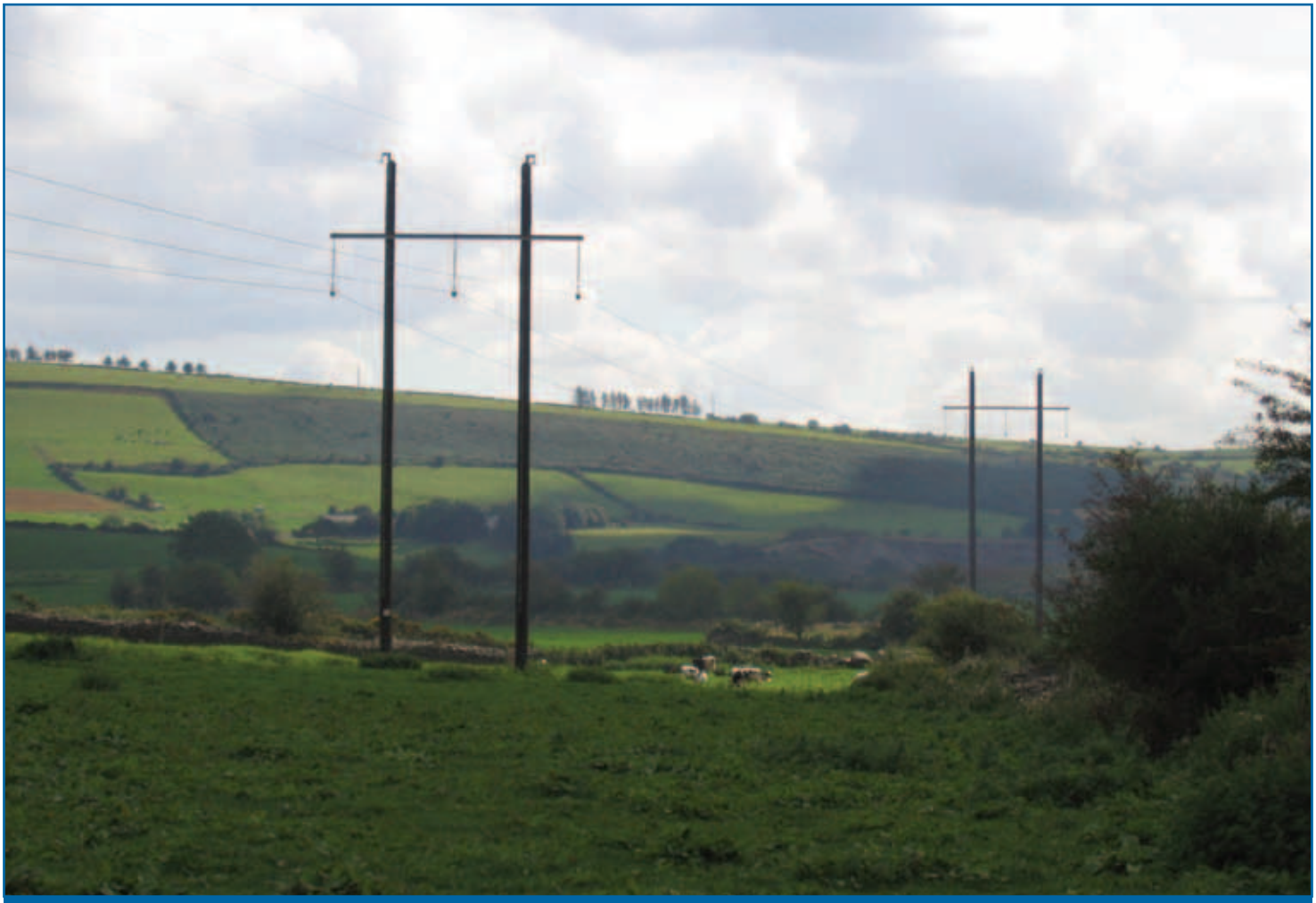
ESB International
ESBI Energy Innovation

LAOIS-KILKENNY REINFORCEMENT PROJECT

PHASE 1 LEAD CONSULTANT'S REPORT

IDENTIFICATION OF EMERGING PREFERRED SUBSTATION SITE AND EMERGING PREFERRED ROUTE CORRIDOR



MAY 2011

EIRGRID

File Reference:

Client / Recipient:	EIRGRID
Project Title:	Laois - Kilkenny Reinforcement Project
Report Title:	Phase 1 Lead Consultants Report – Identification of Emerging Preferred Substation and Emerging Preferred Route Corridor
Report No.:	PE687-F0261-R261-007-000
Rev. No.:	000
Volume 1 Of 1	
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Date:	May 2011

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PART A – PROJECT OVERVIEW

1.0 INTRODUCTION

1.1 PROJECT JUSTIFICATION

The Laois-Kilkenny Reinforcement Project is required to address future impending constraints on the transmission network in the Midlands and South East Region. Although the proposed infrastructure will span between County Laois and County Kilkenny, it will improve quality of supply and security of supply to the wider region as a whole, including counties Laois, Kilkenny, Kildare, Carlow and Wicklow.

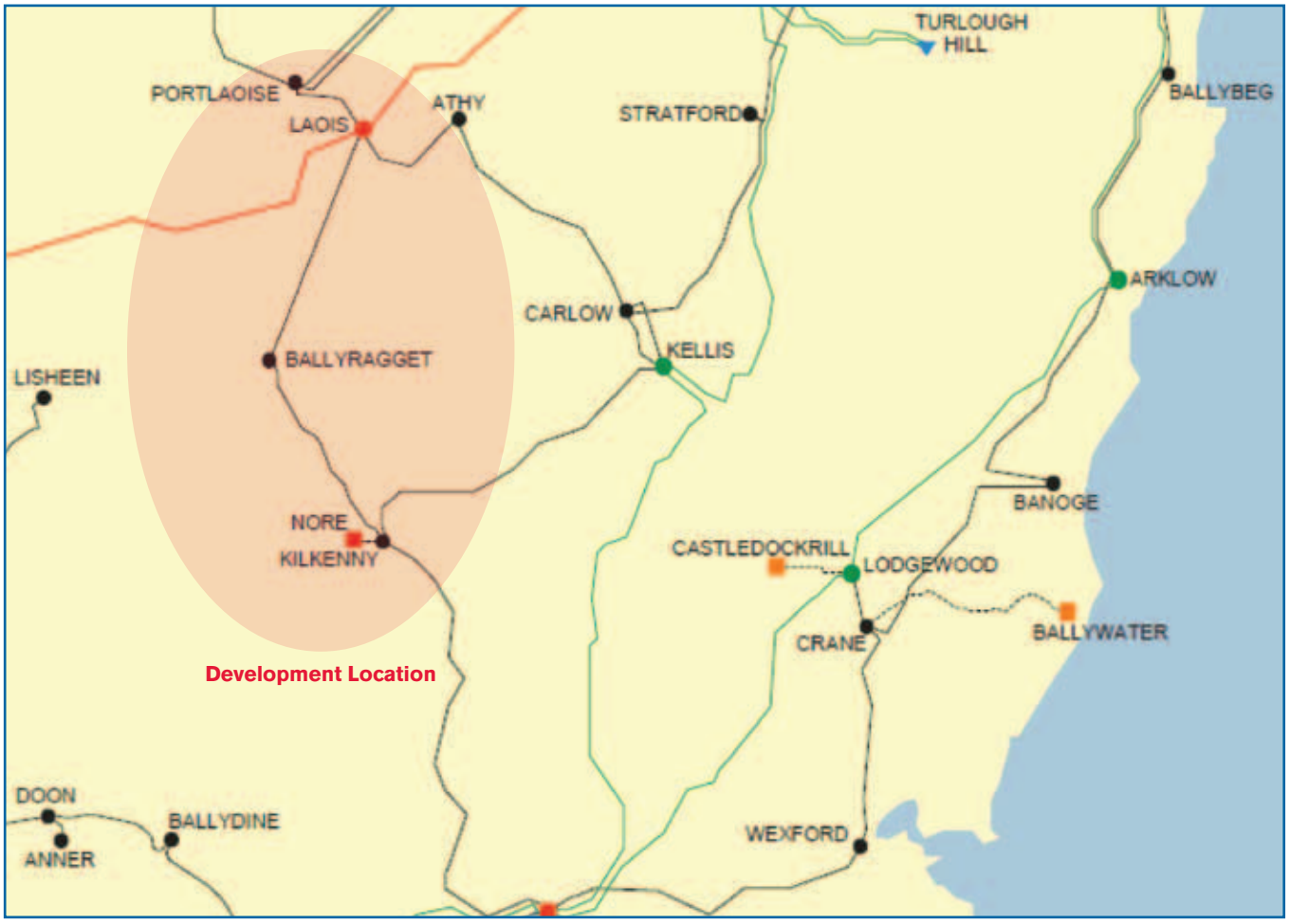

Figure 1: Development Location (Source = Figure I-2, 'Map of Planned Transmission Network at Dec 2016' taken from the EirGrid Transmission Forecast Statement 2010 – 2016)

Transmission Network Constraints:

Electricity supply constraints or problems that are imminent in the area can be categorised into two specific areas, namely:

1. Quality of Supply; and
2. Security of Supply

1. QUALITY OF SUPPLY

Quality of supply is typically indicated by the voltage level. A deterioration in quality of supply in a transmission network is typically seen as lower voltages; an increase in the potential for voltage depressions and a closer proximity to voltage collapse.

The limits of what is considered acceptable and safe for customers are established by a prescribed set of Transmission Planning Criteria (TPC) to which EirGrid plans the transmission network. Detailed technical studies indicate that a decline in the quality of supply can be expected which will result in breaches of these TPC. It is on this basis of breaches in these planning criteria that this reinforcement is now required.

As part of the ongoing process of implementing reinforcements to ensure compliance with the TPC, a capacitor bank was recently installed in Kilkenny substation in order to address the current concerns. A capacitor bank is a piece of

equipment installed in a substation that is used to regulate voltage on the local network. This can only be seen as a short term solution and a long term solution in the form of the Laois-Kilkenny Reinforcement project is now required.

2. SECURITY OF SUPPLY

Security of supply is primarily concerned with ensuring continuity of supply to a customer/consumer. Based on the TPC, the larger the load or demand, the greater is the imperative to ensure continuity of supply to that load/demand.

- The typical approach for a town of Kilkenny's load (demand) size, would be to have three transmission lines supplying power to the town.
- With the existing two line configuration, if one of the lines feeding Kilkenny was out for maintenance the supply is reliant on just one remaining overhead line. If a fault occurred on the remaining working line then the supply to Kilkenny would be lost, seen as a blackout to customers in the local area.
- Therefore concerns relating to security of supply primarily affects Kilkenny substation and are not a direct issue for Portlaoise substation. Portlaoise is currently served by 4 no. 110 kV overhead lines, whilst Kilkenny is served by just 2 no. overhead lines. Portlaoise is therefore considered to be more secure than Kilkenny.

The proposed solution will provide adequate security of supply to Kilkenny by way of a new 110 kV circuit from Laois to Kilkenny.

Additional Benefits

By its very nature, the addition of new transmission infrastructure has the beneficial effect of incrementally increasing the capacity of the network to accommodate a step change in load. Such a step increase in capacity would have the benefit of supporting any efforts to attract new loads to the area. Together with the improvement to quality of supply and security of supply, this would further support any efforts to attract industrial and other high value load customers that are sensitive to the quality of power supply.

Summary

In summary, by adding the proposed infrastructure to the existing transmission network it will significantly improve the quality, power flow and security of supply to the region. Although the proposed new circuit runs directly between Laois and Kilkenny, as it forms part of a meshed transmission network, it will benefit the region as a whole. It is not simply a case of benefitting Laois or benefitting Kilkenny. The transmission network is the vital backbone of the power system and will improve the following:

- The quality of supply to the area will be enhanced with the addition of new transmission circuits and the injection of the 400 kV in-feed into the area.
- The security of supply to the area will be improved ensuring that the area will remain unaffected by any single line outage. Currently, single contingencies (meaning the loss of a circuit in the region (due to maintenance or a fault)) will become an issue even for moderate load growth scenarios for the area.
- The capacity of the system to deliver more power to the area is increased. The ability of the existing transmission network to support and sustain further load growth, or the addition of substation new loads in the area is enhanced. This will support any initiatives to attract new industrial (or any other large scale facilities) to the area.

1.1.1 TECHNICAL ALTERNATIVES CONSIDERED

The problems described above have existed on the system for a number of years and various solutions and alternatives have been considered before arriving at the proposed solution.

It should be noted that these are electrical studies based on power flow analysis to assess their suitability or otherwise.

Technical studies have been ongoing for some time with results documented since January 2005, finally culminating in the internal decision to expedite a reinforcement project in the region being made in April 2008.

Similar reinforcement options have been identified and considered throughout the period during which investigations were conducted. The following regional reinforcement options were identified as being viable alternatives to address the identified problems, namely:

- Option A: 400 kV reinforcement option - A new 400/110 kV station at Laois which loops into the existing Dunstown-Moneypoint 400 kV line and the Athy-Portlaoise 110 kV line; and a 110 kV circuit between Laois and Kilkenny via Ballyragget.

- Option B: A combination 400 kV and 110 kV reinforcement option - A 220/110 kV injection point at Dunstown 400/220 kV station. New 110 kV circuits: Dunstown-Monread 110 kV circuit; Dunstown-Pollaphuca 110 kV circuit; and Carlow – Kilkenny 110 kV circuit.
- Option C: 110 kV reinforcement option - New 110 kV circuits: Maynooth-Monread 110 kV circuit; Carlow -Kilkenny 110 kV circuit; and Kilkenny-Lisheen via Ballyragget 110 kV circuits.
- Option D: A combination of 220 kV and 110 kV reinforcements - a new 220/110 kV station in Kilkenny looped into the existing Great Island-Kellis 220 kV line; new 110 kV circuits: Carlow-Portlaoise 110 kV circuit; and Maynooth Monread 110 kV circuit.

These options are consistent with those originally contemplated as part of the project justification leading to the recommendation of the 400kV reinforcement options – referred to as Option A above. These options include modifications or adjustments where necessary to respond to the recent economic developments within Ireland and their impact on the demand for electrical energy; and to account for the greater clarity and commitment from generators who are expected to connect within the region the options that were originally considered were reviewed and adjusted where necessary.

EirGrid has therefore identified the following solution in response to the technical problems currently affecting the transmission system in the general Midlands / South East area:

- A new 400/110 kV substation near Portlaoise, Co. Laois. The existing Carlow-Portlaoise 110 kV and the Dunstown-Moneypoint 400 kV overhead lines will connect into this new substation.
- A new 110 kV extension to the existing 38 kV substation in Ballyragget, Co. Kilkenny.
- A new 110 kV circuit between the above substations in Laois and Ballyragget.
- Change in operational voltage of the existing Ballyragget-Kilkenny overhead line from 38 kV to 110 kV including necessary works at Kilkenny 110 kV substation.

This reinforcement of the transmission system between Laois and Kilkenny is vital in order to improve both quality and security of supply to the general Laois, Kilkenny, Carlow, Kildare and Wicklow regions.

1.2 THE PURPOSE OF THIS REPORT

The purpose of this Phase 1 – Lead Consultant's Report is to present what is considered by ESB International to be the emerging preferred substation site and also the emerging preferred corridor within which to locate the proposed new 110 kV circuit. The emerging preferred 400 kV corridor from the existing 400 kV overhead line to the substation site is also identified.

ESB International are the Lead Consultants for the project but have engaged AOS Planning Ltd as Environmental Sub-consultants.

It is the intention that the information contained herein will enable consultation between the project team and all interested parties. This a continuation of the information gathering process that has occurred to date and any feedback on the findings to date will be evaluated in the subsequent stage of the project.

Upon publication of this report there will be a time period during which it will be possible for all stakeholders to provide feedback on the emerging preferences. This feedback will be evaluated and assessed by the Project Team which may or may not result in modifications to the original preferences.

This report therefore sets out to:

- Present the need for the project.
- Establish a study area for the project.
- Identify any constraints within the defined study area.
- Identify potential substation site locations and evaluate same having regard to environmental and engineering constraints.
- Identify an emerging substation site for the project.
- Identify potential route corridor options for the project within the defined study area and evaluate same having regard to the environmental and engineering constraints.
- Identify an emerging preferred corridor for the project within which to route the proposed 110 kV circuit and the 400 kV circuit required to connect to the substation in Laois.

1.3 ABOUT EIRGRID

EirGrid is the state owned independent Transmission System Operator (TSO) and Market Operator (MO) 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 transmission system.

The Transmission System (also known as the 'National Grid') is a meshed network of approximately 6,500km of high voltage overhead lines and underground cables and over 100 transmission stations. The transmission system operates at voltages of 110 kV, 220 kV and 400 kV.

The system can be compared to Ireland's motorway network – delivering power from generators to over 100 bulk transfer points or "nodes" all over Ireland similar to motorway interchanges. Power is then carried onwards from these substation 'nodes', to individual customers and households, via the low voltage distribution system similar to the regional and national road network.

EirGrid has several roles:

- To operate a safe, secure, reliable and efficient national electricity grid.
- To plan and develop the necessary grid infrastructure to support Ireland's economy.
- To schedule electricity generation with power generators to ensure that supply matches demand.
- To operate the wholesale electricity trading system.

It is in this capacity that EirGrid is proposing this Laois-Kilkenny Reinforcement Project.

1.4 STRATEGIC PLANNING CONTEXT

The purpose of this section is to describe the Strategic Planning Context for this project. This is set out in National, Regional and Local Policies and Objectives.

1.4.1 NATIONAL OBJECTIVES

White Paper on Energy Policy Framework 2007-2020

The White Paper sets out the current national energy policy framework 2007-2020 to deliver a sustainable energy future for Ireland.

Strategic goals outlined in the White Paper in relation to security of energy supply include:

- Ensuring that electricity supply consistently meets demand;
- Delivering electricity and gas to homes and businesses over efficient, reliable and secure networks; and
- Being prepared for energy supply disruptions.

The White Paper emphasises that *'the availability of reliable, secure and competitively priced electricity supply must be assured at all times'* and highlights the fact that electricity *'is a vital ingredient in the competitiveness of Irish industry and Ireland's long term economic and social development'.*

The White Paper also sets the target of 33% of electricity being produced from renewable generation by 2020. This target was subsequently increased to 40%.

National Development Plan 2007-2013

The National Development Plan 2007-2013 sets out to ensure that Ireland remains competitive in the global international marketplace and that the fruits of our economic success would be shared more equally at regional level and throughout our society. A strategic objective of the Energy Programme of the NDP is to ensure security of supply nationally and regionally. The NDP further states that the main focus of investment by EirGrid *'will entail improvement of the transmission network for electricity to accommodate increased usage and enhance security of supply, to allow increased connection of sustainable and renewable energy sources to the network and to support greater interconnection with Northern Ireland and Great Britain'.*

National Spatial Strategy 2002-2020

The NSS is a 20 year Spatial Planning Strategy, which is a strategic vision for the spatial development of Ireland. It outlines how a strengthened network of cities and towns together with rural communities and their resources will be mobilised and complemented by appropriate social and physical infrastructure, to create more balanced development across the country.

In relation to key infrastructure projects, the NSS identifies that *'a feature of the most mature and successful economies is that they possess highly developed, well integrated infrastructure that supports movement, i.e. public and private transport, and energy and communications networks.'*

The NSS identified nine, strategically located, medium sized 'hubs' whose purpose is to work together to promote regional development in their areas. Kilkenny has been identified as one of these hubs. Some 58% of current demand for electricity is in gateway cities and towns, as identified in the National Spatial Strategy (NSS). The NSS defines gateways as having a strategic location, nationally and relative to their surrounding areas, and provide national scale social, economic infrastructure and support services. The Grid25 (see section 1.3.4) strategy endorses the NSS goal of developing gateways and achieving balanced regional development.

1.4.2 REGIONAL OBJECTIVES

Midlands Region Authority, Regional Planning Guidelines 2010-2022

These Regional Planning Guidelines provide a robust sustainable planning framework for the Midlands Region within the context of the Planning and Development Act 2000 (as amended), and the National Spatial Strategy 2002-2020. Importantly not only do they have regard to the National Spatial Strategy in the context of the Midlands Region, but they also consider the surrounding regions.

Chapter 5 addresses the Region's *'Transport and Infrastructure Strategy'.* This section recognises that an efficient, reliable and cost effective electricity supply is a key resource for regional development.

The Regional Planning Guidelines promote the improvement and expansion of the transmission network throughout the Midlands Region, and includes a section which provides policy framework for Electricity Provision (Section 5.8.1.1, pg 105) as follows:-

- *Development Plans should facilitate the sustainable provision of energy networks in principle provided that it can be demonstrated that:*
- *The development is required in order to facilitate the provision or retention of significant economic or social infrastructure*
- *The route proposed has been identified with due consideration for social, economic, environmental and cultural impacts*
- *Where impacts are inevitable mitigation methods have been included*
- *Where it can be shown that the development is consistent with best international practice.*

Transport and Infrastructure Policies are set out in Section 5.10 of the document, and includes policy which supports and promotes improvement and expansion of the national grid, namely TIP32:

- *TIP32 Support and promote the sustainable improvement and expansion of the electricity transmission and distribution network that supply the Midland Region.*

South East Region Authority, Regional Planning Guidelines 2010-2022

The Regional Planning Guidelines (Chapter 3, Section 3.2, Objective A9) sets out the following strategic goal for the region.

'Supporting the development and improvement of key economic infrastructure, such as energy generation and transmission networks, including renewable energies and telecommunications, all of which are essential for the continued development of the region.'

The Energy Section (Chapter 6, Section 6.2) acknowledges the role of EirGrid and the key transmission projects identified in the GRID25 (see section 1.3.4) strategy. The need to improve the electricity infrastructure in the region is recognised in Section 6.2.3.2, which states:

'The South-East Regional Authority recognises the need to increase electrical infrastructure which will be required within the region, including development of new 'main' 400 kV lines and strengthening of 220 kV , 110 kV transmission lines and equipment.'

Furthermore, Planning Policy Objective 6.5 states:

PPO 6.5 The Regional Authority supports the sustainable development and expansion of the GRID network and future connections to renewable sources of energy (including Gate 3 projects), subject to appropriate assessment of all necessary environmental considerations.

1.4.3 LOCAL OBJECTIVES

Laois County Development Plan 2006 - 2012

The current Laois County Development Plan 2006 – 2012 does not contain policies relating to energy networks. However there are energy policies included in the Draft Laois County Development Plan 2012 – 2018 which are relevant to the project.

Draft Laois County Development Plan 2012-2018 (Reviewed March 2011)

Chapter 9, Section 9.5 of the Draft Laois County Development Plan lists the new transmission and distribution infrastructure projects in the area, including the Laois-Kilkenny Reinforcement Project.

Chapter 9 also includes specific policies which support and facilitate the development of enhanced electricity supplies. *Policy ET9/P13* indicates the intention to protect national grid infrastructure by safeguarding strategic infrastructure corridors from encroachment by inappropriate development. Other policies relating to energy networks include:

ET9/O05 To support and facilitate the development of the electricity infrastructure to ensure a secure supply for the residents of County Laois and ensure that any plan or project associated with energy generation or supply which has the potential to significantly affect a Natura 2000 site is appropriately assessed in accordance with Article 6 of the Habitats Directive in order to avoid adverse impacts on the integrity of the site.

ET9/P11 Support and facilitate the development of enhanced electricity and gas supplies, and associated networks, to serve the existing and projected residential, commercial, industrial and social needs of the County.

Laois County Council acknowledges the need to utilise electricity for domestic and commercial use within the County.

Kilkenny County Development Plan 2008- 2014

The Kilkenny County Development Plan was adopted in June 2008. Chapter 9 deals with *'Infrastructure and Environment'.*

Kilkenny County Council recognises the critical importance of energy availability to facilitate new development. *'in support of sustainable development and efficient energy utilisation, Kilkenny County Council supports the infrastructural renewal and development of electricity networks in the region, including the overhead lines to provide the required networks, subject to amenity and health considerations'.* (Chapter 9, Section 9.8.1, 'National Grid')

1.4.4 GRID25

GRID25 – A Strategy for the Development of Ireland's Electricity Grid for a Sustainable and Competitive Future (2008) outlines EirGrid's high level strategy for upgrading Ireland's electricity network up to the year 2025, in response to the government White Paper on Energy Policy.

It should be noted that while they are largely aligned there is some overlap between the boundaries of the Grid 25 regions and the regions as defined by the Regional Authorities.

The sections on the South East and Midlands Region (GRID25) outline the consequences of non action as follows:

- *Over the next five to ten years, there will be no capacity in the network to cater for new customers and the reliability of supply to existing customers will fall below normal international standards;*
- *There will be no capacity in the network to allow further renewable generation to be connected; this will have severe consequences on the ability of Ireland to meet its renewable targets and its long term sustainable energy supplies;*

Benefits to the region include;

- *Future growth in demand from both industry and domestic users can be accommodated;*
- *Proposals will ensure security of supply to major urban areas and to the region as a whole;*
- *Increased transmission capacity will allow for growth of renewable generation connections in the region;*

1.5 EIRGRID POSITION ON UNDERGROUND CABLES

EirGrid has the exclusive statutory function to operate, maintain and develop a safe, secure, reliable economic and efficient electricity transmission system in Ireland, while having due regard for the environment.

EirGrid has established a position and practices for the construction and operation of high voltage overhead lines and underground cables in Ireland. Whenever a new high voltage circuit is proposed, this position guides the decision on whether to use overhead line or underground cable.

EirGrid's position states that an underground cable will be used only when all of the following conditions apply:

1. An overhead line is not environmentally and/or technically feasible.
2. A technically and environmentally acceptable route for an underground cable can be found.
3. The effect on the transmission network due to the electrical characteristics of the underground cable is acceptable, and the relative poorer 'availability' of the underground cable relative to that of an equivalent overhead line is tolerable.
4. The relative greater cost of the underground cable when compared to an overhead line can be justified.

The full document *'Policy on the use of Overhead Line and/or Underground Cable',* GDC-1R001-00, is included in Appendix A-1.

Notwithstanding this position, the use of underground cable has been considered in detail for this specific project. The circuit in question is the proposed Laois-Ballyragget 110 kV circuit.

In relation to condition (1) above, Chapters 4, 5 and 6 of this report confirm that there are three environmentally feasible corridors including variants of these corridors, within which to route a 110 kV overhead line, and that the predicted environmental impacts of such a development are sustainable. As such, condition (1) does not apply.

In relation to condition (2) above, EirGrid commissioned ESB International to carry out a feasibility study to identify an underground cable route option. This study identified and evaluated several feasible routes identifying one preferred route. This study entitled *'110 kV Underground Cable Feasibility Study'* (Ref: PE424-F0000-R000-011-004) is included in Appendix A-2. A further environmental study was then carried out on this one cable route. This report found that while there are some environmental impacts, especially during the construction phase, these can be minimised with appropriate mitigation measures and the environmental impacts are therefore sustainable. This study is entitled *'Environmental Reports in Relation to an Underground Electricity Circuit for the Laois-Kilkenny Reinforcement Project'* and is included in Appendix A-3. As such condition (2), does apply.

In relation to condition (3) above, a project specific technical screening study has examined the electrical characteristics of using a cable for the proposed circuit. This study found that whilst the use of a cable would result in a more onerous utilisation of the local 110 kV network, the overall effect is deemed tolerable. This study entitled *'Power System Studies: Laois-Ballyragget Cable Feasibility Studies'* (Ref: PE667-F0400-R300-001-003) is also included in Appendix A-4.

In relation to condition (3) above, the availability of both an overhead line and an underground cable has been assessed based on a combination of fault data from the Irish Transmission System and from CIGRÉ (Conseil International des Grands Réseaux Électriques (The International Council of Large Electric Systems)) data on 110 kV faults. From these it has been concluded that on average, over it's lifetime an overhead line will give a better service availability than an underground cable. This is based on the knowledge that, on average, the fault rates of underground cables are comparable with the fault rates of overhead lines (sustained faults as opposed to transient faults) however the repair times for underground cable faults (average repair time of 15 days for 110 kV UGC) are considerably longer than for faults on overhead lines (average repair time of less than one day). It follows therefore that an overhead line will provide a better level of service availability, and is therefore more reliable than an equivalent underground cable. Based on this criterion and for this development, an overhead line is considered preferable to an underground cable.

In relation to condition (4) above, the costs for both an overhead line and an underground cable solution have been estimated. Based on the emerging preferred overhead line route corridor identified in Chapter 6 and the emerging preferred underground cable route identified in the Underground Cable Feasibility Report, it is estimated that the underground cable would cost nearly three times more to install than the equivalent overhead line. The relative high cost of an underground cable cannot be justified given the fact that viable overhead line solutions exist and therefore condition (4) does not apply.

In summary, EirGrid's position on the use of high voltage underground cable and overhead line in the Ireland states that all four of EirGrid's conditions must apply for an underground cable to be used for a proposed circuit.

As only one of the four policy conditions is applicable, EirGrid are proceeding with an overhead line solution for the Laois-Ballyragget 110 kV circuit.

1.6 GENERAL PROJECT DESCRIPTION

The proposed Laois-Kilkenny Reinforcement Project will consist of the following:

- A new 400/110 kV substation near Portlaoise, Co. Laois. The existing Carlow-Portlaoise 110 kV and the Dunstown-Moneypoint 400 kV overhead lines will connect to this new substation.
- A new 110 kV extension to the existing 38 kV substation in Ballyragget, Co. Kilkenny.
- A new 110 kV circuit between the new 400/110 kV substation near Portlaoise and the new 110 kV substation extension in Ballyragget, Co. Kilkenny.
- Change in operational voltage of the existing Ballyragget-Kilkenny overhead line from 38 kV to 110 kV including necessary works at Kilkenny 110 kV substation.

The existing Dunstown-Moneypoint 400 kV overhead line will be connected to the planned new substation in Laois[1].

This connection will be made using a combination of 400 kV double circuit and single circuit lines. A double circuit line consists of six electrical conductors and one earthwire, while a single circuit line consists of three electrical conductors and two earthwires. At 400 kV level steel lattice towers are used to support the conductors.

The existing Carlow-Portlaoise 110 kV overhead line will also be connected to the planned new substation in Laois[2]. This connection will be made using single circuit lines (a single circuit line consists of three electrical conductors and two earthwires). At 110 kV level, woodpole portal structures are used to support the conductors. Where the line changes direction steel lattice towers are used.

It is also intended to construct the new 'Ballyragget to New 400/110kV Substation' 110kV circuit as a single circuit overhead line[3].

[1] The emerging preferred substation site is approximately 1.5km from the Dunstown-Moneypoint 400kV line – see section 3 "Substation Site Identification"
[2]The emerging preferred site is adjacent to the Carlow-Portlaoise 110kV line – see section 3 "Substation Site Identification"
[3]The emerging preferred line route corridor is approximately 26km – see section 6.4 Lead Consultant's Recommendation

1.7 TYPICAL STRUCTURES DESCRIPTION

1.7.1 OVERHEAD LINE STRUCTURES 400 KV

400kV overhead lines are carried on steel lattice towers. There are two types of structures that are proposed for the Laois – Kilkenny Reinforcement Project; these are Single Circuit towers and Double Circuit towers.

Single Circuit Intermediate and Angle Structure

Lattice steel towers are used to carry 400 kV overhead lines. They typically range in height from circa 26 – 55 metres depending on the ground profile. These structures hold three conductors, connected to electrical insulators along the lower crossarm and two earthwires supported on the earthwire peaks of the mast. Figure 2 shows a photograph of a 400kV lattice steel towers which are similar to the one of the types of towers proposed for the new short length of 400kV overhead line.

Figure 2: Photograph of a 400kV Single Circuit Intermediate Tower

Double Circuit Intermediate and Angle Structure

In some instances, the most efficient method of carrying two circuits along the same route is to use a double circuit angle tower. As its name implies, a double circuit tower is capable of carrying two circuits (6 conductors) with an earthwire supported on the top. As they are supporting more weight, these structures are taller than the single circuit angle towers. Their typical heights can range from circa 50 – 68 metres, Figure 3 shows a photograph of an existing double circuit steel intermediate tower on a 400 kV line which is similar to the one of the types of towers being planned for the new 400kV overhead line.

Figure 3: Photograph of a 400kV Double Circuit Intermediate Tower

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

1.7.2 OVERHEAD LINE STRUCTURES 110 KV

Two types of structures are used to carry 110kV overhead lines. These are woodpole portal structures (predominately) and lattice steel angle towers where the line changes direction.

Single Circuit Intermediate Woodpole Portal Structure

Overhead line intermediate woodpole portal structures consist of two wood poles, 5 metres apart, connected near the top with a rolled steel channel. The full length of the wood poles varies from 16-23m with a minimum 2.3m of this buried underground. The polesets carry three conductors (also known as phases) suspended from electrical insulators. These conductors carry the electrical current. Two earthwires are supported on top of the poles on earthwire brackets which extend 0.45 metres above the top of the pole. These earthwires do not carry electrical power and serve only to protect the overhead line and connected equipment from lightning strikes.

Figure 4 shows a photograph of an existing 110 kV line which would be similar to the proposed Ballyragget – Laois 110 kV line.

Figure 4: Photograph of a Single Circuit 110 kV wood poleset structure

Single Circuit Angle Structure (Lattice Steel Angle Tower)

Lattice steel angle towers are used on 110 kV overhead lines where the line changes direction. They typically range in height from circa 17 – 24 metres depending on the ground profile. The angle structure holds three conductors, connected to electrical insulators in a horizontal formation along the lower crossarm. Two earthwires are supported on the earthwire peak of the mast (upper crossarm). Figure 5 shows a photograph of an existing steel angle tower on a 110 kV line which would be similar to those found on the proposed Laois-Ballyragget overhead line.

Figure 5: Photograph of a typical Single Circuit 110 kV angle tower structure

1.8 STATION DESCRIPTIONS

A substation is the location where equipment is placed in order to safely change the electricity from higher transmission voltages to lower voltages that are appropriate for use by end-customers. It does this by using equipment known as transformers. They 'transform' the electricity from one voltage to another and they represent the means through which electricity is drawn from the transmission system.

A substation also acts as a point of common connection or a 'node' for several circuits. It is helpful to think of them like a roundabout. Power comes in on one circuit (road) and can be sent down another circuit. This is achieved by using other equipment in the substation such as switches and circuit breakers. All of this equipment together is known as a substation.

New Laois 400/110 kV Substation

Two alternative types of substation were considered for this particular project. One is an outdoor type, known as an Air Insulated Switchgear (AIS) substation. The second type is an indoor type, known as a Gas Insulated Switchgear (GIS) substation.

As their name suggests, both use different insulating mediums (Air or Gas) between hardware devices (circuit breakers) within the station. Smaller distances between parts can be achieved with gas as its insulating strength is higher than that of air, resulting in a more compact overall station size. The land take size associated with the GIS stations can be significantly smaller than when compared to AIS.

In Laois, it is estimated that the AIS compound would be approximately 11.6 acres (4.68 hectares) in size, whilst the GIS compound would be of the order of 2.6 acres (1.06 hectares) in size.

A typical 400/110kV AIS substation compound consists of a control building typically circa 15m x 25m x 7m in height. All of the switchgear is outdoors. The highest elements of this substation are several lightning protection structures spaced around the compound which are typically circa 28m in height; Figure 6 illustrates an indicative 400/110kV AIS substation layout.

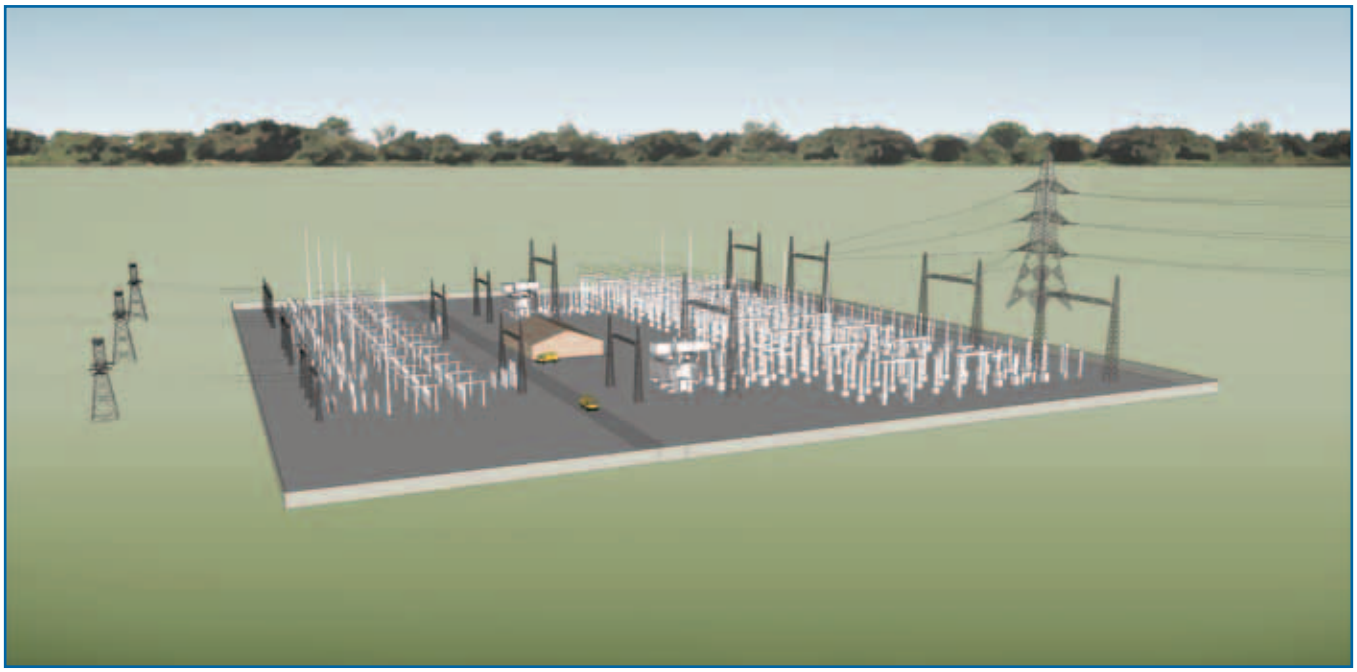

Figure 6: AIS Type 400/110kV Substation

A typical 400/110kV GIS substation compound consists of a 400kV building, typically circa 12m x 43m x 11m in height and a 110kV building typically circa 27m x 10m x 8m in height. These buildings contain the switchgear. The power transformers are located next to the 400kV building and are separated by a fire wall. The highest element of this substation is a single lightning protection structure in the centre of the compound which is typically circa 28m in height; Figure 7 illustrates an indicative 400/110kV GIS substation layout.

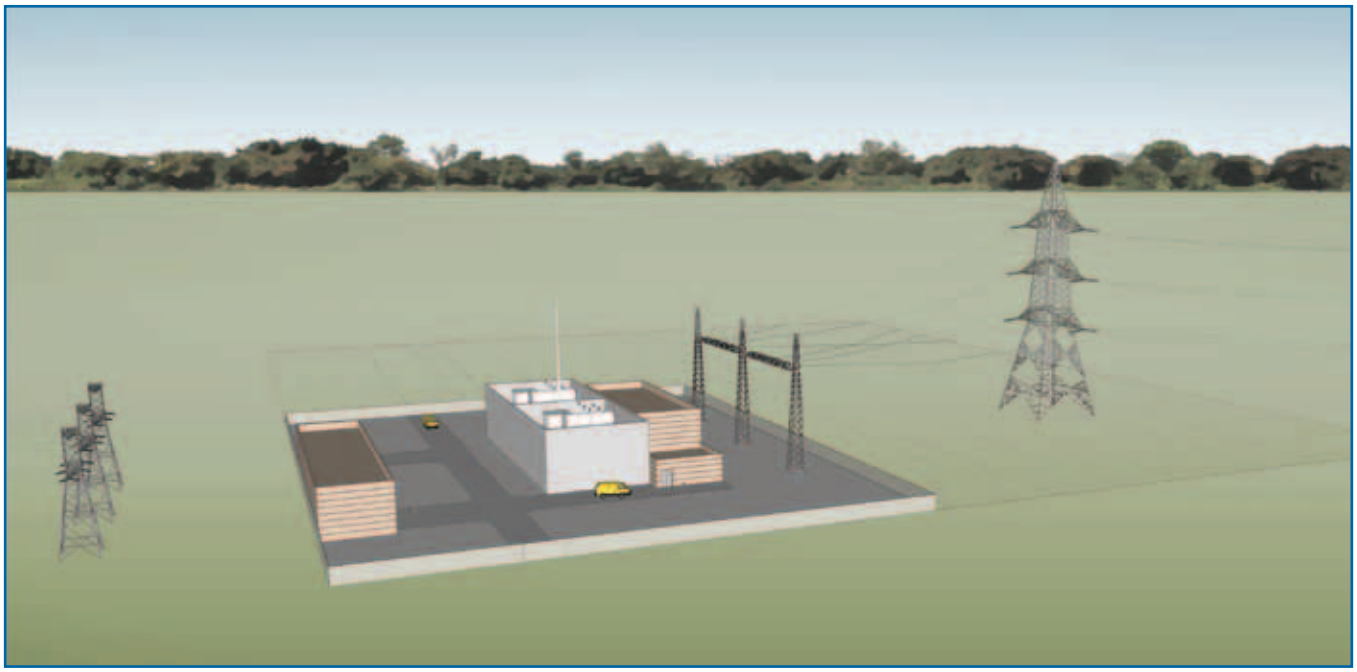

Figure 7: GIS Type 400/110kV Substation

When considering the type of substation to use, land take is only one consideration. Technical performance including operational flexibility and maintenance as well as comparative costs must also be considered.

ESBI carried out a comparison report on the substation technology options and the recommendation was to proceed with a GIS solution. This recommendation was based on both the cost and technical aspects as well as taking into account the overall smaller size and the associated reduced environmental impact. This Report is entitled '*Technical Comparison of AIS vs. GIS Substation Options'* (Ref: PE595-F1268-R268-003-003) and can be found in Appendix B.

Having considered this recommendation, EirGrid have decided that it is appropriate to proceed with a GIS type substation in this particular instance.

It is planned that the existing 400 kV Dunstown-Moneypoint and 110 kV Carlow-Portlaoise overhead lines will connect into this new GIS station by way of overhead lines.

It is also planned to construct a new 110 kV overhead line from this GIS substation to Ballyragget.

Ballyragget 110 kV Substation Extension

Ballyragget substation is a 38kV/MV substation. To facilitate the requirements of this reinforcement project a new 110 kV extension is required. This new extension will consist of 110 kV busbar, 110 kV line bays and 110 kV transformer bays and will interface with the existing 38kV/MV station.

The extension will be a compact AIS extension and the size will be similar to what is already there. (i.e. 0.5 acres). Local realignment and rearrangement of the existing overhead line into the station will be required.

Kilkenny Substation

The existing Ballyragget-Kilkenny overhead line is currently constructed to 110kV but operating at 38 kV and as such is connected to the 38 kV busbar in Kilkenny station. As described in the project description, it is intended to operate this line at the higher voltage of 110 kV. The line will therefore need to be moved from the 38 kV busbar to the 110 kV busbar. This may entail some realignment of the existing structures close to the station.

1.9 PROJECT ROADMAP

A project roadmap outlining the key phases/stages of the project, from beginning through to submission of planning application is shown in figure 8. This report represents the conclusion of Phase/Stage 1.

Figure 8: Project Roadmap

EIRGRID

1.10 PROJECT TEAM

ESB International has been appointed by EirGrid as the Lead Consultant for this project.

Specialist environmental reports / inputs have been prepared by AOS Planning Ltd. and their subconsultants.

1.11 HEALTH AND SAFETY

ESB International has been appointed as Project Supervisor Design Process (PSDP) and Designers for the Laois – Kilkenny Reinforcement Project and will fulfil all relevant duties as defined by the Safety, Health and Welfare at Work (Construction) Regulations 2006 (S.I No 504).

ESB International will therefore ensure that the principles of prevention are applied throughout the design process and that the proposed development submitted to the Planning Authority is:

a) designed and is capable of being constructed safely and without risk to health

b) able to be maintained safely and without risk to health during use, and

c) compliant in all respects, as appropriate, with the relevant health and safety statutory provisions.

2.0 STUDY AREA AND CONSTRAINTS IDENTIFICATION

2.1 STUDY AREA IDENTIFICATION AND DESCRIPTION

The Project Study Area is the broad geographical region within which a practical feasible route corridor can expect to be found having regard to the technical rationale for the project as outlined in chapter 1. In this case it covers an area of approximately 29 x 30km (870 sq km). This study area was established taking into consideration the connection requirements for the project. These requirements include connection to the existing Dunstown-Moneypoint 400 kV overhead line, connection to the existing Carlow-Portlaoise 110 kV overhead line and a connection to a new 110 kV extension of the existing Ballyragget 38 kV substation. This study area has been reviewed by AOS Planning Ltd. and is deemed to be an appropriately sized study area based on the objectives of the project.

The Project Study Area mainly lies within the counties of Laois and Kilkenny. The Project Study Area is bounded to the north by Portlaoise, to the east by Athy, to the west by Mountrath, and to the south by Freshford.

It is generally rural in nature and is generally characterised by farmland interspersed with towns, villages and settlements connected by a network of national, regional and local roads.

The landscape of the Project Study Area is mainly characterised by lowlands through which the River Nore flows and higher ground underlain by the Castlecomer Plateau. The lowlands in the western section are underlain by limestone and are generally flat and have fertile soils. The area is dominated by farmland, with a network of fields containing improved grasslands and tillage, with a well developed hedgerow network.

The Castlecomer Plateau area contains higher ground extending up to 330m Ordnance Datum (OD) and is underlain by shales and sandstone. This area has an undulating hilly landscape with low peaks and some low-lying valleys that are drained by tributaries of the River Nore. This type of environment and geology means that soil is less fertile with impeded drainage, and as a result wet grasslands are a prominent feature of these hillsides. Conifer plantations are also regularly found in this area. Elevation in the study area ranges from 60 metres (m) OD along the River Nore channel to 326m OD near Fossy Mountain.

The majority of this project study area is found within the River Nore catchment and the proposed site of the 110kV substation at Ballyragget is situated near the river adjacent to the existing 38kV substation. A section on the eastern side of the study area lies within the Barrow catchment. Figure 9 shows the Project Study Area

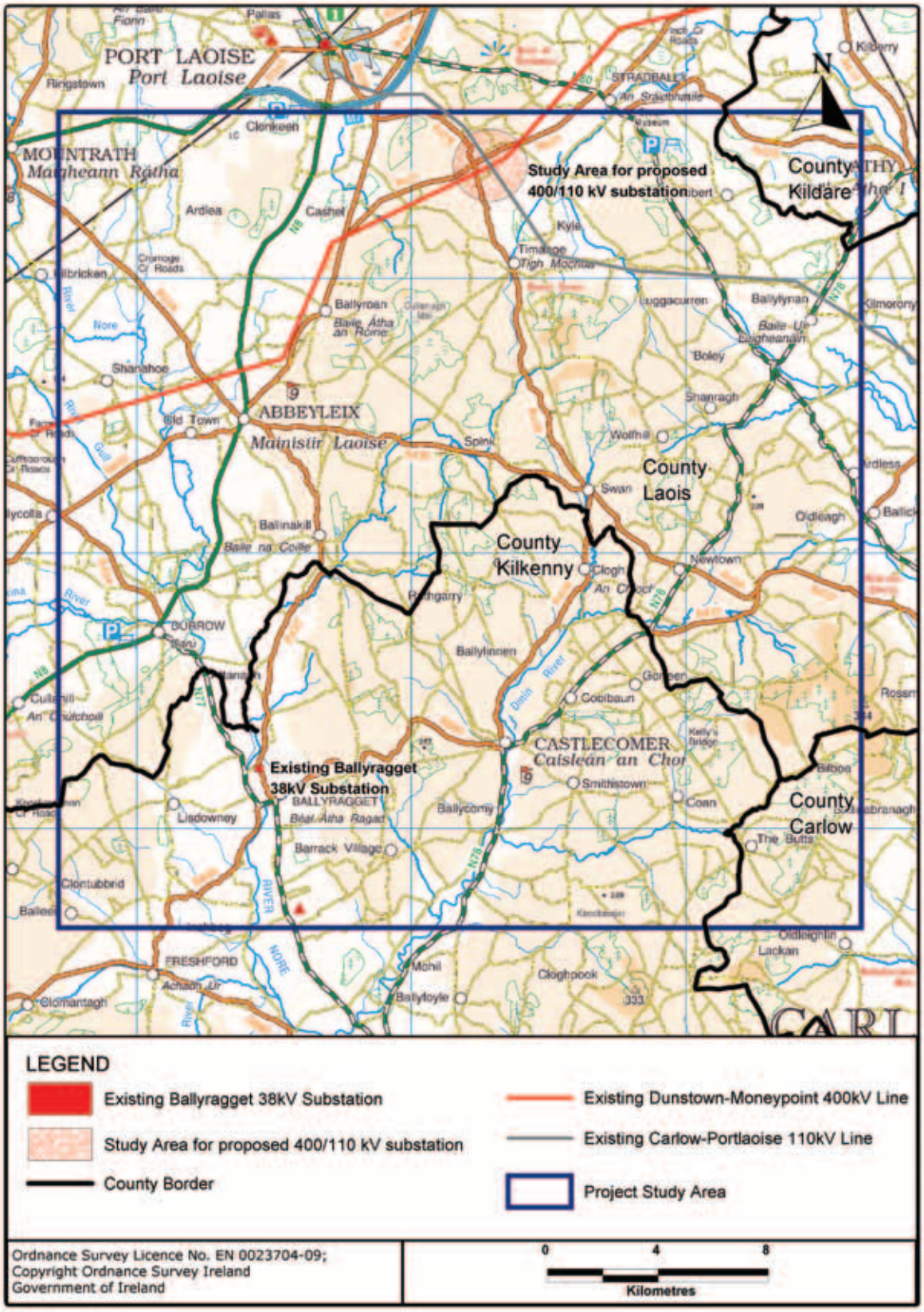

Figure 9: Laois-Kilkenny Reinforcement Project, Project Study Area

2.2 IDENTIFICATION OF CONSTRAINTS

The identification of environmental and other constraints within the study area assists in determining potential locations for the planned infrastructure. Constraints can generally be divided into three principal categories, namely:

- Natural Constraints (naturally occurring landscapes and features)
- Man made Constraints (forming part of the built environment)
- External Parameters (design standards, policy, procedural and legal issues)

A *'Constraints Map'* (Ref: PE687-D261-001-004-003) was produced during the earlier part of this Phase 1, and this can be seen in Appendix C-1.

A supplementary 'Toolkit' explanatory report of the constraints identified within the study area was also produced. This report is entitled *'Description of Project Constraints'* (Ref: PE687-F0261-R261-004-002') and this can also be found in Appendix C-2.

Constraints were identified through the following process:

- Review of the Planning and Environmental Legislation. All EirGrid projects comply with current planning and environmental legislation.
- Evaluation of Study Area by Environmental Consultants. Environmental Consultants were commissioned to analyse the study area in order to identify environmental constraints. The detailed reports are found in Appendix D-1, D-2, D-3, D-4, D-5, D-6, D-7, D-8 & D-9.
- Aerial Photography. Aerial Photography for the entire study area was acquired. This aerial photography was used as a basis for the constraints mapping and was itself used as a means of identifying and confirming environmental and other constraints within the area.
- OSI Mapping. OSI Mapping (Ordnance Survey Ireland), was obtained and used to identify potential constraints.
- Consultation. Part of the process for the identification of constraints includes consultation with statutory and non statutory consultees including the general public (see section 2.4).
- An Post Geodirectory. The An Post Geodirectory information was obtained and mapped along with ongoing reviews of publically available data from Laois and Kilkenny County Councils.
- Site Visits. Regular site visits were made by the project team to the study area to familiarise themselves with and to confirm all of the identified constraints therein.
- ESBI GIS Database. ESBI hold a database of environmental data including Special Areas of Conservation (SAC's), Special Protection Areas (SPA's), Natural Heritage Areas (NHA's) and proposed Natural Heritage Areas (pNHA's) sourced from the National Parks and Wildlife Service (NPWS). Also on record are the Forestry Planning and Inventory System (FIPS) data sourced from Coillte and the Sites and Monuments Records (SMR's) data soured from www.archaeology.ie.

2.3 CONSTRAINTS MAP PRODUCTION AND SUMMARY

A Project Constraints Map (PE687-D261-001-004-003) was produced and is included in Appendix C-1.

As some constraints may overlap with other constraints, in addition to the master map (Appendix C-1), to assist viewing, three 'sub-maps' have also been produced which separate the constraints into appropriate groupings. These are listed below and are also included in Appendix C-3, C-4 & C-5.

- ESB and Bord Gais Data, (Appendix C-3)
- Natural and Archaeological Constraints , (Appendix C-4)
- County Development Plan Designations , (Appendix C-5)

To assist the reader in viewing the *'Constraints Map'* and understanding the types of constraints found in the Project Study Area, a short report, *'Description of Project Constraints'* (PE687-F0261-R261-004-002) has also been produced (Appendix C-2).

The Study Area was examined under the following headings by environmental consultants:

- Human Being
- Cultural Heritage
- Landscape
- Ecology (Flora and Fauna)
- Soils and Geology
- Hydrology and Hydrogeology

These Reports can be found in Appendix 'D-1, D-2, D-3, D-4, D-5 & D-6'. Seasonal ornithology Reports were also commissioned to assess the abundance and distribution of wintering wader and wildfowl birds within the study area. These are ongoing at the time of writing; however there are three interim reports available that can be seen in Appendix D-7, D-8 & D-9.

Constraints have been classified as 'Man-Made Constraints' or 'Natural Constraints'.

2.3.1 MAN-MADE CONSTRAINTS

2.3.1.1 HUMAN BEINGS

(Please see Appendix D-1 for the 'Study Area Constraints Report - Human Beings')

The key constraints in relation to Human Beings are the following:

Settlements – Towns including Strabally, Timahoe, Ballyroan, Ballylynan, Luggacurren, Abbeyleix, Ballycolla, Durrow, Ballinakill, Castlecomer, Ballyragget, as well as smaller villages and one off housing scattered throughout the area, primarily along local and regional roads.

Areas of Tourism Interest – The location of structures in and relative to, areas of scenic importance need to be carefully considered in order to minimise the landscape impact and associated attractiveness of the area for tourism and amenity purposes.

The main features of tourism within the study area include: The River Nore SAC, the Heritage Town of Abbeyleix, the Abbeyleix Wood Complex, views overlooking Castlecomer and Ballyragget and views towards the Slieve Bloom Mountains, Timahoe Round Tower and heritage gardens and parks (for example Heywood Gardens).

2.3.1.2 CULTURAL HERITAGE

(Please see Appendix D-2 for the 'Study Area Constraints Report - Cultural Heritage')

The archaeological and architectural heritage features located within the study area can be categorised under the following headings:

National Monuments: Three national monuments in state ownership are located within the study area and all are located within the vicinity of Timahoe, Co. Laois.

Recorded Monuments: 993 recorded monuments including 15 redundant records are located within the study area

Protected Structures: See below.

National Inventory of Architectural Heritage: 385 structures listed in the NIAH are located within the study area. 179 of these are found in Laois, and 206 in Kilkenny. The majority of sites are located within towns or villages.

All of the cultural heritage sites identified within the study area represent constraints to the proposed overhead lines and substation. The cultural heritage features data from the Bronze Age through to the modern period and the overall density of sites within the study area is considered high. Noticeable distribution patterns include the high numbers of enclosures and ringforts (384), and churches (70) which occur within the study area. River banks are areas of archaeological potential / sensitivity and this should be considered in the route selection process. Whilst upland areas appear to have fewer recorded sites, this is due mainly to the lack of detailed upland archaeological surveys which have been carried out to date. This is the case within this study area where there appears to be a limited number of monuments over upland areas. Of particular note in the study area are the presence of field systems and deserted medieval settlements. These are extensive monuments on the ground and span over several fields.

2.3.1.3 EXISTING INFRASTRUCTURE

The key existing infrastructure in the study area is as follows:

Roads:

The M7 / M8 motorway and the National Routes N77, N78, N80, and N8 all traverse the study area as well as Regional Routes, R425, R426, R427, R430, R432, R433, R694, and R431. There is also an extensive network of local and rural roads throughout.

Electricity Infrastructure:

The Dunstown-Moneypoint 400 kV and Carlow-Portlaoise 110 kV overhead transmission lines traverse the study area as well as a number of 38 kV, MV and LV distribution lines. Ballyragget 38 kV substation is also within the study area.

Gas Transmission Pipeline:

A section of An Bord Gais gas pipeline (4 bar) is also found in the southern section of the study area, stopping at Ballyragget.

2.3.2 NATURAL CONSTRAINTS

2.3.2.1 LANDSCAPE

(Please see Appendix D-3 for the 'Study Area Constraints Report - Landscape')

The study area contains four principle types of landscapes:

Central Plain Lowlands

These are an abundant type of landscape through the centre of Ireland that comprise fairly level ground - usually used for pasture and tillage on lighter soils – interspersed with areas of wetlands and occasional bogs. These landscapes generally have lower visual absorption capacity in areas with higher agricultural capability where fields are larger and hedges are lower. In areas of impeded drainage or poor soils these areas can have medium to high capacity to absorb visual effects - though areas of open water, wetland and bogs are very visually vulnerable. Landscapes west of Ballyragget and Abbeyleix are of the more open type.

River Valleys

These are common, but very localised landscapes - rarely extending for more than 0.5 km on either side of the river. They are visually complex – often having high degrees of visual robustness on account of topography and dense vegetation – though open views along the length of the river can be very expansive and proportionally vulnerable. These conditions are usually interlinked, leading to a general character of visual sensitivity in such landscapes. The River Nore is a river landscape that is noted as a visual and amenity resource.

Transitional Areas

The zone where lowlands blend into uplands are usually characterised by smaller fields, less fertile soil and complex patterns of vegetation, topography and settlement - all of which combine to give relatively high capacity to absorb visual effects.

Uplands

Elevation, topographic exposure, little or no tall vegetation, and few other man-made structures mean that upland areas are usually characterised as being more visually vulnerable than other landscapes - even when used for agriculture.

The southern section of the study area is located in the Landscape Character Area 'Castlecomer Plateau' as identified in the Kilkenny Landscape Character Assessment (Kilkenny County Development Plan). It is adjacent to the Castlecomer transition area B2.

The Castlecomer Plateau (B) is noted in the Landscape Assessment as being an extensive upland area with an almost circular shape that lies between the valleys of the Rivers Nore and Barrow, covering most of the north-east of the County. The terrain slopes steeply from the river valleys to the surface of the Plateau, which gently undulates and gives rise to several small ridgelines at an elevation of between 200 and 340m above the sea level. The elevated nature of this physical unit provides a defined skyline and significant and scenic views over the Kilkenny basin and the Nore and Barrow river valleys.

The Castlecomer Transition (B2) is also noted in the Landscape Assessment. This western area is a long linear strip of land, running in a north-south direction, which is parallel to the River Nore Valley and close to the Dinin River. The area encompasses the environs of Ballyragget and Castlemarket areas. The Assessment notes that *'These transitional areas are not perceived as having special landscape or scenic amenity values and are considered suitable for development'.*

In general terms, the best and only mitigation measure is a route selection process that minimises visual intrusion on skylines, shorelines or waterbodies and that avoids or minimises excessive proximity or dominance on sensitive visual receptors such as scenic routes, residences, tourism and leisure amenities and facilities. Seeking upper mid-slope routes that generally parallel river valleys and ridges in the centre of the study area – to the east of the River Nore would generally achieve this.

2.3.2.2 ECOLOGY

(Please see Appendix D-4 for the 'Study Area Constraints Report - Flora and Fauna)

Following the identification of ecological features within the study area, the main ecological constraints relevant to the planned development include:

Sites of Conservation Interest

The study area contains several sites of conservation interest that have been designated by the NPWS as candidate Special Areas of Conservation (SAC), Natural Heritage Areas (NHA) or proposed Natural Heritage Areas (pNHA). The study area also includes one Nature Reserve that is owned by the State (Timahoe Eskers). There are 3 SAC's, 1 NHA and 10 pNHA's within the study area.

The largest and most ecologically significant designated site in the study area is the River Nore and Barrow SAC. This large SAC includes the main River Nore channel, the majority of its main tributaries (Rivers Gully, Erkina, Owenbeg, Glashagal, Ironmills, Gloshna, Dinin) and some adjacent habitats.

Other smaller sites designated for nature conservation are scattered around the study area.

Important Bird Areas

There is only one Important Bird Area (IBA) close to the study area. This IBA is known as the Upper Barrow flood plain (IE 108). It extends from Monasterevin to Athy on the North Kildare/Laois border, adjacent to the study area. This area attracts wintering Bewick's and Whooper Swans as well as Mute Swans.

Several important sites within the study identified for waterbirds have been examined. These sites have attracted various wetland species of conservation interest including species listed on Annex I of the EU Birds Directive and other species listed on the Amber and red lists of Bird Conservation Concern in Ireland (BoCCI).

Fisheries and Protected Aquatic Species

The study area contains several important rivers, of which the River Nore is the most significant. Several important tributaries of the River Nore flow through the study area. The major tributaries are also designated in certain areas as part of the River Barrow and Nore SAC. Tributaries of the River Barrow are also found within the study area.

Many of the freshwater streams and rivers in the Nore and Barrow catchemnt are important nursery waters for salmonid species such as Atlantic Salmon and Brown Trout. The River Nore also contains several other aquatic species listed on Annex II of the EU Habitats Directive including, White Clawed Crayfish, Brook, Sea and River Lamprey and Twaite Shad.

The study area also contains the only site in the world for the hardwater form of the freshwater pearl mussel. This is an Annex II species requiring strict protection. Its distribution is currently limited to a stretch of the River Nore between Poormansbridge and Ballyragget. Other parts of the Nore and its tributaries contain the more common form of the Freshwater pearl mussel. Both species are only known from the Nore above Ballyragget. Otter and Kingfisher, both legally protected species are likely to be found within the study area also.

Other Rare and Notable Species

There are a number of records of other rare plant and animal species, or species with restricted distributions within the study area. Several records of rare plant species such as Yellow Marsh Saxifrage are quite old and have not been verified for 100 years. Opposite-leaved Pondweed is recorded in the NPWS as it has been recorded along the river Goul. This species is listed in the Red Data Book and is also protected by the Flora Protection Order.

Mammal species listed in the Red Data Book that are present within the study area include Badger, Stoat, Hedgehog, Red Squirrel, Pine Marten and Irish Hare. Fallow Deer and Sika Deer are also present in the area, as well as several bat species. All species of bat occurring in Ireland are protected under the EU Habitats Directive, listed under Annex IV.

It should be noted that many notable and rare species of conservation importance are not just confined to designated areas or sites of importance and may in fact be found widely distributed throughout the study area.

2.3.2.3 SOILS & GEOLOGY

(Please see Appendix D-5 for the 'Study Area Constraints Report - Soils and Geology')

The key constraints in relation to soils and geology are the following:

- Sloping ground and soft ground including blanket peat - there are a number of potential impacts associated with the construction of structures in sloping ground, soft ground and blanket peat, in particular in the identified areas to the west of Ballyroan and to the south of Abbeyleix. Slope angle, accumulation of water following a high intensity rainfall event and the presence of drains in the vicinity of the construction area can lead to peat slope failure. On site machinery and dewatering activities can also be contributing factors to peat slope failure.
- Areas of made ground – these areas are located at residential areas (towns and villages such as Castlecomer, Ballyragget, Timahoe and Abbeyleix). Cut material would be generated if construction was located in these areas, however the amount would not be significant.
- Areas where rock is close to the surface – Rock at the surface is present in isolated locations within the study area. Bedrock would be generated as surplus material if construction was located in these areas. Due to the nature of the construction works the amount would not be significant.
- Areas of Geological Heritage – 8 sites of geological interest lie within the study area. The GSI have stated that there are no set distance requirements for planned developments in the vicinity of geological NHAs and CGSs, distance being decided on a site by site basis.

The implementation of appropriate mitigation measures can ensure that there will be no significant residual impacts on the environment from the planned development with respect to soils and geology.

2.3.2.4 HYDROLOGY AND HYDROGEOLOGY

(Please see Appendix D-6 for the 'Study Area Constraints Report - Hydrology and Hydrogeology')

The key constraints in relation to water are the following:

- Physical Constraints – Water courses are located within the study area. The requirement for the crossing of water bodies is the main constraint.
- Historical Flooding – There is a history of flooding in some locations within the study area (e.g. the River Nore at Abbeyleix and Durrow, and the River Dinin at Castlecomer). Cognisance should be given to the locations of these previous flood events when locating structures, particularly in the vicinity of watercourses and floodplains and other surface water features.
- Groundwater Supplies – A number of groundwater supplies have been identified from the GSI well database. Additional public or private water supplies may be present in the area.
- Groundwater Vulnerability – Regionally important bedrock and gravel aquifers are located within the study area. The GSI vulnerability rating in some of these locations is classified as extreme.

The implementation of appropriate mitigation measures can ensure that there will be no significant residual impact on the environment from the planned development with respect to water.

2.4 PHASE 1 CONSULTATION

It is reiterated that the project is only at the information gathering stage and feedback received will be considered and evaluated as the project develops. The project team are committed to engaging with all interested parties on this project and continue to welcome any feedback on the project to gate.

2.4.1 AN BORD PLEANÁLA

An initial pre-application consultation meeting took place with An Bord Pleanála on the 5th August 2009. The purpose of this meeting was to establish whether or not the project was deemed strategic under the Planning and Development (Strategic Infrastructure) Act 2006 (as amended). If deemed strategic, the planning application will be submitted directly to An Bord Pleanála as opposed to the local Planning Authority. A further pre-Application meeting(s) is required in order to establish if the project is deemed strategic infrastructure or not. EirGrid intends to request a second meeting soon after the launch of this report, primarily to present the findings of this report.

2.4.2 STATUTORY AND NON STATUTORY CONSULTEES

Consultation was undertaken by letter with both statutory and non statutory consultees. These letters were followed up with further correspondence where appropriate. Details of all consultees are included in Appendix E.

2.4.3 PUBLIC CONSULTATION

Public Consultation began the week commencing the 26th October 2009 with the publication of a newspaper notice in six regional newspapers namely the Kilkenny People, Leinster Express, Laois Nationalist, Carlow Nationalist, Kildare Nationalist and Leinster Leader. The newspaper notice consisted of a blank study area map supplemented with a project description. A copy of this notice is included in Appendix F-1. The purpose of this notice was to inform the wider public of the planned project as well as to seek information and inputs that could be incorporated into the information gathering process at the earliest possible stage.

Numerous phone calls, emails, and letters of queries, objections and other correspondence were received from the general public.

Meetings were held with a local group who asked that an alternative location for the 400/110 kV substation be considered. The suggested location was examined by the Project Team and the findings can be found in the report *'Assessment of Alternative 400/110 kV Substation Study Areas'* (PE687-F0261-R261-003-003'), which is included in Appendix F-2. The suggested location was not considered viable by the project team for a number of reasons outlined in that separate report.

Upon completion of the Project Constraints Map a second newspaper notice was placed the week commencing the 14th June 2010 seeking further public input. This notice was placed in the Leinster Express, Laois Nationalist, Kilkenny People and the Carlow Nationalist. The purpose of this notice was to seek information and inputs that could be incorporated into the route corridor and site selection process. A copy of this notice is included in Appendix F-3.

Public information days were held on the following days:

- 17th of June 2010 in River Court Hotel, Kilkenny (10am – 7pm)
- 18th of June 2010 in the Heritage Hotel, Portlaoise (10am – 7pm)

A project specific website is also in place on the EirGrid website where project data and updates are accessible to the wider public.

A radio interview on Midlands FM 103 was also carried out as well as several newspaper interviews with local newspapers.

A dedicated project email and direct contact telephone number and postal address are also publicised, this allows ongoing consultation with the project team at any stage outside more formal organised events[4].

2.4.4 REVIEW

All information received by any member of the Project Team, from either statutory or non statutory stakeholders, or any other interested parties is evaluated so as to assess its impact on the project team decision making process.

[4]Please see contact details on last page of this report.

3.0 SUBSTATION SITE IDENTIFICATION

The purpose of the previous chapter was to outline the steps taken in order to establish the Project Study Area and constraints therein.

Before any feasible route corridor options can be identified it is necessary to establish the emerging preferred substation location for the 400/110kV substation.

As noted above, an iterative 'Site Selection Process' (see Figure 10) was applied, which firstly defined a Substation Study Area within the overall Project Study Area.

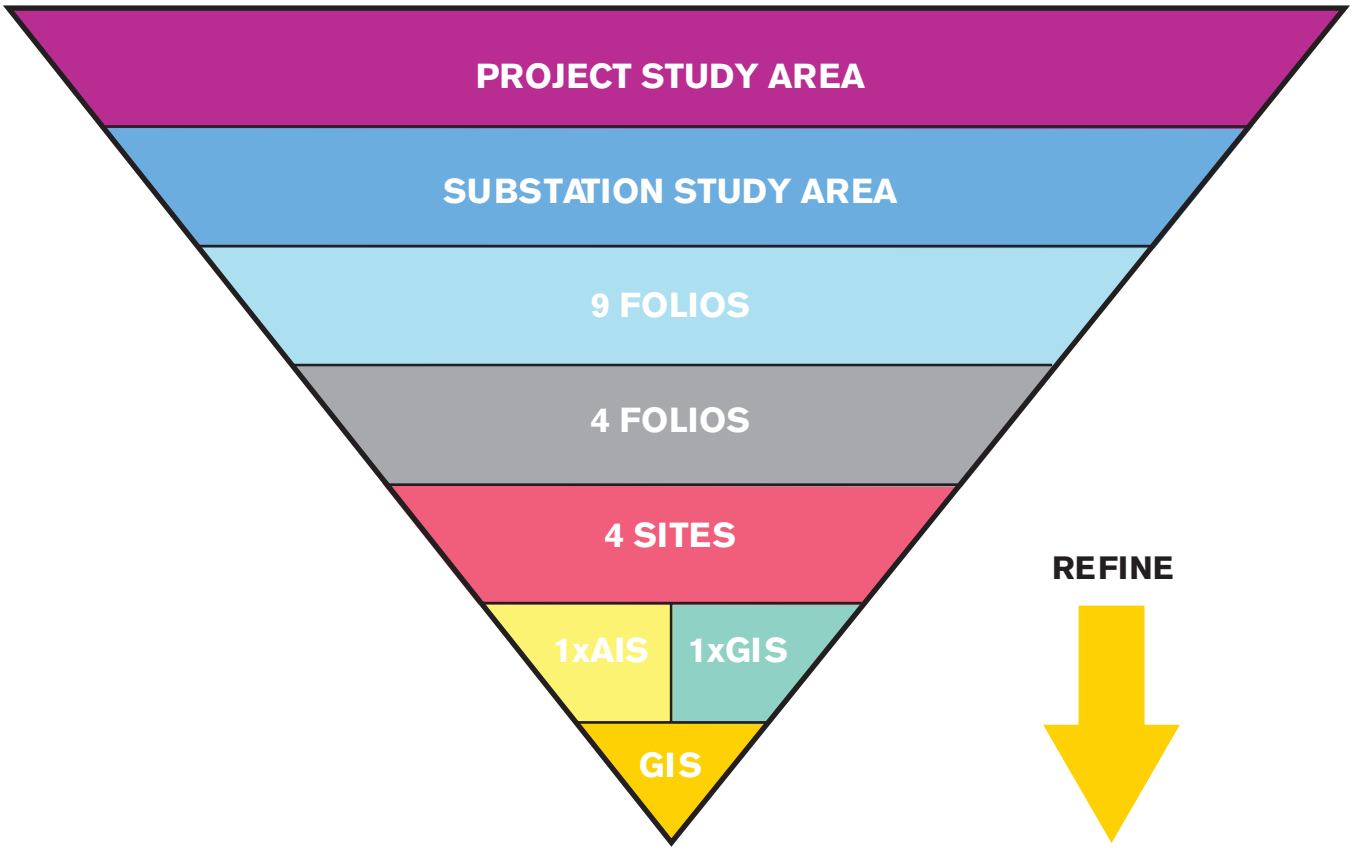

Figure 10: The Substation Site Identification and Selection Process

Having regard to the technical rationale for the project, the substation study area is centred on the intersection point of the existing 400kV and 110kV overhead lines, in the townland of Money Lower. As such, it is 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 12.5km^2 in area as seen in Figure 11.

Using the same methodology as described in section 2.2, nine suitable land folios within this study area were identified as being potentially suitable in which to site the planned substation, primarily comprising those which avoided identified environmental and other constraints to the optimum extent.

Figure 11: Substation Study Area: (Red Line = Dunstown-Moneypoint 400kV Line; Black line = Carlow–Portlaoise 110kV Line).

A preliminary environmental appraisal of these entire folios was carried out which resulted in the nine identified potential folios being refined down to four. Some of these folios could accommodate AIS type designs, others GIS, whilst some could accommodate both types.

Following the environmental assessment of the shortlisted folios, which highlighted particular issues of potential concern within folios; the process then comprised of the identification and high-level technical and environmental assessment of suitable substation site layouts within the folios, together with identification of potential indicative connections to the existing transmission lines in the area. The end result was that one emerging preferred site location for an AIS and one for a GIS was identified.

Following further study, it was deemed appropriate to proceed with a GIS substation in this instance.

The emerging preferred site is located in the southern portion of the substation study area, in the townland of Coolnabacky – see Figure 12. It is approximately 1.5km south of the existing 400 kV overhead line and is located in an isolated area close to a disused quarry. The folio has good topographical enclosure and good screening vegetation. It is well located as there are a low number of dwellings in the immediate vicinity and the site is accessed from an existing quarry road, with good screening from the R426 and R427 roads.

Whilst additional overhead lines and associated structures will be required in order to connect the existing transmission network into this site, this is an area that has existing overhead lines and new structures will be seen in this context.

The full report '400/110 kV Emerging Substation Site' (Ref: PE687-F0261-R261-006-003) can be found in Appendix G.

Figure 12: Emerging Preferred Substation Site (approximate location represented by red square).

4.0 ROUTE CORRIDOR IDENTIFICATION

The environmental and other constraints identified within the project study area were used to assist in identifying possible route corridor options between the two substations (being the planned new 400/110kV station as identified in section 3 and the existing Ballyragget substation).

Potentially feasible corridors within which a transmission line could be accommodated were identified and can be seen below in Figure 13 and also in Appendix H-1 (400/110 kV Route Corridor Map with Constraints) and Appendix H-2 *(Route Corridors - No Constraints)*. The corridors can generally be divided into a western (navy), a central (green) and an eastern (brown) corridor with sub route corridors shown in grey and the 400kV corridor shown in light blue. For the purposes of this information gathering stage, the corridors are generally 1km wide. No potential route within that corridor has been identified at this stage.

A numbering system was also applied to the points at which corridors intersect. These points are referred to as "Nodes". This assists in referencing sections of a particular corridor for the purposes of evaluation, for example, Central Corridor Node 3 to 4 etc.

The remainder of this chapter provides a brief description of each corridor, highlighting any key issues relevant to the corridor:

4.1 400kV Route Corridor (Light Blue)

4.2 Western 110kV Route Corridor (Navy)

4.3 Central 110kV Route Corridor (Green)

4.4 Eastern 110kV Route Corridor (Brown)

4.5 110kV Sub Route Corridors (Grey)

Note: The three main corridors are described from the existing Ballyragget 38kV substation to the planned new 400/110kV substation site i.e. from south to north.

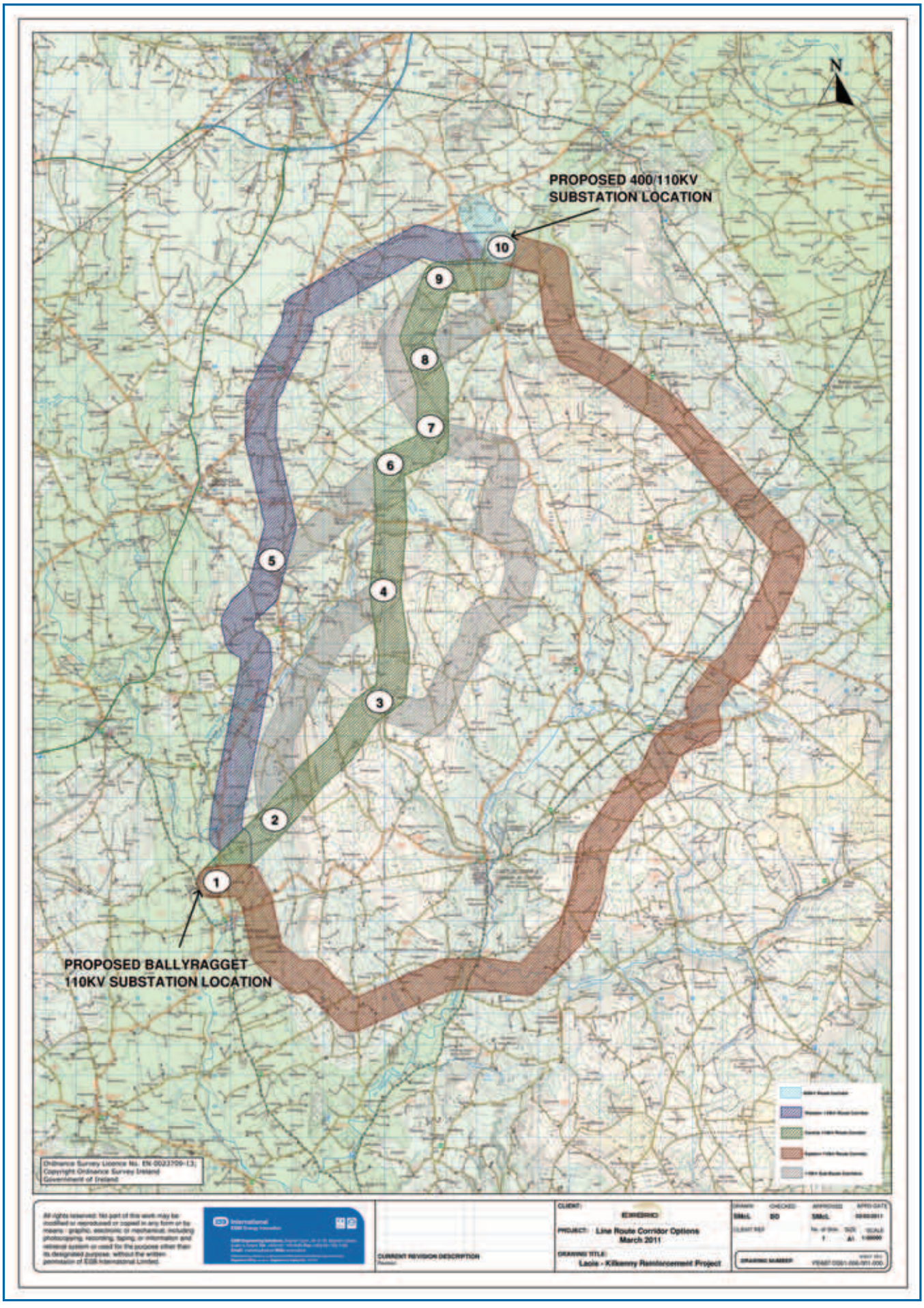

Figure 13: Line Route Corridors (see appendix H-2)

4.1 400KV ROUTE CORRIDOR

The 400kV route corridor is centred along and follows the existing Carlow – Portlaoise 110kV line from its intersection with the Dunstown – Moneypoint 400kV line to the 400/110kV substation site.

Approximate total length of corridor = 1.8km

4.2 WESTERN 110KV ROUTE CORRIDOR

The western route corridor leaves Ballyragget substation heading northeast for approximately 1km then turning north to meet the Ballyconra – Portlaoise 38kV line route. The Ballyconra – Portlaoise 38kV line route is an existing distribution overhead line that runs close to the planned 400/110kV substation (within approximately 6km of the planned substation). The western route corridor follows this electrical infrastructure corridor up to where the 38kV line meets the existing Dunstown-Moneypoint 400kV overhead line. The corridor then follows the Dunstown-Moneypoint 400kV electricity infrastructure to the planned 400/110kV substation.

The route corridor crosses the Glashagal River and the Owenbeg River which is an SAC before veering east of Ballinakill. The route corridor continues north passing west of Ballyroan village then continuing north passing east of Abbeyleix town before meeting the Dunstown-Moneypoint 400kV overhead line. The route corridor turns to continue northeast towards the planned 400/110kV substation at the crossover point between the 38kV and 400kV lines, utilising the existing 400kV line electrical infrastructure corridor.

Approximate total length of corridor = 28km

4.3 CENTRAL 110KV ROUTE CORRIDOR

The central route corridor leaves Ballyragget 38kV substation in a north easterly direction following the existing Ballyragget – Castlecomer 38kV line as an electrical infrastructure corridor that crosses over a High Amenity Area. The corridor continues into County Laois at which point the corridor turns north and continues in this direction crossing the Owenbeg River which is an SAC. The corridor continues north before turning to proceed in a northeast direction avoiding higher ground. The corridor then turns north and continues for approximately 5km before turning northeast again to the planned 400/110kV substation.

Approximate total length of corridor = 26km

4.4 EASTERN 110KV ROUTE CORRIDOR

The eastern route corridor leaves Ballyragget 38kV substation in an easterly direction then turns south following the existing Ballyragget – Kilkenny 38kV line as an electrical infrastructure corridor for a short distance. The route corridor leaves the Ballyragget – Kilkenny 38kV line infrastructure corridor to head in a southeast direction skirting around the southern boundary of a High Amenity Area. The route corridor then turns to head in an easterly direction crossing the Gloshia River, then two tributaries of the Dinin River all of which are SAC's. The route corridor then heads in a north easterly direction over higher ground towards a Special Area of Development Control before crossing over the Killeen River and then continuing towards Gales Hill where the route corridor turns to head in a northwesterly direction traversing the centre of a second Special Area of Development Control where it crosses the existing Carlow – Portlaoise 110kV overhead line. The route corridor then continues generally in a northwesterly direction to the planned 400/110kV substation.

Approximate total length of corridor = 44km

4.5 110KV SUB ROUTE CORRIDORS

The following are sub route corridors identified as possible alternatives to the main three corridors. These corridors are all described starting at their southern end.

4.5.1 NODE 2 TO NODE 4

This sub route corridor leaves the central route corridor to run between the western and central route corridor for approximately 8km. The first straight of this corridor is wider than the normal 1km corridor. This is to allow for a line route to avoid an area of dispersed dwellings at the southern end of the corridor. For this section the edges of the corridor are between the 210m contour line on the east and a tributary of the Glashagal river on the west of the corridor. The corridor avoids a High Amenity Area and proceeds in a generally north easterly direction crossing over the Owenbeg River which is an SAC before rejoining the central corridor.

Approximate total length of corridor = 9km

4.5.2 NODE 3 TO NODE 7

This sub route corridor leaves the central route corridor at the point where the central corridor separates from the Ballyragget – Castlecomer 38kV line. This sub corridor follows the Ballyragget – Castlecomer 38kV line as an electrical infrastructure corridor for 3km before leaving this corridor to proceed generally in a northerly direction with a slight chicane halfway along a 9km stretch. The route corridor then turns to head in a northwesterly direction to rejoin the central corridor.

Approximate total length of corridor = 15km

4.5.3 NODE 5 TO NODE 6

This sub route corridor joins the western corridor to the central corridor. The corridor leaves the western corridor where it crosses the R432 and heads in a north easterly direction for approximately 4km to meet back with the central corridor.

Approximate total length of corridor = 5km

4.5.4 NODE 7 TO NODE 9

This sub route corridor leaves and skirts the eastern side of the central corridor for approximately 4km along the foothills of the Cullenagh Mountain before returning to the central route corridor.

Approximate total length of corridor = 5.5km

4.5.5 NODE 9 TO NODE 10

This sub route corridor leaves the central route corridor in the Raheenduff Big townland area heading northeast for approximately 2km towards Timahoe village then turning north passing Timahoe esker and then on to the planned 400/110kV substation.

Approximate total length of corridor = 5km

[5] See table 9 for notes on the criteria

PART B – OVERVIEW OF ENVIRONMENTAL ISSUES

5.0 CONSULTANTS FINDINGS

The environmental consultants were requested to review the potential route corridors and identify any potential constraints. Furthermore, the consultants were requested to identify their most preferred, less preferred and least preferred corridor options. This section now presents summaries of the key findings under each heading.

Each consultant had regard to the following criteria:

- Emerging Preferred: At this stage, it is considered that route corridors in this group may have the least impact on the identified constraints.
- Less Preferred: At this stage, it is considered that route corridors in this group may have a greater impact on the identified constraints.
- Least Preferred: At this stage, it is considered that route corridors in this group may have the greatest impact on the identified constraints[5].

The full reports can be found in Appendix I-1, I-2, I-3, I-4, I-5 & I-6.

5.1 HUMAN BEINGS

(Please see Appendix I-1 for the 'Assessment of Corridors Report - Human Beings Report')

The main objectives of this desk study were to identify potential constraints within each proposed route corridor and to recommend the 'most preferred' route corridor i.e. the one that will minimise the overall impact of the planned development on the study area.

Population, Economic activities, Tourism and Landuse in the area were all considered when evaluating the route corridor options.

The desk study indicated that there are no significant constraints in relation to human beings. The implementation of appropriate mitigation measures during detailed design will ensure there will be no significant residual impact on the environment from the planned development with respect to human beings.

The central route corridor nodes 1, 2, 3, 4, 6, 7, 8, 9, 10 has the lowest number of dwellings within the corridor, hence this would be the preferred corridor. This finding is supported by GeoDirectory data which shows that with 124 addresses, the central corridor has the least number of addresses along its route (compared with 442 addresses on the western corridor and 330 on the eastern corridor). In light of this data and other relevant information it was also possible to conclude that the western corridor as well as Node 8 – 10 (due to the proximity to Timahoe) is the least preferred route and that the eastern corridor is the 'less preferred' route.

5.2 CULTURAL HERITAGE

(Please see Appendix I-2 for the 'Assessment of Corridors Report - Cultural Heritage Route Selection')

A desk-based route selection report was undertaken having regard to three potential route corridors including a number of sub-route corridor options between Loughteeog, Co. Laois in the north to Ballyragget, Co. Kilkenny in the south to highlight areas of potential archaeological sensitivity and to identify all recorded cultural heritage sites that may influence the selection of the potential routes for the planned electricity transmission line. The assessment also includes an assessment of a 400kV route corridor which will link the selected line route to the planned substation site.

The aim of the route selection report is to assess each of the route corridors for their archaeological landscape potential and map each route showing the identifiable cultural heritage sites that may impact on choosing one route corridor over another for the planned electricity transmission line. For the purposes of this report, cultural heritage is considered to include the following elements:

- Sites listed in the Sites & Monuments Record (SMR)
- Record of Monuments & Places (RMP)
- Sites listed in the Archaeological Inventory Series
- Archaeological sites listed on the National Monuments Service website: www.archaeology.ie
- Sites listed in the Record of Protected Structures (RPS)

- National Inventory of Architectural Heritage, Buildings of Ireland: www.buildingsofireland.ie
- Sites uncovered in Excavations Bulletins

The following sources were consulted in order to identify and map cultural heritage sites within the study area:

- Sites and Monuments Record (SMR) and Record of Monuments & Places (RMP) and www.archaeology.ie National Monuments Service website
- List of Monuments covered by Preservation Orders and List of National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government
- Archaeological Inventory of County Laois (Kilkenny Inventory not yet Published)
- Kilkenny County Development Plan 2008-2014
- Laois County Development Plan 2006-2012
- Record of Protected Structures
- www.buildingsofireland.ie website of the National Inventory of Architectural Heritage
- Excavations Bulletins (www.excavations.ie)
- 1st and 2nd edition OS mapping

A constraints report was previously undertaken by the same consultant to highlight areas of cultural heritage potential to assist in the route corridor selection process (see appendix D-2). An examination of documentary, archival and cartographic sources has revealed archaeological and architectural heritage sites within the study area that span a significant period of pre-history and history from the Bronze Age (2400-500BC) to the 19th century. The conclusion from the initial constraints study was that the overall density of archaeological and architectural heritage sites within the study area was relatively high.

The archaeological and architectural heritage features located within the route corridor alternatives were categorised under the following headings:

- National Monuments
- Recorded Monuments
- Structures listed in the National Inventory of Architectural Heritage

All of the Cultural Heritage sites identified within each route alternative represent constraints to the planned overhead line. The cultural heritage features date from the Bronze Age through to the modern period and the overall density of sites between each route corridor alternative varies. The route corridors were assessed using numbered points along the corridors (nodes). The cultural heritage features between the nodes were addressed separately for clarity.

Nodes 1-10 do not contain any National monuments but contain 40 recorded monuments. A number of clusters of monuments occur within this route corridor. Two structures listed in the NIAH are located between nodes 1 and 10 along the periphery of the corridor and therefore should not be impacted on by the overhead line. No national monuments and 12 recorded monuments are located within Nodes 7-3 along the central sub route corridor. No structures listed in the NIAH are located within this route corridor. No national monuments are located between nodes 10-9-8-7-6-4-3-2-1 and 23 recorded monuments are located along this corridor including 2 field systems (KK005-016 and KK005-095 in Ballymartin and Rathduff townlands, Co. Kilkenny). Cremorgan House and Garden (Ref. LA-55-S-523917) is listed in the Historic Garden and Designed Landscape inventory (NIAH) and is located within this route corridor. Structures should ideally not be placed within historic gardens or demesnes.

One National Monument and Recorded monument (Timahoe Round Tower Reg. 117 – ownership) is located within the southern edge of the corridor (Nodes 10-8). This is a prominent and much visited structure therefore it is recommended that should this route corridor alternative be selected, that angle masts and polesets be placed at a remove from the structure so as not to negatively impact on the monument. Nodes 9-7 do not contain any National monument with just 9 recorded monuments. On the basis that the monuments are avoided, this would be regarded as a suitable option. Nodes 6-5 do not contain any national monuments with just 2 recorded monuments present. On the basis that the monuments are avoided, this would be a suitable route corridor alternative. Nodes 4-2 do not contain any National Monuments and contains 19 recorded monuments. One cluster of monuments is located centrally in the route corridor in the townland of Loughill and consist of churches, graveyards and religious houses. The overhead line should not span these structures and the polesets should be placed at a remove from the buildings so as not to visually impact on the sites. Nodes 10-5-1 contain 46 recorded monuments and 10 structures listed in the NIAH. This route also crosses Haywood Demesne.

The preferred route corridor option is the central route corridor from Nodes 10-9-8-7-6-4-3-2-1 on the basis that it contains the least number of cultural heritage sites. Furthermore, it does not contain any large clusters of archaeological monuments or National Monuments or NIAH structures. The overall density of monuments with in this route is low. Node 9-7 may also be incorporated into this corridor as the monuments are located at the periphery of the corridor.

The 400kV route corridor does not contain any known Cultural Heritage constraints and on this basis is considered suitable.

In order to minimise any potential visual or direct impacts on recorded monuments and architectural heritage features polesets and angle masts should not be placed on or immediately adjacent to such sites. Placing support structures on field boundaries or in adjacent fields to the monuments may ameliorate such potential impacts.

It is recommended that relevant field surveys be carried out on the preferred route corridor to identify potential areas of archaeological sensitivity and additional features of architectural merit. This will enable the formulation of a comprehensive mitigation strategy to reduce and offset negative impacts on the cultural heritage.

5.3 LANDSCAPE

(Please see Appendix I-3 for the 'Assessment of Corridors Report - Landscape Route Selection')

This section analyses the existing landscape character and significance within the study area of the proposed route corridors. It also provides an evaluation of the potential for landscape and visual impacts associated with the planned development in the study area. The assessment is made having regard to the vulnerability of the landscape to change and to the location of the visual receptors relative to the planned development.

Landscape Context

The area under analysis is the transition between the Central Plain and the outliers of the Castlecomer Plateau. The core of the area contains complex small-scale landscapes formed by the incisions of the River Nore and its tributaries. It is a relatively lightly populated area with relatively few features of regional or county landscape. The general landscape types – which consist of agricultural lowlands and transitional/upland landscapes are of a type that is regional and nationally abundant.

Landscape Character

The study zone contains four principle types of landscapes.

- Central Plain Lowlands.
- River Valleys.
- Transitional Areas.
- Uplands.

Landscape Significance

The southern route corridor of the proposed line traverses the Landscape Character Area Castlecomer Plateau as identified in the Kilkenny Landscape Character Assessment. It is adjacent to the Castlecomer transition area B2. The Assessment notes that 'These transitional areas are not perceived as having special landscape or scenic amenity values and are considered suitable for development'.

Route Selection

It is recommended that the emerging preferred route corridor to minimise landscape and visual impacts is the Central 110 kV Route Corridor (Node 1,2,4,6,7,9,10).

This route will still give rise to residual landscape and visual impacts – particular attention will need to be given to the location of supports – especially angle masts on ridgeline locations – in particular those just south west and north of Node 4 that are likely to appear on the skyline when seen from Abbeyleix and its eastern environs.

While the western variant between nodes 7 and 9 follows higher ground this route may provide less visual impact because the line will be more difficult to discern against the background of the nearby woodland edge.

5.4 ECOLOGY

(Please see Appendix I-4 for the 'Assessment of Corridors Report - Ecology Route Selection')

Impacts associated with sites of known ecological importance have primarily been used to differentiate between the various route corridors. There are a number of potential impacts identified that are common to each route corridor including: local disturbance to fauna during construction phase; localised disturbance and loss of habitat (at locations of angle masts and polesets); and, potential disturbance to ecology of watercourses at crossing locations. These potential impacts have also been used to aid differentiation between route corridors, mainly by considering the number of watercourse crossings required and the overall length of route (and requirement for angle masts).

The main criteria for the selection of a preferred route corridor include:

(a) minimising direct and indirect impacts on sites (cSAC, pNHA, NHA, important wetland sites for waterbirds), habitats (Annex I EU Habitats Directive) and species (Annex II EU Habitats Directive, Annex I EU Birds Directive, and other species of conservation interest) of conservation importance;

(b) minimising indirect impacts on major water-courses in the study area via runoff from other stream and river crossings; and

(c) minimising the construction footprint and length of the overall power-line (and requirement for angle masts).

The following Tables summarise sites of known ecological importance within 3 km of each of the proposed route corridors and associated sub corridors.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
River Barrow & Nore	002162	cSAC	Within cSAC at Ballyragget (start of route)
River Nore/Abbeyleix Woods	002076	pNHA	Within pNHA at Ballyragget (start of route)
Avonmore Ponds	/	WS	Wetland bird site within 0.7 km W of corridor
River Nore floodplain (at Grange)	/	WS	Wetland bird site within 1.9 km of southern end of corridor
Glashagal River	/	River	Crosses river (undesignated section) (River Nore catchment)
River Barrow & Nore	002162	cSAC	Crosses Owenbeg River 2.5 km south of Ballynakill
Lisbigney Bog	000859		Adjacent to E side of route corridor
Lisbigney Pond	/	WS	Wetland bird site 0.2 km east of route corridor.
Ballynakill Lake	/	WS	Wetland bird site 0.4 km west of route corridor
Mass Lough (Ballynakill)	/	WS	Wetland bird site 1.0 km west of route corridor
Gloreen Stream and tributary	/	River	Crosses river (undesignated section) (River Nore catchment) Ballyroan
Cush River tributary	/	River	Crosses stream (undesignated section) (River Barrow catchment) northern section
Foyle River	/	River	Crosses river (undesignated section) (River Barrow catchment) northern section
Timahoe Esker	000421	River	Part of pNHA overlap with route corridor at northern end

Table 1: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of the Western 110kV Route Corridor. WS – Wetland site of importance to waterbirds.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
River Barrow & Nore	002162	cSAC	Within cSAC at Ballyragget (start of route). Crosses designated section of Owenbeg River at Boleybeg.
River Nore/ Abbeyleix Woods	002076	pNHA	Within pNHA at Ballyragget (start of route)
Avonmore Ponds	/	WS	Wetland bird site within 0.7 km start of route
River Nore floodplain (at Grange)	/	WS	Wetland bird site within 1.4 km of start of route
Unidentified streams	/	River	Crosses one small stream tributary of River Nore.
River Barrow & Nore	002162	cSAC	2.1 km from designated section of Owenbeg River.
Ironmills River	/	River	Crosses tributary of Ironmills River (undesignated section) (River Nore catchment)
Ballynakill Lake	/	WS	Wetland bird site 2.9 km NE of route corridor
Mass Lough (Ballynakill)	/	WS	Wetland bird site 2.4 km NE of route corridor
Unidentified streams	/	River	Crosses the headwaters of several small streams (undesignated) that are tributaries of the Owenbeg River
Unidentified streams	/	River	Crosses several tributaries of Timahoe River (streams) (Barrow catchment)
Timahoe Eskers	000421	pNHA	Overlaps with 2 sections of this pNHA and National Nature Reserve and is adjacent to another section.

Table 2: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of the Central Route Corridor. WS – Wetland site of importance to waterbirds.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
River Barrow & Nore	002162	cSAC	Within cSAC at Ballyragget (start of route)
River Nore/Abbeyleix Woods	002076	pNHA	Within pNHA at Ballyragget (start of route)
Avonmore Ponds	/	WS	Wetland bird site within 0.7 km start of route
River Nore floodplain (at Grange)	/	WS	Wetland bird site within 1.4 km of start of route
Inchbeg	000836	pNHA	2.8 km SE of corridor at southern end
River Barrow & Nore	002162	cSAC	Crosses River Gloshna (part of 2162) SW of Castlecomer
River Barrow & Nore	002162	cSAC	Crosses Dinin River (part of 2162) twice S of Castlecomer
Coan Bogs	002382	NHA	Partially within NHA
River Kileen	/	River	Crosses river (undesignated section) (River Nore catchment)
Douglas River	/	River	Crosses river (undesignated section) (River Barrow catchment)
Crooked River	/	River	Crosses several stream tributaries (undesignated section) (River Barrow catchment)
Clopook Wood	000860	pNHA	1.6 km NE at northern end
Ballyprior Grassland	002256	cSAC	1.7 km E at northern end
Timahoe River	/	River	Crosses river (undesignated section) (River Barrow catchment)
Timahoe Esker	000421	pNHA	Overlaps with one section of pNHA & NNR at northern end

Table 3: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of the Eastern 110 kV Route Corridor. WS – Wetland site of importance to water birds.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
Glashagal River	/	River	Crosses river (undesignated section) (River Nore catchment)
River Barrow & Nore	002162	cSAC	Route corridor overlaps with cSAC along Owenbeg River east of Ballynakill
Ironmills River	/	River	Crosses river (undesignated section) (River Nore catchment)
Lisbigney Bog	000859	cSAC	cSAC is 1.7 km from NE side of route corridor
Lisbigney Pond	/	WS	Wetland bird site 2.5 km NE of route corridor
Ballynakill Lake	/	WS	Wetland bird site 0.6 km NE of route corridor
Mass Lough (Ballynakill)	/	WS	Wetland bird site 1.6 km NE of route corridor

Table 4: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of Sub Corridor Node 2-4. WS – Wetland site of importance to waterbirds.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
Unidentified streams	/	River	Crosses several undesignated tributaries of the Dinin River (Nore catchment)
Unidentified streams	/	River	Crosses an undesignated tributary of Moyadd Stream and Dinin River (Nore catchment)
Owenbeg River	/	River	Crosses headwaters of Owenbeg River (undesignated section) and a small tributary of this river.

Table 5: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of Sub Corridor Nodes 3-7.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
River Barrow & Nore	002162	cSAC	Route corridor is 0. 3 km of Owenbeg river (designated section NE of Ballynakill
Unidentified streams	/	River	Crosses several small stream tributaries (undesignated) of Ownebeg River
Ballynakil Lake	/	WS	Wetland bird site 0.4 km west of route corridor
Mass Lough (Ballynakil)	/	WS	Wetland bird site 1.0 km west of route corridor

Table 6: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of Sub Corridor Nodes 5-6.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
Unidentified streams	/	River	Crosses or overlaps with several tributaries of Timahoe River (streams) (Barrow catchment)
Timahoe Eskers	000421	pNHA	Overlaps with 2 sections of this pNHA and National Nature Reserve and is adjacent to another section.

Table 7: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of Sub Corridor Nodes 8-10.

Name	Site Code	Status	Approximate distance from corridor (nearest point)
Timahoe River	/	River	Crosses tributary of Timahoe River (stream) (Barrow catchment)
Timahoe Eskers	000421	pNHA	This pNHA and National Nature Reserve is located 1.4 km to the east of the sub corridor.

Table 8: Sites of known ecological importance, as identified in the constraints report, occurring within 3 km of Sub Corridor Nodes 7-9.

The study area contains sites rated as being of international ecological importance, sites of national importance and a site of rare and protected species, including one species only found in the study area and nowhere else in the world (the Nore Freshwater Pearl Mussel). If mitigation measure are not implemented several of the proposed route corridors are likely to have some direct impacts on the River Barrow and Nore cSAC to some extent as they all cross rivers within the cSAC.

The emerging preferred route corridor is the Central Route Corridor. This corridor passes over higher ground of the Castlecomer Plateau so it is somewhat removed from the habitats and species of interest along the River Nore lowlands. This route involves a single crossing of the River Barrow and Nore cSAC. The proposed crossing is located at a narrow section of the cSAC (the Owenbeg River at Boleybrack). This route also crosses some minor rivers and streams in the Nore and Barrow catchments that are still likely to be used by fauna species of conservation importance. There is also increased potential for runoff during construction activities affecting aquatic species of conservation interest downstream in the catchment as this corridor passes over higher ground. However this risk can be minimised by appropriate environmental engineering controls and measures being incorporated into the design of the project.

Sub Route Corridor Node 2-4 is less preferred than the Central Route (Node 2-3-4) due to potential impacts arising from proximity of the Sub Route Corridor to the River Barrow and Nore cSAC along the Owenbeg River and the required crossings of significant sections of undesignated rivers (Glashagal, Ironmills River).

Similarly the Central Route Corridor between Node 3-4-6-7 is more preferred than Sub Route Corridor Node 3-7. Sub Route Corridor Node 3-7 would remove the necessity to cross the cSAC, as the route would cross the same river (Owenbeg River) further upstream, removed from the designated part. However, this corridor would extend the overall length of the route corridor and also cross a longer section of higher ground. In addition, the requirement for a greater number of angle masts along this route would increase the potential for adverse impacts.

Between Nodes 8, 9 and 10 the Central Corridor is preferable to Sub Route Corridor Node 8 - 10 as it is further removed from the main part of the Timahoe Eskers pNHA, thus reducing the potential for adverse impacts on this designated site.

There are only minor differences between the Central Corridor at Node 7, 8, and 9 and Sub Route Corridor Node 7-9. The Central Corridor is slightly preferred due to its occurrence on less elevated ground and shorter length.

Following the Central Route Corridor, the next most preferred route is the Western Route Corridor. This route corridor has a river crossing over the Owenbeg River that is part of the cSAC and also crosses several other undesignated streams and rivers that are likely to be of ecological importance. This route also passes adjacent to Lisbigney Bog cSAC and has potential to disturb wildlife in this area. This route corridor is also close-by the lowland area between the River Nore and Owenbeg floodplain between Ballyraggett, Durrow and Attanagh that is a site of potential value to wintering waterbirds. This zone is also more likely to contain potential flight corridors of wintering waterbirds that are moving along the River Nore floodplain.

The next most Preferred Route would be a combination of the southern part of the Western Route Corridor (Node 1-5), Sub Route Corridor Node 5-6 and the northern part of the Central Route Corridor (Node 6-7-8-9-10). This combination is less preferred to the above due to the proximity of Sub Route Corridor 5 -6 to a section of the River Barrow to Nore SAC.

The least preferred route corridor is Eastern Route Corridor. This eastern route is the longest route and would have the greatest construction footprint. There are two crossings over rivers designated as part of the River Barrow and Nore cSAC and a number of other crossings over undesignated watercourses. This route also crosses directly over Coan Bog NHA.

In conclusion, following a desktop ecological assessment of the different Route Corridors, the most preferred option is deemed to be the Central Route Corridor (Node 1-2-3-4-6-7-8-9-10).

5.5 SOILS & GEOLOGY

(Please see Appendix I-5 for the 'Assessment of Corridors Report - Soils & Geology Route Selection')

The potential impacts relating to soils and geology are generally related to the construction phase and the management of machinery on site. The application of mitigation measures will help ensure that the residual impacts for all substation options are imperceptible during both the construction phase and the operational phase.

In terms of the route corridor selection the level of impact identified was slight negative for all route corridors. The least preferred options would be Nodes 1-5 of the Western 110kV Route Corridor and the Eastern Route Corridor with the associated 400kV Route Corridor due to the presence of blanket peat. The less preferred options would be Nodes 8-10 and 9-10 (and the associated 400kV Route Corridor) due to the locations of site of geological significance. The remaining nodes display potential impacts that are common to all and would be the preferred options in terms of soils and geology.

5.6 HYDROLOGY & HYDROGEOLOGY

(Please see Appendix I-6 for the 'Assessment of Corridors Report - Soils & Geology Route Selection')

The potential impacts relating to the water environment are generally related to the construction phase and the management of machinery on site. The application of the mitigation measures will ensure that the potential impacts for each route option are imperceptible during both the construction phase and the operational phase.

In terms of the route corridor selection the level of impact identified was a combination of slight negative and moderate negative for all route corridors. The least preferred options in terms of potential water impacts would be nodes 5-10 of the Western 110kV Route Corridor option and Eastern 110kV Route Corridor option between Nodes 1–10 (and associated 400kV Route Corridor) due to the presence of both regionally and locally important sand & gravel and bedrock aquifers.

Based on the number of potential impacts and the level of impacts the less preferred route options would be the following nodes:

- Nodes 8-10 (110kV Sub-Route Corridor and associated 400kV Route Corridor)
- Nodes 9-10 (Central 110kV Route Corridor and associated 400kV Route Corridor)
- Nodes 7-8 (Central 110kV Route Corridor)
- Nodes 7-9 (110kV Sub-Route Corridor)
- Nodes 2-4 (110kV Sub-Route Corridor)
- Nodes 5-6 (110kV Sub-Route Corridor)
- Nodes 1-5 (Western 110kV Route Corridor)

Based on the number of potential impacts and the level of impacts the preferred route options would be the following nodes:

- Nodes 1-2 (Central 110kV Route Corridor)
- Nodes 2-3 (Central 110kV Route Corridor)
- Nodes 3-4 (Central 110kV Route Corridor)
- Nodes 3-7 (110kV Sub-Route Corridor)
- Nodes 4-6 (Central 110kV Route Corridor)
- Nodes 6-7 (Central 110kV Route Corridor)

PART C- LEAD CONSULTANT'S RECOMMENDATION

6.0 CONCLUSIONS AND RECOMMENDATIONS

It is the lead consultant's responsibility to review all expert inputs into the project and to evaluate information with the aim of identifying an emerging preferred route corridor. The method in which this was done is detailed below.

6.1 REVIEW

A review of the evaluation and recommendations on each route corridor option received from expert consultants (summarised in chapter 5 above) was carried out by the lead consultants.

The information is presented in concise tabular format (Tables 10, 11, 12, 13 & 14) to visually represent data received using the rating system described in Table 9.

Two of the route corridor options are divided into sections as there are variants (or sub-route corridors to these primary corridors). These sections are identified using the node points marked on the constraints map Route Corridors Map in Appendix H-1. As there are no variants on the eastern corridor it is not divided into sections. The route corridors are then assessed comparatively to each other based on the constraints identified and evaluated in chapter 5. In this way, if no one corridor in its current form distinguishes itself as being the optimum route corridor, based on all the relevant criteria, then possibly a hybrid route corridor, comprising the variants between node sections from a number of route corridor options, may be preferable.

6.2 ROUTE CORRIDOR APPRAISAL

Tables 10, 11, 12, 13 & 14 summarises the evaluation outcome of the identified 400kV route corridor option, the three identified 110kV route corridor options (Western, Central and Eastern), and the identified 110kV sub route corridor options respectively. A colour coding is used to rate the possible constraints on each environmental topic (see Table 9). Where constraints exist, a brief overview summary is included. Further details on these constraints can be found in the consultant's reports. (Appendix I-1, I-2, I-3, I-4, I-5 & I-6).

	Emerging Preferred: At this stage, it is considered that route corridors in this group may have the least impact on the identified constraints.
	Less Preferred: At this stage, it is considered that route corridors in this group may have a greater impact on the identified constraints.
	Least Preferred: At this stage, it is considered that route corridors in this group may have the greatest impact on the identified constraints.
Notes	This appraisal matrix evaluates the corridors (or identified parts thereof) against the criteria set out in Chapter 5 in order to facilitate the identification of a corridor (or corridors) which overall performs best against the criteria and which therefore best meets the overall routing objective. In carrying out this corridor appraisal it is acknowledged that other more site-specific social, environmental and economic criteria are likely to be of relevance to routing e.g ornithology, archaeological conservation, proximity to dwellings, and these will be further considered at the more detailed routing stages.

Table 9: Route Corridor Appraisal Ratings

Criterion	Element	400kV Route 1
Economic	Length	1.8km
Environment	Length	
	Human Beings	
	Cultural Heritage	
	Ecology	
	Landscape/Visual	
	Hydrology and Hydrogeology	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers
	Soils and Geology	
Existing Infrastructure	Roads	0
	Transmission Lines	1 (connection point)
	Bord Gáis pipeline	0

Table 10: Primary Appraisal of the 400kV Route Corridor

Criterion	Element	Western 110kV Route 1	
	Node	1 to 5	5 to 10
Economic	Length	28km	
Environment	Human Beings	0.5km from Ballinakill Centre.	Includes Ballyroan. 2km from Abbeyleix Centre
	Cultural Heritage	Highest density of Cultural Heritage Sites – 56 for the full route corridor 1-5-10	Highest density of Cultural Heritage Sites – 56 for the full route corridor 1-5-10
	Ecology	Crosses the Owenbeg River that is part of the River Barrow and Nore cSAC	
	Landscape/Visual	Passes near and parallel to amenities and roads and close to settled areas	Passes near and parallel to amenities and roads and close to settled areas
	Hydrology and Hydrogeology	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers	Regionally and locally important Karstified bedrock aquifer, Sand and gravel aquifers
	Soils and Geology	Presence of Blanket Peat	
Existing Infrastructure	National Road Crossings	2	4
	Transmission Lines	0	1
	Bord Gáis pipeline	0	0

Table 11: Primary Appraisal of the Western Route Corridor

Table 12: Primary Appraisal of the Central Route Corridor

Criterion	Element	Central 110kV Route 4							
	Node	1 to 2	2 to 3	3 to 4	4 to 6	6 to 7	7 to 8	8 to 9	9 to 10
Economic	Length	26km							
Environment	Human Beings								
	Cultural Heritage								
	Ecology				Crosses the River Barrow and Nore cSAC				Timahoe Esker
	Landscape/ Visual		Traverses a High Amenity Area with associated scenic views						
	Hydrology and Hydrogeology						Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers
	Soils and Geology								Timahoe Esker Site of Geological Significance
Existing Infrastructure	National Road Crossings	1	0	0	1	0	0	0	1
	Transmission Lines	0	0	0	0	0	0	0	0
	Bord Gáis pipeline	0	0	0	0	0	0	0	0

Criterion	Element	Eastern 110kV Route Corridor
	Node	1 to 10
Economic	Length	44km
Environment	Human Beings	Crosses Special Area of Development Control
	Cultural Heritage	High amount of recorded monuments
	Ecology	Greatest contruction footprint, crosses SACs several times
	Landscape/Visual	Route passes through upland areas with lower visual absorption, Approximate to, and parallel to amenities and roads, and close to settled areas
	Hydrology and Hydrogeology	Regionally and locally important Karstified bedrock aquifer, Sand and gravel aquifers
	Soils and Geology	Crosses Blanket Peat and Kyle Spring
Existing Infrastructure	National Road Crossings	6
	Transmission Lines	1
	Bord Gáis pipeline	0

Table 13: Primary Appraisal of the Eastern Route Corridor

Criterion	Element	110kV Sub Route Corridors				
		2 to 4	3 to 7	5 to 6	7 to 9	8 to 10
Economic	Length	9km	15km	5km	5.5km	5km
Environment	Human Beings	Passes close to Ballinakill				Passes through northwest corner of Timahoe near Timahoe Round Tower and Eskers
	Cultural Heritage	Clusters of Sites	Clusters of Sites	Clusters of Sites		Passes close to Timahoe Round Tower
	Ecology	Proximity to the River Barrow and Nore cSAC	Longer route, more construction	Crosses the River Barrow and Nore cSAC		Proximity to Timahoe Eskers pNHA
	Landscape/ Visual		High Ground with a number of elevated ridgeline crossings			
	Hydrology and Hydrogeology	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers		Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers	Regionally important Karstified (diffuse) bedrock aquifer, sand and gravel aquifers
	Soils and Geology					Timahoe Esker Site of Geological Significance
Existing Infrastructure	National Road Crossings	0	2	3	0	1
	Transmission Lines	0	0	0	0	1
	Bord Gáis pipeline	0	0	0	0	0

Table 14: Primary Appraisal of the Sub Route Corridors

6.3 SELECTION OF THE EMERGING PREFERRED 110KV ROUTE CORRIDOR

6.3.1 ENVIRONMENTAL CONSULTANTS ROUTE CORRIDOR PREFERENCE

As well as assessing each corridor on a detailed node to node basis, each individual consultant also concludes their section by providing an overall corridor preference. This is captured in Table 15 below and it is clear that in general the central group of corridors are emerging as preferred. It is important to note that no corridors are excluded at this stage; this is merely a means of identifying what comprises the consultants emerging preferred route corridor.

Criterion	Western Corridor	Central (including variants)	Eastern Corridor
Human Beings			
Cultural Heritage			
Ecology			
Landscape			
Hydrology & Hydrogeology			
Soils & Geology			
Emerging preferred Corridors		Corridor 1-2-4-6-7-8-9-10: Corridor 1-2-3-4-5-7-8-9-10: Corridor 1-2-3-4-6-7-9-10 and Corridor 1-2-4-6-7-9-10	

Table 15: Environmental Consultants Corridor Preference

6.3.2 EMERGING PREFERRED ROUTE CORRIDOR

As is clear from the above tables the process has established four emerging preferred route corridors, namely Corridor 1-2-4-6-7-8-9-10: Corridor 1-2-3-4-6-7-8-9-10: Corridor 1-2-3-4-6-7-9-10 and Corridor 1-2-4-6-7-9-10 see figure 14.

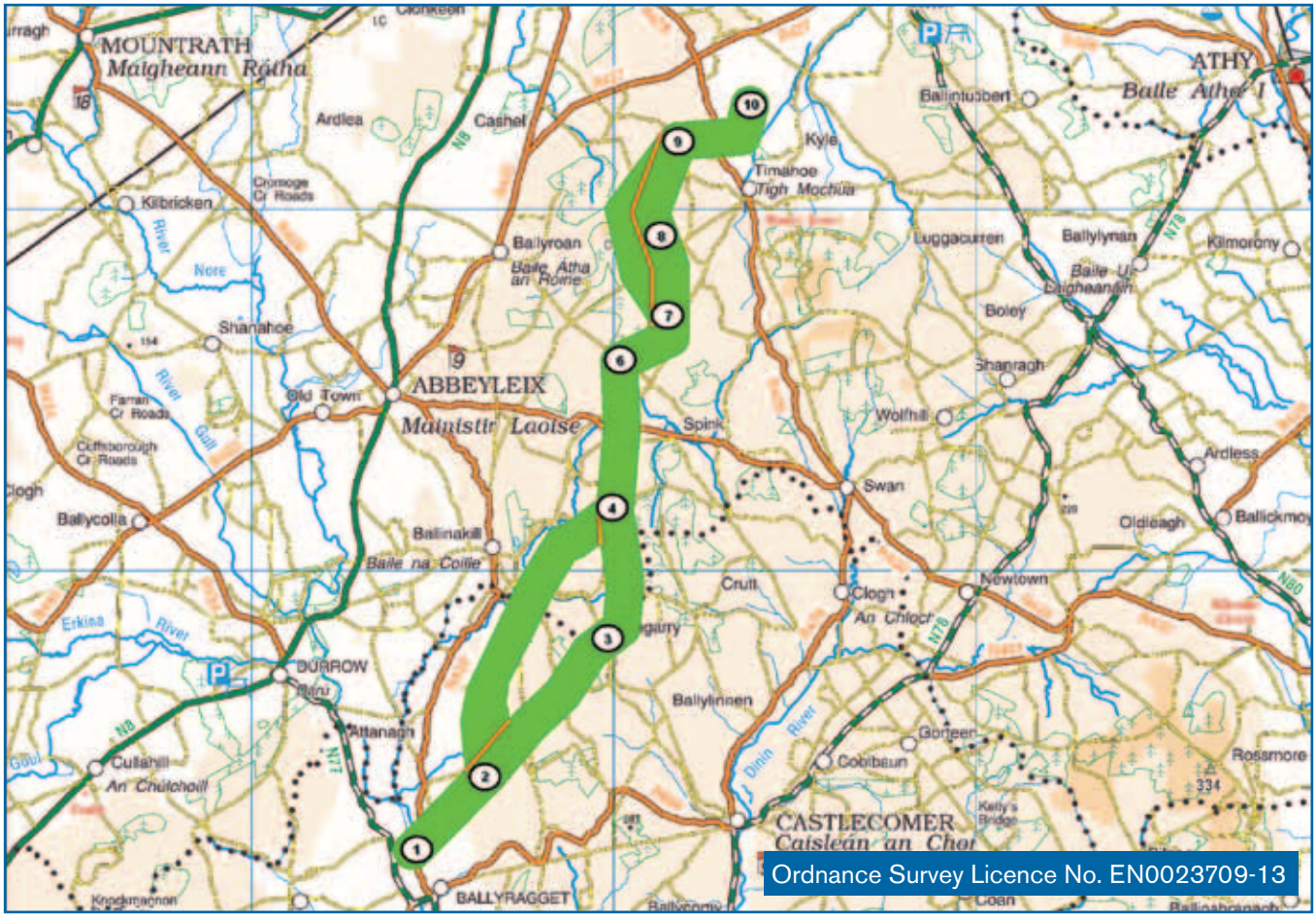

Figure 14: Emerging preferred 110kV Route Corridors

Because nodes 7-9 and nodes 7-8-9 are considered at this stage to be equally feasible on the environmental topics examined, and these sections of corridor overlap considerably, it has been decided to amalgamate them into one corridor – see figure 15.

Figure 15: Emerging preferred 110kV Route Corridors with nodes 7-9 and nodes 7-8-9 amalgamated

Amalgamating nodes 7-9 and nodes 7-8-9 has the effect of reducing the emerging preferred route corridors down to two, namely corridor 1-2-3-4-6-7-(8)-9-10 and corridor 1-2-4-6-7-(8)-9-10. The difference between these two route corridors is now along nodes 2-3-4 versus nodes 2-4.

As nodes 2-3 of the 2-3-4 section traverse a High Amenity Area with associated scenic views, it is considered at this stage to be less preferred then nodes 2-4 therefore corridor 1-2-4-6-7-(8)-9-10 is considered the emerging preferred route corridor – see Figure 16.

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Figure 16: Emerging Preferred 110kV Route Corridor

6.4 LEAD CONSULTANT'S RECOMMENDATION

Having reviewed all data, it is the opinion of ESB International as Lead Consultants supported by AOS Planning, that the project proceed to the second phase of public consultation, with a variant of the Central Route Corridor made up of sections 1-2-4-6-7-(8)-9-10 (see figure 16) as the emerging preferred 110kV route corridor for the Laois – Kilkenny Reinforcement Project.

The 1.8km identified 400kV corridor to the existing Dunstown-Moneypoint 400kV line is considered at his stage to be the optimum route corridor as it follows an existing electricity infrastructure corridor (the Carlow – Portlaoise 110kV line route corridor) over the shortest possible distance. Figure 17 shows the emerging preferred 400kV and 110kV Route Corridors.

Figure 17: Emerging Preferred 400kV and 110kV Route Corridors

Appendix J-1, J-2, J-3 & J4 show detailed maps of this emerging preferred route corridor option.

[6] Emerging Preferred: The Lead Consultants preference based on an initial assessment of options prior to consultation on that preference.
[7] Route Corridor: An identified strip of land typically 1km wide within which a transmission line could be located.
[8] www.eirgridprojects.com/projects/laoiskilkenny
[9] Preferred: EirGrid's confirmed preference following consultation.

6.5 REPORT SUMMARY AND KEY FINDINGS

This report identifies the Lead Consultant's emerging preferred[6] substation site for the 400/110 kV substation and associated connections in Laois and also identifies the emerging preferred route corridor[7] for the 110 kV circuit between Laois and Ballyragget. The Phase 1 Report is reliant on a number of detailed reports which are included in the Appendices which are available online[8].

Key Findings

The key findings can be summarised as follows:

- The emerging preferred substation technology for the 400/110 kV substation is GIS (Gas Insulated Switchgear) – primarily built indoors, this is the smallest and most compact station type.
- The emerging preferred location for the 400/110 kV site is in the townland of Coolnabacky on the southern boundary of the substation study area, close to the existing 110 kV overhead line. Approximately 1.5km of new 400 kV overhead line would be required to connect to this location.
- The emerging preferred technology for the 110 kV circuit is overhead line.
- The emerging preferred route corridor for the 110 kV overhead line between Laois and Ballyragget stations is identified.

Next Steps

A four week consultation period follows the publication of this report. During this period the project team will consult on the findings of the report with stakeholder bodies including members of the general public. Members of the public are encouraged to make submissions and this can be done through any of the communication channels listed.

Further 'Information Days' are also scheduled during the four week period where members of the project team will be available locally to discuss any of the findings - the time and venue for these information days will be advertised in local newspapers.

At the end of the four week period all emerging preferences identified in this report will be evaluated in respect of any submissions made with a view to confirming preferred[9] findings

Due to the large amount of data contained within the appendices they are contained separately. These appendices can be either viewed or downloaded from the project website:

www.eirgridprojects.com/projects/laoiskilkenny

Or requested from the project manager at the address provided below:

PROJECT MANAGER
(LAOIS - KILKENNY REINFORCEMENT PROJECT)
EIRGRID PLC
THE OVAL
160 SHELBOURNE ROAD
BALLSBRIDGE
DUBLIN 4

TEL: +353 (0)1 702 6642
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Any member of the general public is welcome to make submissions on the emerging preferred and can do so by writing to the Project Manager at the postal address and/or email address provided above.

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