



Laois-Kilkenny Reinforcement Project

400/110kV Emerging Substation Site

PE687-F0261-R261-006-003



ESBI Engineering & Facility Management Ltd

Stephen Court, 18/21 St Stephen's Green, Dublin 2, Ireland

Telephone+353-1-703 8000 Fax+353-1-661 6600

www.esbi.ie

AOS Planning Limited

2nd Floor The Courtyard, 25 Great Strand Street, Dublin 1, Tel 01 874 7704,

www.aosplanning.ie



ESB International

File Reference: PE687-F0261

Client: EirGrid

Project Title: Laois-Kilkenny Reinforcement Project

Report Title: 400/110kV Emerging Substation Site

Report No.: PE687-F0261-R261-006-003

Rev. No.: 3

Volume 1 of 1

Prepared By Environmental Sections – Ciara Kellett, AOS Planning Ltd.
Technical Sections – Shane McLoughney, ESB International

APPROVED: Shane McLoughney
TITLE: Overhead Line Planner

DATE: April 2011

COPYRIGHT © ESB INTERNATIONAL LIMITED (2004)

ALL RIGHTS RESERVED, NO PART OF THIS WORK MAY BE MODIFIED OR REPRODUCED OR COPIES IN ANY FORM OR BY ANY MEANS - GRAPHIC, ELECTRONIC OR MECHANICAL, INCLUDING PHOTOCOPYING, RECORDING, TAPING OR INFORMATION AND RETRIEVAL SYSTEM, OR USED FOR ANY PURPOSE OTHER THAN ITS DESIGNATED PURPOSE, WITHOUT THE WRITTEN PERMISSION OF ESB INTERNATIONAL LIMITED.

Executive Summary

The purpose of this report is to present the process that was undertaken in order to identify a suitable location for siting the proposed 400/110 kV substation in Laois.

The proposed substation can be either Air Insulated Switchgear (AIS) or Gas Insulated Switchgear (GIS) type design. At the time of preparing this report no decision has been made on which technology to employ and as a result this report finds one suitable location for each type.

The proposed substation is to connect to the existing Moneypoint-Dunstown 400kV and Carlow-Portlaoise 110kV overhead lines which intersect (pass over) in the study area. A new 110kV circuit is also required to connect to a new 110kV development proposed adjacent to the existing ESB Ballyragget 38kV substation located in Ballyragget, Co. Kilkenny.

An iterative approach was applied in order to identify the emerging preferred sites. The general methodology was firstly to define a suitable Substation Study Area. A 4km diameter circular area, centred on the intersection of the existing Moneypoint-Dunstown 400kV and Carlow-Portlaoise 110kV overhead lines was selected. This was deemed an appropriately sized area within which it could be expected to find a suitable site.

The next step was to identify constraints within the Study Area. This allowed for an informed identification of nine folios by ESBI which could potentially accommodate the development. Due to the considerable size difference in the overall footprints between an AIS and a GIS station, some of the smaller folios can only accommodate a GIS type design. These nine folios were then subject to an environmental appraisal by AOS Planning Ltd.

As well as providing an overall evaluation of each folio in its entirety, the assessments also highlighted constraints confined to certain parts of a folio. On the basis of these assessments it was deemed unsuitable to progress further with some folios and as a result the nine folios were refined down to four. This assessment process also provided an informed starting point for identifying and developing specific layouts within these folios.

Specific sites and line route configurations associated with each of the four suitable folios were developed. These four sites and line route configurations were subsequently assessed by ESBI and considered under the following technical criteria: *Siting of Substation within Folio, Required Connections to Transmission System, Capacity for Accommodating Potential Future Offloads, Road Access to Substation, Screening and Cost*. This process established sites 3 and 4 as the emerging preferences for the AIS and the GIS solutions respectively.

For *due diligence* a final environmental assessment was carried out on all four sites. This did not identify any environmental constraints that deemed the preferred substation sites unsuitable.

No geotechnical site investigations or ground surveys have been carried out on any of the sites. It is therefore recommended that specialist site investigations are carried out prior to the final acquisition of the preferred site.

It is the recommendation of this report that site 3 is acquired if an AIS substation is to be developed and site 4 if a GIS substation is to be developed.

Contents

Executive Summary		ii	
PART A: OVERVIEW & INITIAL FOLIO SELECTIONS.			
1	Introduction	1	
1.1	Overview	1	
1.2	Substation Study Area Details	2	
1.3	Proposed 400/110kV Substation Development	4	
1.4	Overhead Line Connections	6	
2	Selection of Suitable Folios	7	
2.1	Methodology for Initial Folio Selection	7	
2.2	Substation Study Area Constraints	7	
2.3	Initial Folio Identification & Appraisals	9	
2.4	Summary of Initial Folio Selection	24	
PART B: ENVIRONMENTAL ASSESSMENT OF FOLIO SELECTIONS.			
3	Environmental Assessment of Candidate Folios	26	
3.1	Overview	26	
3.2	Assessment of Substation Folios – Ecology	27	
3.3	Assessment of Substation Folios – Cultural Heritage	34	
3.4	Assessment of Substation Folios – Hydrology & Hydrogeology	46	
3.5	Assessment of Substation Folios – Soils & Geology	54	
3.6	Assessment of Substation Folios - Human Beings	59	
3.7	Assessment of Substation Folios – Landscape & Visual Impact	64	
3.8	Overall Assessment	72	
PART C: IDENTIFICATION , TECHNICAL & ENVIRONMENTAL ASSESSMENT OF SUITABLE SUBSTATION SITES.			
4	Identification and Technical Assessment of Suitable Substation Sites	76	
4.1	Site 1	77	
4.2	Site 3	79	
4.3	Site 4	82	
4.4	Site 5	84	
4.5	Preferred Compound Site(s)	86	
5	Environmental Considerations of Suitable Substation Sites	87	
5.1	Site 1	88	
5.2	Site 3	90	
5.3	Site 4	92	
5.4	Site 5	94	
5.5	Overall Environmental Assessments of Sites	96	
PART D: CONCLUSION & RECOMMENDATION.			
6	Conclusion & Recommendation	97	
Appendix A – Study Area Location			99
Appendix B – Sites Location Map			100
Appendix C – Ecology			101
Appendix D – Cultural Heritage			101
Appendix E – Hydrology & Hydrogeology			102
Appendix F – Soil & Geology			106

Appendix G – Proposed GIS Compound Site on Folio 1	108
Appendix H – Proposed GIS Compound Site on Folio 3	109
Appendix I – Proposed AIS Compound Site on Folio 3	110
Appendix J – Proposed GIS Compound Site on Folio 4	111
Appendix K – Proposed GIS Compound Site on Folio 5	112
Appendix L - Photographs of Typical Overhead Line Structures	113

PART A: OVERVIEW & INITIAL FOLIO SELECTIONS

1 Introduction

1.1 Overview

This report identifies and assesses a number of potential candidate folios in order to identify the optimum site in which to locate the proposed Laois – Kilkenny Reinforcement Project 400/110kV substation. The proposed substation development is to be either Air Insulated Switchgear (AIS) or Gas Insulated Switchgear (GIS) type design and as a result, this report identifies a site for both design types. The report is divided into 4 parts (parts A, B, C & D) as follows:

Part A: Overview & Initial Folio Selections

Identify candidate folios to accommodate a 400/110kV AIS and/or GIS substation development and associated connections.

Part B: Environmental Assessment of Folio Selections

Establish the preferred folio(s) for the substation development by environmental assessment of candidate folios identified. This section therefore creates a shortlist of folios for further study and also identifies any particular areas of constraint within these shortlisted folios.

Part C: Identification , Technical & Environmental Assessment of Suitable Substation Sites

- Establish a suitable site location for the substation compound within each of the preferred folio(s) from a technical perspective. This results in the identification of a preferred substation site for an AIS and also for a GIS type layout.
- A due diligence environmental assessment of the suitable site locations is then carried out.

Part D: Conclusion & Recommendation

Conclude and recommend the optimum AIS and/or GIS substation site for acquisition.

All folios identified¹ were reviewed with both technologies considered, however not all folios identified can accommodate an AIS type substation due to its size, which is considerably larger than a GIS substation.

As requested by EirGrid, the proposed substation will connect to the existing transmission network by looping the existing Dunstown-Moneypoint 400kV and the Carlow–Portlaoise 110kV circuits to the substation. These lines cross each other in the townland of Money Lower, Co. Laois which was identified as the centre of the substation study area. See Figure 1.1 overleaf and also Appendix A.

¹For this report the word folio is used to describe a parcel of land or landholding, usually under a single owner and registered under a single “folio number” by Irelands Property Registration Authority.

Furthermore, the proposed substation will connect to a new 110kV development proposed adjacent to the existing ESB Ballyragget 38kV substation located in Ballyragget, Co. Kilkenny via a new 110kV circuit.

A 4km diameter circular substation study area was established by ESB. This study area was considered to be a suitable study area size by virtue of the fact that it would minimise the necessary circuit connections to the transmission system while taking technical and environmental constraints into account.

All environmental assessments within this report were carried out by AOS Planning Ltd., and all technical assessments including initial folio selection and site identification were carried out by ESB International.

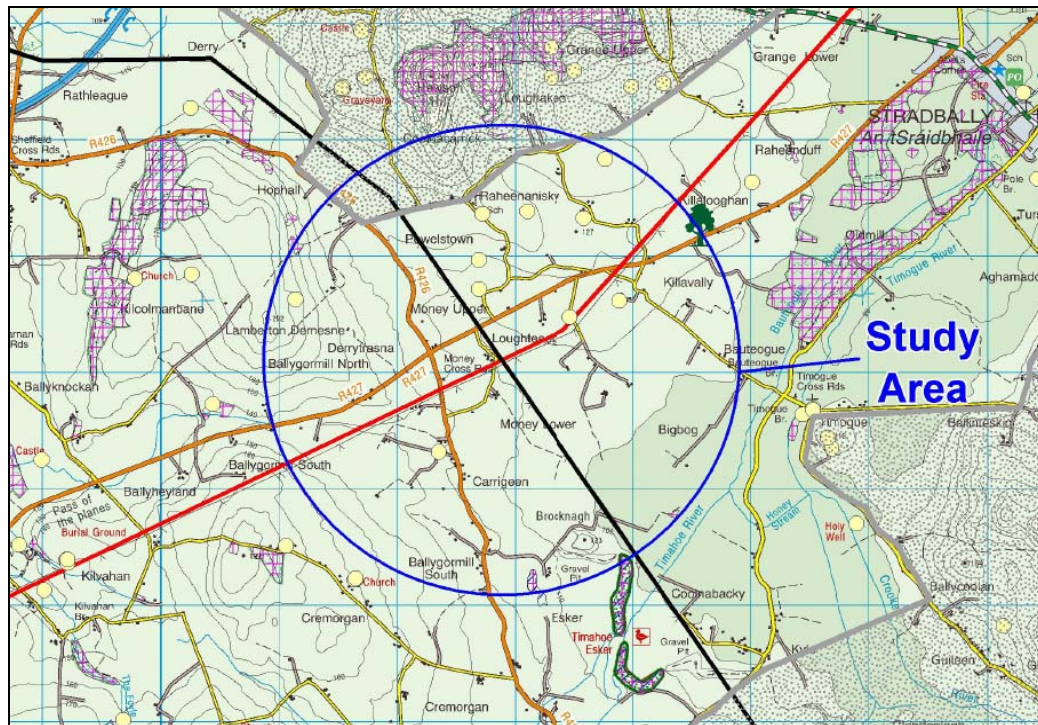


Figure 1.1: Substation Study Area: (Red Line = Dunstown-Moneypoint 400kV Line; Black line = Carlow-Portlaoise 110kV Line).

Ordnance Survey Licence No. EN0023709-13

1.2 Substation Study Area Details

The study area is located approximately 5km south west of Stradbally, Co. Laois and 7km south east of Portlaoise, Co. Laois. The circular study area is 4km in diameter and 12.5km² in area, centred on the intersection point of the existing 400kV and 110kV overhead lines in the townland of Money Lower (see appendix A).

The substation study area is located in a relatively low lying area bounded to the east by the Timahoe and Bauteogue Rivers, to the southeast by Ballymore/Ballyprior Hills, to the west by the R426 road, to the south by Timahoe village and to the north by Hewson Hill, Grange Upper and the N80 Portlaoise-Carlow national road.

The substation study area encroaches either fully or partially on 21 townlands. These are as follows:

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

1.3 Proposed 400/110kV Substation Development

The technical requirements for the new 400kV substation is as follows:

- Minimum 6 x 400kV bays (2 x Transformer bays, 4 x line bays = Moneypoint and Dunstown and 2 spare bays)
- 1 x 400 k V double busbar (rated to 3000A)
- 1 x 400kV Coupler
- 400/110kV 250MVA double wound Transformers
- 1 x 110kV double busbar (rated to 2500A)
- 2 x 110kV Coupler (one of which is to be a spare)
- Minimum 9 x 110kV bays (2 x Transformers bays, 7 x Line bays = Portlaoise, Carlow, Ballyragget and 4 spare bays)

Note: It is standard practice to provide future capacity in new substations in the form of spare bays. For the purposes of the Laois – Kilkenny Reinforcement Project, five circuits to the station are required (4 of these connections will be to existing overhead lines already in the area, while the fifth will be the new circuit to Ballyragget).

At the time of writing this report a decision on the selection of either AIS or GIS technologies had still to be made by EirGrid, therefore the report assesses sites for both technologies and establishes the optimum site. Based on the scope of the substation as defined by EirGrid, the indicative sizes of the AIS and GIS substation compounds were estimated to be:

Air Insulated Substation:	235.5m x 199m	(c.11.6 acres/ 4.68ha)
Gas Insulated Substation:	90.7m x 117m	(c.2.62 acres/ 1.06 ha)

Table 1.1 Substation sizes

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 1.2 illustrates an indicative 400/110kV AIS substation layout.



Figure 1.2: Indicative AIS Substation Layout

No screening is shown on the image above.

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 1.3 illustrates an indicative 400/110kV GIS substation layout.



Figure 1.3: Indicative GIS Substation Layout*

***The shaded area outside the compound illustrates the difference in size between an AIS substation and a GIS substation**

No screening is shown on the image above.

Additional lands for roads, landscaping, possible end masts and/or future expansion of the site were also considered when reviewing lands in the study area.

1.4 Overhead Line Connections

The report assumes connection to an AIS substation will be made via overhead line connection for both 400kV and 110kV connections.

Connections to a GIS substation are assumed to connect directly to the substation for the 400kV circuit and connect to a line/cable interface mast close to the substation compound boundary for the 110kV circuits.²

400kV lines are supported by lattice steel towers ranging in height from circa 28m to 68m.

110kV lines are generally supported by portal woodpole structures ranging in length from circa 16m to 23m (a minimum of 2.3m is buried underground) except where the line changes direction where a lattice steel tower is used ranging in height circa 18m to 24m.

Photographs of the typical overhead line structures used for the proposed can be seen in Appendix L.

² Typically GIS manufacturers design the equipment on the basis that all incoming connections will be cabled in (via a cable basement/pit). At 400kV, the line is fed directly into the GIS (via busduct) due to the expense and the difficulty of working with 400kV cables (Large bending radius, ducting requirements etc). At all other voltage levels (MV - 220KV) the lines are cabled into the GIS.

2 Selection of Suitable Folios

2.1 Methodology for Initial Folio Selection

Initially a desktop study was carried out including review of OSi mapping, An Post Geodirectory and Aerial Photography. Consequently a preliminary visit by ESBI staff to the study area assessed conditions/topography, existing infrastructure and local constraints to identify folios that would accommodate the proposed substation development.

Taking into consideration the indicative design footprints of both the AIS and GIS compounds, the property ownership of these folios was reviewed via Property Registration Authority, Ireland (PRAI) to identify landholdings large enough to cater for the development.

Folios with connectivity to public roads and under/or in close proximity to the existing electrical infrastructure were specifically selected as potential sites.

This process resulted in nine potential folios being identified for the development – see Appendix B.

The selected folios were located in all directions of the centre point of the study area and all were of sufficient size to cater for either an AIS and/or a GIS style design. All folios are occupied by, or close to one or both of the existing electrical circuits required to connect to the substation site.

2.2 Substation Study Area Constraints

2.2.1 Planning History

Planning permission was investigated using the online planning search facility by Laois County Council³. No planning permission applications were identified that would act as a constraint as of 17th December 2010.

A Special Area of Developmental Control (SADC) encroaches onto the north of the study area. This is an area in need of special protection due to its sensitive character.

2.2.2 Waterways, Rivers and Canals

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

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

2.2.3 Settlement Pattern and Ribbon Development (RD)

Areas of concentrated rural housing exist in the townland of Ballygormill South and Ratheniska. Ratheniska the main settlement in the study area is a rural settlement consisting of a School, Roman Catholic Church, GAA Grounds and ancillary buildings and is

³ www.laois.ie/Planning (site visited December 2010)

situated at the foothills of Hewson Hill and Grange Upper to the north of the substation study area.

2.2.4 Road and Railways

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

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

There are no railways in this substation study area.

2.2.5 Airports, Quarries and Forestry

There are no airports in this substation study area.

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

2.2.6 Existing electricity infrastructure

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



Figure 2.1: The intersection of the existing 110kV and 400kV overhead lines crossing in the townland of Money Lower looking south east from the R427.

2.2.7 Bord Gais Eireann (BGE) infrastructure

There are no Bord Gais Eireann pipelines within this substation study area at present.⁴

⁴ <http://www.bordgais.ie/networks> (Site visited December 2010)

2.3 Initial Folio Identification & Appraisals

Following the initial visit to the substation study area, nine folios were identified as potentially viable for the proposed development.

The nine folio locations are identified in Appendix B.

All nine folios were appraised on the following factors:

- **General Location**
- **Vehicular Access**
- **Topography**
- **Planning History**
- **Flooding History / Drainage**
- **Overhead Line Access to Existing Network**
- **Technical Factors**

2.3.1 Folio No. 1

General Location

Folio No. 1 is located directly under/adjacent to the intersection of the Carlow-Portlaoise 110kV and Dunstown-Moneypoint 400kV lines in the townland of Money Lower. The predominant land use at present is crop farming/tillage.

The landholding is 44.5 hectares.

Vehicle Access

Access to the folio is from a local rural road that links the R427 and the R426 regional roads. Use of the rural road would be confined to access from the R426 for large scale deliveries due to the presence of mature trees shadowing the road from the R427 side.

Topography

The ground is generally level bounded by mature hedgerows and some trees.



Figure 2.2: Residence and trees near Folio No. 1

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio. There are no rivers or streams in the area.

Overhead Line Access to Existing Network

The folio is located at the intersection of both the 110kV and 400kV lines.



Figure 2.3: Photo taken from R426 near junction of R427 facing north east towards Folio No. 1

Technical Factors

The folio has good connectivity to the existing transmission system and is well serviced by public roadways. The folio is split by a rural road linking the R426 and R427 regional roads and the preferred location within the site is in a field to the east of this road that contains the crossing point of the existing 400kV and 110kV lines.

The section of the folio suitable will only accommodate a GIS development due to the small size of the landholding in question.

2.3.2 Folio No. 2

General Location

This folio is located in the Loughteeog and Money Lower townlands adjacent to and in close proximity to both the existing 110kV and 400kV lines. The folio is relatively flat (see figure 2.4 below).

This folio features high hedges that screen it from the R427 and minor roads. The folio is located off the R427 roadway close to Money Crossroads and is directly under/ adjacent to the Dunstown-Moneypoint 400kV line. The land is currently used for crop/tillage farming. The folio also includes an occupied dwelling with actively worked yards and buildings associated with farming.

The landholding is 31.7 hectares.



Figure 2.4: Field near Folio No. 2 facing southwest from minor road

Vehicle Access

Access to the folio can be obtained from the R427 secondary road to the north.



Figure 2.5: R427 road near proposed entrance to Folio No. 2.

Topography

The folio is generally level with some fall off to the south of the holding. The lands are bounded by existing hedgerows and some trees.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

During a site inspection in January 2010 some evidence of localised flooding at the R427 roadway near the entrance driveway to the holding was observed (see figure 2.6); however no significant record of flooding is registered on the OPW *Floodmaps.ie* database. There are no named rivers or streams on this folio.



Figure 2.6: Showing flooding to northern section of Folio No. 2 along the R427*

***Photo taken January 2010**

Overhead Line Access to Existing Network

This folio is situated adjacent to the existing 400kV and 110kV lines.



Figure 2.7: Looking towards Folio No. 2 with existing 400kV angle tower in middle background, facing North West from minor road in Loughteeog townland.

Technical Factors

The folio has good connectivity to the existing 400kV line and is well serviced by public roadways.

An AIS and GIS development on the folio is possible with minimal connection distances to both the 400kV and 110kV transmission systems and its footprint would easily be accommodated on the south of the folio.

Folio No. 2 is considered to be able to accommodate future 110kV offloads to the southwest but may be constrained due to existing housing in all other directions.

2.3.3 Folio No. 3

General Location

This substation folio is located in the townland of Money Lower and is adjacent to the existing 110kV line. It is an isolated site and relatively flat. The folio is expansive and also includes a large occupied dwelling with active yards and buildings.

The landholding is 79.1 hectares.



Figure 2.8: Looking from R426 looking north east towards Folio No. 3 in the townland of Carrigeen

Vehicle Access

Access to the folio can be achieved from a local rural road that links the R427 and the R426 regional roads. Use of this rural road would be confined to access from the R426 for large scale deliveries due to the presence of mature trees shadowing the road from the R427 side.

Topography

The folio is level and the lands are bounded by existing hedgerows and some mature trees.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

To facilitate the substation a 400kV connection will be required from the north. The total length of 400kV line diversion required would be dependent on the final position within the folio.

Technical Factors

The folio has good connectivity to the existing 110kV line and is serviced by public roadways.

Either an AIS or a GIS development is possible on the folio with minimal connection distances to the 110kV system. The size and relative isolation of the landholding are

favourable to a substation development however realignment of the existing 400kV line will be required.

2.3.4 Folio No. 4

General Location

This folio is located in the townland of Coolnabacky and is approximately two kilometres south of Money crossroads, directly under the Carlow-Portlaoise 110kV line. The folio is located in an isolated area north-west of a disused quarry.

The main land use here is crop/tillage farming.

The landholding is 12.7 hectares.



Figure 2.9: View from access road in townland of Coolnabacky facing north with quarry to the RHS near Folio No's. 4 and 5

Vehicle Access

Access to the folio is from the R426 road and a private quarry/access track.

Topography

The site is level and bounded by existing hedgerows and some large mature trees.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

An overhead 400kV line connection will be required to the north of this folio. The length would be approximately 1.5km. The 110kV line is adjacent to the substation folio and no considerable routing of 110kV circuit is required.

Technical Factors

The folio has good connectivity to the existing 110kV transmission system and is well serviced by public and private roadways. Circa 1.5 km of 400kV diversion would be required to connect the site to the Dunstown-Moneypoint 400kV line.

The folio size is suitable for the development of a GIS development due to the small size of the landholding in question.



Figure 2.10: Typical road condition of access road in *Coolnabacky* leading to Folio No's 4 and 5.

2.3.5 Folio No. 5

General Location

This folio overlaps the two townlands of Esker and Coolnabacky and is approximately two kilometres south of Money crossroads directly under the Carlow-Portlaoise 110kV lines. The folio is located in an isolated area north of a disused quarry.

The main land use here is crop/tillage farming.

The landholding is 7.7 hectares.

Vehicle Access

Access to the folio is from the R426 road and a private quarry/access track.

Topography

The folio is level and bounded by existing hedgerows and some large mature trees.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

An overhead 400kV line connection would be required from the north to this site. The length would be approximately 1.5km. The 110kV line is adjacent to the substation site and therefore no considerable routing of 110kV circuit is required.

Technical Factors

The folio has good connectivity to the existing 110kV transmission system and is well serviced by public and private roadways. The remote location of the site would lend itself favourably for substation development. Approximately 1.5km of 400kV diversions would be required to connect the site to the Dunstown-Moneypoint 400kV line.

The folio size is suitable for the development of a GIS development due to the small size of the landholding in question.

2.3.6 Folio No. 6

General Location

The folio is located south of the R427 directly under the Dunstown-Moneypoint 400kV line approximately 1.5 km east of Money Crossroads towards Stradbally. It is located in the townland of Killavally/Loughteeog, and is sited along the minor road leading to Timogue Cross Roads. The folio is relatively flat and is adjacent to the existing 400kV line. It is currently used for crop/tillage farming.

The landholding is 64.3 hectares.

Vehicle Access

Access to the folio can be obtained from the R427 road to the north or via a rural roadway which bounds the site to the west.



Figure 2.11: R427 road junction with minor road leading to Folio No. 6 facing north east

Topography

The folio is relatively level with a small fall off to the south and is bounded by existing hedgerows and some trees. A dwelling occupies the folio and there are several dwellings neighbouring the folio.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

The folio is adjacent to the existing 400kV line and approximately 800m from the 110kV line.



Figure 2.12: Overlooking high hedge into Folio No. 6 facing south west from minor road. Farm buildings can be seen as well as the existing 400kV line in centre of picture

Technical Factors

The size of this folio will cater for an AIS or GIS development. The site is adjacent to the 400kV transmission line.

2.3.7 Folio No. 7

General Location

This folio overlaps the two townlands of Ballygormill North & Ballygormill South. The folio is located directly under the Dunstown-Moneypoint 400kV line. It is the most westerly location of the folios identified in this study.

The main land use is crop/tillage farming. The landholding is 12.2 hectares.



Figure 2.13: View from R426 looking south west towards Folio No. 7

Vehicle Access

Access to the folio can be achieved from the R427 secondary road or from the R426 and a private access track/driveway.

Topography

The folio falls slightly in a northerly direction and bounded by existing hedgerows and some mature trees.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

The folio is located under the existing 400kV line. However an 110kV connection of up to 1km would be required from the east of the site.

Technical Factors

The folio has good connectivity to the existing 400kV transmission system and is well serviced by public roadways.

The folio size is suitable for the development of a GIS development due to the small size of the landholding in question.

2.3.8 Folio No. 8

General Location

Folio 8 is located on the R427 road, north east of Money Crossroads directly under/adjacent to the Carlow-Portlaoise 110kV line and is located in the townlands of Powelstown and Money Upper. It is adjacent to the R426 road to Portlaoise. The folio is bounded by the R426 and R427. Lamberton Demense House overlooks the site from west of the R426. The folio is also be overlooked by the upland area of Raheenanisky.

The main land use is crop/tillage farming. The landholding is 55.6 hectares



Figure 2.14: Showing Money Cross Roads, junction of R426 and R427 facing north with Folio No. 8 to the RHS of picture

Vehicle Access

Access to the folio can be achieved from either the R427 or R426 roadways.

Topography

The folio is level and bounded by existing hedgerows and some trees. The topography is more elevated in nature with Lamberton Demesne to the west and Hewson Hill to the north.

Planning History

There are no planning permission applications outstanding or pending on these lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

The folio is adjacent to the 110kV line; it will require a connection to the 400kV line that will necessitate crossing the R427.

Technical Factors

The folio size is suitable for both GIS & AIS substation builds.

The site has good connectivity to the existing 110kV transmission system and is well serviced by public roadways. Approximately 400m of 400kV diversions would be required.



Figure 2.15: Open ground as seen from R426 facing north east in substation Folio No.8



Figure 2.16: Open ground as seen from R426 facing east at substation Folio No. 8

2.3.9 Folio No. 9

General Location

Folio No. 9 is located north east of Money Crossroads in the townlands of Raheenanisky and Killalooghan. It is situated under/adjacent to the Dunstown- Moneypoint 400kV line. The site is overlooked by a number of houses and will be visible from the upland area of Raheenanisky.

The land is currently used for crop farming. The landholding is 51.7 hectares.

Vehicle Access

Access to the folio would be from a local rural road.

Topography

The folio is level and bounded by existing hedgerows and some trees. The site is open in nature. It is situated on elevated ground. A number of houses overlook the site.

Planning History

There are no planning permission applications outstanding or pending on the lands.

Flooding History / Drainage

There is no evidence or history of significant flooding on the folio.

Overhead Line Access to Existing Network

An overhead connection will be required for the 110kV to the south-west of the folio. A short circuit of 400kV to connect to the existing line will also be required.

Technical Factors

The folio size is suitable for the development of an AIS or GIS substation. Although under/adjacent to the 400kV line, the 110kV connection circuit routes may prove difficult due to the presence of existing housing close to the site.



Figure 2.17: Open ground on Folio No. 9 looking north near R427 and Killalooghan townland.



Figure 2.18: Showing existing 400kV line on substation Folio No. 9

2.4 Summary of Initial Folio Selection

For each of the nine selected folios the criteria given below were compared at a high level.

- **General Location**
- **Vehicular Access**
- **Topography**
- **Planning History**
- **Flooding History / Drainage**
- **Overhead Line Access to Existing Network**
- **Technical Factors**

The following table (table 2.1) summarises all nine folios together under the initial evaluation criteria.

		<i>Folio No. 1</i>	<i>Folio No. 2</i>	<i>Folio No. 3</i>	<i>Folio No.4</i>	<i>Folio No.5</i>	<i>Folio No.6</i>	<i>Folio No.7</i>	<i>Folio No.8</i>	<i>Folio No.9</i>
General Location (Hectares)		44.5 hectares	31.7 hectares	79.1 hectares	12.7 hectares	7.7 hectares	64.3 hectares	12.2 hectares	55.6 hectares	51.7 hectares
Vehicle Access		Available	Available	Available	Available	Available	Available	Available	Available	Available
Topography		Level	Slight fall	Level	Level	Level	Level	Slight fall	Level	Level no screening
Planning History(Pending)		None	None	None	None	None	None	None	None	None
Flooding History/Drainage		None	Localised	None	None	None	None	None	None	None
OHL Access to existing Network	400kV 110kV	Minimal Minimal	Minimal Minimal	Circa 0.5km Minimal	Circa 1.5km Minimal	Circa 1.5km Minimal	Minimal Circa 0.5km	Circa 1.0km Circa 1.5km	Circa 0.5km Minimal	Circa 1.0km Minimal
Technical Factors		GIS Only	AIS/GIS	AIS/GIS	GIS Only	GIS Only	AIS/GIS	GIS Only	AIS/GIS	AIS/GIS

Table 2.1: Comparison Matrix of Substation Folio Options

PART B: ENVIRONMENTAL ASSESSMENT OF FOLIO SELECTIONS

3 Environmental Assessment of Candidate Folios

3.1 Overview

Following on from the initial high level technical assessment of the folios described in Chapter 2, AOS Planning Ltd. was then tasked with reviewing the nine substation folios from an environmental perspective. This section evaluates all nine folios under the following environmental topics:

- Ecology
- Cultural Heritage
- Hydrology & Hydrogeology
- Soils & Geology
- Human Beings
- Landscape & Visual Impact

The main objective of these studies is to identify any potential environmental constraints at each folio and identify a preferred option (best folio). The identification of a preferred folio does not necessarily mean that other less preferred folios are excluded from consideration. Notwithstanding this, as well as evaluating each folio against the environmental criteria, the folios were also compared to each other and ranked accordingly.

As well as providing an overall environmental assessment of each entire folio, the environmental assessments also identify specific constraints within parts of folios. This highlighting of areas that should be carefully considered or avoided allows for an informed site layout design.

The studies were carried out in November/December 2010; the following table (table 3.1) details the authors of each topic.

Ecology	Dr. Mark McCorry PhD, MIEEM.
Cultural Heritage	Tobar Archaeological Services
Hydrology & Hydrogeology	Mr. Brian Tiernan of AWN Consultants.
Soils & Geology	Mr. Brian Tiernan of AWN Consultants.
Human Beings	Ciara Kellett of AOS Planning Ltd.
Landscape & Visual Impact	Conor Skehan of AOS Planning Ltd.

Table 3.1 Report Authors

3.2 Assessment of Substation Folios – Ecology

3.2.1 Methodology

This section follows guidelines recommended by the EPA (2002, 2003) and IEEM (2006) on the information to be contained in ecological surveys. Habitats are classified according to Fossitt (2000). The report is based on a desk study of the area. Sources of information such as National Parks and Wildlife Service (NPWS) and site synopses of sites of conservation interest (www.npws.ie) were used to identify areas of conservation interest. Records of rare plant and animal species (www.npws.ie) in the study area were consulted. The purpose of this desk top study was to collate the available information on the ecological environment and identify Local, National and European ecological constraints associated with the various potential substation folios.

Consultation has previously been carried out with NPWS, Southern Regional Fisheries Board (now part of Inland Fisheries Ireland) and Birdwatch Ireland regarding ecological constraints in the study area and potential impacts (*Study Area Constraints Report AOS Planning Ltd. 2010*).

3.2.2 Description of the general substation area

The general location of the potential substation folios is south of Money Cross Roads along the R427 road between Abbeyleix and Stradbally. Money Cross Roads is located 4km north of Timahoe village. Nine different folios are spread over an area of about 500 ha (5 km²) with the most distant folios being 2.65km apart.

The landscape of this area is mainly characterised by lowlands with elevations between 90-150 m. The underlying bedrock is limestone and calcareous shale and there are several soil and sub-soil types, with most based on this calcareous parent material. There are some glacial deposits in the area with alluvium deposits. Further south are some esker ridges (Timahoe Eskers).

This is a rural area and is dominated by farmland, with a network of fields containing improved grassland and tillage and connected by hedgerows. The soils of the area are generally quite fertile. There are scattered dwellings and other buildings in the area, mainly located along the various roads and private lanes in the area.

This area falls within the River Barrow catchment. The main water-courses in the area include the Timahoe River to the south, that flows to the east, and a small stream to the west that flows west towards the Triogue River. Further downstream the river is renamed the Bauteogue River. Further on, the river is again renamed the Stradbally River, east of Stradbally. The water-quality of the nearest sampling site along the Timahoe River (downstream of the general area) was assessed as having a Q-value of 3-4 (considered moderate water quality).

3.2.3 Ecological Constraints

Ecological constraints within the overall study area have been described in a previous report (*Study Area Constraints Report AOS Planning Ltd. 2010*). Ecological constraints include sites of conservation interest that have been designated by NPWS as Special Areas of Conservation (SAC), candidate Special Areas of Conservation (cSAC), Natural Heritage Areas (NHAs) or proposed Natural Heritage Areas (pNHA) (*Table 3.2*). The study area also includes one Nature Reserve that is owned by the state (Timahoe Eskers, also a proposed Natural Heritage Area). Summaries and site synopses of designated sites are present in *Study Area Constraints Report AOS Planning Ltd. 2010*.

Type	NPWS site code	NPWS Name	County	Distance from nearest potential site (km)	Nearest potential folio
cSAC	002256	Ballyprior Grassland	La	3.8	4
cSAC	002162	River Barrow and Nore	La	3.6	9
pNHA	000860	Clopook Wood	La	5.0	4
pNHA	001800	Stradbally Hills	La	4.9	9
pNHA	000421	Timahoe Esker	La	0.38	4
pNHA	000876	Ridge of Portlaoise	La	3.8	7
pNHA	001494	Dunamase Woods	La	3.1	9
pNHA	000878	Rock of Dunamase	La	3.2	9
pNHA	000867	Kilteale Hill	La	3.2	9

Table 3.2: Sites of conservation interest around the general area of the proposed sub-station folios.

Table 3.2 also lists distances from sites of conservation interest to the nearest proposed substation folio. The nearest designated site is Timahoe Eskers pNHA and Nature Reserve, which is approximately 0.38 km from the closest potential folio (Folio 4). The rest of the designated sites are generally more than 3 km from any of the potential substation folios. The nearest part of the River Barrow and Nore cSAC is the Stradbally River, east of Stradbally Town. This river is downstream of the Stradbally River.

Ecological constraints also include wetland sites of importance to waterbirds and Important Bird Areas (IBA) (*Study Area Constraints Report AOS Planning Ltd. 2010*). The Important Bird Area (IBA) designation is a non-statutory designation, and therefore offers no legal conservation protection in Ireland. They have been identified and described as part of the Birdlife Important Bird Area Programme (Birdlife International 2001). Some of these IBAs overlap with pNHAs and cSACs. Other wetland sites of ecological value to waterbirds have been identified (Crushell 2010). The nearest significant wetland site of importance to waterbirds is at Cloney along the River Barrow, and this site is over 10 km away from the potential substation folios.

The overall study area contains several important rivers with significant fisheries value, of which the most important is the River Nore (Table 3.3). There are several small rivers and streams around the potential substation folios. These are also listed as ecological constraints, although they are not part of any particular designation or conservation area.

The Timahoe River flows towards Stradbally where the river is named the Stradbally River. The section east of Stradbally is listed as part of the River Barrow and Nore cSAC. This section contains the three Lamprey species including Brook Lamprey (*Lampetra planeri*), Sea Lamprey (*Petromyzon marinus*), River Lamprey (*Lampetra fluviatilis*) (all listed on Annex II of the EU Habitats Directive) (King 2006). Natura Environmental Consultants (2008) also recorded White-clawed Crayfish (*Astacus pallipes*) and Otter (*Lutra lutra*) (both Annex I species listed on Annex II of the EU Habitats Directive) and Kingfisher (*Alcedo atthis*), (bird species listed on Annex I of the EU Birds Directive), in the Bauteogue River section. Otter have also been recorded in the general area (on the Foyle River several km to the west of the site). These species along with the Lamprey species were also recorded up-stream and west of Stradbally in the Bauteogue River section. There are also suitable gravel beds present for Salmonid fish in the Stradbally River (King 2006). However, this river is subject to moderate pollution, particularly when there are low water levels (SERBD 2009).

Annex I species such as White-clawed Crayfish and Otter are also likely to be present in the Timahoe River section adjacent to the general substation folio area as they have been recorded downstream in the Bauteogue River section.

Name	Conservation/fisheries value	Rating
Barrow Catchment		
Timahoe	Salmonid nursery.	C
Foyle	Salmonid nursery.	C
Triogue River	Salmonid nursery.	C

Table 3.3: Summary of conservation/fisheries value of rivers around the general area. Sources include the Southern Regional Fisheries Board, Doherty et al. 2004, Igoe et al. 2004, Kurz & Costello 1999, Moorkens 1999, Reynolds 1988. See Appendix C for explanation of rating.

In addition to the rare and notable species of conservation interest described above, there are a number of records of other rare plant and animal species or species with restricted distributions recorded around this area that are listed from the NPWS database (www.npws.ie) (Table 3.4). While the NPWS database does have several records of some notable species such as Bat species and Otter, these species are likely to be much more widespread than indicated from this list.

Species	Common Name	Location	Ten KM Square	Full grid	Recorded date	Listed in Annex II	Listed in Annex IV	Listed in Annex V	Red Data Book
<i>Galeopsis angustifolia</i>	Red Hemp Nettle	Portlaoise	S49	S4080	1933			1	V
<i>Acinos arvensis</i>	Basil Thyme	Portlaoise	S49	S4080	1896			1	V

Table 3.4: List of species of conservation interest found around the general area (taken from NPWS database www.npws.ie).

Main ecological constraints

The main ecological constraints of significant conservation value likely to be affected by construction of a substation at any of the potential folios includes the Timahoe Eskers pNHA and the Timahoe River (and downstream to the Stradbally River and the River Barrow designated as the River Barrow and Nore cSAC). The Timahoe River, while undesignated,

is likely to contain some aquatic Annex I species and also have value as Salmonid fisheries nursery. Other sites of conservation interest in the general area are over 3 km away from any of the potential folios and are therefore not likely to be affected by development at any of the potential folios.

3.2.4 Description of the potential sub-station folios

These descriptions are taken from examination of aerial photos of the area and from photographs and other information of each folio supplied by AOS Planning Ltd. Most folios are located in tillage fields planted with cereal crops (BC1) and are surrounded by hedgerows (WL1) (habitat codes refer to Fossitt 2000). Folios 3 and 7 are located in fields containing agricultural grassland (GA1). Note that listed habitats may be out of date as tillage land may now be ploughed or reseeded as grassland or planted with another crop (BC2/BC3/GA1). Table 3.5 outlines the main habitats at each folio and the approximate distance from the main ecological constraints of Timahoe River and Timahoe Esker pNHA.

Folio	Main Habitats	Distance from Timahoe River (km)	Distance from Timahoe Eskers (km)	Notes
1	BC1/WL1	2.2	1.9	level under existing power lines
2	BC1/WL1	1.9	1.9	level under existing power line
3	GA1/WL1	1.6	1.3	level under existing power line access to 400kV to north
4	BC1/WL1	0.7	0.4	level under existing power line access to 400kV to north access from existing quarry
5	BC1/WL1	0.9	0.5	level under existing power line access to 400kV to north access from existing quarry
6	BC1/WL1	1.6	2.1	level under existing power line access to 110kV to west
7	GA1/WL1	2.8	1.9	level under existing power line access to 110kV from east
8	BC1/WL1	2.7	2.5	level under existing power line access to 400kV from south
9	BC1/WL1	1.6	2.6	level under existing power line access to 110kV from west

Table 3.5. Summary of habitats at potential sub-station folios.

3.2.5 Potential ecological impacts requiring mitigation

The potential impacts of the development of a substation on ecological constraints are outlined in this section. Impact assessment has been undertaken with reference to the EPA Advice Notes on Current Practice (2003); the EPA Guidelines on the information to be contained in Environmental Impact Statements (2003); with reference to Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment (IEEM, 2006) and the National Roads Authority's Guidelines (NRA 2006), for ecological impact assessment. A precautionary approach has been used to making these assessments and in cases of uncertainty it was assumed the effects could be significant.

Each of the folios 1-9 are located within farmland (arable crops or agricultural grassland), which has low local ecological value (E) (habitat rating refers to NRA 2006 – Appendix C). Development of the substation at any of these potential folios will mean no *significant* loss of any habitat of significant local ecological value. Hedgerows that form field boundaries are more valuable and can be important wildlife corridors for wildlife in the area. Hedgerows have medium local ecological value (D). It is not known at this stage if hedgerows have to be removed at any of the folios, although there is likely to be some loss at some folios due to creating access roads etc.

This area is likely to be used by common farmland birds and also some birds listed on the Red and Amber lists of Birds of Conservation Concern (Lynas *et al.* 2007) such as Yellowhammer. It is also likely to be occupied by species such as Badger (*Meles meles*) (which are protected by the Wildlife Act). Other mammal species listed on the Red List (Marnell *et al.* 2009) that are likely to be present in the study area include Stoat (*Mustela erminea*), Hedgehog (*Erinaceus europaeus*) and Red Squirrel (*Sciurus vulgaris*). The hedgerows are also likely to be used by feeding Bat species such as Soprano Pipistrelle (*Pipistrellus pygmaeus*), Common Pipistrelle (*Pipistrellus pipistrellus*) and Leisler's Bat (*Nyctalus leisleri*), which are likely to be present in the area.

Tall electric structures are already present at each of these folios. Some folios may require further erection of overhead lines to link the substation to one or other of the existing power lines. However, the area is some distance away (> 10 km) from any wetland sites of importance to waterbirds and this area is unlikely to contain any regularly-used flight-lines used by species such as Whooper Swans, which could be affected by the erection of additional overhead lines.

The various substation folios are some distance away from most of the sites with ecological constraints in the study area (Table 3.2). There will be no significant permanent loss or fragmentation of any habitats of conservation significance at these sites.

The distance of most substation folios from sites of conservation interest minimises any potential impact of disturbance to wildlife using these sites. Only folios 4 and 5 are relatively close to Timahoe Esker (0.4-0.5 km) and do have potential to create some disturbance to wildlife, particularly during the construction phase.

Most of the impacts that can be predicted at this stage are largely associated with the construction phase. Construction impacts can involve disturbance to wildlife from light and noise. Potential impacts on aquatic habitats, fisheries and water quality could arise from the use of fuels, oils and other pollutants and run-off through soil disturbance during construction activity. These impacts could directly or indirectly (by affecting habitats downstream in the catchment) affect some of the water-courses in the study area. Care should be taken to minimise the run-off of silt into drains during the construction phase. Suitable mitigation measures include the use of silt-traps to avoid run-off of silt during construction entering the adjacent drainage system.

The location of the potential substation folios relative to the Timahoe River and drainage ditches that link to this river may be significant. The closest substation folio (Folio 4) is 0.7 km from the Timahoe River. Drainage ditches are also mapped in the field boundary north of Foliros 4 and 5 that flows east towards the Timahoe River.

Consultations with the Southern Regional Fisheries Board (now part of Inland Fisheries Ireland) have also highlighted several other issues to be taken into consideration, such as the use of silt-traps to intercept runoff to streams and rivers and secure storage of fuels. The Fisheries Boards (now Inland Fisheries Ireland) have published guidelines relating to construction works along rivers⁵. The aim of these guidance notes is to identify the likely impact on fisheries habitat in the course of construction and development work, and to outline practical measures for the avoidance and mitigation of damage.

Construction practices should aim to reduce disturbance to habitats such as hedgerows at these folios. Care should be taken to limit disturbance to wet and dry drainage ditches. Where possible, the felling of mature trees should be minimised. Consideration should be given to the Wildlife Act. Any felling of trees and clearance of vegetation should take place outside of the bird nesting season (March to August). It is an offence to disturb the breeding place of protected bird species. However, there are certain exemptions for particular operations and consultations should be carried out with regional NPWS staff.

In general, there should be limited residual impact to any of the sites containing habitats of conservation significance or used by species of conservation significance (ecological constraints). Proper planning and mitigation should minimise any potential negative impacts on water quality of water courses in the study area.

3.2.6 Substation Folio Selection

The main criteria used for selection of preferred folios are

- (a) the distance from Timahoe Esker pNHA,
- (b) the distance from the Timahoe River, and
- (c) minimising the construction footprint and length of the substation folio and additional lines and structures that may be required to connect the substation into the existing 400kV and 110kV lines.

⁵ <http://www.srfb.ie/pdf/ROADCONSTRUCTION.pdf> - website visited Nov 2010.

3.2.7 Recommended Folio

Each of the potential substation folios does have the potential to have some ecological impacts. Mitigation measures can be developed to address the majority of potential impacts at the construction stage for all folios; however there may be some residual impacts during the operational stage as indicated.

Folios 4 and 5 are closest to Timahoe Esker pNHA and Nature Reserve (within 0.4-0.5 km from the northern boundary). Construction at both potential substation folios may have potential to cause some disturbance to wildlife using the Timahoe Esker area and there may be some permanent disturbance impacts when construction of the substation is completed. Both folios are also located close to a field boundary with a drainage ditch directly linked to the Timahoe River. Both folios are least preferred for these reasons but should not be considered excluded.

Folios 2-9 are all located along the 400 kV or 110 kV power lines. Folio 1 is the only folio where the two overhead lines intersect.

Folio 1 is the preferred folio as it is located where the two existing overhead lines intersect. This would therefore reduce or minimise the requirement for any additional overhead lines and structures. Folios 2 and 8 are the next preferred, as these are the next closest to the existing overhead lines.

Finally, folios 3, 6, 7 and 9 are considered less preferred.

3.2.8 Desktop survey constraints

It is important to note that NPWS state that their datasets may be incomplete so that absence of records in a particular area should not be taken as an indicator of low biodiversity. Other useful datasets that may have valuable information are not generally available or distribution data is only available at a low resolution (e.g. 10 km grid squares – National Biodiversity Data Centres).

This report assessed the potential ecological constraints of the various substation folios based on available desk-top data. However, field-based ecological surveys during the EIS stage are likely to provide more detailed data on the ecological value of the various substation folios. For example the hedgerows at any of the substation folios may contain Badger setts (which are protected by the Wildlife Act).

3.3 Assessment of Substation Folios – Cultural Heritage

3.3.1 Introduction

A previous Constraints Report identified the most significant Cultural Heritage constraints within the overall project study area (*Study Area Constraints Report, AOS Planning Ltd 2010*).

3.3.2 Assessment of Substation Folios

A desk-based assessment report was undertaken for nine potential substation folios to highlight areas of potential archaeological sensitivity and to identify all recorded cultural heritage sites that may influence the selection of the substation folio at the northern end of the proposed electricity transmission line. The folios are all located in the vicinity of the existing Carlow-Portlaoise 110kV line or the Dunstown-Moneypoint 400kV line in County Laois.

The aim of this section is to assess each of the potential substation folios for their archaeological landscape potential and map each folio showing the identifiable cultural heritage features that may impact on choosing one folio over another. A preferred substation folio or folios will also be identified. 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 of County Laois
- 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

3.3.3 Documentary and Archival Sources

Documentary sources were used to assess the archaeological landscape potential of the study area within which the potential substation folios are located and to compile an archaeological and historical framework for the identified cultural heritage sites.

Archival sources were used to identify and map cultural heritage sites. The following archival sources were consulted:

- ***Sites and Monuments Record (SMR) and Record of Monuments & Places (RMP) and www.archaeology.ie National Monuments Service website***

A primary cartographic source and base-line data for the assessment was the consultation of the Sites and Monuments Record (SMR) and Record of Monuments and Places (RMP)

for County Laois. All known recorded archaeological monuments are indicated on 6 inch Ordnance Survey (OS) maps and are listed in this record. The SMR/RMP is not a complete record of all monuments as newly discovered sites may not appear in the list or accompanying maps. In conjunction with the consultation of the SMR and RMP the electronic database of recorded monuments which may be accessed at www.archaeology.ie was also consulted.

- ***Record of Protected Structures***

The Record of Protected Structures in the Laois County Development Plan was consulted for any cultural heritage sites that exist within the study area. No spatial data or grid references are available for the protected structures for Laois, therefore this information is not presented in the report.

- ***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***

National Monuments in the ownership / guardianship of the Minister for the Environment, Heritage and Local Government are listed on the Department of the Environment, Heritage and Local Government's website www.archaeology.ie.

- ***Archaeological Inventory of County Laois***

Further information on archaeological sites may be obtained in the published County Archaeological Inventory series prepared by the Department of the Environment, Heritage and Local Government. The archaeological inventories present summarised information on sites listed in the SMR/RMP and include detail such as the size and location of particular monuments as well as any associated folklore or local information pertaining to each site. The inventories, however, do not account for all sites or items of cultural heritage interest which are as yet undiscovered.

- ***Laois County Development Plan 2006-2012***

The Laois County Development Plan 2006-2012 was consulted for the schedule of buildings (Record of Protected Structures) and items of cultural, historical or archaeological interest which may be affected by the proposed development. The development plan also outlines policies and objectives relating to the protection of the archaeological, historical and architectural heritage landscape of the county (see Constraints Report for further detail).

- ***National Inventory of Architectural Heritage www.buildingsofireland.ie***

This source lists some of the architecturally significant buildings and items of cultural heritage and is compiled on a county by county basis by the Department of the Environment, Heritage and Local Government. The NIAH has been undertaken for County Laois and any relevant sites within the study area are included in this report.

- ***Excavations Bulletins (www.excavations.ie)***

Excavations' Bulletin is an annual account of all excavations carried out under license. The database is available on line at www.excavations.ie and includes excavations from 1985 to 2005. This database was consulted as part of the desktop research for this assessment to establish if any archaeological excavations had been carried out within the study area.

Folio No. 1

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 1. The nearest National Monuments are located c. 3.5km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 1.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located on or within close proximity to substation Folio No. 1. The nearest recorded monument (LA018-005 - Enclosure) is situated c. 260m to the north, on the north side of the public road.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 1. The nearest structure listed therein is located c. 980m to the north-west in Lamberton Demesne (Lamberton House Gate Lodge – Reg. 12801803) and is unlikely to be visually impacted by the construction of a substation in this folio. The associated house and demesne are now gone.

Folio No. 2

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 2. The nearest National Monuments are located c. 3.5km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 2.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

One recorded monument (LA018-013 – Enclosure) is located at the east side of Folio No. 2. It comprises an enclosure which is shown on the 1841 and 1909 editions of the OS map, located in the corner of a field (Fig. 3.1). No surface trace of the monument now survives therefore the construction of a substation in Folio No. 2 will not have a visual impact on the enclosure. Sub-surface elements of the monument are likely to survive, however and are located within Folio No. 2. The construction of a substation in this area could therefore have a direct impact on the enclosure. For a full description of the monument see Appendix D.

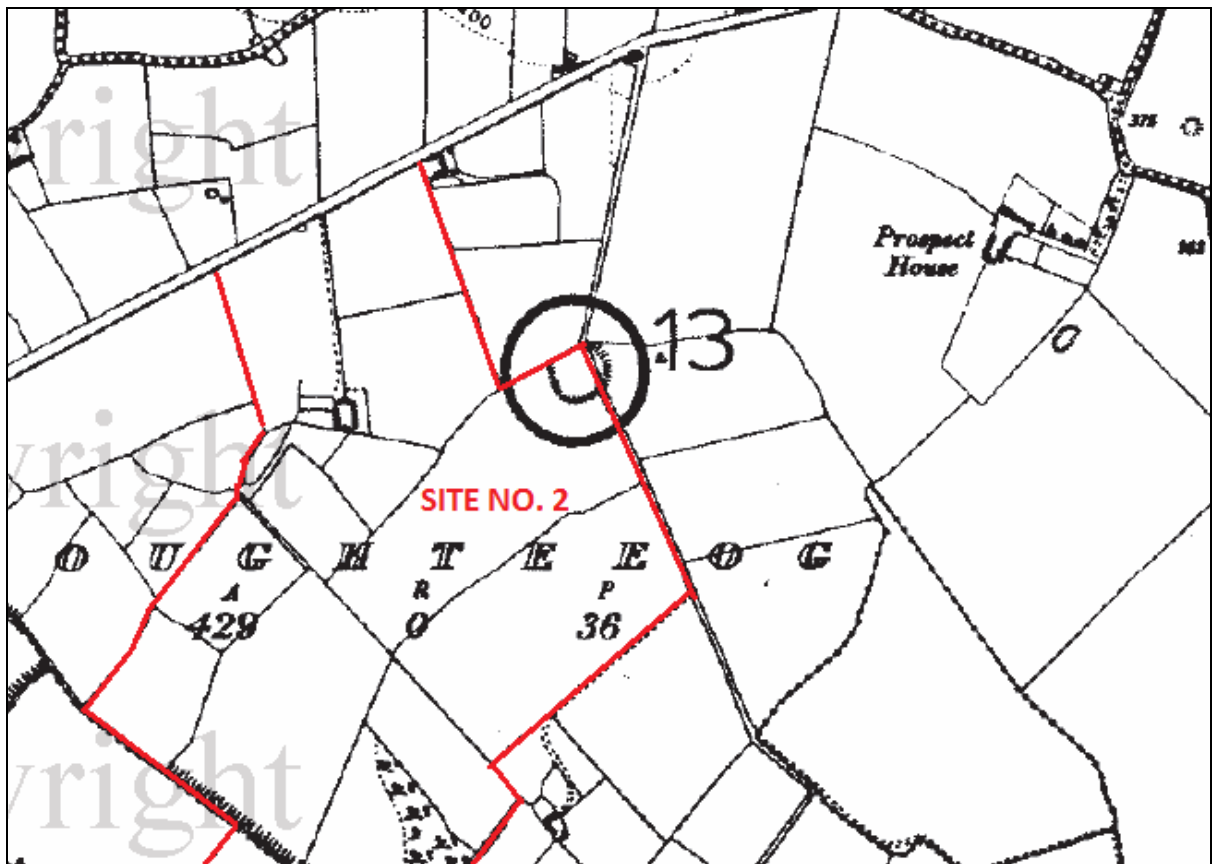


Figure 3.1: Extract from Record of Monuments and Places, Laois Sheet 18, showing Enclosure LA018-013 in relation to Folio No. 2.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 2. The nearest structure listed therein is located over 1km to the north-west in Lamberton Demesne and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 3

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 3. The nearest National Monuments are located c. 2.6km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 3.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located on or within close proximity to substation Folio No. 3. The nearest recorded monument (LA018-014 – Horizontal Wheeled Water Mill) is situated c. 460m to the west, on the west side of the R426 public road. No surface trace of this monument survives (see Appendix D).

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 3. The nearest structure listed therein is located over 1km to the north-west in Lamberton Demesne and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 4

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 4. The nearest National Monuments are located c. 2.4km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 4.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located on or within close proximity to substation Folio No. 4. The nearest recorded monuments are located over 1km from the folio and are unlikely to be directly or indirectly impacted by the construction of a substation on this folio.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 4. The nearest structure listed therein is located c. 2.8km to the south in Timahoe village (Library – Reg. 12801802) and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 5

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 5. The nearest National Monuments are located c. 2.4km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 5.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located on or within close proximity to substation Folio No. 5. The nearest recorded monuments are located over 1km from the folio and are unlikely to be directly or indirectly impacted by the construction of a substation on this folio.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 5. The nearest structure listed therein is located c. 2.8km to the south in Timahoe village (Library – Reg. 12801802) and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 6

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 6. The nearest National Monuments are located c. 3.6km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 6.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

Two recorded monuments (LA018-049/001 and 002) are located within potential substation Folio No. 6. The monuments consist of a castle site (001) and a possible settlement cluster (002), both of which are unlocated (See Appendix D for full description). It is thought that the castle was located in the area now occupied by Prospect House, however, no trace of the structure survives. The location of the possible settlement has not been identified and only a vague reference to the presence of a settlement in the townland of Loughteeog survives. The supposed location of the castle should be noted when finalising substation locations in order to avoid any potential impacts on possible subsurface remains which may exist in this area.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 6. The nearest structure listed therein is located over 1km to the north-west in Lamberton Demesne and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 7

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 7. The nearest National Monuments are located c. 3.4km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 7.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located on or within close proximity to substation Folio No. 7. The nearest recorded monument is located c. 420m to the east of the folio and consists of a horizontal water mill (LA018-014) which has no visible surface trace. The monument is therefore unlikely to be directly or indirectly impacted by the construction of a substation on this folio.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 7. The nearest structure listed therein is located c. 1km to the north in Lamberton Demesne and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 8

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 8. The nearest National Monuments are located over 4km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 8.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

No recorded archaeological monuments are located within the boundary of Folio No. 8. The site of an enclosure (LA018-005) bounds the substation folio to the east however, although no surface trace of the monument now survives. The construction of a substation within the boundary of Folio No. 8 is unlikely to have any visual impact on this monument given the lack of surviving upstanding remains. It is possible, however, that some sub-surface elements of the enclosure survive and may be located just inside the eastern boundary of the substation folio (Fig. 3.2).

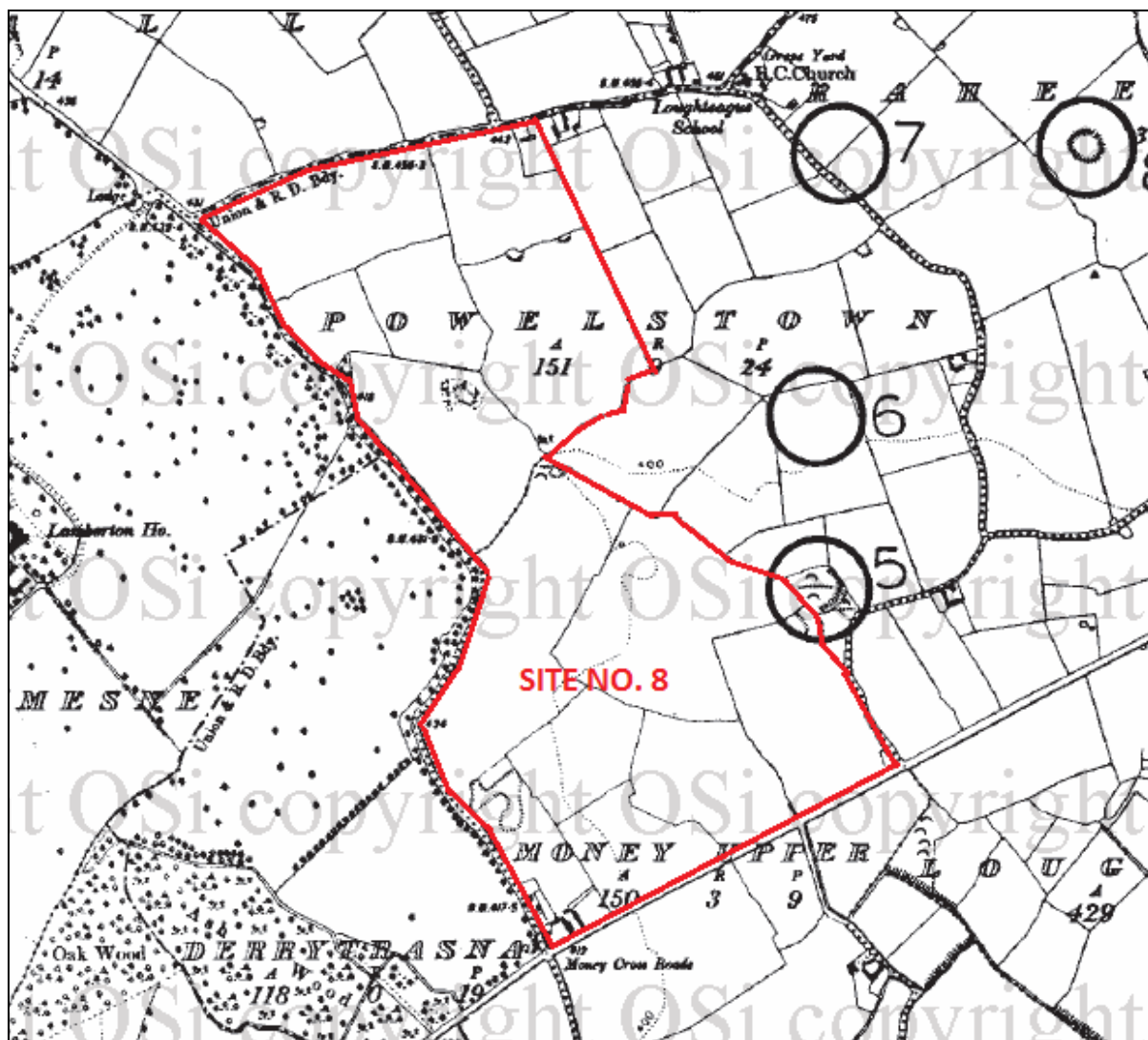


Figure 3.2: Extract from Record of Monuments and Places, Laois Sheet 18, showing substation folio No. 8 in relation to adjacent recorded monument LA018-005.

Protected Structures and NIAH

No structures listed in the NIAH are located on Folio No. 8. The nearest structure listed therein is located c. 600m to the west in Lamberton Demesne and is unlikely to be visually impacted by the construction of a substation in this folio.

Folio No. 9

National Monuments

No *National Monuments* in State Care/Ownership are located on or within close proximity to substation Folio No. 9. The nearest National Monuments are located over 4km to the south in Timahoe (Reg. 114) and are unlikely to be directly or indirectly impacted by the construction of a substation on Folio No. 9.

Record of Monuments and Places (RMP) and Sites and Monuments Record (SMR)

One recorded monument (LA018-009) is located within substation folio No. 9. It is listed in Archaeological Inventory of County Laois (Sweetman *et al.* 1995, 53) as an enclosure (site)

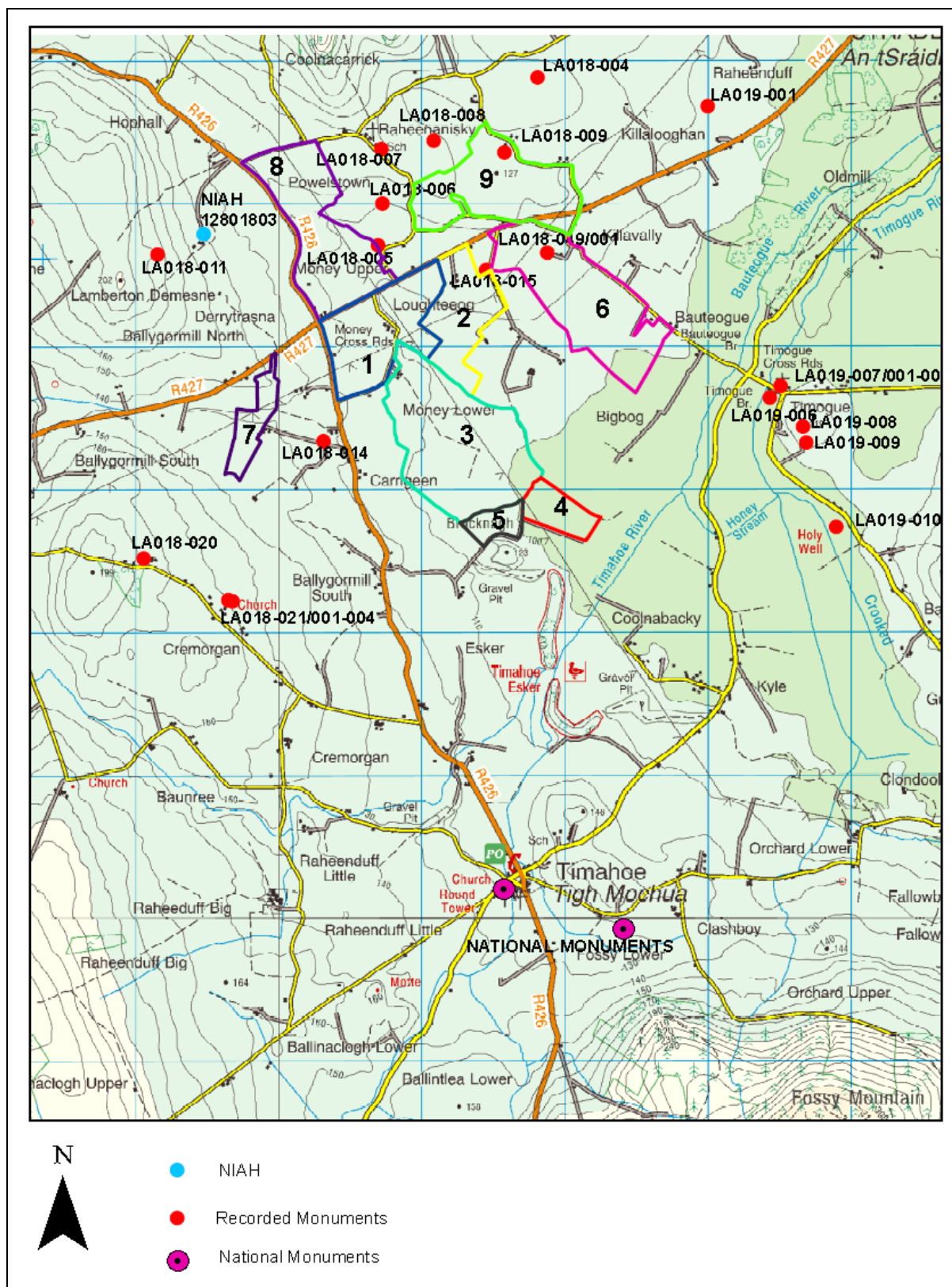


Figure 3.4: Discovery Series map showing potential substation folios (1-9), recorded monuments, National Monuments and adjacent NIAH sites.

3.3.4 Selection of Preferred Substation Folio

The overall objective of this assessment report is to highlight cultural heritage sites within or near to each substation folio so that an informed decision can be made regarding the avoidance of cultural heritage features during the substation folio selection process. A general impact statement will be made regarding each substation folio and a preferred folio or folios will be chosen. Cultural heritage sites include Recorded Monuments, Protected Structures/NIAH and National Monuments. Only the available documentary and cartographic sources were utilised in order to assist in the selection process and no field work was undertaken.

Folio No. 1: No cultural heritage sites are located on or in close proximity to this potential substation folio. The nearest recorded monument consists of a levelled enclosure (LA018-005) which has no visible surface trace. Direct or indirect (visual) impacts on this monument as a result of the construction of a substation within folio No. 1 are unlikely. In this regard Folio No. 1 is regarded as an acceptable option.

Folio No. 2: One recorded monument (LA018-015 Enclosure) is located within the boundary of substation Folio No. 2. The enclosure does not have any above ground remains therefore no visual impacts are anticipated. Sub-surface features and deposits associated with the enclosure may survive on the folio. Ground works associated with the construction of a substation have the potential to directly impact on such features and deposits therefore the area of this enclosure should be avoided when selecting the substation site. No further impacts on additional cultural heritage sites are anticipated.

Folio No. 3: No cultural heritage sites are located on or in close proximity to this potential substation folio. The nearest recorded monument (LA018-014 – Horizontal Wheeled Water Mill) is situated c. 460m to the west, on the west side of the R426 public road. No surface trace of this monument survives, therefore no visual impacts are anticipated. In this regard Folio No. 3 is regarded as an acceptable option.

Folio No. 4: No cultural heritage sites are located on or in close proximity to this potential substation folio. The nearest recorded monuments are located over 1km from the folio therefore no direct or visual impacts are anticipated. Folio No. 4 is regarded as the most preferred option for the proposed substation folio.

Folio No. 5: No cultural heritage sites are located on or in close proximity to this potential substation folio. The nearest recorded monuments are located over 1km from the folio therefore no direct or visual impacts are anticipated. Folio No. 5 is therefore also regarded as the most preferred option for the proposed substation folio.

Folio No. 6: Two recorded monuments (LA018-049/001 and 002) are located within potential substation Folio No. 6. The monuments consist of a castle site (001) and a possible settlement cluster (002), both of which are unlocated. While both monuments are not precisely located, local information places the castle on the site of the present-day Prospect House. Visual impacts are unlikely given the lack of upstanding remains. It is possible however that the construction of a substation in this folio may have a direct impact

on sub-surface archaeological remains which may be present. In this regard Folio No. 6 is not a preferred option for the substation folio.

Folio No. 7: No cultural heritage sites are located on or in close proximity to this potential substation folio. The nearest recorded monument consists of a horizontal mill site (LA018-014), over 400m to the east, which has no above-ground expression. As no direct or visual impacts are anticipated Folio No. 7 is regarded as an acceptable option for the substation.

Folio No. 8: No cultural heritage sites are located within the boundary for Folio No. 8. One archaeological monument (LA018-005 – Enclosure) bounds the folio to the east. Although no above-ground trace of the enclosure survives it is possible that some sub-surface elements of the monument survive and may be located just inside the eastern boundary of the substation folio. Construction works associated with the proposed substation have the potential to have a direct impact on such sub-surface remains. Folio No. 8 may still be regarded as an acceptable option if the south-eastern portion of the folio was excluded from all development.

Folio No. 9: One recorded monument (LA018-009 – Enclosure) is located within Folio No. 9. The enclosure does not have any surface trace therefore visual impacts are not anticipated. It is possible that sub-surface features and deposits associated with the monument are located within the substation folio and may be directly impacted by construction works. In this regard Folio No. 9 is not a preferred option for the substation site.

3.3.5 Preferred Substation Folio

The preferred substation folios are No's 1, 3, 4, 5 and 7. Folios 4 and 5 are the most preferable given the lack of cultural heritage sites on or within close proximity to same. Folios 2, 8 and 9 are considered least preferred, but should not be considered excluded. Folio 6 possibly contains sub surface features and is the least preferred option.

3.3.6 Recommendations

The assessment contained within this report is based on a desktop study only. In order to fully assess all potential impacts and to avoid any direct or indirect impacts on the cultural heritage landscape the following recommendations are made:

- It is recommended that all cultural heritage sites should be excluded from the proposed substation folio, where possible.
- The chosen folio should be subject to a visual field inspection by a suitably qualified archaeologist prior to the commencement of any site works.

3.4 Assessment of Substation Folios – Hydrology & Hydrogeology

3.4.1 Methodology and Information Sources

The following list of maps and publications, together with the databases noted, were reviewed as part of the desk study:

- The Geological Survey of Ireland (GSI) well and groundwater records, with reference to hydrology and hydrogeology,
- Ordnance Survey of Ireland Discovery Series 1:50,000 Map Series, Nos. 54 & 55,
- GSI, Geology of Kildare-Wicklow, Sheet 16,
- Department of Environment, Environmental Protection Agency (EPA) & GSI, Groundwater Protection Scheme Guidelines, 1999,
- Water Framework Directive Monitoring Programme, EPA 2006,
- South Eastern River Basin District Management Plan, SERBD 2009,
- Office of Public Works flood mapping data (www.floodmaps.ie).

3.4.2 Hydrology

The study area is located within the South Eastern River Basin District, as defined by European Communities Directive 2000/60/EC, establishing a framework for community action in the field of water policy (commonly known as the Water Framework Directive). There are no rivers at or adjacent to the proposed substation locations but the study area is within the catchments of a number of rivers. A river is defined in the Water Framework Directive as “a body of inland water flowing for the most part on the surface of the land but which may flow underground for part of its course”.

3.4.2.1 Surface Water Features

No major surface water features were found at the proposed locations or adjacent to the proposed locations. See Figure 1 (Appendix E). However, there may be streams within the study area that are not identified on the OSI and EPA mapping. For the purpose of the constraints study the following rivers were assessed as the proposed substation locations are within the vicinity of these catchments:

- Timahoe River
- Timogue River
- Bauteogue River

Any watercourses within the study area are likely to be tributaries of these rivers.

Baseline data has been collected from the aforementioned information sources in order to form a comprehensive database of the water quality in the study area. This will assist in the assessment of any potential impact(s) on the hydrological environment from the proposed substation option when chosen.

3.4.2.2 Water Framework Directive Surface Water Quality Status

The European Water Framework Directive (2000/60/EC) (WFD) was implemented in Ireland by S.I. 722 of 2003, European Communities (Water Policy) Regulations 2003. These regulations established in Irish law, a framework for community action in the field of water policy. The Water Framework Directive requires 'good water status' for all European waters by 2015, to be achieved through a system of river basin management planning and extensive monitoring. The study area is located within the South Eastern River Basin District (SERBD). Significant water management issues are included in the SERBD within the water management action plans compiled as part of the SERBD Management Plan 2009 - 2015. Table 3.6 shows the current status of the rivers monitored in the study area as part of the plan.

River	WFD Status
Timahoe River	Moderate
Timogue River	Poor
Bauteogue River	Moderate

Table 3.6: WFD Status of rivers within the Study Area

3.4.2.3 Water Supply

Water usage in the study area is primarily supplied by Laois County Council from their surface water abstractions of water courses and supplemented by groundwater abstraction boreholes. There are also a number of private wells within the study area used by individual landowners. A search of the GSI well database was undertaken. The GSI have 2 recorded wells within the study area however there is no information in relation to the depth to groundwater, the yield or the use of each well.

3.4.2.4 Flooding Events

The Office of Public Works (OPW) Flood Hazard Database was used in order to obtain information on historical flooding events within the study area. This information was used to establish the current baseline conditions in terms of sections of the study area that are liable to flood. No flooding events were recorded by the OPW within the study area.

3.4.3 Hydrogeology

3.4.3.1 Aquifer Classification

The GSI Online maps were consulted in relation to the occurrence of bedrock and quaternary aquifers in the study area. Regionally Important Karstified (diffuse) bedrock aquifers underlie the study area, see Figure 2 (Appendix E). Locally Important sand and gravel aquifers are present in the townland of Brocknagh where folios 4 and 5 are located, see Figure 3 (Appendix E) for locations of sand and gravel aquifers in the study area.

The GSI Well Card Index is a record of wells drilled in Ireland, which is kept by the GSI. While much useful information can be obtained from this Index, it is by no means exhaustive, as it requires individual drillers to submit details of wells drilled in each area. A search of the GSI well database was undertaken. The GSI have 2 recorded wells within the

study area however there is no information in relation to the depth to groundwater, the yield or the use of each well.

3.4.3.2 Groundwater Vulnerability

The GSI, EPA and DoEHLG have developed a programme of Groundwater Protection Schemes, with the aim of maintaining the quantity and quality of groundwater in Ireland; in addition the programme aims, in some cases to improve groundwater quality by applying a risk assessment approach to groundwater protection and sustainable development. The vulnerability mapping guidelines allow for the assignment of vulnerability ratings from “extreme” to “low”, depending upon the subsoil type and thickness. Aquifer vulnerability is classed by the GSI as high-extreme at the substation locations. At folios 1, 3, 4, 5 and 7 it is classified as High. At folios 2, 6, 8 and 9 it is classified as Extreme. See Figure 4 (Appendix E) for GSI Vulnerability ratings in the study area.

3.4.4 Constraints of Study Area – Water

The key constraints in relation to Hydrology and Hydrogeology are the following:

- **Construction Phase**

Physical constraints – While no major water features are located within the study area, there may be some streams that are not identified on the OSI and EPA mapping. Some construction works may take place in the vicinity of these streams in the riparian zone. A buffer area would be established to protect the riparian and aquatic zones from disturbance. Any watercourse crossings for site works should be planned in consultation with Laois County Council, the Fisheries Board and in accordance with the necessary guidelines.

Groundwater Vulnerability - Regionally Important Karstified (diffuse) bedrock aquifers underlie the study area. Locally Important sand and gravel aquifers are present in the townland of Brocknagh where folios 4 and 5 are located. Also the GSI vulnerability rating is classified as high-extreme.

Surface Water Runoff - Surface water runoff during the construction phase may contain increased silt levels or become polluted from construction activities. Runoff containing large amounts of silt or pollutants can cause damage to surface water systems and receiving watercourses.

On-Site Machinery - Potential impacts could derive from accidental leakage of fuels or oils or accidental spillage of paints which could impact water quality if allowed to infiltrate to runoff to surface water systems and/or receiving watercourses.

Dewatering - this may be required in locations where the water table is high. As such, pumping or draining by gravity will be required. Other impacts from the proposed construction works include the increase in groundwater vulnerability arising from the removal of subsoil cover, the increase in flow to surface water systems from dewatering discharges and change of groundwater quality.

- **Operational Phase**

Without proper control measures surface water and foul water from the proposed substation can ingress into the surrounding environment. During the operational phase potential

impacts include contamination from oil, fuels and paints during maintenance works, which could cause localised contamination if allowed to infiltrate to ground.

3.4.5 Assessment of Substation Alternatives

The magnitude of potential impacts is defined in accordance with the criteria provided in the EPA publication "Guidelines on the Information to be contained in Environmental Impact Statements" (2002), outlined in Tables 4.7 and 4.8:

Quality of Impacts	Description
Positive Impact	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities).
Neutral Impact	A change which does not affect the quality of the environment.
Negative Impact	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 3.7 Impact Assessment Criteria (Quality)

Magnitude of Impact	Description
Imperceptible	An impact capable of measurement but without noticeable consequences
Slight	An impact that alters the character of the environment without affecting its sensitivities
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Significant	An impact, which by its character, magnitude, duration or intensity alters a sensitive aspect of the environment.
Profound	An impact which obliterates all previous sensitive characteristics

Table 3.8 Impact Assessment Criteria (Magnitude)

3.4.5.1 Folio 1

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality.	Slight Negative

Table 3.9 *Estimation of Magnitude of Impact on Water (Folio 1)*

3.4.5.2 Folio 2

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - Extreme	Very High	Impact on groundwater quality and water supply quality	Moderate Negative

Table 3.10 *Estimation of Magnitude of Impact on Water (Folio 2)*

3.4.5.3 Folio 3

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 3.11 **Estimation of Magnitude of Impact on Water (Folio 3)**

3.4.5.4 Folio 4

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Locally Important sand and gravel Aquifer.	High	Impact on groundwater abstraction rate and recharge	Slight Negative
Aquifer Vulnerability - Moderate	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 3.12 **Estimation of Magnitude of Impact on Water (Folio 4)**

3.4.5.5 Folio 5

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Locally Important sand and gravel Aquifer.	High	Impact on groundwater abstraction rate and recharge	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 3.13 **Estimation of Magnitude of Impact on Water (Folio 5)**

3.4.5.6 Folio 6

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - Extreme	Very High	Impact on groundwater quality and water supply quality	Moderate Negative

Table 3.14 *Estimation of Magnitude of Impact on Water (Folio 6)*

3.4.5.7 Folio 7

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 3.15 *Estimation of Magnitude of Impact on Water (Folio 7)*

3.4.5.8 Folio 8

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - Extreme & High	Very High	Impact on groundwater quality and water supply quality	Moderate Negative

Table 3.16 *Estimation of Magnitude of Impact on Water (Folio 8)*

3.4.5.9 Folio 9

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability – High Extreme	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 3.17 *Estimation of Magnitude of Impact on Water (Folio 9)*

3.4.6 Preferred Substation Option

The potential impacts relating to the water are generally related to the construction phase and the management of machinery on site. The application of mitigation measures highlighted will help ensure that the potential impacts at all substation options are imperceptible during the construction phase and the operational phase.

In terms of the substation selection, based on the estimation of magnitude of impact on water the least preferred options would be Folios 2, 6, 8 and 9 as these are located in areas of extreme aquifer vulnerability. The less preferred options would be the folios 4 and 5 as these are located in an area underlain by locally important sand and gravel aquifers. Folios 1, 3 and 7 are the preferred options as these folios have impacts of the least magnitude.

3.5 Assessment of Substation Folios – Soils & Geology

3.5.1 Methodology and Information Sources

The following list of maps and publications, together with databases, were reviewed as part of the assessment of constraints in relation to soils and geology:

- Ordnance Survey of Ireland Discovery Series 1:50,000 Map Series, Nos. 54 & 55,
- Soil Map of Ireland, An Foras Taluntaisi, 1980,
- Geological Survey of Ireland (GSI)/Teagasc Soils Map, Online Map Database,
- GSI, Geology of Kildare-Wicklow, Sheet 16,
- Karst Database, GSI,
- Quaternary (Subsoils) Database, GSI,
- Groundwater Well Database, GSI,
- Landslides in Ireland, GSI Irish Landslides Working Group, 2006,
- GSI Heritage Programme, Sites of Geological Interest.

3.5.2 Soils

The soils distribution across the study area is provided on the GSI/Teagasc Soils Map and the Soils Map of Ireland. The maps identified Grey Brown Podzolics as the distinct soil type that exists in the study area. Grey Brown Podzolics are classified as generally poor soils, depleted of nutrients by heavy rainfall leaching through an organic layer (the podzolisation process). The surface layer contains organic matter that is intimately mixed with mineral matter.

3.5.3 Quaternary Geology

The study area was glaciated on at least two occasions but the majority of the sediments present today are as a result of the last glaciation, which was at its maximum some 24,000 years ago.

With reference to the GSI Quaternary (Subsoils) Database, the subsoils comprise of till derived from sandstones, shales and limestones of the Carboniferous Period. See Figure 1 (Appendix F). Till is an unsorted sediment derived from the transportation and deposition of, by, or from, a glacier. Glacial till is composed of a heterogeneous mixture of clay, sand, gravel and boulders.

3.5.4 Bedrock Geology

An inspection of the GSI records shows the study area to be underlain by sandstones shales and limestones of the Carboniferous Period. See Figure 2 (Appendix E). Different geological formations that make up the study area are the following:

- **Ballyadams Formation** - Grey thick bedded crinoidal calcarenitic wackstone and packstone limestone with clay wayboards towards the top.

- **Clogrenan Formation** - Cherty argillaceous grey calcarenitic wackstone and packstone limestones.
- **Luggacurren Shale Formation** - Dark-grey to black mudstones and shales with thin bedded muddy cherts and limestones and fossiliferous marine bands.
- **Killeshin Siltstone Formation** - Grey muddy siltstones or silty mudstones with subordinate sandstone.

The GSI Well Card Index is a record of wells drilled in Ireland. While much useful information can be obtained from this Index, it is by no means exhaustive, as it requires individual drillers to submit details of wells drilled in each area. The GSI have 2 recorded wells within the study however there is no information in relation to the depth to bedrock in each well.

3.5.5 Karst Features

The Karst database held by the GSI was consulted. This database holds records of locations and types of reported Karst features. No recorded karst features from the GSI database exist within the study area.

3.5.6 Slope Stability

In areas with sloping ground, the composition and extent of the subsoils is an influencing factor in the stability of slopes. The actual consolidation of deposits varies considerably based on a wide range of factors at a local level. Detailed information of the geotechnical capability of deposits can only be determined following intrusive site investigation.

The GSI has developed a database of historical landslides in Ireland. This database has been consulted. No recorded events from the GSI database exist within the study area.

3.5.7 Areas of Geological Heritage

The GSI was consulted in relation to any areas of geological heritage or interest located in the study area.

The GSI is in partnership with the National Parks and Wildlife Service (NPWS) to identify and select any important geological and geomorphological sites throughout the country for designation as NHAs (Natural Heritage Areas). This is addressed under 16 different geological themes. A large number of sites are currently being examined in order to identify the most significant scientifically. Sites that do not qualify as a proposed NHA, may qualify under the second tier of County Geological Sites (CGS), which would be included in County Development Plans and receive a measure of protection through inclusion in the planning system. According to the GSI, no recorded sites of geological interest exist within the study area.

3.5.8 Constraints

The key constraints in relation to soils and geology will be common for all substation options:

3.5.8.1 Construction Phase

Construction work for the proposed substation will involve the disturbance and excavation of topsoil, subsoil and potentially some bedrock. During the initial site preparation and construction stage, there will be a large volume of machinery on the proposed substation site, which may include diesel powered trucks, excavators, bulldozers, cranes and graders. It is expected that vehicles used on the proposed site will be refuelled at a nearby service station and not on site. In addition, vehicle maintenance and repairs are expected to take place off site in maintenance workshops.

The potential impacts from the construction of the proposed substation could derive from accidental leakage of fuels or oils from machinery which could adversely affect soil and bedrock quality, if allowed to infiltrate to ground.

There is the potential for soil erosion (either via silt laden surface runoff during wet weather or dust generation during dry weather) due to the removal of the surface vegetation cover and the exposure of the underlying soil and stockpiling of excavated soil.

3.5.8.2 Operational Phase

During the operational phase potential impacts include contamination of the soil/bedrock (oil, fuels and paints) during maintenance works, which could cause localised contamination if allowed to infiltrate to ground.

3.5.9 Assessment of Substation Alternatives

The magnitude of potential impacts is defined in accordance with the criteria provided in the EPA publication "Guidelines on the Information to be contained in Environmental Impact Statements" (2002), outlined in Tables 3.18 and 3.19:

Quality of Impacts	Description
Positive Impact	A change which improves the quality of the environment (for example, by increasing species diversity; or the improving reproductive capacity of an ecosystem, or removing nuisances or improving amenities).
Neutral Impact	A change which does not affect the quality of the environment.
Negative Impact	A change which reduces the quality of the environment (for example, lessening species diversity or diminishing the reproductive capacity of an ecosystem; or damaging health or property or by causing nuisance).

Table 3.18 **Impact Assessment Criteria (Quality)**

Magnitude of Impact	Description
Imperceptible	An impact capable of measurement but without noticeable consequences
Slight	An impact that alters the character of the environment without affecting its sensitivities
Moderate	An impact that alters the character of the environment in a manner that is consistent with existing or emerging trends
Significant	An impact, which by its character, magnitude, duration or Intensity alters a sensitive aspect of the environment.
Profound	An impact which obliterates all previous sensitive characteristics

Table 3.19 Impact Assessment Criteria (Magnitude)

In terms of soils and geology, the magnitude of potential impacts is common to all proposed substation locations. Table 3.20 highlights the attributes, associated impacts and the level of impacts in accordance with Tables 3.18 and 3.19.

Attribute	Attribute Importance	Impact	Level of Impact
Excess excavated soil and rock generated during the construction stage.	Low	Excess soil and rock is expected to be minimal due to the nature of the proposed development; however excess soil will require off-site disposal or recovery at a nearby permitted/ licensed waste facility.	Slight Negative
Soil and subsoil quality – alluvium and Glaciofluvial sand and gravels, limestone sands and gravels.	Low	Irreversible loss of small proportion of local low fertility soils. Disruption of soil is expected to be minimal due to the nature of the proposed development.	Slight Negative
Soil contamination during the construction phase.	Low	Contamination caused by accidentally spillages/leaks during construction. The likelihood of contamination occurring is low however if it does occur, the extent of the soil contamination would need to be determined, sampled and tested before being transported to an appropriately licensed facility by permitted contractors.	Slight Negative
Removal of the surface vegetation cover and the exposure of the underlying soil.	Low	Local scale soil erosion during extended dry periods	Slight Negative
On-Site Maintenance during the operational phase	Low	Contamination caused by accidentally spillages/leaks during on-site maintenance. The likelihood of contamination occurring is low however if it does occur, the extent of the soil contamination would need to be determined, sampled and tested before being transported to an appropriately licensed facility by permitted contractors.	Slight Negative

Table 3.20 Estimation of Magnitude of Impact on Soils & Geology

3.5.10 Preferred Substation Option

The potential impacts relating to the 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 potential impacts for all substation options are imperceptible during the construction phase and the operational phase.

In terms of the substation selection there is no preference. The level of impact identified was slight negative for all options.

3.6 Assessment of Substation Folios - Human Beings

3.6.1 Methodology and Information Sources

The following list of information sources were reviewed as part of the desk study:

- Laois County Development Plan 2006 - 2012;
- Ordnance Survey Mapping and Photography;
- EPA Corine Land Use Maps.

3.6.2 General Planning Background

The nine locations are located in the Laois Council administrative area and at a local level are subject to the provisions of Laois County Development Plan. At a higher level in the land use planning hierarchy, the area falls within the provisions of the Regional Planning Guidelines for the Midlands Region 2010-2022 and the National Spatial Strategy 2002-2020.

All of the plans in the planning hierarchy support the development and reinforcement of the electricity supply network, subject to adequate protection of the environment. An analysis of the Study Area Constraints has already been prepared and is also applicable for the following potential substation folio analysis and has been taken into account when considering the potential folios (Study Area Constraints Report, AOS Planning Ltd, October 2010).

3.6.3 Folios

In general terms all the folios are located within the same locality – at the intersection of the existing 400kV and the 110kV lines.

The folios have similar characteristics in terms of *overall* population, economic factors and tourism amenities with minor changes from folio to folio. Existing 'Land Use' on a number of the folios is different which is the main feature of note between the folios. The numbers of dwellings in the vicinity of each folio has been a consideration in this analysis.

Figure 3.5 following is taken from the EPA ENVision maps illustrating Land Cover in the study area.

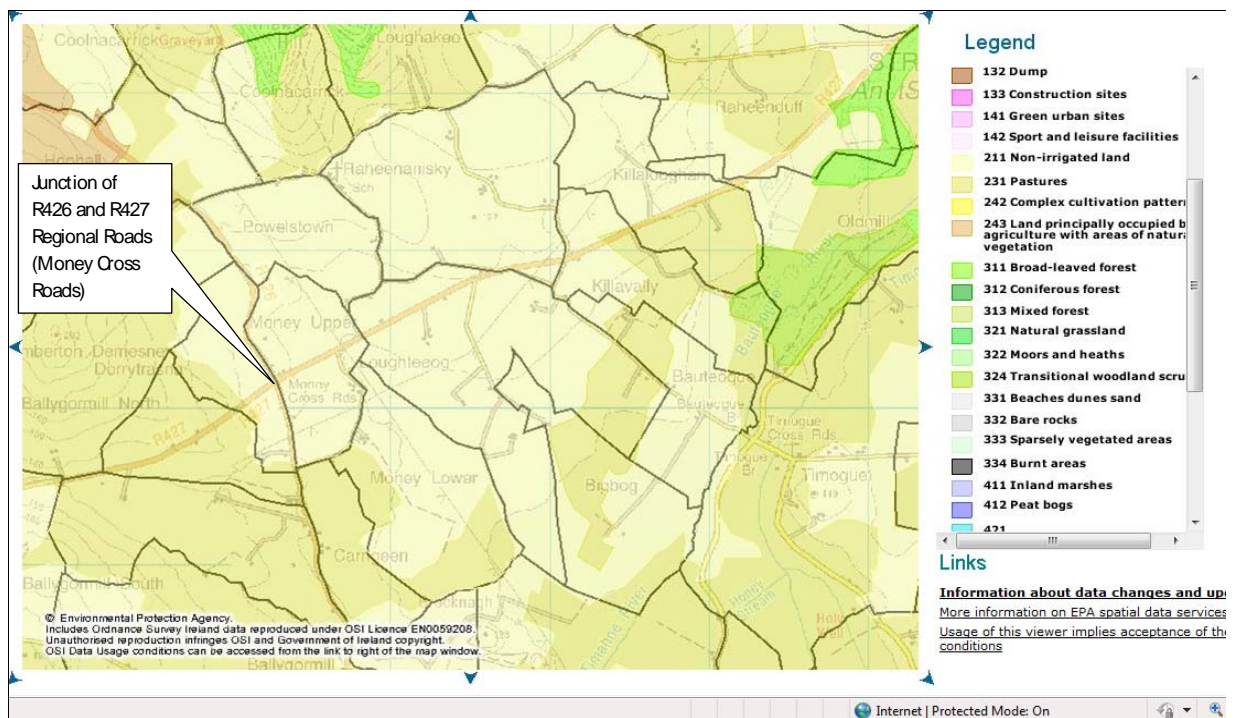


Figure 3.5 : EPA ENVision Corine Map Land Cover (Ordnance Survey Ireland License No AR 0077410)

Folio no. 1

Folio no.1 is at the junction of cross roads of R426 and R427. Land use in the area is 'Non irrigated land' as illustrated in Figure 3.5 above.

Folio no.2

Folio no. 2 is located off the R427 and is proximate to a number of dwellings. The land use is similar to Folio no. 1 as illustrated in Figure 3.5 above.

Folios 1 and 2 are located as illustrated in Figure 3.6 below.

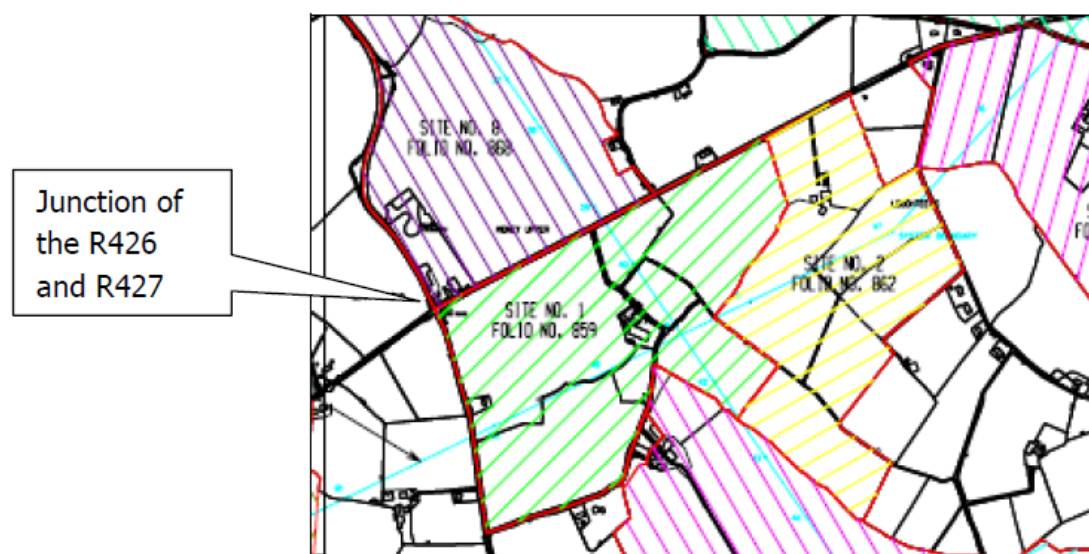


Figure 3.6: Folios 1, 2 and 8 - See Appendix B

Folio no.3, 4 & 5

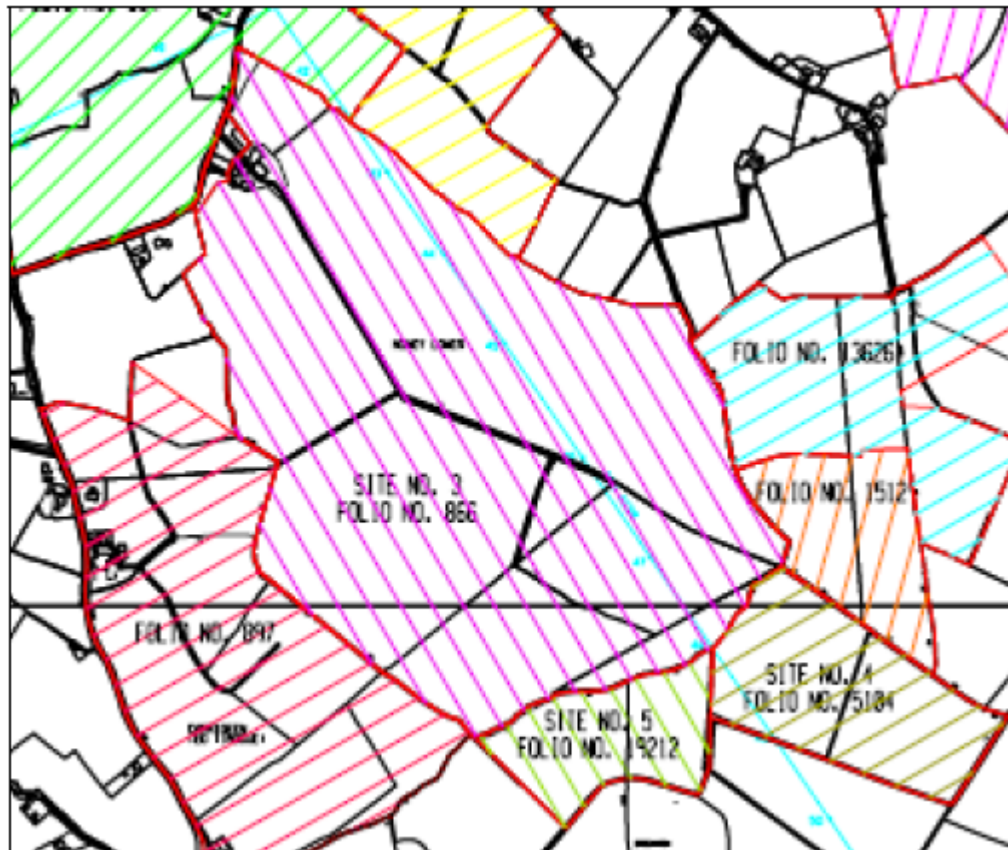


Figure 3.7: Folios 3, 4 and 5 - See Appendix B

Folio no.3, 4 and 5 land use is as per Figure 3.5 above – a mixture of ‘Pastures’ and ‘Non irrigated land’.

Folios 4 and 5 are adjacent to a quarry that is in intermittent use and they are also accessed via a quarry road. There are a minimal number of dwellings in the vicinity of the quarry and these folios are also away from the main road.

Folio no. 6

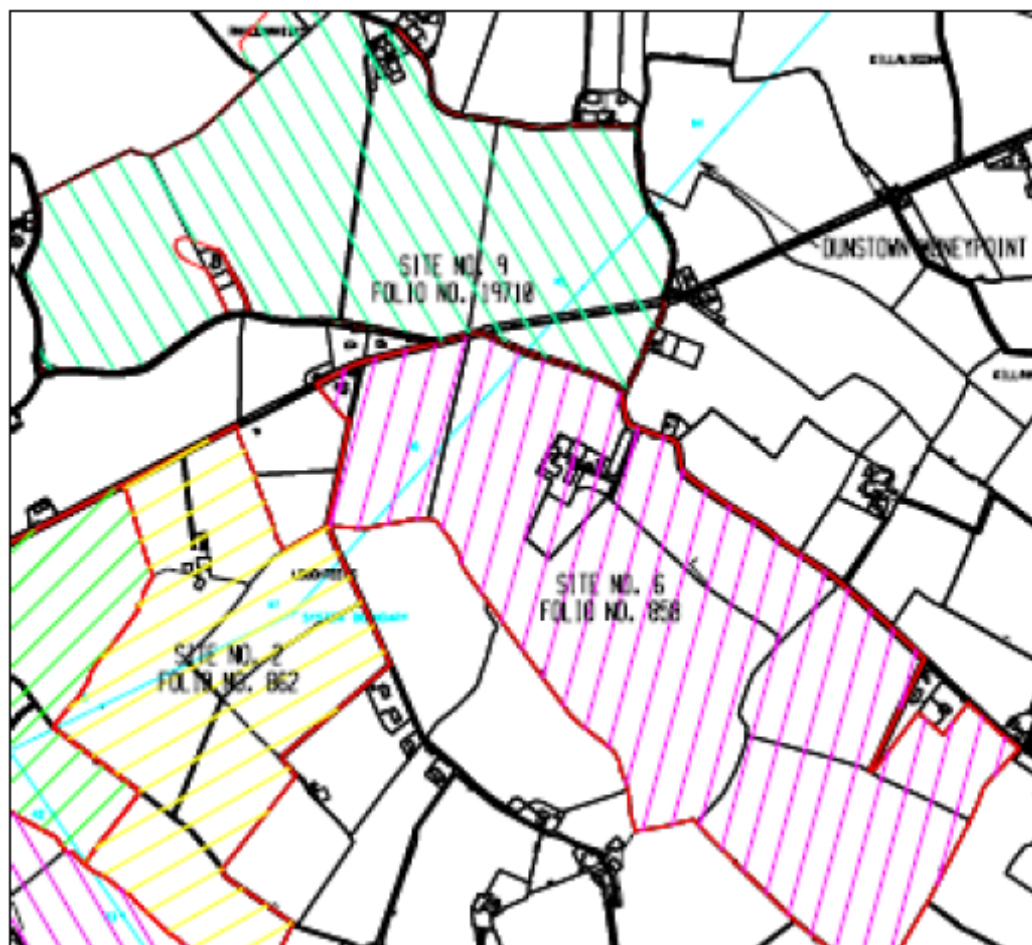


Figure 3.8: Folios 6 and 9 - See Appendix B

Folio no. 6 is a mixture of 'Pastures' and 'Non irrigated land' as illustrated in Figure 3.5 above. There are a number of dwellings in the vicinity of this folio which should be taken into consideration when deciding where the substation is to be located within this folio.

Folio no.7

Folio no.7 is the only folio on the western side of the R426 and will require additional overhead lines to cross the R426 road. Land use in this area is 'Pastures'. There are a number of dwellings in the vicinity of the folio adjacent to the R427.

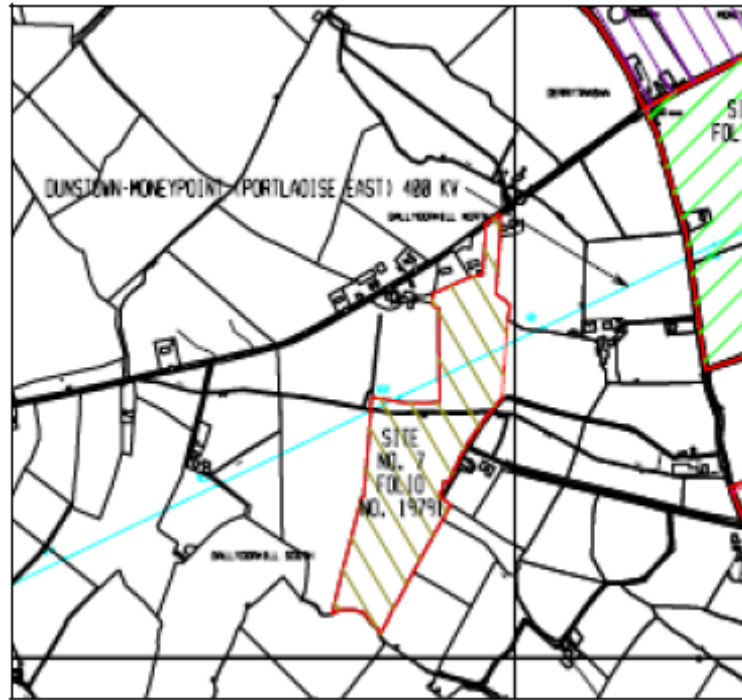


Figure 3.9: Folio 7- See Appendix B

Folios no's. 8 & 9

Folio no. 8 is as illustrated in Figure 3.6 and Folio no.9 is illustrated in Figure 3.8 above. Land use is 'non irrigated land'. Both folios are adjacent to the R426 and/or R427 roads.

3.6.4 Conclusions

There are no significant constraints in relation to human beings. As noted in Section 3.6.3 above, the folios are in close proximity to each other and therefore impacts on population, economic impact, tourism and amenities, and land use are similar.

It is appropriate to minimise impacts on individual dwellings. There are small clusters of dwellings mainly in the vicinity of Folio no.2 and particularly Folio no.7. Hence Folio no. 2 would be less preferred and Folio no.7 is least preferred. Folio no.8 is adjacent to the R426 road with poor screening and would also be considered less preferred. The remainder of the sites can be considered acceptable.

In terms of most preferred folios, Folios 4 & 5 are the most preferred due to the location of these folios down a quarry road and with a minimum number of dwellings in the vicinity.

3.7 Assessment of Substation Folios – Landscape & Visual Impact

3.7.1 Methodology

The following list of information sources were reviewed as part of the desk study:

- Laois County Development Plan 2006 - 2012;
- Ordnance Survey Mapping and Photography;
- Fáilte Ireland and Local Tourism websites.

The main landscape constraints were identified through a combination of road-based site visits and documentation surveys. The general potential to visually affect the landscape constraints was estimated by reference to the following factors:

- The capacity of the existing landscape to absorb the proposed development;
- Effects on landscape character and features (e.g. removal or alteration);
- Proximity of sensitive viewpoints (e.g. scenic routes) and visual receptors; and
- The location and height of any proposed substation electrical structures.

3.7.2 Description of the general substation area

The general location of the potential substation folios is south of Money Cross Roads along the R427 road between Abbeyleix and Stradbally. Money Cross Roads is located 4km north of Timahoe village. Nine different folios are spread over an area of about 500 ha (5 km²) with the most distant folios being 2.65km apart.

The landscape of this area is mainly characterised by lowlands with elevations between 90-150 m. The underlying bedrock is limestone and calcareous shale and there are several soil and sub-soil types, with most based on this calcareous parent material. There are some glacial deposits in the area with alluvium deposits. Further south are some esker ridges (Timahoe Eskers).

This is a rural area and is dominated by farmland, with a network of fields containing improved grassland and tillage and connected by hedgerows. The soils of the area are generally quite fertile. There are scattered dwellings and other buildings in the area, mainly located along the various roads and private lanes in the area.

This area falls within the River Barrow catchment. The main water-courses in the area include the Timahoe River to the south, that flows to the east, and a small stream to the west that flows west towards the Triogue River. Further downstream the river is renamed the Bauteogue River. Further on, the river is again renamed the Stradbally River, east of Stradbally.

3.7.3 Landscape Constraints

Landscape constraints within the overall study area have been described in a previous report (Study Area Constraints Report AOS Planning Ltd. 2010).

3.7.4 Description of the potential substation folios

Folio no. 1



Folio No. 1 is located directly below the existing 400kV and the 110kV lines on level ground adjoining the road junction of the R427 and R426. The folio has good topographical enclosure and good screening vegetation. However, the folio is proximate to a number of dwellings as well as the road junction.

This folio has the advantage of requiring minimum additional structures to connect to the existing power lines due to its proximity to the existing lines.

Folio No. 2



Folio no. 2 is located below the Dunstown Moneypoint 400kV line. This folio has little enclosure or screening vegetation. There are a number of dwellings proximate to this land and it is adjacent to a local road. Depending on where the substation is located within this area, there will be minimum additional structures required to connect to the existing lines.

Folio no. 3

Folio no. 3 is located adjacent to the existing Carlow - Portlaoise 110kV line. The area has good topographical enclosure and some existing screening vegetation. It is a favourable folio with respect to adjacent dwellings as these are limited. It is however visible from the R426 – which is a regional road.

Additional structures will be required to connect to the existing 400kV lines.

Folios no's. 4 & 5



Folios no's 4 and 5 are located adjacent to a quarry, which is in intermittent use. Both folios have good topographical enclosure and good screening vegetation. Both folios are well located with respect to adjacent dwellings, as there are minimal dwellings in the immediate vicinity and are accessed from a quarry road and are well screened from the R426 road.

These folios will require a number of additional structures to connect to the existing 400kV line.

Folio no. 6

Folio no. 6 has little topographical enclosure or screening vegetation. It is proximate to the R427 Regional road and adjacent to a number of dwellings. It is below the existing Dunstown Moneypoint 400kV line and will require additional structures to connect to the existing 110kV line.



Folio no. 7



Folio no. 7 has good topographical enclosure to the north and west and some screening vegetation. It is proximate to dwellings and busy roads. It is below the 400kV line but will require additional structures to connect to the 110kV line.

Folio no. 8



Folio no. 8 has poor topographical enclosure and poor screening vegetation. It is adjacent to a number of dwellings and the cross roads of two busy Regional roads, the R427 and the R426.

Folio no. 9



Folio no 9 has poor topographical enclosure, poor screening vegetation, is adjacent to the R427 and located adjacent to a number of dwellings.

3.7.5 Recommended Sub-Station Folio

Folios 4 and 5 adjacent to the quarry are the preferred folios due to their location away from dwellings and busy roads as well as the existing screening.

While additional pylons and structures will be required, this is in an area that has existing lines and with careful planning, these new structures can be sited proximate to these existing lines and structures.

Folios 1, 7 and 3 are the next preferred whilst folios 2 and 6 are less preferred and, 8 and 9 are the least preferred.

3.8 Overall Assessment

This report identified a number of suitable folios for the proposed 400/110kV substation and associated transmission connections for the Laois-Kilkenny Reinforcement Project.

Nine potential landholdings were identified as sites for the substation. The identification of a preferred folio does not necessarily mean that other less preferred folios are excluded from consideration. However, the terms of reference of this report were to establish a preferred site for the development of the substation and a comparative analysis of the folios is developed below to assist with this.

In evaluating the folios they can be considered as:

- Preferred
- Acceptable
- Less Preferred
- Least Preferred

3.8.1 Summary of Environmental Findings

The following is a summary of the findings of the Environmental Consultants as described in this chapter.

For most environmental topics, mitigation measures can be employed at a specific folio to minimise the impact of the substation on the environment, however, in landscape and visual terms, selection of the most appropriate folio is the primary mitigation measure.

As the Soils & Geology analysis did not express any preference all sites are considered to rank equally and not discussed further below.

As stated above, the evaluation process identifies preferred folio(s), followed by acceptable folio(s), followed by less and least preferred folios(s). It should be noted that whilst some folios are identified as “least preferred” their exclusion from further consideration has not necessarily been recommended.

Folio no.1

This folio is an acceptable folio for all topics considered.

Folio no.2

This folio is an acceptable folio for topics – Ecology, and Soils & Geology. It is the least preferred from the perspective of Hydrology. It is less preferred from the perspective of Cultural Heritage due to the presence of a Recorded Monument, but this can be avoided at detailed design stage. Similarly from a Human Beings and Landscape perspective it is less preferred, but mitigation measures in terms of where it is located within the folio can minimise any potential impact. However, when compared to the other folios, it is considered that this folio should not be considered further.

Folio no.3

This folio is an acceptable folio for all topics considered.

Folios no's.4 and 5

These two folios have similar results. These two folios are the preferred folios from a Human Beings, Cultural Heritage and Landscape perspective. They are the least preferred from an Ecological perspective due to their proximity to the Timahoe Eskers. They are less preferred from a Hydrology perspective. However the Eskers are 0.4km away from these potential folios and mitigating measures can be put in place to prevent any potential impact on the Eskers.

Folio no.6

This folio is an acceptable folio from a Human Beings perspective. It is the least preferred folio from a Hydrology and Cultural Heritage perspective and less preferred from all other perspectives. When compared to the other folios, it is considered that this folio should not be considered further.

Folio no.7

This folio is an acceptable folio for topics –Cultural Heritage, and Landscape & Visual Impact. It is preferred site from a Hydrological perspective. It is least preferred from a Human Beings perspective and less preferred from an Ecological perspective. Folio no.7 is the only folio on the western side of the R426 and will require a road crossing. It is located proximate to a cluster of dwellings and when compared to the other sites should not be considered further.

Folio no.8

This folio is an acceptable folio for topics considered – Ecology, Soils & Geology. It is a least preferred folio from a Hydrology, Cultural Heritage and landscape perspective and when compared to the other sites should not be considered further.

Folio no.9

This folio is an acceptable folio for Human Beings only. It is a least preferred folio from a hydrology and landscape perspective and less preferred from an Ecology, and Cultural Heritage perspective. When compared to the other sites this site should not be considered further.

A summary of the results of the findings can be seen in table 3.21 overleaf.

Folio Option	Environmental (Ecology)	Environmental (Cultural Heritage)	Environmental (Hydrology & Hydrogeology)	Environmental (Soils & Geology)	Environmental (Human Beings)	Environmental (Landscape & Visual Impact)	Progress to Next Stage? (site within folio)
Folio 1	Preferred	Acceptable	Preferred	Acceptable	Acceptable	Acceptable	YES
Folio 2	Acceptable	Less Preferred	Least Preferred	Acceptable	Less Preferred	Less Preferred	NO
Folio 3	Less Preferred	Acceptable	Preferred	Acceptable	Acceptable	Acceptable	YES
Folio 4	Least Preferred	Preferred	Less Preferred	Acceptable	Preferred	Preferred	YES
Folio 5	Least Preferred	Preferred	Less Preferred	Acceptable	Preferred	Preferred	YES
Folio 6	Less Preferred	Least Preferred	Least Preferred	Acceptable	Acceptable	Less Preferred	NO
Folio 7	Less Preferred	Acceptable	Preferred	Acceptable	Least Preferred	Acceptable	NO
Folio 8	Acceptable	Less Preferred	Least Preferred	Acceptable	Less Preferred	Least Preferred	NO
Folio 9	Less Preferred	Less Preferred	Least Preferred	Acceptable	Acceptable	Least Preferred	NO

Table 3.21 Summary of the results of the findings from section 3.8.1

3.8.2 Conclusion and Recommendations

In terms of long-term adverse landscape and visual impacts that cannot generally be further mitigated, folios 4 and 5 are preferable as these two folios are not adjacent to public roads, have good screening and are isolated from dwellings.

Folios 1 and 3 have the advantage of being closest to the intersection with the existing 400kV line and are considered acceptable folios but are more visible.

Folios 2, 6, 7, 8 and 9 are considered 'less preferred' or 'least preferred' under a number of headings. Therefore from an environmental perspective and having regard to the terms of reference it is considered that these folios should not be considered further. It is appropriate that folios 1, 3, 4 and 5 are taken to the next stage of analysis with due consideration given to the Consultants findings for each site.

PART C: IDENTIFICATION , TECHNICAL & ENVIRONMENTAL ASSESSMENT OF SUITABLE SUBSTATION SITES.

4 Identification and Technical Assessment of Suitable Substation Sites

The previous section by AOS Planning, deemed five of the nine folios as 'less preferred' or 'least preferred' to locate the substation, namely folios 2, 6, 7, 8 & 9. The following section establishes suitable locations and layouts for the proposed development within the four remaining folios, namely 1, 3, 4 and 5. Each of the remaining four folios are considered under the following criteria:

- Siting of substation compound within the folio.
- Required Connections to Transmission System.
- Capacity for Accommodating Potential Future Offloads.
- Road Access to Substation.
- Screening.
- Cost.

The following sections 4.1 to 4.5 should be read in conjunction with maps in Appendix G, H, I, J & K.

4.1 Site 1

See map PE493-D108-006-001-000 in Appendix G

4.1.1 Siting Of Substation Compound within Folio 1

Though the landholding associated with the folio is quite large, the area identified to locate the substation is the most south-easterly field of the folio where the Dunstown - Moneypoint 440kV line crosses over the Carlow – Portlaoise 110kV line.

Other areas within the folio were considered less suitable due to housing surrounding the areas which limit routes for connections to the transmission lines and future offloads.

The field in question will only support a GIS substation. The orientation of the substation is influenced by the location of the existing Dunstown - Moneypoint 400kV line therefore the 400kV busbar is in a southwest – northeast alignment to the north of the substation with the 110kV in the same alignment to the south of the substation.

4.1.2 Required Connections to Transmission System

The proposed substation site is approximately 100m from the 400kV line. There is potential to connect to the proposed substation to this line using two single circuit lines looping into the 400kV line within the site. This would introduce two new single circuit towers both with a typical height of circa 37 metres directly under the existing 400kV line to divert the line towards the substation. The line would then continue to two further new single circuit end masts both of typical height of circa 28 metres within 50 metres of the substation compound and then directly onto the gantries within the substation compound. It should be noted that tower heights are provisional and are used for indicative purposes only.

The 110kV connections can be accommodated by looping into the Carlow – Portlaoise 110kV line between structure numbers 41 and 43 with cable interface masts and using underground cables from these points to connect into the south of substation. A further 110kV connection is required to the Ballyragget 110kV substation, this connection will also be cabled from the 110kV side of the substation to a line cable interface mast on the site from where an overhead line route to Ballyragget can commence.

4.1.3 Future Offloads

The proposed substation will have the capacity for four 400kV connections and seven 110kV connections with two of the 400kV connections and three of the 110kV connections forming the initial project. Should further connection capacity to the substation be required, the existence of ribbon development to the west, east and north of the site will reduce the potential for overhead line routes leaving the most likely routes for such lines coming from south of the substation.

4.1.4 Road Access to Substation

Access to this site is via a rural road that connects the R426 and R427 regional roads. Though the site has an existing access point, a new opening will be required to the west of the site that will satisfy sight line requirements. An access road within the site approximately 200m in length will be required.

4.1.5 Screening

Screening in the form of berms and/or landscaping may be limited given the size of folio.

4.1.6 Cost

The cost assumes that all sites are equal in price with variations for different connection proposals. It is important to note that no site was entered to carry out surveys or geotechnical site investigations therefore each site may vary from a civil engineering development point of view. Site 1 is the least cost solution because the minimum rerouting of existing lines is required and access to the site already exists.

4.2 Site 3

See map PE493-D108-009-001-000 in Appendix H for GIS layout and map PE493-D108-011-001-000 in Appendix I for AIS layout.

4.2.1 Siting Of Substation Compound within Folio 3

This site will support an AIS or GIS substation.

4.2.1.1 AIS Substation

The area identified to locate an AIS substation is to the southeast of the folio close to the Carlow – Portlaoise 110kV line. It was considered that this is a suitable location as it was to the side of the folio and close to the Carlow – Portlaoise 110kV line.

The orientation of the substation is influenced by the location of the existing Dunstown - Moneypoint 400kV line and potential connection to it, therefore the 400kV busbar is in a southwest – northeast alignment to the north of the substation with the 110kV in the same alignment to the south of the substation.

The position of the substation allows for proposed and future end masts to be located to both the 400 and 110kV sides of the substation compound.

4.2.1.2 GIS Substation

The area identified to locate a GIS substation is to the southeast of the folio close to the Carlow – Portlaoise 110kV line. It was considered that this is a suitable location as it was to the side of the folio and close to the Carlow – Portlaoise 110kV line.

The orientation of the substation is influenced by the location of the existing Dunstown - Moneypoint 400kV line and potential connection to it, therefore the 400kV busbar is in a southwest – northeast alignment to the north of the substation with the 110kV in the same alignment to the south of the substation.

The position of the substation allows for proposed and future end masts to be located to both the 400 and 110kV sides of the substation compound.

4.2.2 Required Connections to Transmission System

4.2.2.1 AIS Substation

The proposed AIS substation site is approximately 875m from the existing 400kV line. There is potential to connect the proposed substation to this line using two single circuit lines breaking into the existing 400kV line between the 110kV crossover point and structure no. 118 using two single circuit towers both with a typical height of circa 37 metres. The 400kV lines are then routed to a double circuit angle mast of typical height circa 52 to 62 metres which then routes the line along the Carlow - Portlaoise 110kV corridor towards the proposed substation compound via an intermediate double circuit mast of typical height circa 51 to 68 metres and then to a further double circuit angle mast of typical height circa 52 to 62 metres within 50 metres of the compound. The lines then attach to gantries in the substation.

The 110kV connections can be accommodated by looping into the Carlow – Portlaoise 110kV line between structures 45 and 46. Four 110kV towers of typical height circa 18

metres will be required to get to the compound boundary. A further 110kV connection is required to the Ballyragget 110kV substation; this connection will leave the 110kV side of the substation.

4.2.2.2 GIS Substation

The proposed GIS substation site is approximately 875m from the existing 400kV line. There is potential to connect the proposed substation to this line using two single circuit lines breaking into the existing 400kV line between the 110kV crossover point and structure no. 118 using two single circuit towers both with a typical height of circa 37 metres. The 400kV lines are then routed to a double circuit angle mast of typical height circa 52 to 62 metres which then routes the line along the Carlow - Portlaoise 110kV corridor towards the proposed substation compound via an intermediate double circuit mast of typical height circa 51 to 68 metres and then a further double circuit angle mast of typical height circa 52 to 62 metres within 50 metres of the compound. The lines then attach to gantries in the substation.

The 110kV connections can be accommodated by looping into the Carlow – Portlaoise 110kV line between structures 45 and 46. Two 110kV line cable interface masts, typical height circa 18 metres, will be required to accommodate this looped connection. A further 110kV connection is required to the Ballyragget 110kV substation; this connection will also be cabled from the 110kV side of the substation to a line cable interface mast on the site from where an overhead line route to Ballyragget can commence.

4.2.3 Future Offloads

The proposed AIS and GIS substation will have the capacity for four 400kV connections and seven 110kV connections with two of the 400kV connections and three of the 110kV connections forming the initial project. Should further connection capacity to the substation be required, the existence of ribbon development to the west and north of the site will reduce the potential for overhead line routes resulting in the most likely routes for such lines coming from south and east of the substation.

4.2.4 Road Access to Substation

Access to the proposed AIS and GIS substation sites will be via a new access road approximately 1km in length from the substation to a rural road that connects the R426 and R427 regional roads. The proposed location for this road is along the east boundary of the folio.

4.2.5 Screening

Screening for the AIS and GIS substation in the form of berms and/or landscaping is possible on all four sides of the compound.

4.2.6 Cost

The cost assumes that all sites are equal in price with variations for different connection proposals. It is important to note that no site was entered to carry out surveys or geotechnical site investigations therefore each site may vary from a civil engineering

development point of view. Costs for site 3 are deemed to be higher when compared with the other suitable substation sites because it is approximately 875 metres from the existing 400kV and will require approximately 850 metres of new road.

4.3 Site 4

See map PE493-D108-012-001-000 in Appendix J

4.3.1 Siting Of Substation Compound within Folio 4

The site will only accommodate a GIS substation.

The area identified to locate a GIS substation is to the north of the folio close to the Carlow – Portlaoise 110kV line. It was considered that this is a suitable location as it was to the edge of the folio and close to the Carlow – Portlaoise 110kV line.

The orientation of the substation is influenced by the location of the existing Dunstown - Moneypoint 400kV line and potential connection to it, therefore the 400kV busbar is in a southwest – northeast alignment to the north of the substation with the 110kV in the same alignment to the south of the substation.

The position of the substation allows for proposed and future end masts to be located to the 400 and 110kV side of the substation site.

4.3.2 Required Connections to Transmission System

The proposed GIS substation site is approximately 1.5km from the existing 400kV line. There is potential to connect the proposed substation to this line using two single circuit lines looping into the existing 400kV line between the 110kV crossover point and structure no. 118 using two single circuit towers both with a typical height of circa 37 metres. The 400kV lines are then routed to a double circuit angle mast of typical height circa 52 to 62 metres which then routes the line along the Carlow - Portlaoise 110kV corridor towards the proposed substation compound via three intermediate double circuit masts of typical height circa 51 to 68 metres and average distance of 290 metres apart and then onto a further double circuit angle mast of typical height circa 52 to 62 metres within 50 metres of the compound. The lines then attach to gantries in the substation.

The 110kV connections can be accommodated by looping into the Carlow – Portlaoise 110kV line where between structure numbers 48 and 49 with line cable interface masts and using underground cables from these points to connect into the 110kV side of the substation. A further 110kV connection is required to the Ballyragget 110kV substation, this connection will also be cabled from the 110kV side of the substation to a line cable interface mast on the site from where an overhead line route to Ballyragget can commence.

4.3.3 Future Offloads

The proposed substation will have the capacity for four 400kV connections and seven 110kV connections with two of the 400kV connections and three of the 110kV connections forming the initial project. Should further connection capacity to the substation be required, due to the remote nature of the site there is good potential for overhead line routes from/to the site in all directions.

4.3.4 Road Access to Substation

Access to this site would be via a 1.3km existing farm/quarry road from the R426 regional road. Some realignment of this road will be required to enable necessary turning radii to be achieved for equipment delivery.

4.3.5 Screening

Screening for the GIS substation in the form of berms and/or landscaping is possible on all four sides of the compound.

4.3.6 Cost

The cost assumes that all sites are equal in price with variations for different connection proposals. It is important to note that no site was entered to carryout surveys or geotechnical site investigations therefore each site may vary from a civil engineering development point of view. Site 4 costs is considered medium to high compared with the other substation sites because it is approximately 1.5km from the existing 400kV line though beside the 110kV line. However due to the site having an established access minimal new road construction will be required reducing the overall cost.

4.4 Site 5

See map PE493-D108-013-001-000 in Appendix K

4.4.1 Siting Of Substation Compound within Site Folio 5

The site will only accommodate a GIS substation.

The area identified to locate a GIS substation is to the north of the folio close to the Carlow – Portlaoise 110kV line. It was considered that this is a suitable location as it was to the side of the folio and close to the Carlow – Portlaoise 110kV line.

The orientation of the substation is influenced by the location of the existing Dunstown - Moneypoint 400kV line and potential connection to it (see section 4.6.2) therefore the 400kV busbar is in a northwest – southeast alignment to the west of the substation with the 110kV in the same alignment to the east of the substation.

The position of the substation allows for proposed and future end masts to be located on the 400 and 110kV side of the substation site.

4.4.2 Required Connections to Transmission System

The proposed GIS substation site is approximately 1.5km from the existing 400kV line. There is potential to connect the proposed substation to this line using two single circuit lines breaking into the existing 400kV line between the 110kV crossover point and structure no. 118 using two single circuit towers both with a typical height of circa 37 metres. The 400kV lines are then routed to a double circuit angle mast of typical height circa 52 to 62 metres which then routes the line along the Carlow - Portlaoise 110kV corridor towards the proposed substation compound via two intermediate double circuit mast of typical height circa 51 to 68 metres and average distance of 290 metres apart. The line then continues for a further circa 350 metres to a double circuit angle mast of typical height circa 52 to 62 metres where the line again separates out to two single circuit angle masts both with a typical height of circa 37 metres to establish turning points to the substation to two 400kV single circuit end masts both with a typical height of circa 28 metres within 50 metres of the compound.

The 110kV connections can be accommodated by looping into the Carlow – Portlaoise 110kV line where between structure numbers 48 and 49 with line cable interface masts and using underground cables from these points to connect into the south of substation. A further 110kV connection is required to the Ballyragget 110kV substation, this connection will also be cabled from the 110kV side of the substation to a line cable interface mast on the site from where an overhead line route to Ballyragget can commence.

4.4.3 Future Offloads

The proposed substation will have the capacity for four 400kV connections and seven 110kV connections with two of the 400kV connections and three of the 110kV connections forming the initial project. Should further connection capacity to the substation be required, due to the remote nature of the site there is good potential for overhead line routes from/to the site in all directions.

4.4.4 Road Access to Substation

Access to this site would be via a 1.3km existing farm/quarry road from the R426 regional road. Some realignment of this road will be required to enable necessary turning radii to be achieved for equipment delivery.

4.4.5 Screening

Screening for the GIS substation in the form of berms and/or landscaping is possible on all four sides of the compound.

4.4.6 Cost

The cost assumes that all sites are equal in price with variations for different connection proposals. It is important to note that no site was entered to carryout surveys or geotechnical site investigations therefore each site may vary from a civil engineering development point of view. Site 4 costs is considered medium to high compared with the other substation sites because it is approximately 1.5km from the existing 400kV line though beside the 110kV line. However due to the site having an established access minimal new road construction will be required reducing the overall cost.

4.5 Preferred Compound Site(s)

	Siting of substation compound within site	Required Connections to Transmission System	Capacity for Accommodating Potential Future Offloads	Road Access to Substation	Screening	Cost
Site 1	GIS only	No major constraints	Restricted	Existing	Limited	Least Cost
Site 3	GIS and AIS	No major constraints	Restricted	New Road Required	Limited for AIS. Not limited for GIS	High Cost
Site 4	GIS only	No major constraints	Open	Existing	Not limited	High Cost
Site 5	GIS only	No major constraints	Open	Existing	Not limited	High Cost

Table 4.1: Technical criteria summarised for each site.

Table 4.1 above is a summary of the criteria reviewed in this section. Based on this criteria the following is recommended:

Site 1 – Least preferred GIS option due to limited offloading potential to the west, north and east and limited screening potential.

Site 3 – Preferred AIS option when compared to other AIS site. Less favourable GIS option when compared to other GIS sites due to the requirement of a new long access road and limited offloading potential to the west and north.

Site 4 and 5 – Preferred GIS options when compared with other suitable GIS sites. There is existing access. However of sites 4 and 5, site 4 is preferred as it is at the preferable side of the 110kV line to minimise the requirement of 400kV single circuit structures.

5 Environmental Considerations of Suitable Substation Sites

Following analysis of the nine folios from an environmental perspective (section 3) a number of the folios were not considered further due to identified constraints within the folio.

In Chapter 4, ESBI identified proposed site layouts within each of the four remaining folios and then assessed each particular layout using the technical criteria. This resulted in the identification of two preferred options (one for AIS and for GIS). In carrying out due diligence it was deemed appropriate to carry out a final environmental assessment of all four site layouts. Thus, the next stage of the study was to analyse the substation within the folio from an environmental perspective. All of the Consultants were provided with maps of the potential footprints of the substation and requested to review their findings on this basis.

Soils and Geology:

- Soils and geology findings were the same for all sites. The potential impact is slight negative for all options. Therefore, the potential impact for the proposed footprint of the substations, access roads and towers within those four folios is also the same and is not considered further in this section.

5.1 Site 1

Site 1 was considered for a GIS substation only.

Landscape and Visual Impact:

This site within the folio is located in the area furthest away from the roads and is almost directly below the intersection of the two lines and is deemed acceptable.

Ecology⁶:

Site 1 is located within a single field that contained tillage crops in 2010. It is surrounded by fields on 4 sides. Access is from an adjacent minor road. There seems to be no significant hedgerow or tree removal (other than for access). The north-eastern hedge seems to be the best-developed hedge and may also have a drain associated with the hedge. Potential mitigation measures such as silt-traps may be required to limit runoff into the drain during construction and from the completed development.

There is no significant change to criteria A, B or C from Section 3 above. Site 1 still remains the preferred substation site from an ecological view-point, as it is located close to where the two overhead lines intersect and therefore would reduce the construction associated with the erection of additional steel towers and overhead lines.

Hydrology and Hydrogeology:

The entire site 1 land folio is located in the same surface water catchment area and on a regionally important karstified (diffuse) bedrock aquifer with high vulnerability. Therefore, the potential impact for the proposed footprint of the Gas Insulated Station (GIS), access roads and towers within site 1 would be the same for any substation location selected within this land folio.

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality.	Slight Negative

Table 5.1: Estimation of Magnitude of Impact on Water for site 1

⁶ In terms of Ecology the main criteria used for selection of preferred sites are:

(A) the distance from Timahoe Esker pNHA,

(B) the distance from the Timahoe River and

(C) minimising the construction footprint and length of the substation site and additional lines and structures (potentially steel towers) that may be required to connect the substation into the existing 400kv and 110kv lines.

Reference to criteria A, B and C within each Ecology section refers to the criteria above.

Human Beings:

This site is located away from the road junction. It is however located adjacent to a number of individual dwellings.

Cultural Heritage:

No known constraints are identified on the site. Testing of substation site and access road prior to construction would be necessary.

Conclusion:

The location of Site no.1 is acceptable.

5.2 Site 3

Site 3 was considered for both an AIS and GIS substation.

Landscape and Visual Impact:

This site is located further away from the main roads than site no.1.

Ecology:

Site 3 (GIS station) is located in a single field that contained agricultural grassland in 2010. The field is surrounded by hedgerows on 4 sides. There seems to be no significant planned hedgerow or tree removal (other than for access). Access is from a minor road via a new planned track about 1.1 km long.

There is no significant change to criteria A, B and C in relation to criteria for selecting preferred sites or in significant potential ecological impacts. The footprint within the land folio is about 200-300 m closer to Timahoe River and the Timahoe Eskers pNHA. However, this is not likely to increase the magnitude of any potential ecological impact significantly.

Site 3 (AIS station) is mostly located in a single field that contained agricultural grassland in 2010. The field is surrounded by hedgerows on 4 sides. There is a small overlap with a second field. There is a small overlap with a hedgerow, where a portion of the hedgerow is likely to be removed. Access is from a minor road via a new planned track about 1.1 km long.

There is no significant change to criteria A and B in relation to criteria for selecting preferred sites or in significant potential ecological impacts. The footprint within the land folio is about 200-300 m closer to Timahoe River and the Timahoe Eskers pNHA. However, this is not likely to increase the magnitude of any potential ecological impact significantly. This site for the AIS station has a much larger footprint and therefore has a greater overall impact. There is no significant change in potential ecological impacts from the route of the connecting overhead line and the preliminary positions of towers to the proposed substation from the existing lines.

Hydrology and Hydrogeology:

The entire site 3 land folio is located in the same surface water catchment area and on a regionally important karstified (diffuse) bedrock aquifer with high vulnerability. Therefore, the potential impact for the proposed footprint of the substation (which may be AIS or GIS), access roads and towers within site 3 would be the same for any substation location selected within this land folio. Estimation of magnitude of impact is as follows:

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 5.3: Estimation of Magnitude of Impact on Water for site 3

Human Beings:

This site is an acceptable option for either an AIS or GIS due to its relative isolation from dwellings and the public roads.

Cultural Heritage:

This is clear from known constraints and the proposed substation site as well as proposed structures would not appear to impact on known archaeological constraints. Testing of substation site and access road prior to construction would be necessary.

Conclusion:

Site 3 is an acceptable option for either an AIS or GIS substation.

5.3 Site 4

Site 4 was considered for a GIS substation only.

Landscape and Visual Impact:

This site has good topographical enclosure and good screening vegetation. The site is well located with respect to adjacent dwellings, as there are minimal dwellings in the immediate vicinity and is accessed from a quarry road and is well screened from the R426 road. These findings apply to any location within this land folio.

Ecology:

Site 4 is located in a single field that contained tillage crops in 2010. It is surrounded by hedgerows on 4 sides. There appears to be no significant planned hedgerow or tree removal (other than for access). Access is from a minor road via an existing track. Potential mitigation measures such as silt-traps may be required to limit runoff into a drain along a field boundary during construction and from the completed development. Some field assessment should also be carried out of the riparian value of the drainage ditch along the field boundary during the EIS stage, with some consideration given to potential mitigation of fragmented riparian habitats from culverts etc.

There is no significant change to criteria A, B or C in relation to criteria for selecting preferred sites or in significant potential ecological impacts. There is no significant change in potential ecological impacts from the route of the connecting overhead lines and the preliminary positions of towers to the proposed substation from the existing lines.

Hydrology and Hydrogeology:

The entire site 4 land folio is located in the same surface water catchment area and on a regionally important karstified (diffuse) bedrock aquifer with high vulnerability. Based on the GSI maps, the southern portion of the land folio is located on a locally important sand and gravel aquifer, the northern portion is on the periphery of the aquifer. The proposed footprint of the substation is located on the sand/gravel aquifer. Positioning the substation in this portion of site 4 will have a moderate negative potential impact on the sand and gravel aquifer. It would be preferable to locate the substation outside the aquifer boundary.

If the sand/gravel aquifer is present, it may be an issue in terms of the hydrological connection to water supplies. The GSI well card data shows a spring 1.3km south east of the site which is registered as being used by Laois Co. Co. as a public water supply. The GSI well card data is not a fully comprehensive database so there may be other groundwater abstraction wells/springs in the vicinity of the site. This will increase the mitigation measures required during construction and operation. The additional mitigation measures will obviously have cost implications for the construction phase.

While the presence of the sand and gravel aquifer decreases the suitability of the site for development, mitigation measures can be implemented to ameliorate the potential impacts. The mitigation measures will be more significant and costly than would be required on sites 1, 2 or 3 where the GSI records show no evidence of a sand/gravel aquifer.

However, it should be noted that in absence of site specific site investigation data, it is unknown if the sand/gravel aquifer is definitely underlying the site. The GSI mapping is the only available information on the sand/gravel aquifer boundaries and it is only indicative, not definitive. If site 4 is selected as the preferred site, a comprehensive site investigation would

be needed to establish ground conditions, the presence/absence of the sand/gravel aquifer, the elevation of the water table and the depth to bedrock. This information would confirm the presence/absence of the aquifer and provide the information necessary to determine the most appropriate mitigation measures.

Estimation of magnitude of impact (based on the information currently available) is as follows:

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Locally Important sand and gravel Aquifer.	Very High	Impact on groundwater quality, abstraction rate and recharge	Moderate Negative
Aquifer Vulnerability – High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 5.4: Estimation of Magnitude of Impact on Water for site 4

Human Beings:

This site is an acceptable option due to its relative isolation from dwellings and the public roads. These findings apply to any location within the folio.

Cultural Heritage:

This site is also clear of known archaeological constraints (See Section 3). The additional structures (red line on provided mapping) which would meet the existing line further to the north would not present any impacts as no known constraints are located along this line.

Conclusion:

This site is an acceptable site.

5.4 Site 5

Site 5 was considered for a GIS substation only.

Landscape and Visual Impact:

In a similar manner to Site no.4 this site has good topographical enclosure and good screening vegetation. The site is well located with respect to adjacent dwellings, as there are minimal dwellings in the immediate vicinity and it is accessed from a quarry road and is well screened from the R426 road. These findings apply to any location within this land folio.

Ecology:

Site 5 is located in a single field that contained tillage crops in 2010. It is surrounded by hedgerows on 4 sides. There appears to be no significant planned hedgerow or tree removal (other than for access). Access is from a minor road via an existing track. Potential mitigation measures such as silt-traps may be required to limit runoff into a drain along a field boundary during construction and from the completed development. Some field assessment should also be carried out of the riparian value of the drainage ditch along the field boundary during the EIS stage with some consideration given to potential mitigation of fragmented riparian habitats from culverts etc.

There is no significant change to criteria A, B or C in relation to criteria for selecting preferred sites or in significant potential ecological impacts. There is no significant change in potential ecological impacts from the route of the connecting overhead line and the preliminary positions of structures to the proposed substation from the existing lines.

Hydrology and Hydrogeology:

The entire site 5 land folio is located in the same surface water catchment area and on a regionally important karstified (diffuse) bedrock aquifer with high vulnerability. Based on the GSI maps, the majority of the land folio is located on a sand and gravel aquifer. Therefore, the potential impact for the proposed footprint of the substation, access roads and structures within site 5 would be the same for any substation location selected within this land folio.

If the sand/gravel aquifer is present, it may be an issue in terms of the hydrological connection to water supplies. The GSI well card data shows a spring 1.8km south east of the site which is registered as being used by Laois Co. Co. as a public water supply. The GSI well card data is not a fully comprehensive database so there may be other groundwater abstraction wells/springs in the vicinity of the site. This will increase the mitigation measures required during construction and operation. The additional mitigation measures will obviously have cost implications for the construction phase.

While the presence of the sand and gravel aquifer decreases the suitability of the site for development, mitigation measures can be implemented to ameliorate the potential impacts. The mitigation measures will be more significant and costly than would be required on sites 1, 2 or 3 where the GSI records show no evidence of a sand/gravel aquifer.

However, it should be noted that in absence of site specific site investigation data, it is unknown if the sand/gravel aquifer is definitely underlying the site. The GSI mapping is the only available information on the sand/gravel aquifer boundaries and it is only indicative, not definitive. If site 5 is selected as the preferred site, a comprehensive site investigation would be needed to establish ground conditions, the presence/absence of the sand/gravel aquifer,

the elevation of the water table and the depth to bedrock. This information would confirm the presence/absence of the aquifer and provide the information necessary to determine the most appropriate mitigation measures.

Estimation of magnitude of impact is as follows:

Attribute	Attribute Importance	Impact	Level of Impact
Water Quality - Current WFD Status of rivers within the study area: Timahoe – Moderate, Timogue – Poor and Bauteogue River - Moderate	Very High	Some construction works on site may take place in the riparian zone. This could impact on the water quality of the receiving watercourse(s) and in turn the rivers located within the catchment.	Moderate Negative
Regionally Important Karstified (diffuse) bedrock aquifer.	Medium	Impact on groundwater abstraction rate and recharge if bedrock is encountered. Impact on groundwater quality.	Slight Negative
Locally Important sand and gravel Aquifer.	Very High	Impact on groundwater quality, abstraction rate and recharge	Moderate Negative
Aquifer Vulnerability - High	High	Impact on groundwater quality and water supply quality	Slight Negative

Table 5.5: Estimation of Magnitude of Impact on Water for site 5

Human Beings:

This site is an acceptable option due to its relative isolation from dwellings and the public roads. These findings apply to any location within the folio.

Cultural Heritage:

This site is also clear of known archaeological constraints (See Section 3). The additional structures (red line on provided mapping) which would meet the existing line further to the north would not present any impacts as no known constraints are located along this line.

Conclusion:

This site is an acceptable site.

5.5 Overall Environmental Assessments of Sites

There are no sites excluded due to environmental reasons, however a number of sites are considered preferred options under the various topics considered.

Sites 4 and 5 are the preferred options for Landscape, Cultural Heritage and Human Beings. Sites 4 and 5 are the least preferred from a Hydrological and Hydrogeological perspective as they are located on a sand/gravel aquifer. Only part of folio 4 is on the aquifer so the positioning of the GIS footprint beyond the boundary of the aquifer would be preferable, however, mitigation measures can be employed to mitigate the potential impact on the aquifer. Similarly from an Ecological perspective Sites 4 and 5 due to their relative proximity to the Eskers are considered least preferred but mitigation measures can be employed.

Site 3 is considered acceptable under all the topics and particularly if a GIS station is opted for (from an Ecological perspective).

Site 1 is acceptable and is the preferred option from an Ecological perspective.

Site 2 for an AIS station has a much larger footprint and therefore has a greater overall impact that can be seen with the likely removal of portions of several hedgerows from an Ecological perspective.

PART D: CONCLUSION & RECOMMENDATION

6 Conclusion & Recommendation

This report has been prepared by ESB International in conjunction with AOS Planning Ltd.

This report has identified and reviewed nine potential candidate folios to locate either an Air Insulated Switchgear (AIS) or Gas Insulated Switchgear (GIS) type design 400/110kV Substation for the Laois – Kilkenny Reinforcement Project.

The candidate folios were initially identified and were then subjected to a general environmental assessment (to identify constraints) at a desktop level. This process identified the folios that were most suitable to accommodate the proposed development and reduced the initial nine candidate folios down to four.

These four folios (folios 1, 3, 4 and 5) were then assessed to identify suitable areas within these folios to locate the substation compound using the technical criteria *Siting of Substation Compound within Folio, Required Connections to Transmission System, Capacity for Accommodating Potential Future Offloads, Road Access to Substation, Screening and Cost*. This process established site 3 as preferable for an AIS substation and site 4 as preferred for a GIS solution. It should be noted that Site 4 is not large enough to accommodate an AIS substation.

For *due diligence*, a final environmental assessment was carried out on all the four substation sites. This did not identify any environmental constraints that deemed the preferred substation sites unsuitable.

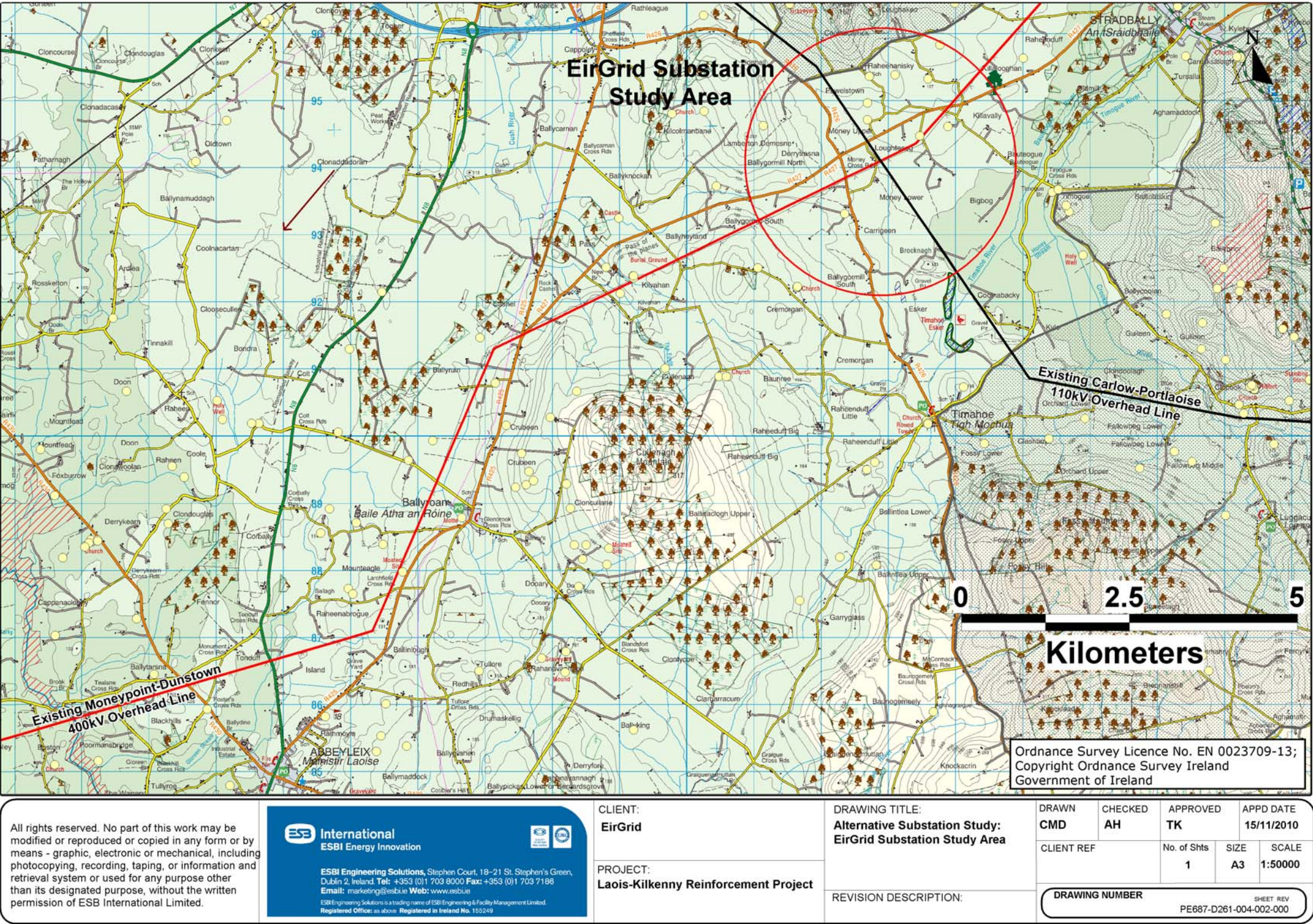
No geotechnical site investigations or ground surveys have been carried out on any of the sites. It is therefore recommended that specialist site investigations are carried out prior to the final acquisition of the preferred site.

It is the recommendation of this report that site 3 is acquired if an AIS substation is to be developed and site 4 if a GIS substation is to be developed.

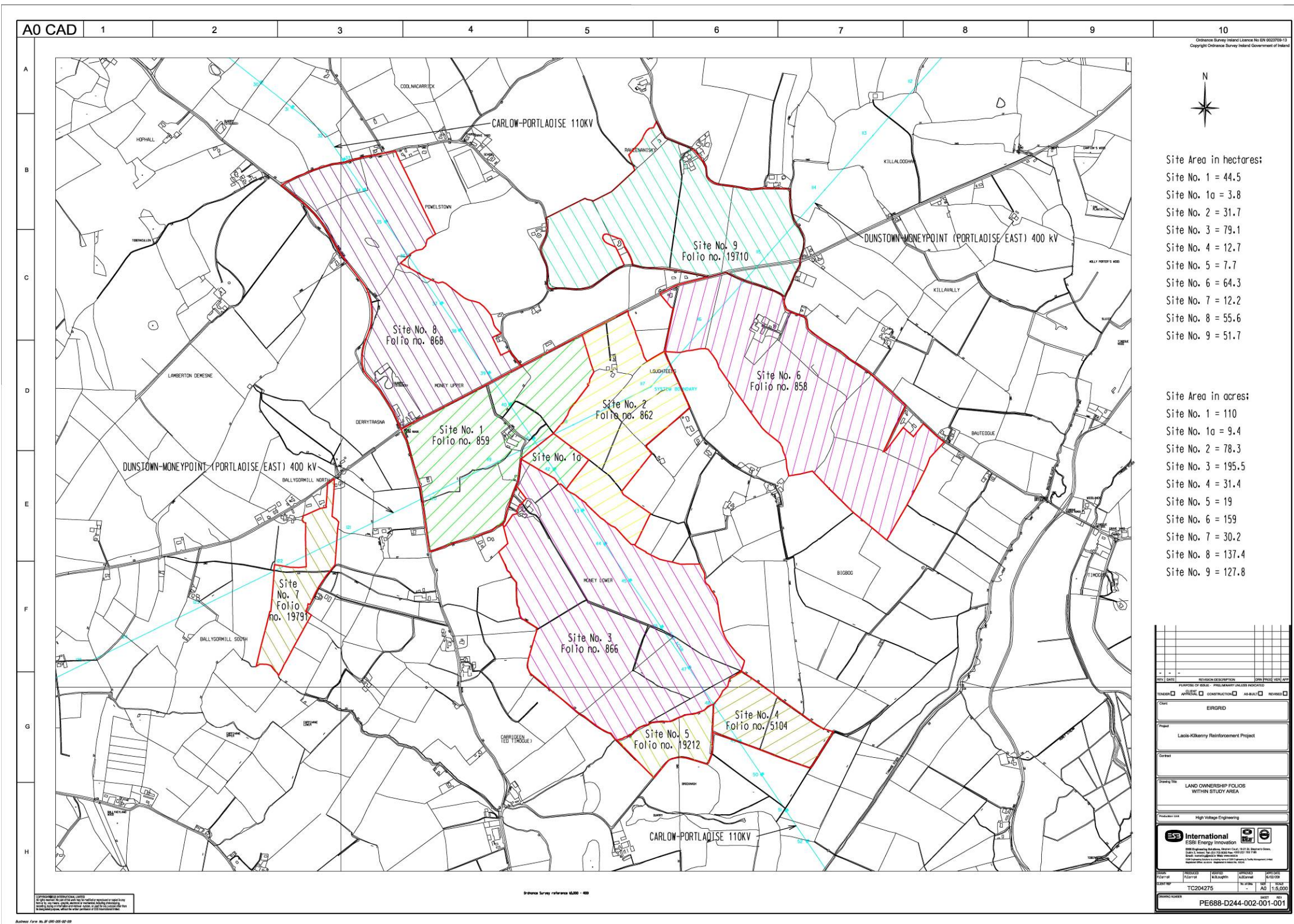
References

- BirdLife International (2001) *Important Bird Areas and potential Ramsar Sites in Europe*. BirdLife International, Wageningen, The Netherlands.
- Crushell, P. (2010). Winter Bird Surveys. Laois – Kilkenny Reinforcement Project: 400/110kv substation including associated line and station works. June 2010. Unpublished Report to AOS.
- Environmental Protection Agency (2002). *Guidelines on the information to be contained in Environmental Impact Statements*. EPA, Wexford, Ireland.
- Environmental Protection Agency (2003). *Advice notes on current practice in the preparation of Environmental Impact Statements*. EPA, Wexford, Ireland.
- Fossitt, J.A. (2000). *A guide to habitats in Ireland*. The Heritage Council, Dublin.
- Institute of Ecology and Environmental Management (2006). *Guidelines for ecological impact assessment in the United Kingdom*. Institute of Ecology and Environmental Management, London.
- King, J.J. (2006) The status and distribution of lamprey in the River Barrow SAC. *Irish Wildlife Manuals* No. 21. National Parks and Wildlife Service, Department of Environment, Heritage and Local Government, Dublin, Ireland.
- Lynas, P., Newton, S.F. and J.A. Robinson (2007). The status of birds in Ireland an analysis of conservation concern 2008-2013. *Irish Birds* 8: 149-166.
- Marnell, F., Kingston, N. & Looney, D. (2009). *Ireland Red List No. 3: terrestrial mammals*. National Parks and Wildlife Service, Dublin.
- National Roads Authority (2006). *Guidelines for assessment of ecological impacts of national road schemes*. National Roads Authority.
- Natura Environmental Consultants (2008). Ecological assessment of proposed drainage works on the River Barrow. Draft report v(ii). The River Barrow Drainage Board.
- (ERBD 2009. Barrow Upper Body Unit Management Plan. Stradbally Water Management Unit . South East River Basin District. www.serbd.com/downloads.htm.
- S.I. No. 39 (1976). *Wildlife Act 1976*. Dublin Stationary Office, Dublin.
- S.I. No. 371 (2001). *Wildlife (Amendment) Act, 2000 (Commencement) (no.2) order, 2001*. Dublin Stationary Office, Dublin.
- www.npws.ie National Parks and Wildlife Service web site synopses for Special Areas of Conservation (SACs) and Natural Heritage Areas (NHAs).
- E-mail: laoiskilkennyreinforcement@eirgrid.com

Appendix A – Study Area Location



Appendix B – Sites Location Map



Appendix C – Ecology

Site evaluation scheme is taken from NRA (2006).

Rating	Geological Value Description
A	<p>Internationally important</p> <p>Sites designated (or qualifying for designation) as SAC* or SPA* under the EU Habitats or Birds Directives.</p> <p>Undesignated sites containing good examples of Annex I priority habitats under the EU Habitats Directive.</p> <p>Major salmon river fisheries.</p> <p>Major salmonid (salmon, trout or char) lake fisheries.</p>
B	<p>Nationally important</p> <p>Sites or waters designated or proposed as an NHA* or statutory Nature Reserves.</p> <p>Undesignated sites containing good examples of Annex I habitats (under EU Habitats Directive).</p> <p>Undesignated sites containing significant numbers of resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive or species protected under the Wildlife (Amendment) Act 2000.</p> <p>Major trout river fisheries.</p> <p>Water bodies with major amenity fishery value.</p> <p>Commercially important coarse fisheries.</p>
C	<p>High value, locally important</p> <p>Sites containing semi-natural habitat types with high biodiversity in a local context and a high degree of naturalness, or significant populations of locally rare species.</p> <p>Small water bodies with known salmonid populations or with good potential Salmonid habitat.</p> <p>Sites containing any resident or regularly occurring populations of Annex II species under the EU Habitats Directive or Annex I species under the EU Birds Directive.</p> <p>Large water bodies with some coarse fisheries value.</p>
D	<p>Moderate value, locally important</p> <p>Sites containing some semi-natural habitat or locally important for wildlife.</p> <p>Small water bodies with some coarse fisheries value or some potential salmonid habitat.</p> <p>Any water body with unpolluted water (Q-value rating 4-5).</p>
E	<p>Low value, locally important</p> <p>Artificial or highly modified habitats with low species diversity and low wildlife value.</p> <p>Water bodies with no current fisheries value and no significant potential fisheries value.</p>

Appendix D – Cultural Heritage

Description of Recorded Archaeological Monuments

SMR Number:	LA018-013----
Class:	Enclosure
National Grid Reference (E,N):	253469, 194505
Townland(s):	LOUGHTEEOG
Record of Monuments and Places:	Yes
Description:	
Marked on the 1841 and 1909 eds. OS 6" maps; a subcircular enclosure (max. diam. c. 60m NE-SW). A road cut through the site at NNE and SE. No visible surface traces.	

SMR Number:	LA018-014----
Class:	Water Mill - Horizontal-Wheeled
National Grid Reference (E,N):	252350, 193320
Townland(s):	BALLYGORMILL SOUTH
Record of Monuments and Places:	Yes
Description:	
Reference to a horizontal watermill (NMI files). No visible traces.	

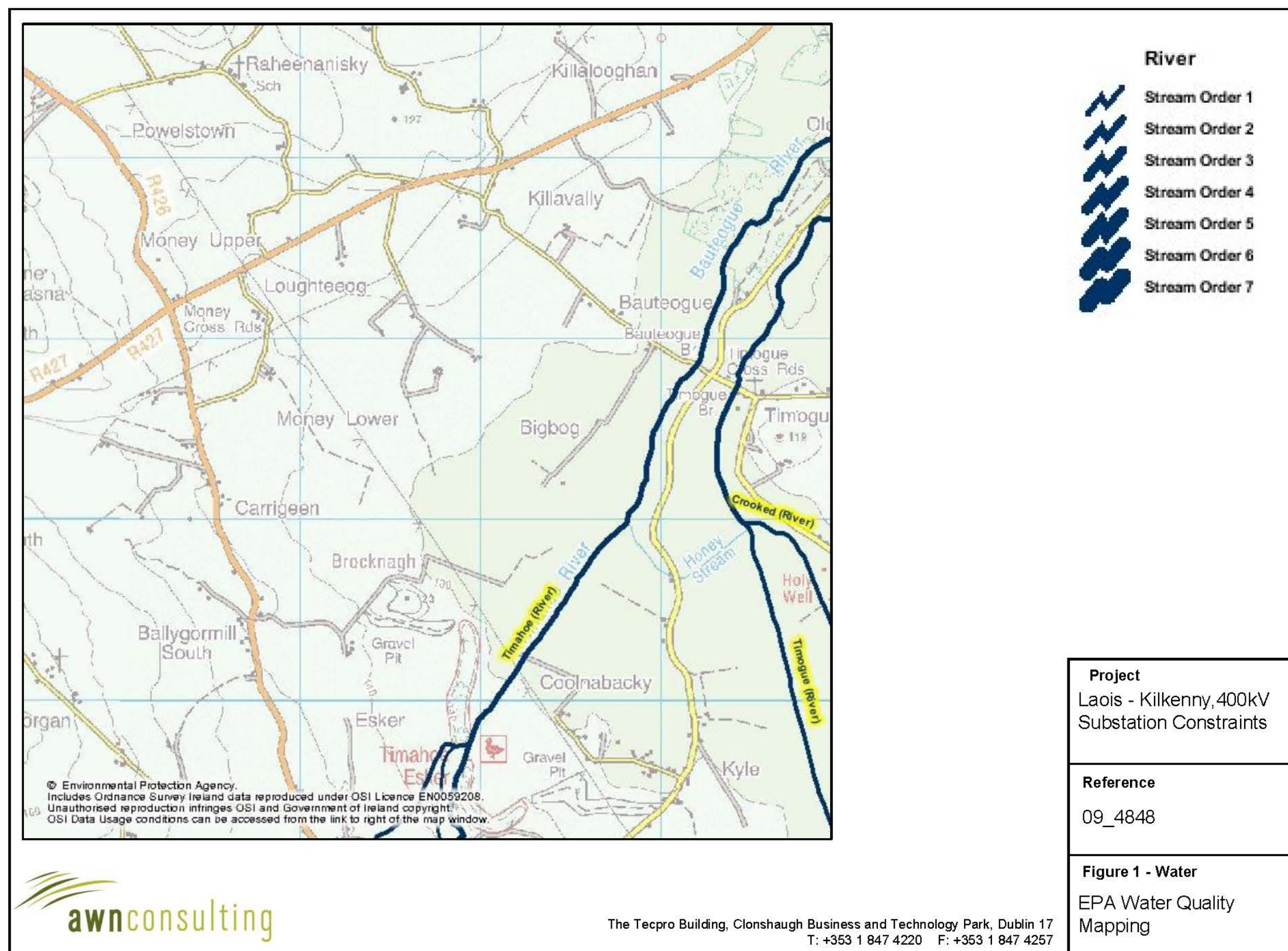
SMR Number:	LA018-049001-
Class:	Castle - Unclassified possible
National Grid Reference (E,N):	253890, 194620
Townland(s):	LOUGHTEEOG
Record of Monuments and Places:	Yes
Description:	Unlocated castle within Loughteeog mentioned in sixteenth century documents as mentioned in the History of the Queens County (O'Hanlon and O'Leary 1907, vol. 2, 451). According to present occupant of Prospect House, it is traditionally believed that the house, which was built in the 1950s when old Prospect House was knocked down, occupies the site of a castle.

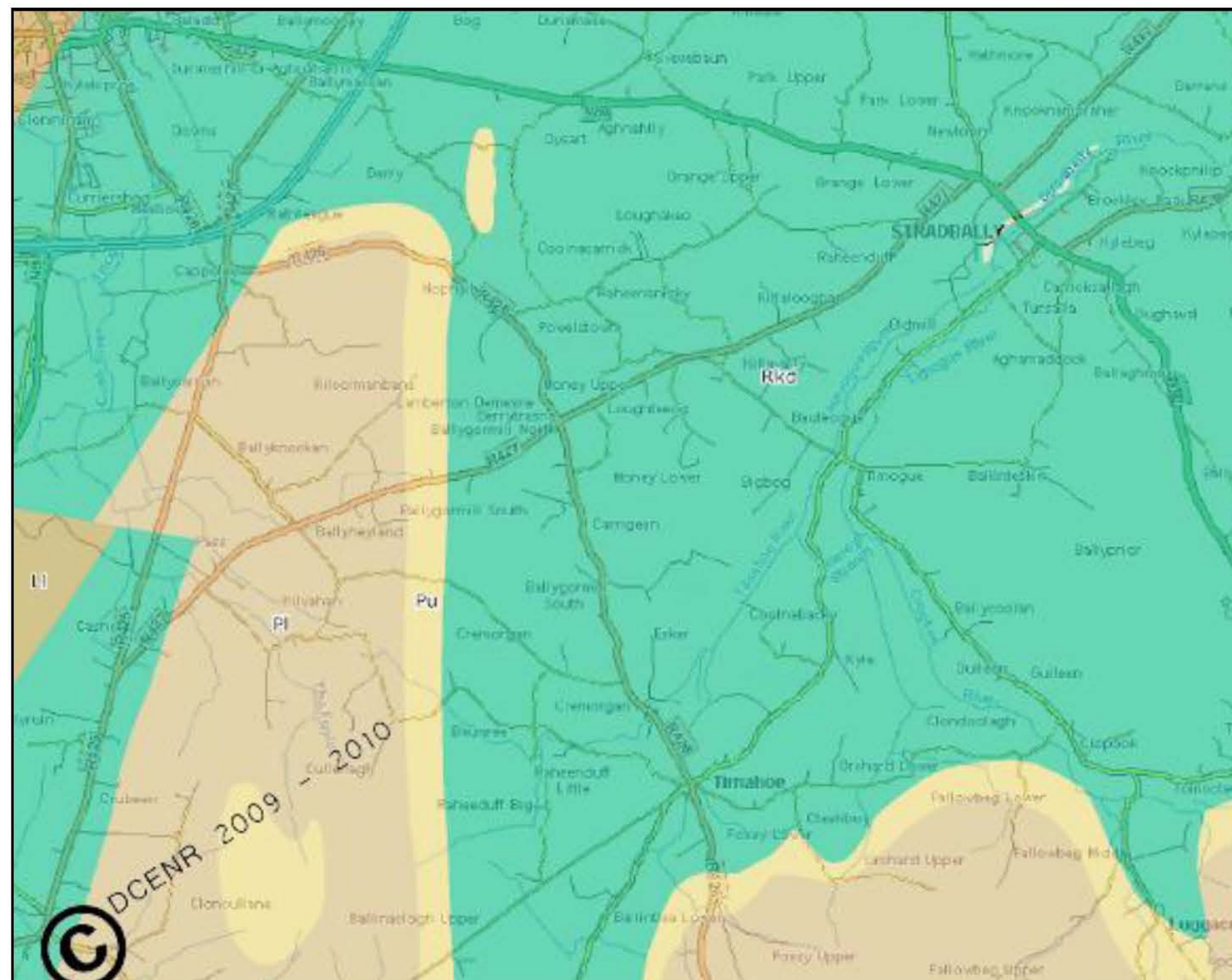
SMR Number:	LA018-005----
Class:	Enclosure
National Grid Reference (E,N):	252690, 194720
Townland(s):	POWELSTOWN
Record of Monuments and Places:	Yes
Description:	
Marked on the 1841 OS 6" map as a circular enclosure; on the 1909 ed., hachures indicate the site from NE-S (C c. 60m). No visible surface traces.	

SMR Number:	LA018-049002-
Class:	Settlement Cluster possible
National Grid Reference (E,N):	0, 0
Townland(s):	LOUGHTEEOG
Record of Monuments and Places:	No
Description:	
Unlocated settlement within townland mentioned in seventeenth century document as the town and landes of Loughticogue (O'Flanagan 1933, p. 97-8)	

SMR Number:	LA018-009----
Class:	Enclosure
National Grid Reference (E,N):	253591, 195358
Townland(s):	RAHEENANISKY
Record of Monuments and Places:	Yes
Description:	
Marked on the 1841 ed. OS 6" map as a large irregular enclosure. On the 1909 ed., only the S half (max. dim. C. 50m E-W) is hachured. No visible surface traces. According to local information, this was an orchard.	

Appendix E – Hydrology & Hydrogeology





- Rf - Regionally important, fissured bedrock aquifer, good development potential
- Rk - Regionally important, karst aquifer, good development potential
- Rkd - Regionally important, diffuse karst aquifer, good development potential
- Rkc - Regionally important, conduit karst aquifer, development potential limited
- Lm - Locally important, generally moderately productive
- LI - Locally important, generally moderately productive in local zones
- PI - Poor aquifer, generally unproductive except in local zones
- Pu - Poor aquifer, bedrock which is generally unproductive

Project
Laois - Kilkenny, 400kV
Substation Constraints

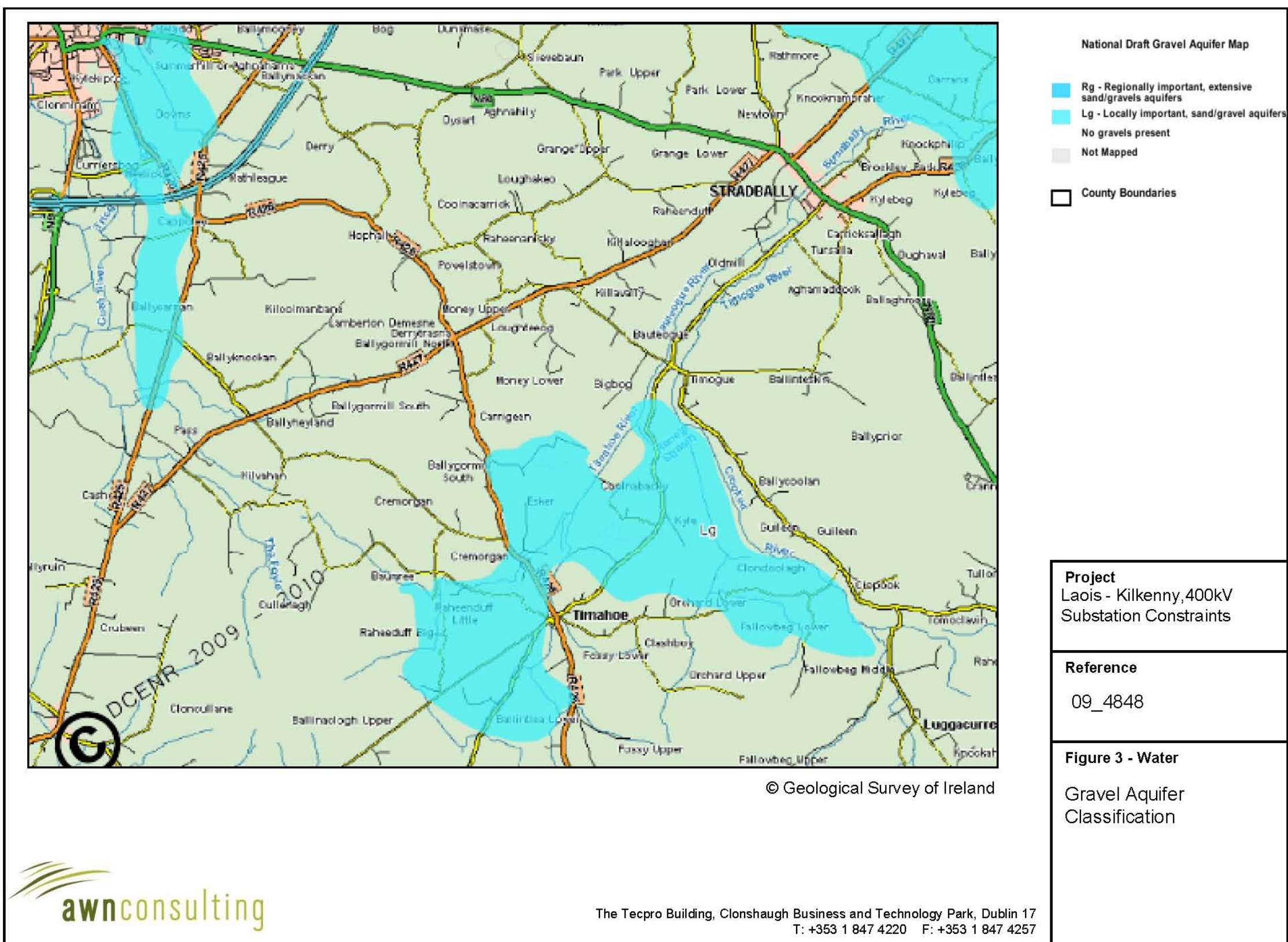
Reference
09_4848

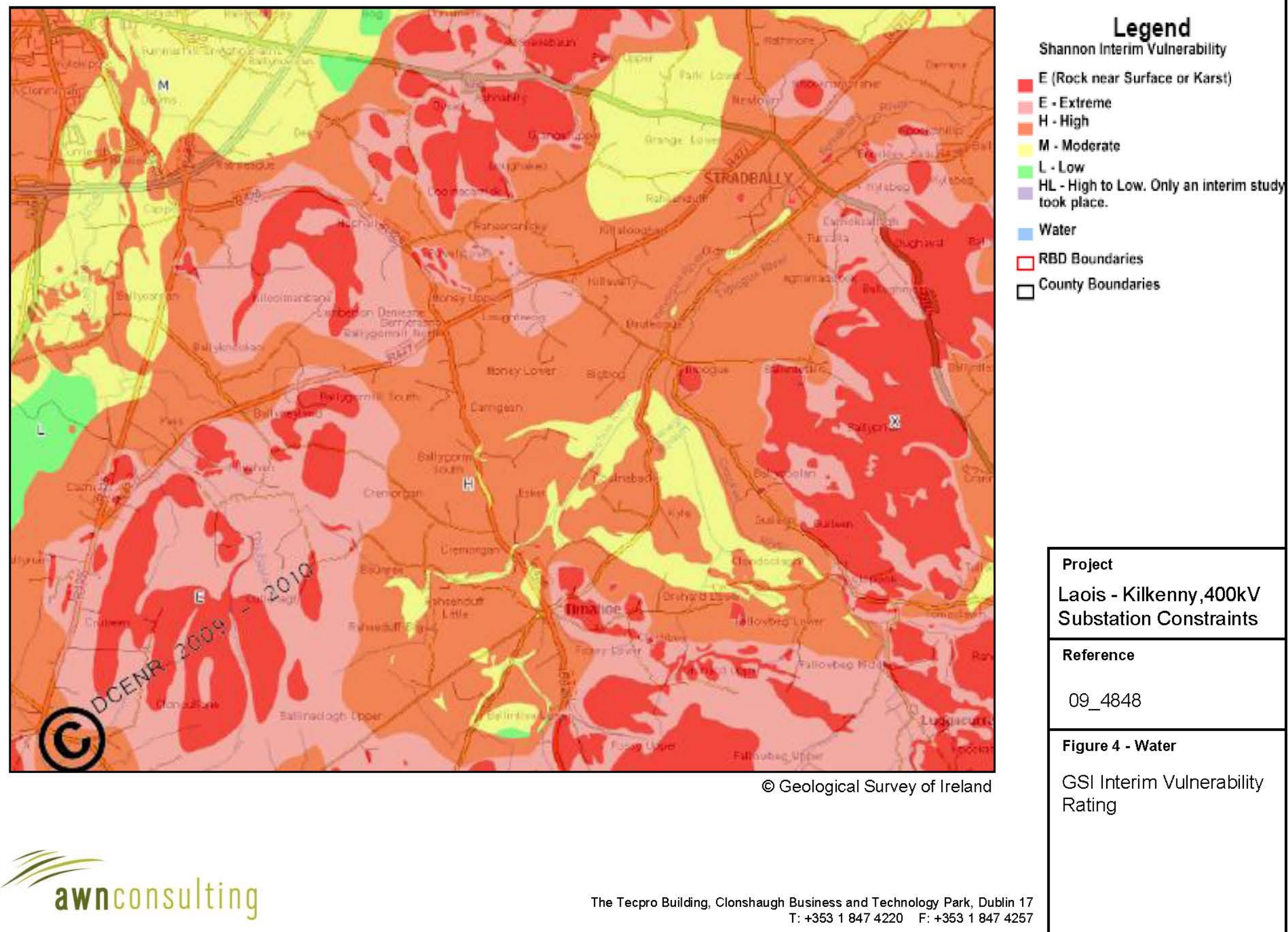
Figure 2 - Water
Bedrock Aquifer
Classification

© Geological Survey of Ireland

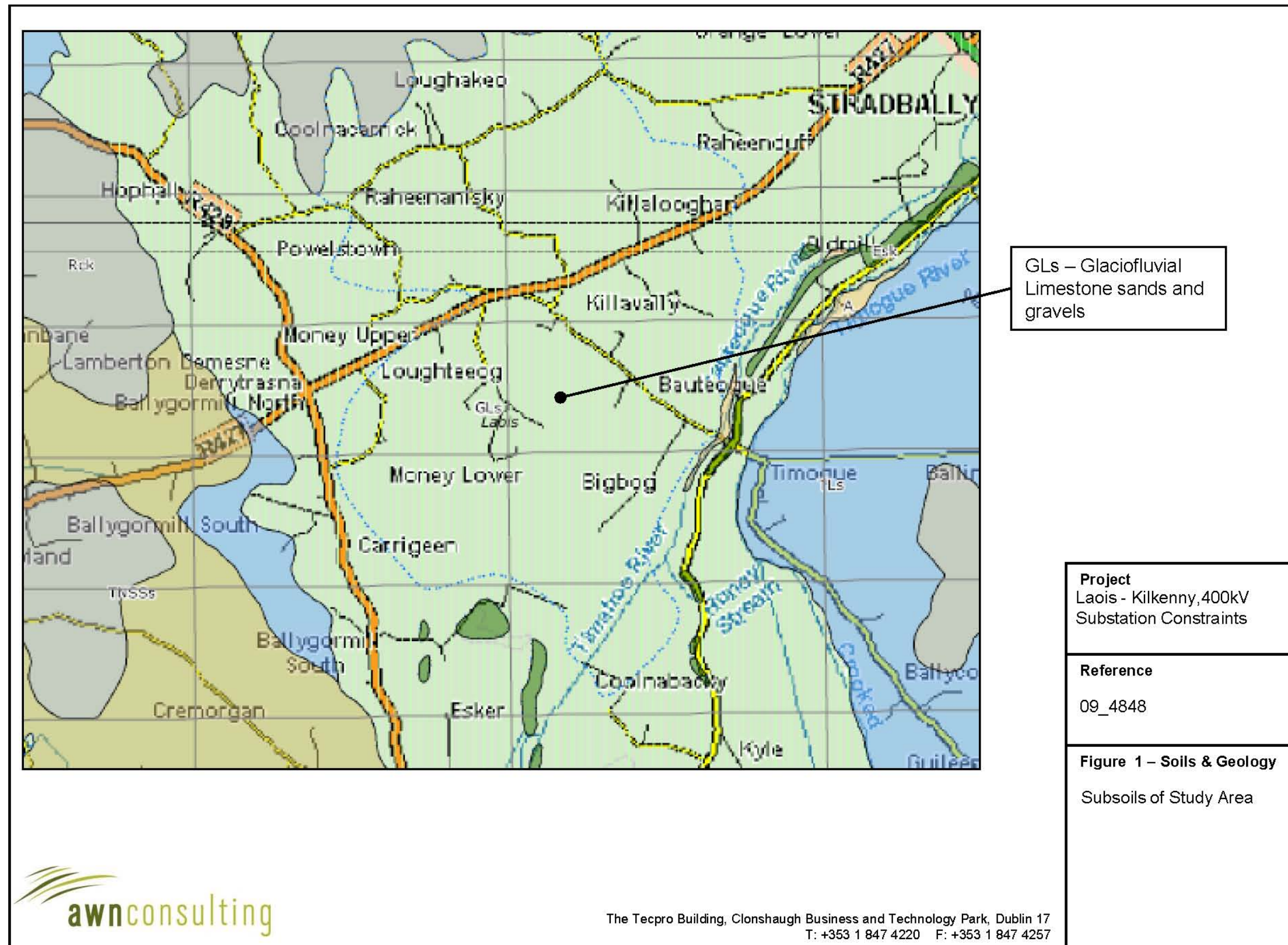


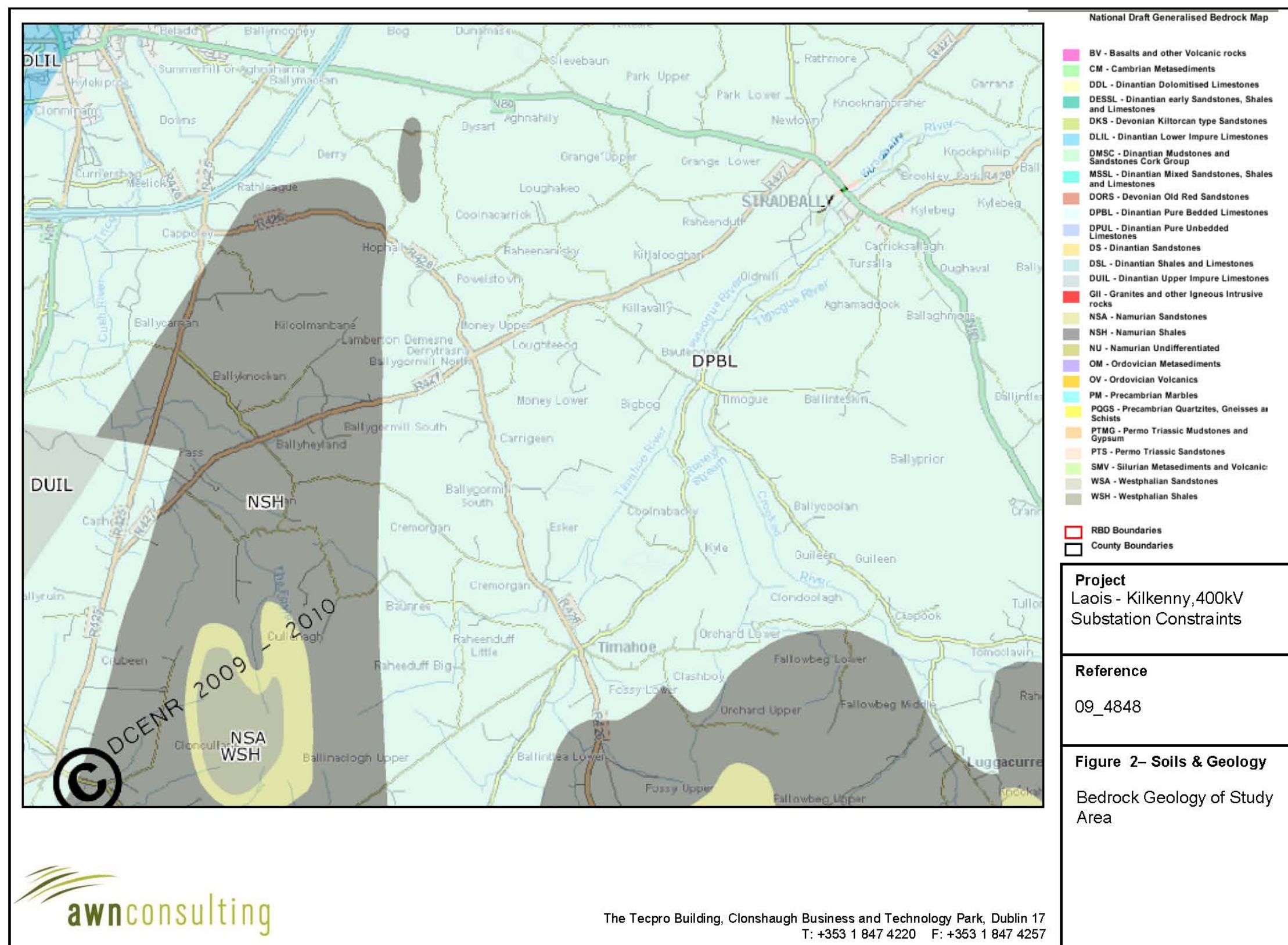
The Tecpro Building, Clonsaugh Business and Technology Park, Dublin 17
T: +353 1 847 4220 F: +353 1 847 4257



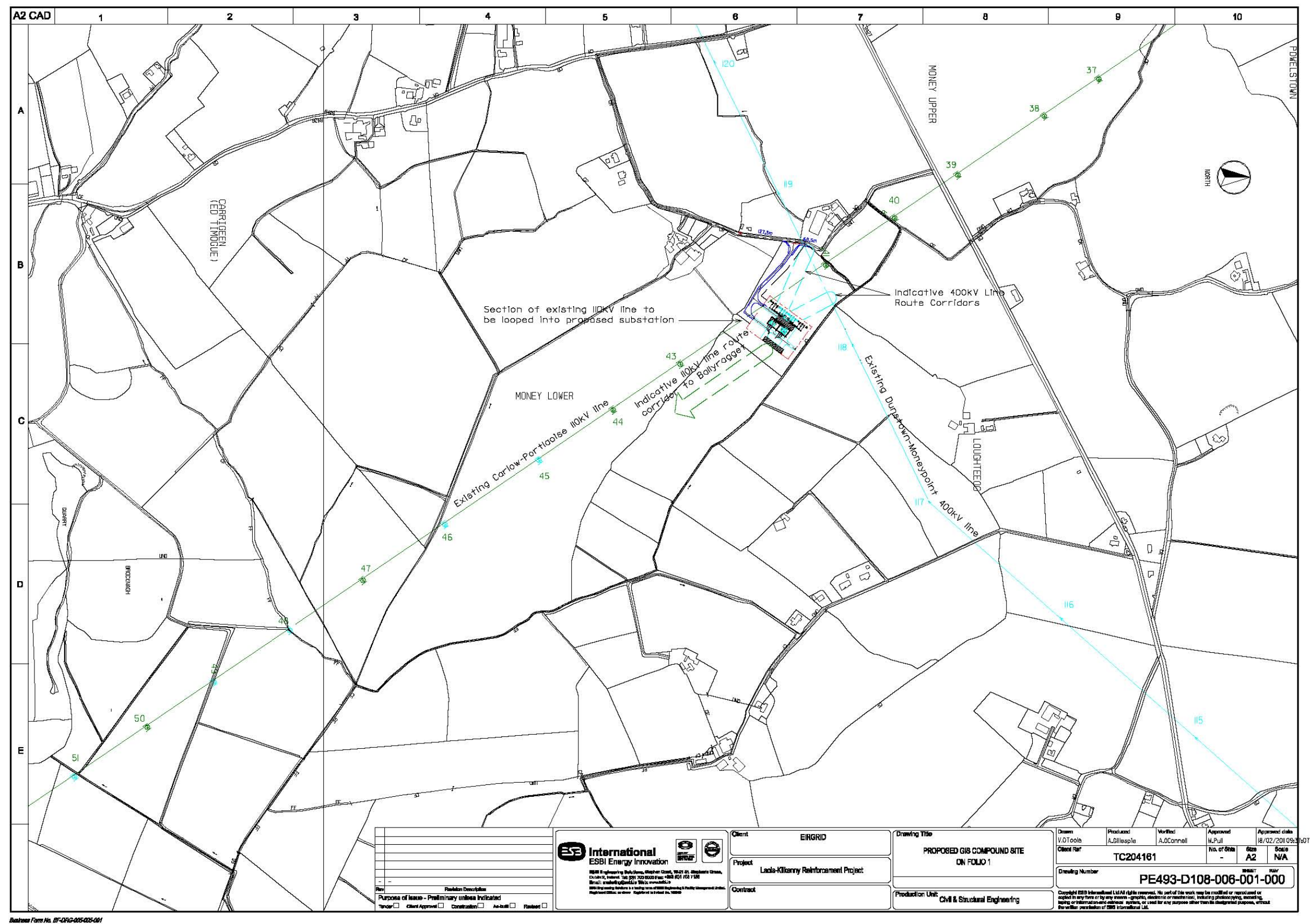


Appendix F – Soil & Geology

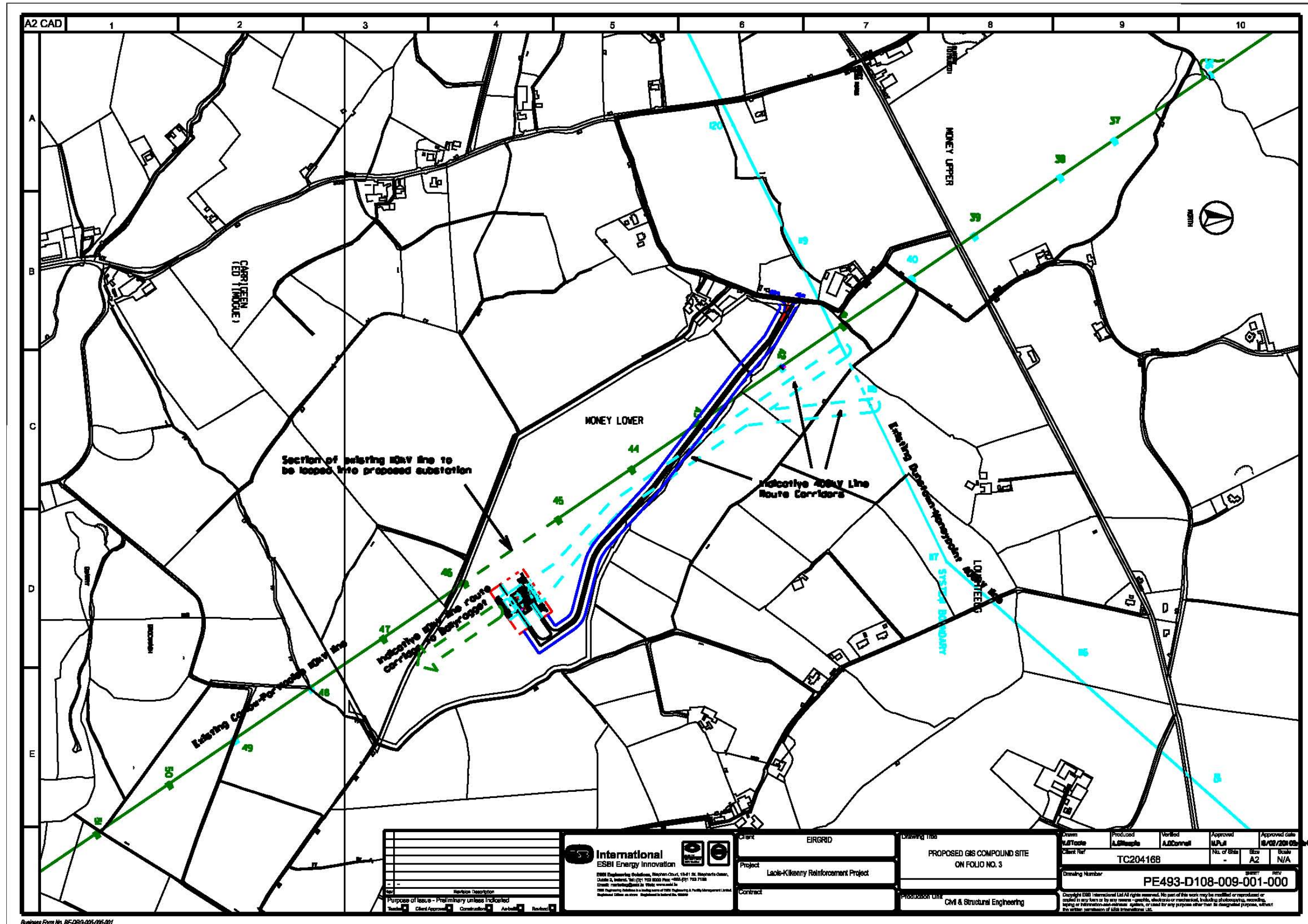




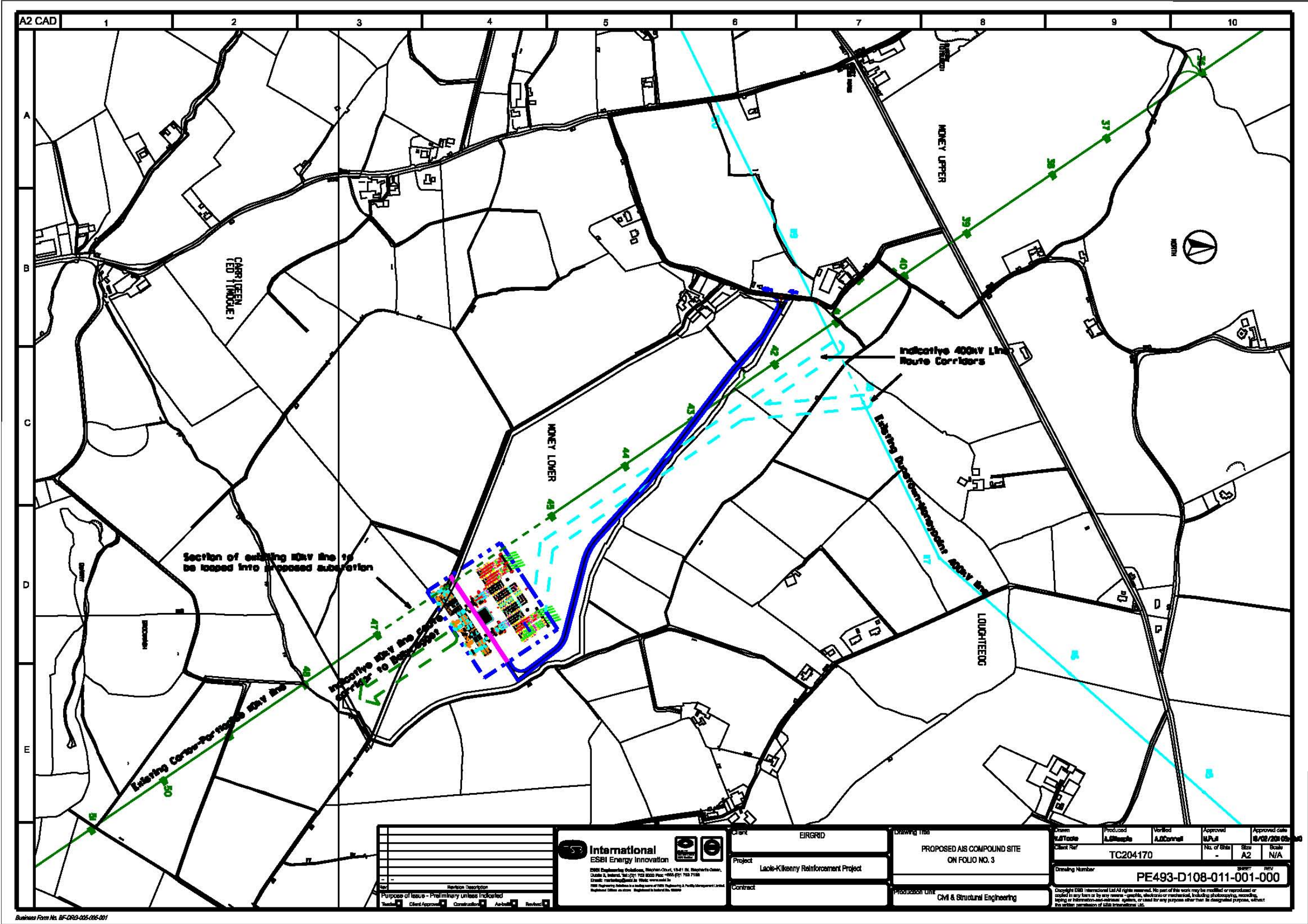
Appendix G – Proposed GIS Compound Site on Folio 1



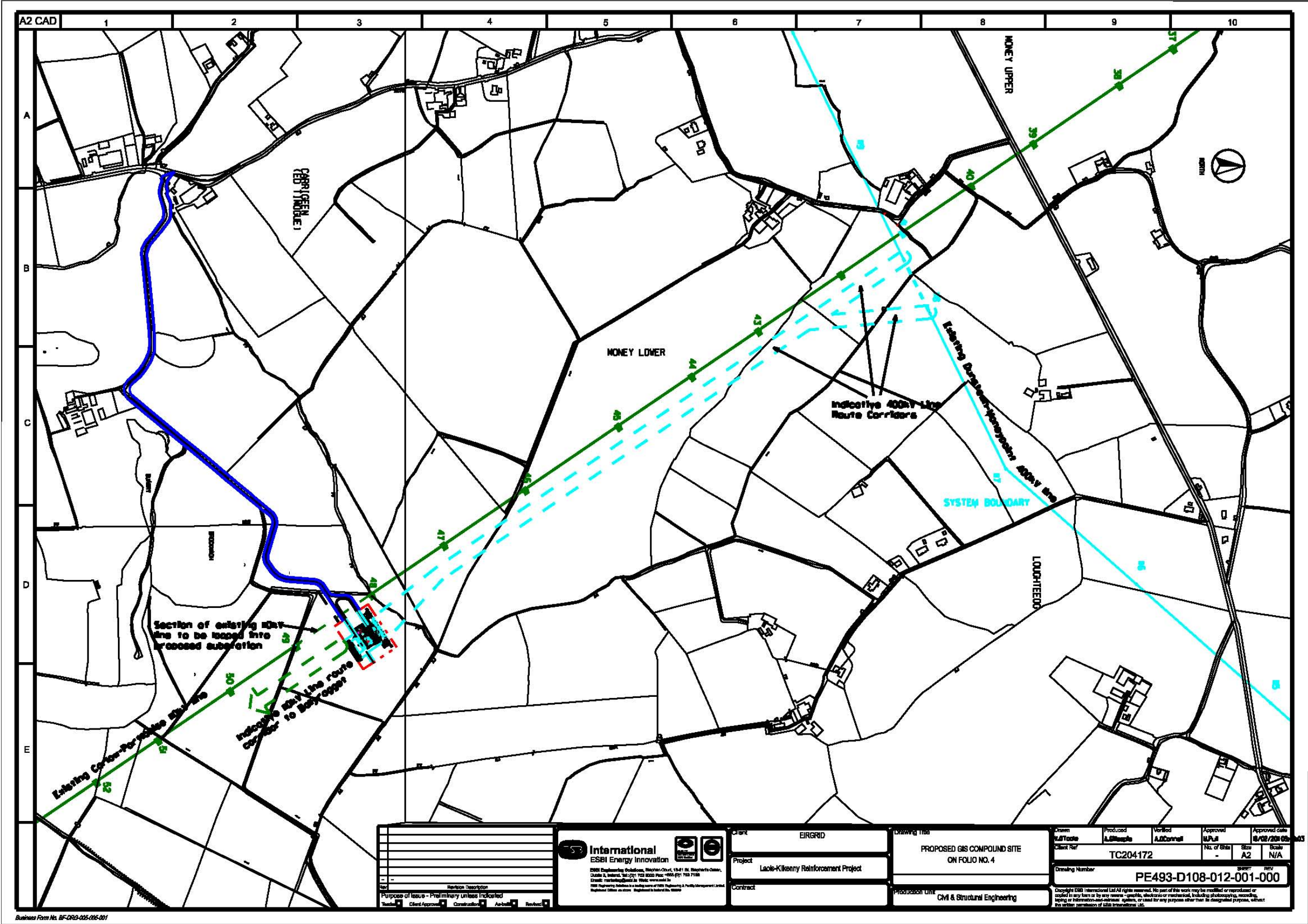
Appendix H – Proposed GIS Compound Site on Folio 3



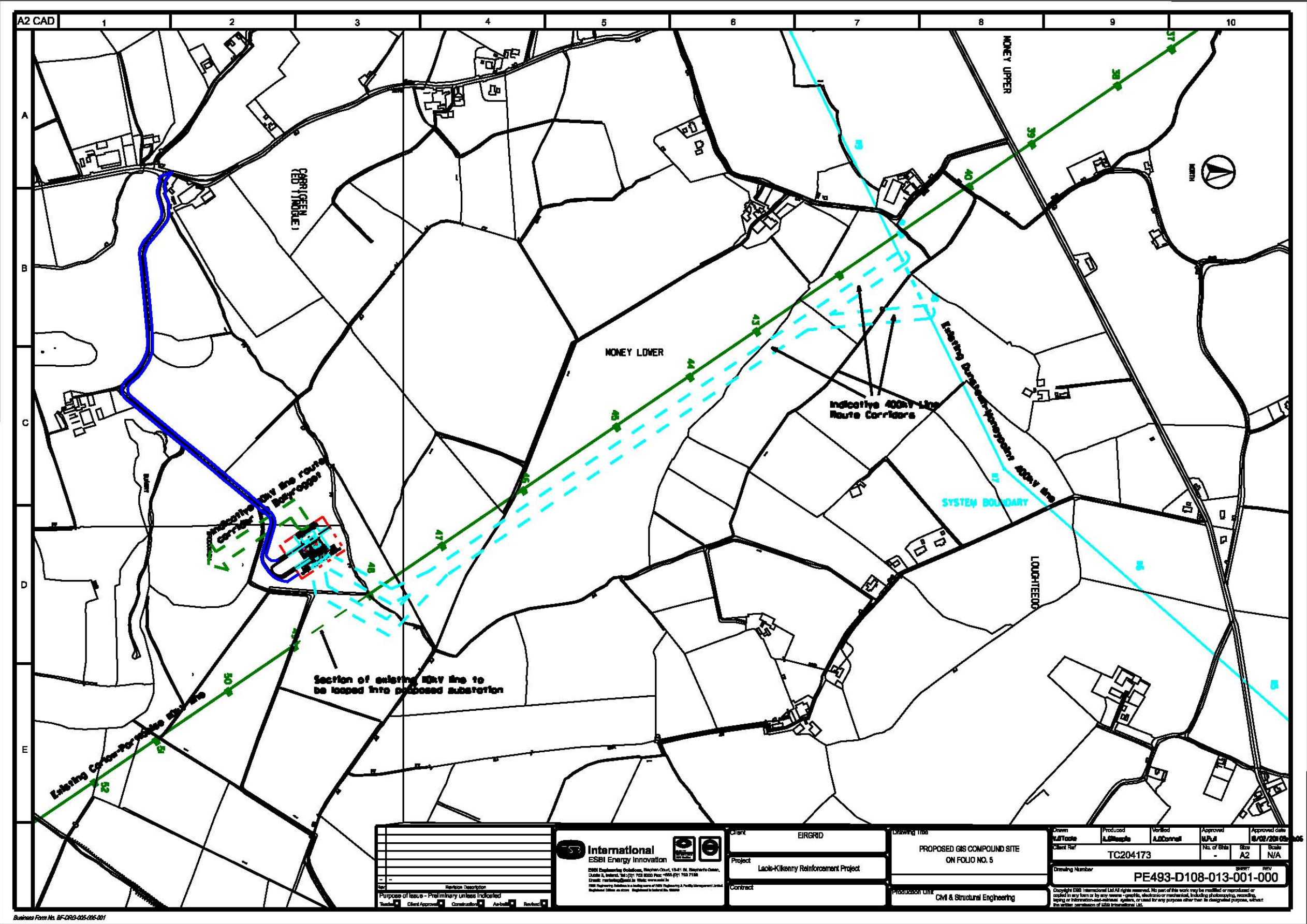
Appendix I – Proposed AIS Compound Site on Folio 3



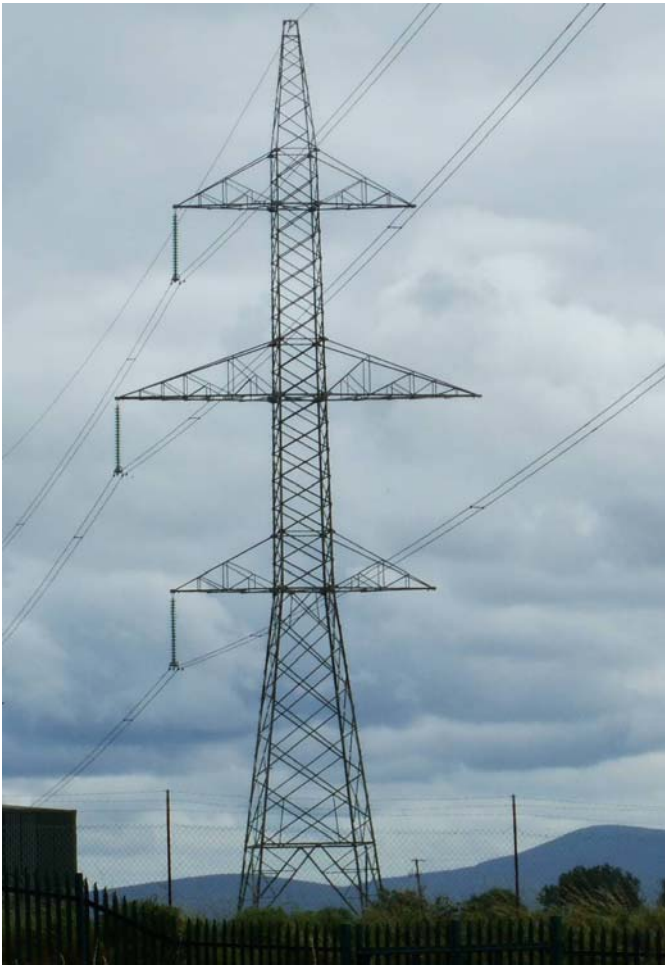
Appendix J – Proposed GIS Compound Site on Folio 4



Appendix K – Proposed GIS Compound Site on Folio 5



Appendix L - Photographs of Typical Overhead Line Structures



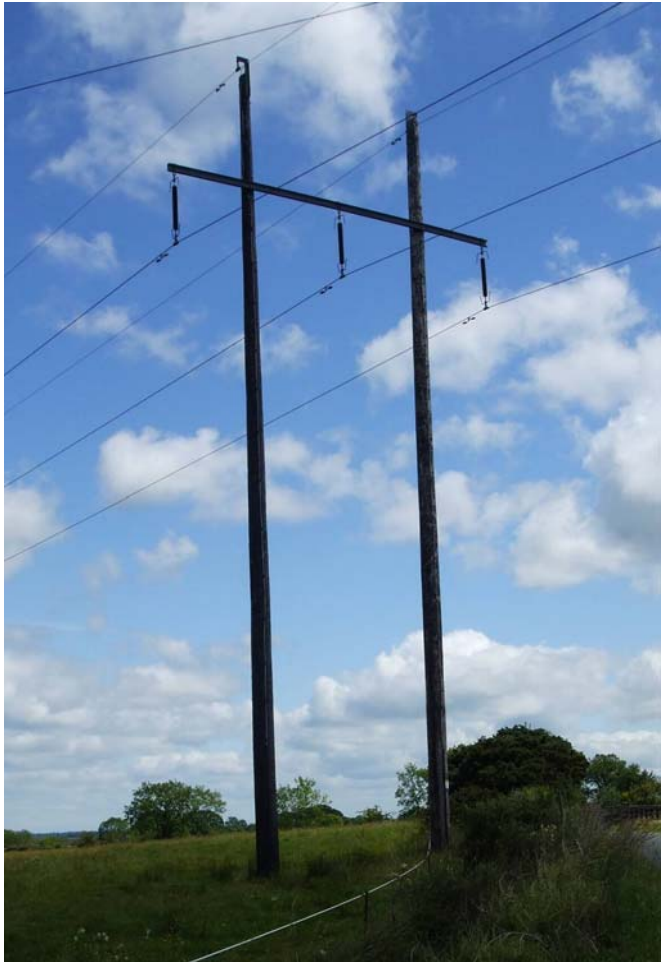
Indicative 400kV Double Circuit Intermediate Tower
Note: Only one side of this tower has conductor attached. The proposals outlined in this report will have conductor on both sides. The wire on top is known as an earthwire which protects the conductors from lightning strikes



Indicative 400kV Single Circuit Intermediate Tower



Indicative 110kV Single Circuit Angle Tower



Indicative 110kV Single Circuit Intermediate Poleset