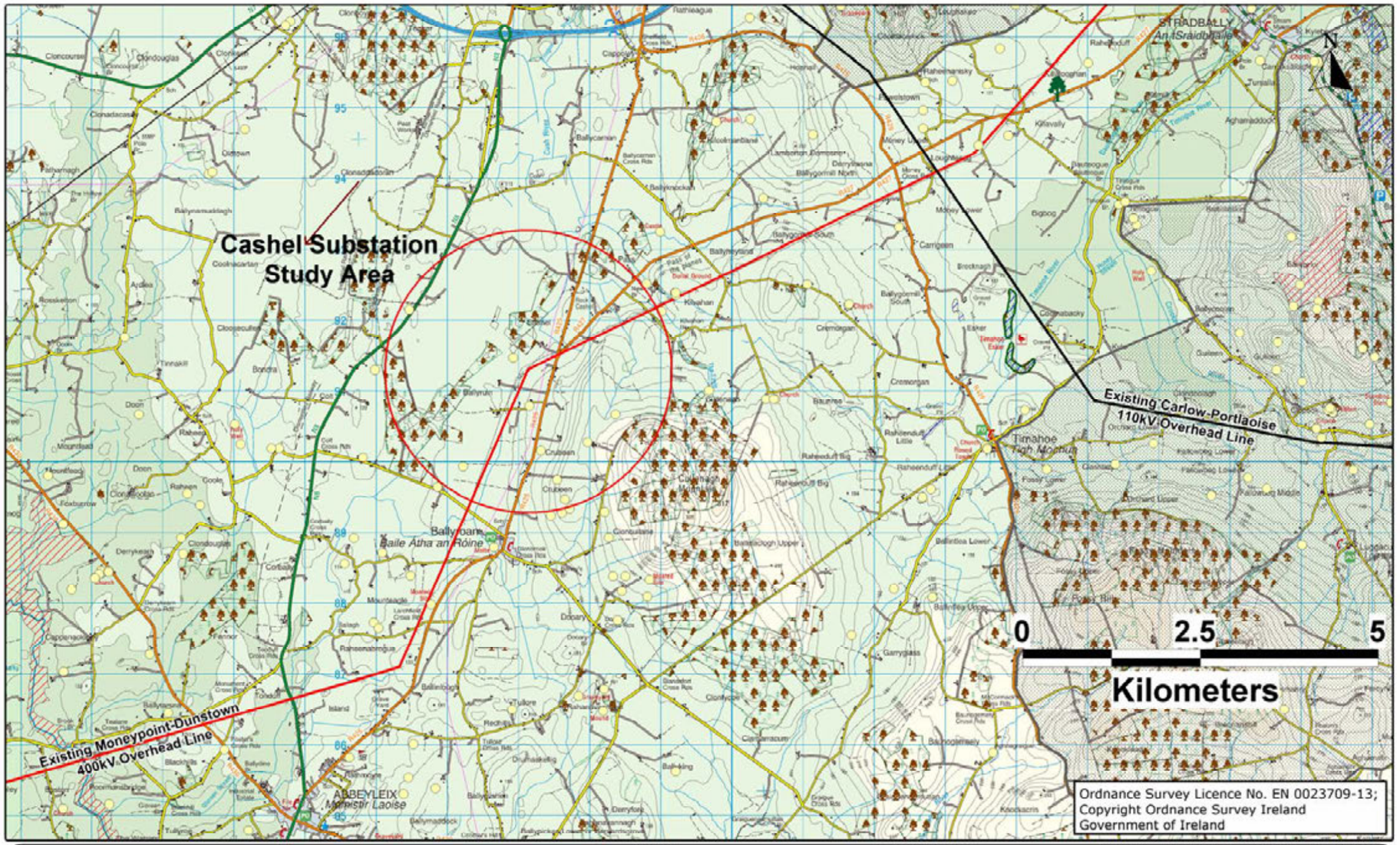
DRAWING NUMBER: PE687-D261-004-004-000 (SHEET REV)

Appendix 6 – Location of Cashel Substation Study Area



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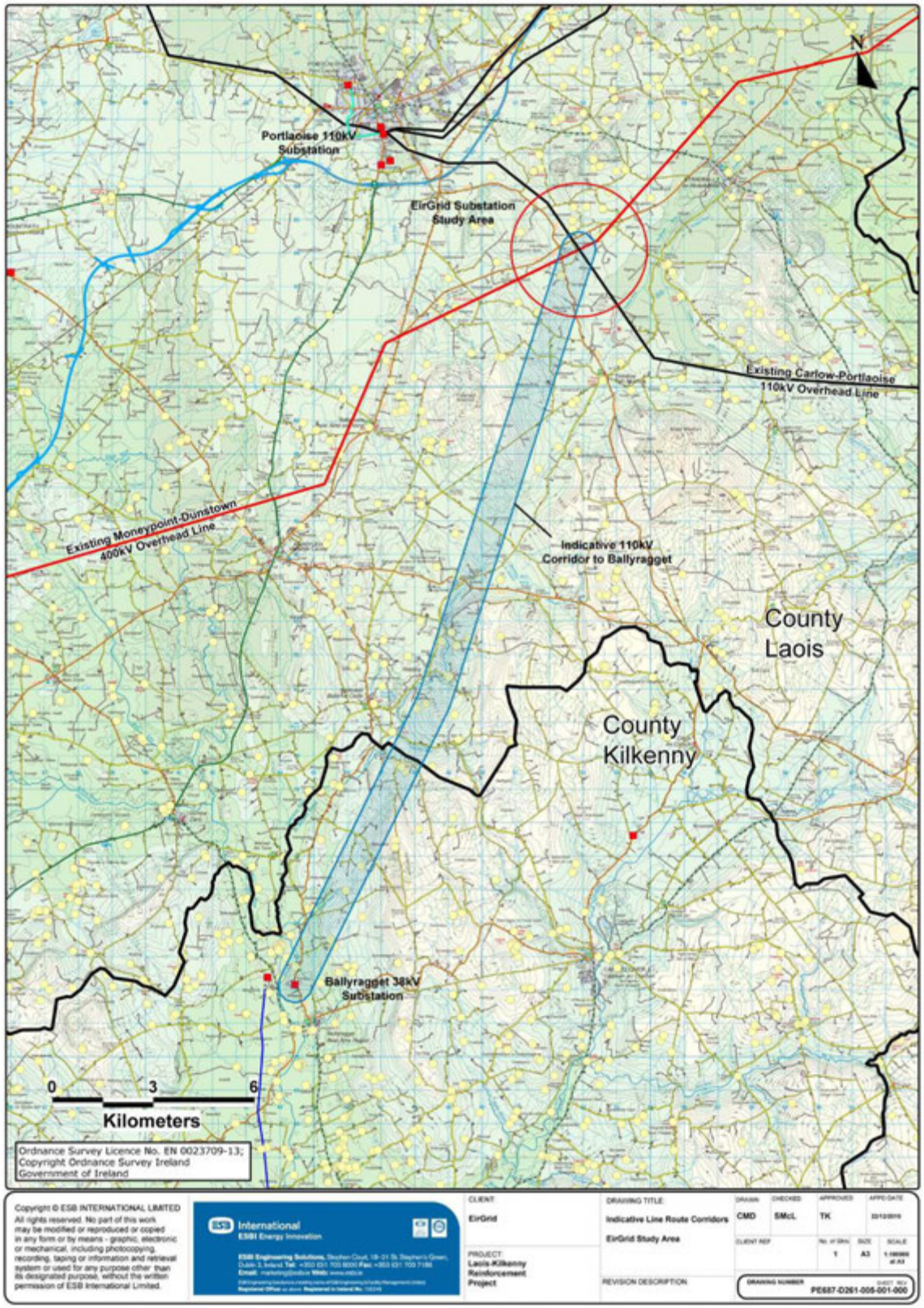
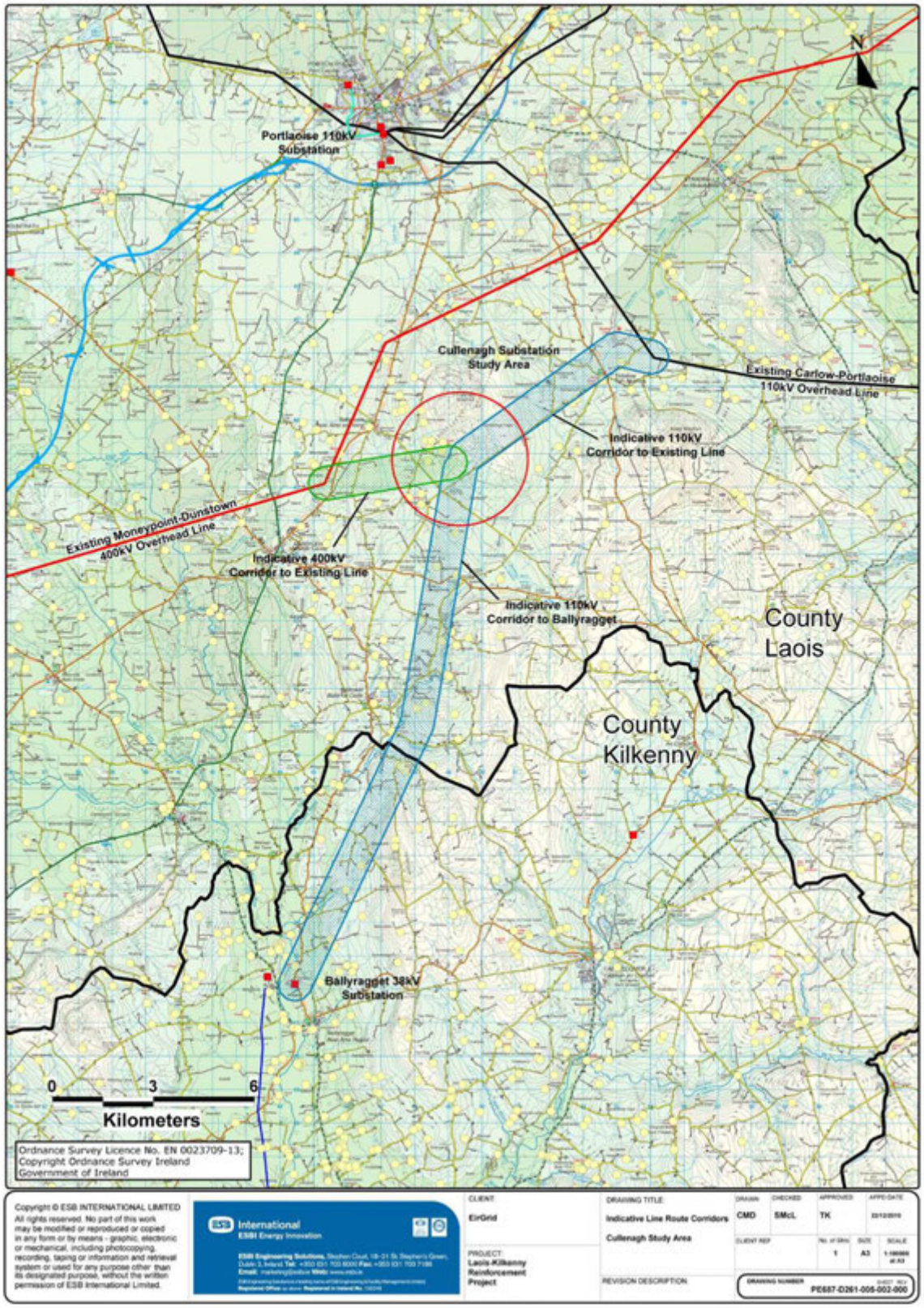
CLIENT:	DRAWING TITLE:	DRAWN	CHECKED	APPROVED	APPD DATE
EirGrid	Alternative Substation Study: Cashel Substation Study Area	CMD	AH	TK	15/11/2010
PROJECT: Laois-Kilkenny Reinforcement Project		CLIENT REF	No. of Shts: 1	SIZE: A3	SCALE: 1:50000
	REVISION DESCRIPTION:	DRAWING NUMBER: PE687-D261-004-005-000		SHEET REV	

Appendix 7 – Indicative Line Route Corridors - Portlaoise Study Area



Appendix 8 – Indicative Line Route Corridors - Cullenagh Study Area



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CLIENT: EirGrid

PROJECT: Laois-Kilkenny Reinforcement Project

DRAWING TITLE: Indicative Line Route Corridors
Cullenagh Study Area

REVISION DESCRIPTION

DRAWN	CHECKED	APPROVED	APPD DATE
CMD	SMcL	TK	03/12/2010

CLIENT REF	No. of Shts	SIZE	SCALE
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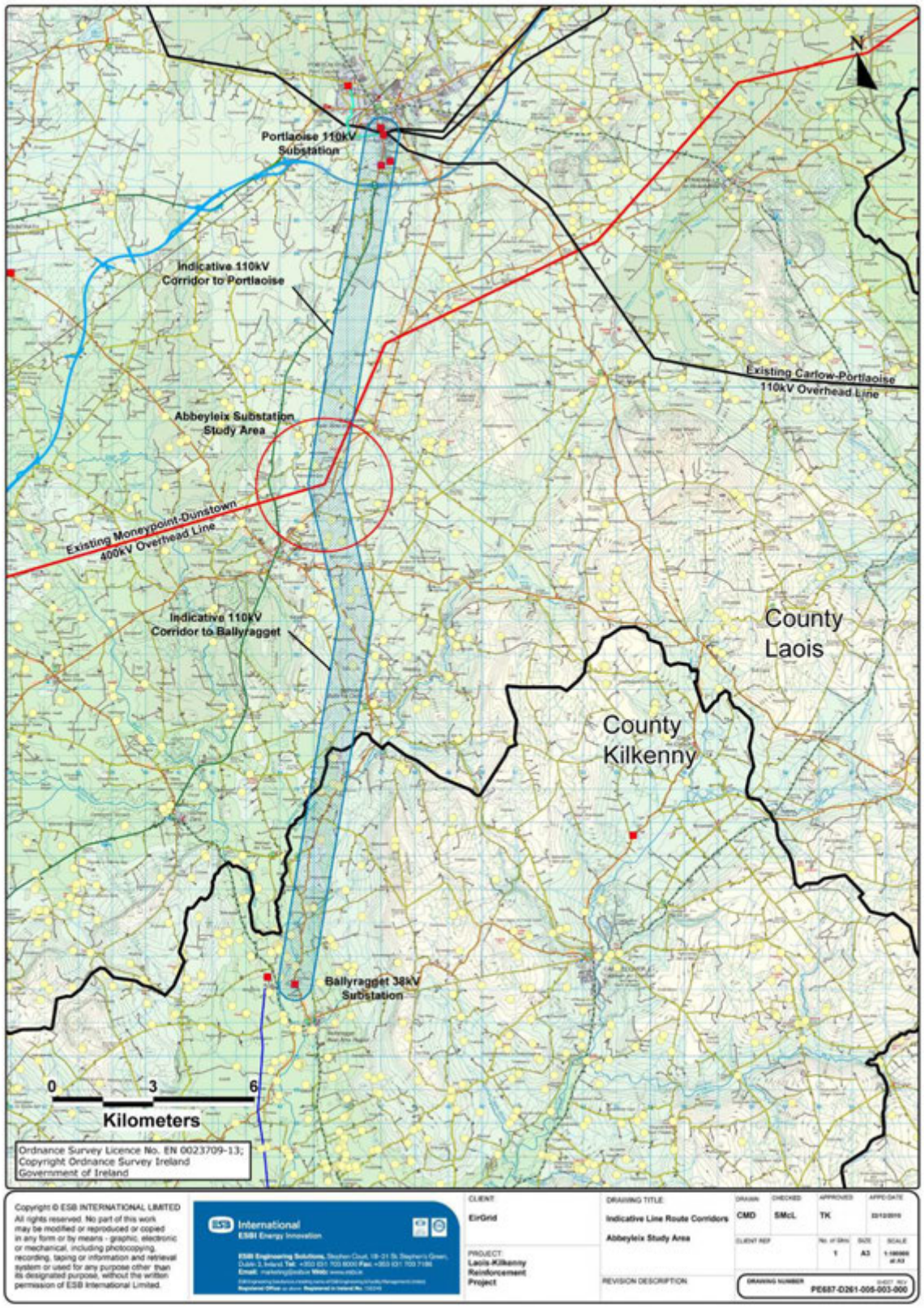
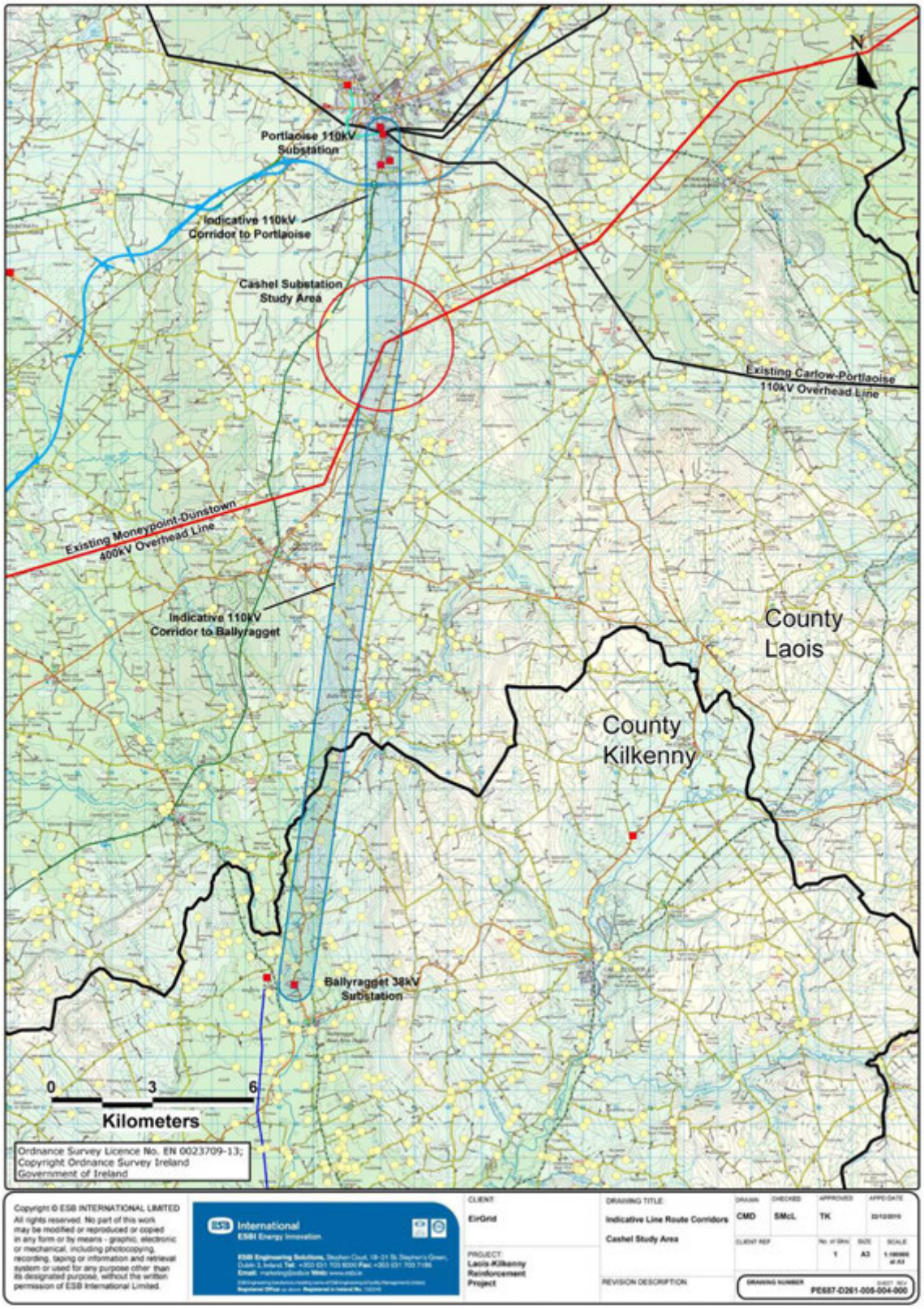
DRAWING NUMBER: PE687-D261-005-002-000

Appendix 9 – Indicative Line Route Corridors - Abbeyleix Study Area



Appendix 10 – Indicative Line Route Corridors - Cashel Study Area



Appendix 11 – Typical Overhead Line Structure Heights

Tower Heights

The typical heights of each of the 400kV Double Circuit, 400kV Single Circuit, 110kV Double Circuit & 110kV Single Circuit towers and 110kV Single Circuit polesets are given below and are indicative only.

400kV Double Circuit:

- Angle Tower: 52m to 62m
- Intermediate Tower: 50m to 68m

400kV Single Circuit:

- Angle Tower: 28m to 37m
- Intermediate Tower: 26m to 55m

110kV Double Circuit:

- Angle Tower: 28m to 40m
- Intermediate Tower: 27m to 43m

110kV Single Circuit:

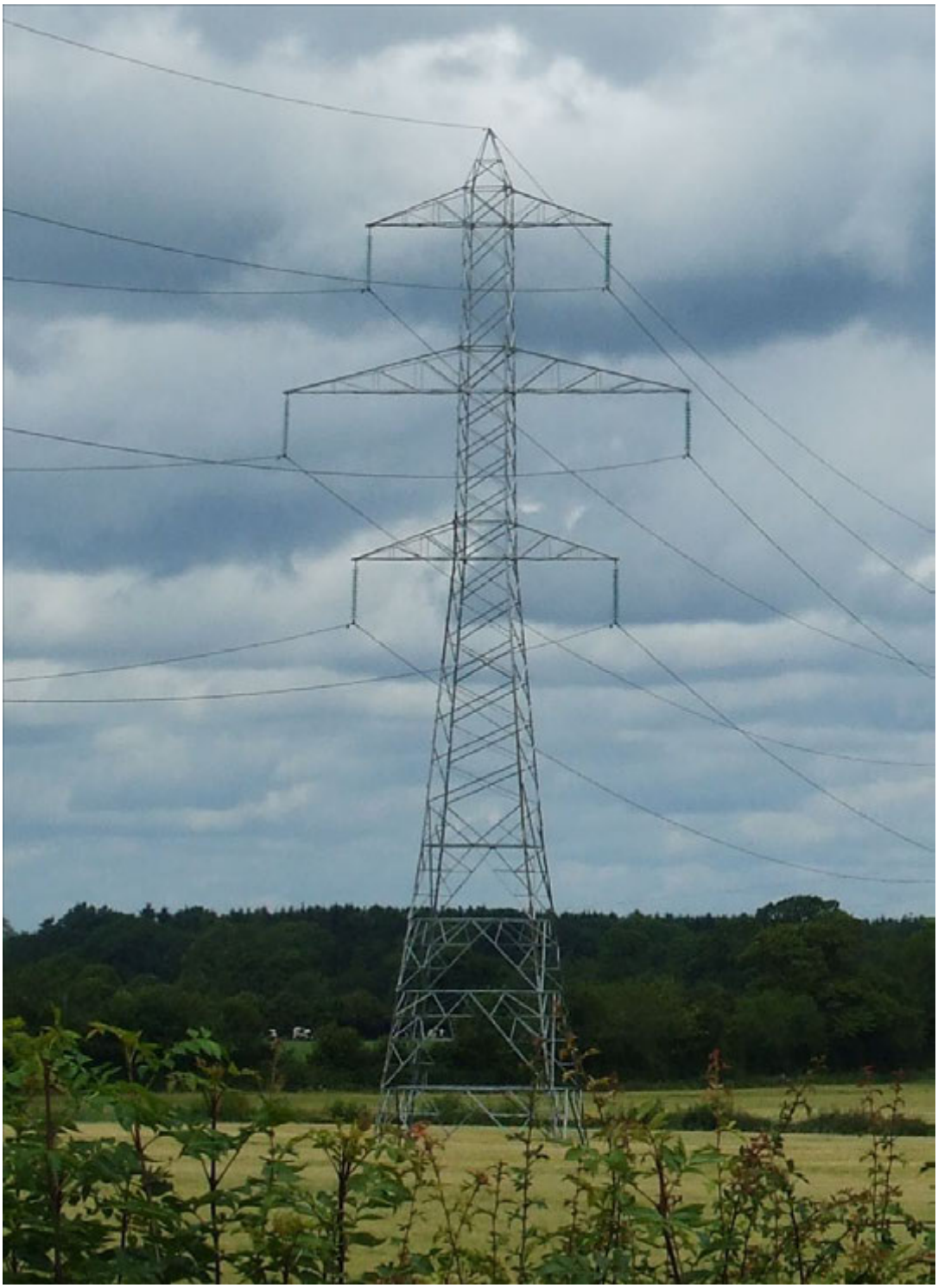
- Angle Tower: 17m to 24m
- Intermediate Poleset length: 16m to 23m (This includes 2.3m burial depth)

Appendix 12 - Photographs of Typical Overhead Line Structures

Indicative 400kV Double Circuit Intermediate Tower

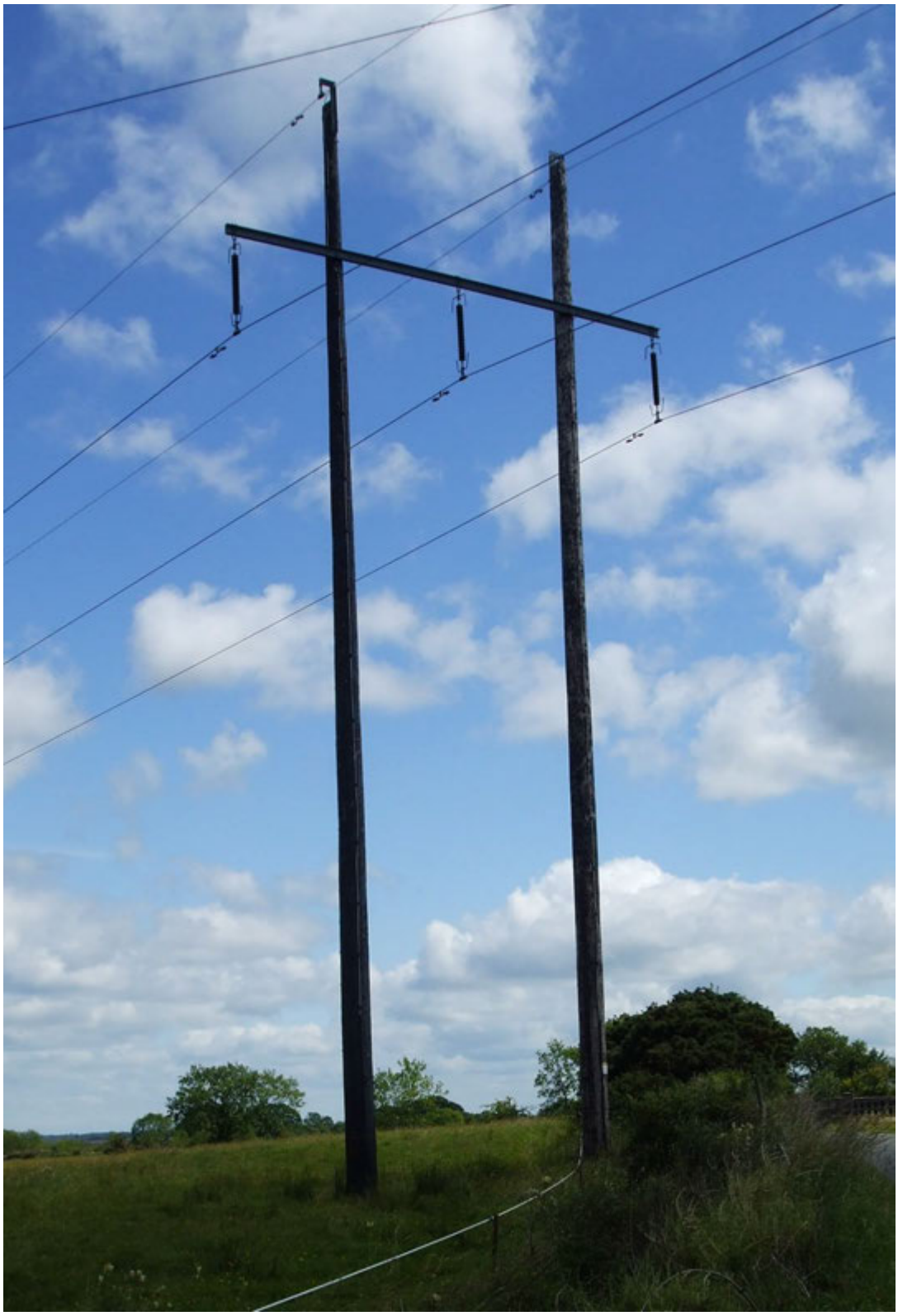
Note: Only one side of this tower has conductor attached. The proposals outlined in this report will have conductor on both sides. The wire on top is known as an earthwire which protects the conductors from lightning strikes

Indicative 400kV Single Circuit Intermediate Tower



Indicative 110kV Double Circuit Intermediate Tower

Indicative 110kV Single Circuit Angle Tower



Indicative 110kV Single Circuit Intermediate Poleset