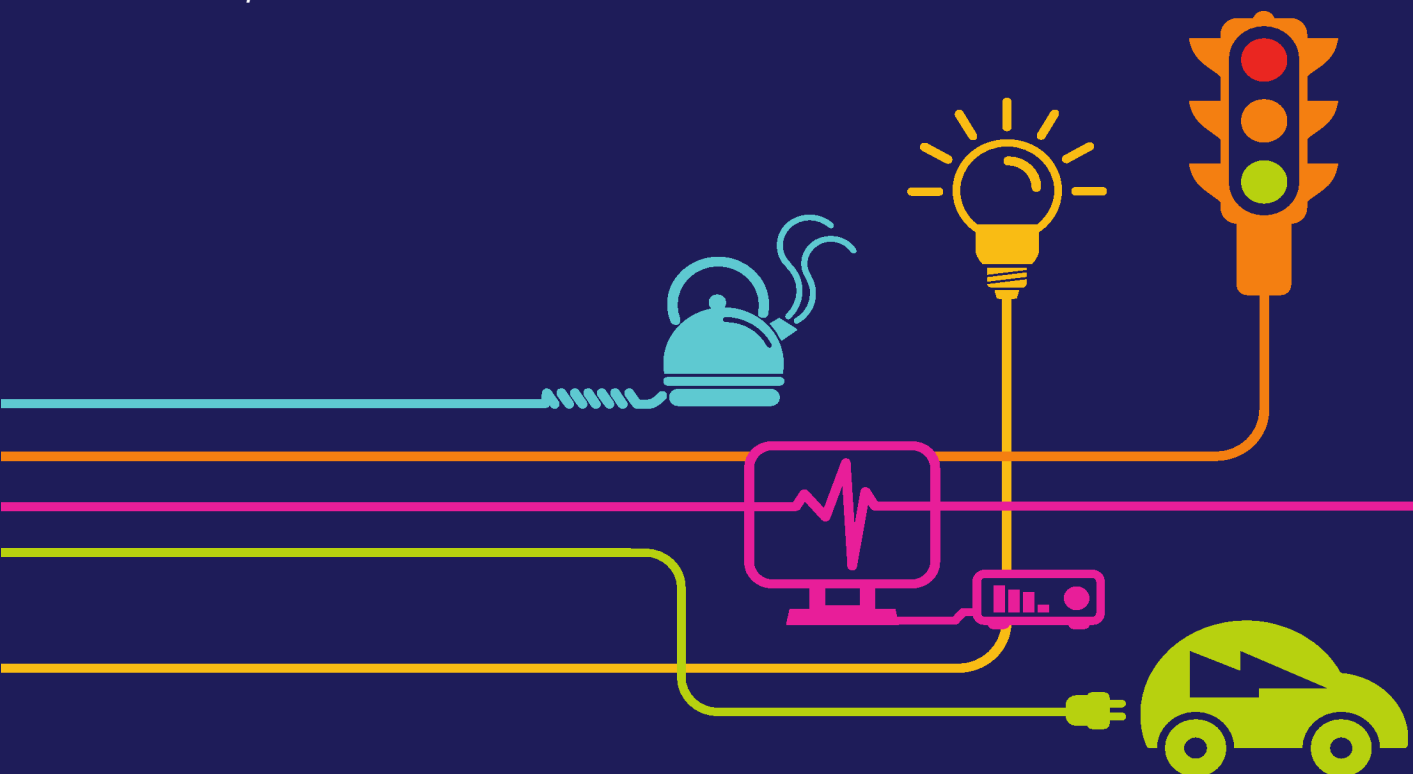


# Wylfa to Pentir Route Options Report (2015)

National Grid (North Wales Connection Project)

*Regulation 5(2)(a) of the Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009*

*First published October 2015*



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## EXECUTIVE SUMMARY

In January 2015, National Grid announced a preferred route corridor for the development of a new electricity transmission line connection between the proposed Wylfa Newydd Nuclear Power Station, on Anglesey, and the existing National Grid substation at Pentir, south-west of Bangor, in Gwynedd. The new connection would be additional to the existing overhead line, which needs to be retained. At the same time, National Grid stated that overhead lines would not be used to cross the Anglesey Area of Outstanding Natural Beauty (AONB) and the Menai Strait. The preferred route corridor broadly follows the route of an existing 400 kilovolt (kV) overhead line between the two sites, and had previously been presented for public consultation as the 'Orange Route Corridor'.

Subsequently, National Grid has identified potential route options, within the preferred route corridor, for a new overhead line between Wylfa and the Anglesey AONB at the Menai Strait, and between the Menai Strait and Pentir. The design of these route options has been informed by a range of environmental, socio-economic, technical and cost considerations identified through data gathering and site visits. A short-list of route options has been identified for public consultation in Autumn 2015 and this Route Options Report provides the background and detailed information, such as the factors influencing the short-listing selection, to inform feedback during this consultation process. Guided by National Planning Policy Statements EN-1 and EN-5, 100m wide route options were identified within which the alignment of a new 400kV transmission line could be developed. Some potential route options were aligned parallel or in close proximity to the existing overhead line, while non-parallel options have also been considered where appropriate.

Studies into the viability and routes for various underground construction techniques to cross the AONB and Menai Strait within a defined search area are on-going at the time of writing this report. However, an overview of the studies being undertaken and options being considered are presented in this report. Further consultation on the technology and location of the underground crossing of the Anglesey AONB and Menai Strait will be undertaken following completion of the crossing option feasibility studies.

This report concludes with an overview describing how these might be further refined and appraised in light of further assessment and consultation feedback, and how a single proposed route might then be selected.

For the purposes of providing a structure to identify and appraise route options, the Orange Route Corridor was divided into five sections:

- **Section 1: Wylfa Power Station to Rhosgoch**, comprising a predominantly linear route corridor along the route of the existing 400kV overhead line and passing Tregel, Cemaes and Llanfechell. Two route options are presented within this section: both broadly run parallel to the existing overhead line to the north, with one presenting a localised deviation away from the line to the east of Llanfechell.
- **Section 2: Rhosgoch to Llandyfydog**, passing between Rhosybol and Capel Parc to the east and Llyn Alaw reservoir to the west. Four route options to both sides of the existing line are presented in this section; three of these include localised deviations away from a parallel alignment to avoid particular features, whilst a fourth is routed to the west, closer to Llyn Alaw reservoir and Site of Special Scientific Interest (SSSI).
- **Section 3: Llandyfydog to the B5110 north of Talwrn**, encompassing the Capel Coch area and keeping east of Llanerchymedd. Three route options are presented in this section; two pass to the north and east of Capel Coch, but seek to avoid the sensitive locations of Cors Erddreiniog SSSI and National Nature Reserve, which is also part of the European protected Corsydd Môn (Anglesey Fens) Special Area of Conservation and Corsydd Môn a Llyn (Anglesey and Llyn Fens) Ramsar site. The third option is routed across a less constrained area to the west of Capel Coch and east of Llanerchymedd, with much of the route not being visible from points that currently experience views of the existing overhead line. This third

option spreads the visual impact of transmission development, but reduces the potential for cumulative effects.

- **Section 4: B5110 north of Talwrn to west of Star**, generally following a corridor around the existing overhead line between Llangefni and Talwrn to a point west of Star, where the existing overhead line turns sharply eastward. Two route options are presented in this section; both broadly parallel to the western side of the existing overhead line, with one presenting a localised deviation away from the line to the west of Talwrn.
- **Section 5: Menai Crossing Area** covering the overhead connection from west of Star to the search area for an underground cable crossing of the Anglesey AONB and Menai Strait, together with an overhead line connection from the Menai Strait to Pentir within Gwynedd. This section includes identification of potential zones for Sealing End Compounds to allow the overhead line to connect to the underground cabling; one compound is required on Anglesey and National Grid has already announced that this should be located outside the Anglesey AONB. At the other end of the cables routes, within Gwynedd, a second compound would be required and National Grid has acknowledged that this will need to be located outside the Vaynol Estate Registered Park and Garden.

Although the Orange Route Corridor was divided into sections, National Grid has considered the various ways in which the sections might be combined along the route. This has assisted in considering the merits of different combinations of short-listed route options. Zones where the routes might transfer from one side of the existing line to the other have also been identified in order to allow various combinations of route options to be achieved.

The Autumn 2015 consultation feedback will be considered alongside more detailed environmental, socio-economic, technical and cost appraisals so that National Grid is able to continue its work to identify a preferred route, between Wylfa and Pentir, within which the alignment of a new transmission line could be developed.

# 1 INTRODUCTION

## 1.1 Background

- 1.1.1 National Grid Electricity Transmission Ltd (National Grid) owns and operates the high-voltage electricity transmission system in England and Wales. National Grid has a statutory duty to promote competition in the supply of electricity and is obliged to offer to connect to the system anyone who applies for such a connection. Horizon Nuclear Power applied to National Grid to connect a proposed new nuclear power station to the system. The proposed power station would be within a site already identified for this type of development in the UK government's National Policy Statement (NPS) EN-6 'Nuclear Power Generation'. Throughout various changes to both the date and scale of the power station development, National Grid has remained contracted to connect this proposed power station. Therefore National Grid is developing proposals that would facilitate this connection by the contracted date of 2024/25.
- 1.1.2 National Grid already owns and operates an electricity substation at Wylfa, which the proposed nuclear power station would connect to. This substation is connected to the main interconnected transmission system in North Wales by a single 400 kilovolts (kV) overhead electricity line (see Figure 1.1). To provide reliable electricity supplies across Great Britain National Grid cannot allow more than 1,800 mega-watts (MW) of power generation to be connected by any single overhead line. As the Horizon Nuclear Power proposal is for a total output of 2,800 MW a second connection is required between Wylfa and the main interconnected transmission system. More details concerning the need for this second connection are set out in National Grid's published 'Need Case' document, which was revised in January 2015<sup>1</sup>.
- 1.1.3 National Grid has considered various means by which this second connection could be established. The strategic options identified represented a number of ways in which the power generated by the proposed nuclear station could be exported to a number of different points on the wider transmission system. National Grid consulted on these strategic options with stakeholders in 2012 and undertook a high-level appraisal of the environmental, socio-economic, technical and cost considerations associated with each. The responses from this initial consultation and the findings of the appraisal were taken into account and used to inform the selection of a preliminary preferred strategic option before presenting the appraisal findings for wider public consultation. National Grid's preliminary preferred strategic option involved the development of a second transmission connection between Wylfa and an existing National Grid substation at Pentir, on the mainland in Gwynedd. Taking into account the work undertaken at that time, it was considered that this connection could be wholly or largely achieved using an overhead transmission line.
- 1.1.4 Due to the number of other generation proposals in North Wales at the time of the appraisal, the preferred strategic option also involved the upgrading of existing National Grid transmission routes between Pentir and Deeside and between Pentir and Trawsfynydd, to remove 'bottlenecks' in the wider system. It was considered that this option was most likely to achieve an appropriate balance between National Grid's technical, economic, environmental and amenity obligations. The findings of this initial strategic options appraisal are set out in National Grid's published 'Strategic Options Report'<sup>2</sup> dated October 2012.

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<sup>1</sup> **National Grid (2015)** *North Wales Connections, Need Case* [on-line] Available at: <http://northwalesconnection.com/route-corridor-announcement.aspx>

<sup>2</sup> **National Grid (2012)** *North Wales Connections, Strategic Options Report* [on-line] Available at: <http://northwalesconnection.com/stage-one-consultation.aspx>

- 1.1.5 In response to subsequent changes in the scale and location of generation projects proposing to connect in North Wales since October 2012, and taking into account stakeholder responses to National Grid's initial round of consultation, a review of the strategic options appraisal has been undertaken. This review is recorded in the updated 'Strategic Options Report'<sup>3</sup> published in January 2015.
- 1.1.6 In parallel with the strategic options appraisal National Grid undertook an assessment of the constraints likely to influence the routeing of a new overhead transmission line between Wylfa and Pentir. This resulted in the identification of four possible route corridors across Anglesey which avoided the most sensitive parts of the island and within which a new overhead line might be developed. As almost the whole of the coastline of Anglesey facing the mainland is designated an Area of Outstanding Natural Beauty (AONB) it would not be possible to route an overhead line to Pentir that would avoid this nationally valued landscape. Five possible locations were identified for crossing the AONB and Menai Strait. Each of the route corridors identified across Anglesey could be connected to each of these crossing points through an area common to the four route corridors (known as the Southern Common Area). The work undertaken to identify the potential route corridors and crossing points is set out in National Grid's published 'Route Corridor Identification Report'<sup>4</sup>, dated October 2012.
- 1.1.7 National Grid presented these options as part of its public consultation undertaken in late 2012 and sought feedback on the relative merits and effects of developing an overhead line within these route corridors and crossing points. This consultation feedback has been considered and is summarised in National Grid's 'Stage 1 Consultation Feedback Report'<sup>5</sup> published in June 2014.
- 1.1.8 Following identification of a preferred strategic option, National Grid undertook further detailed appraisals of the likely effects that the development of an overhead line within each of the four route corridors and five crossing points might have. These appraisals took into account the feedback received during public consultation in 2012 and subsequent discussions with a number of statutory consultees. This work informed the selection of a preferred route corridor and a decision to adopt a technical solution that would avoid the need for an overhead line crossing of the Anglesey AONB and Menai Strait. In January 2015, National Grid announced the preference to take forward the Orange Route Corridor across Anglesey, which broadly follows the route of the existing overhead line across the island, and to avoid the use of an overhead line to cross the AONB and Menai Strait.
- 1.1.9 The Preferred Route Corridor Selection Report summarises that further appraisal work, and explains in more detail the main reasons why the Orange Route Corridor was considered to achieve the best balance of environmental, socio-economic, technical and cost impacts. It also explains why National Grid believes that an overhead line crossing of the AONB and Menai Strait would be inappropriate, in light of relevant planning policies. As such, it is an important document that should inform feedback to the Autumn 2015 consultation. The Preferred Route Corridor Selection Report records the alternatives considered and the main reasons for the decision taken at that stage, to be

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<sup>3</sup> **National Grid (2015)** *North Wales Connections, Strategic Options Report* [on-line] Available at: <http://northwalesconnection.com/route-corridor-announcement.aspx>

<sup>4</sup> **National Grid (2012)** *North Wales Connections, Wylfa-Pentir Initial Route Corridor Report* [on-line] Available at: <http://northwalesconnection.com/stage-one-consultation.aspx>

<sup>5</sup> **National Grid (2014)** *North Wales Connections, Stage One Consultation Feedback Report* [on-line] Available at: [http://nationalgrid.opendebate.co.uk/files/North\\_Wales\\_Connection\\_-\\_Feedback\\_Report.pdf](http://nationalgrid.opendebate.co.uk/files/North_Wales_Connection_-_Feedback_Report.pdf)

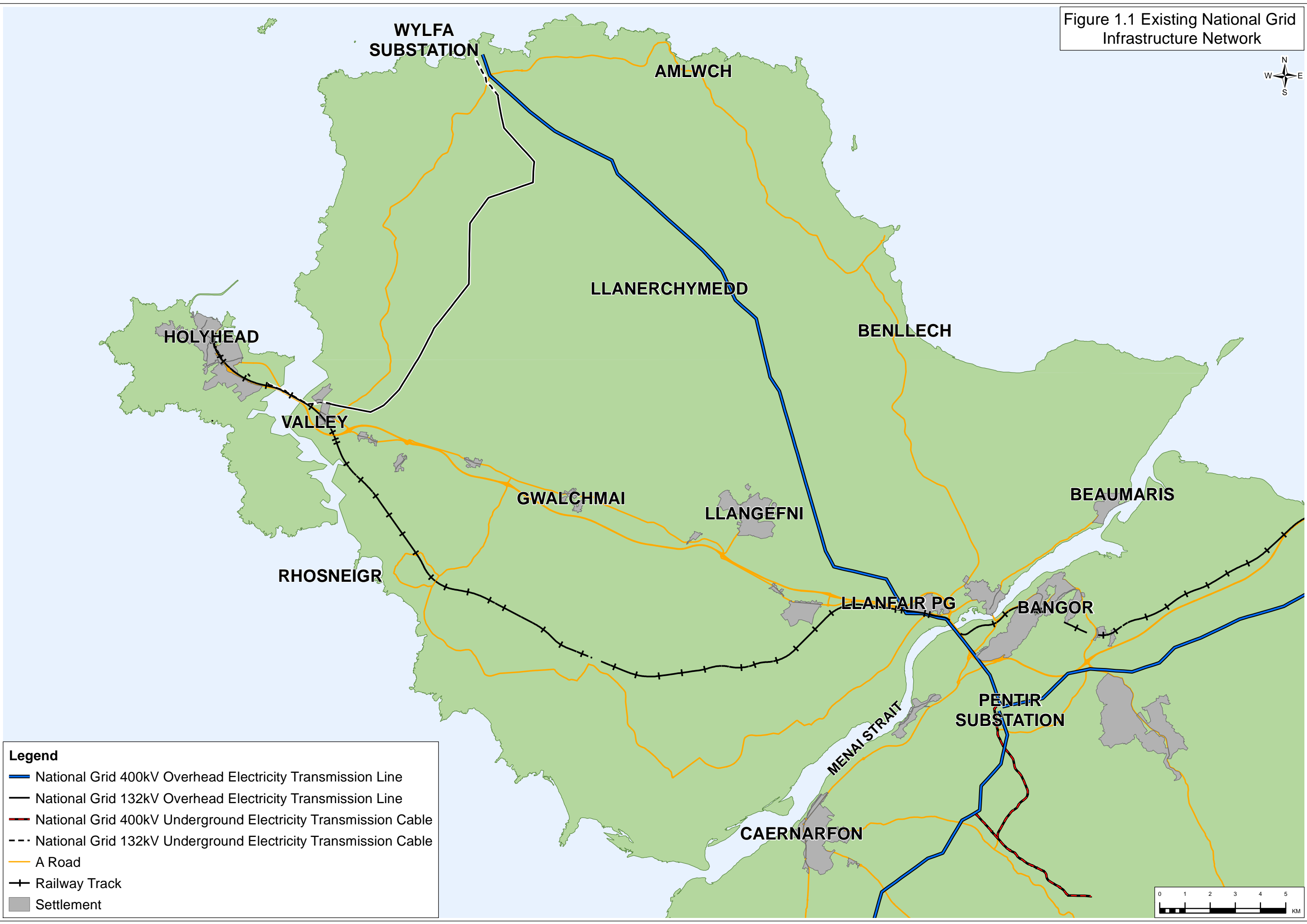
reported in any final Environmental Statement as required by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009.

- 1.1.10 The findings of the route corridor appraisal stage helped confirm the validity of the assumptions made in earlier documents. The findings have also been used to inform the review and updating of the strategic options appraisal as set out in the revised strategic options report published in January 2015.

## **1.2 Purpose of this Report**

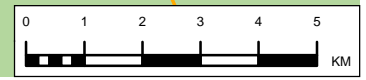
- 1.2.1 This report explains how National Grid has identified and screened potential route options for a new electricity transmission line, within the Orange Route Corridor, between Wylfa and the Anglesey AONB at the Menai Strait, and on the mainland side of the Menai Strait, in Gwynedd, to the Pentir Substation. The factors influencing the selection of the short-listed route options being taken forward are described. The report concludes with an overview describing how these might be further refined and appraised in light of further assessment and consultation feedback, and how a single proposed route might then be selected.
- 1.2.2 Studies into the viability and potential routes for various underground construction techniques to cross the AONB and Menai Strait are on-going at the time of writing this report. However, an overview of the studies being undertaken and options being considered are presented in this report.
- 1.2.3 The route options are to be presented for public consultation in Autumn 2015 and this report provides important background and detailed information that can be used to inform feedback during that consultation.
- 1.2.4 The Route Options Report considers only the appraisal of route options for a new transmission connection between Wylfa and Pentir. This report does not address any other works that National Grid may need to carry out to the existing transmission system on the mainland. These works are described in the Strategic Options Report. National Grid is contracted to have these works in place by 2020 in order to allow generation projects in the Republic of Ireland to connect to the National Grid system at Pentir by that date, substantially in advance of the Wylfa to Pentir connection works, which are needed by 2024/5. Therefore, works on the mainland will be the subject of separate appraisals, consultations and applications for consent. National Grid will continue to keep this position under review as the project progresses, in consultation with stakeholders.

Figure 1.1 Existing National Grid Infrastructure Network



**Legend**

- National Grid 400kV Overhead Electricity Transmission Line
- National Grid 132kV Overhead Electricity Transmission Line
- National Grid 400kV Underground Electricity Transmission Cable
- - - National Grid 132kV Underground Electricity Transmission Cable
- A Road
- + Railway Track
- Settlement



## 1.3 Report Layout

1.3.1 This report describes how the route options for a new Wylfa to Pentir transmission connection within the Orange Route Corridor were identified. The report is structured as follows:

- **Chapter 2:** describes National Grid's duties and policies, including its duty to provide a connection taking account of commercial considerations, and its duty to protect the environment.
- **Chapter 3:** provides the background to the project, examining the development of the Wylfa to Pentir connection options, prior to selection of a preferred route corridor.
- **Chapter 4:** introduces the policy framework within which the proposed Wylfa to Pentir scheme will be evaluated at the Development Consent Order (DCO) determination stage, and includes reference to NPSs, Welsh national policy, and local development plan documents and guidance.
- **Chapter 5:** explains the engineering approaches and technologies available for the implementation of major transmission connections, including overhead lines, underground cables and substations.
- **Chapter 6:** summarises the guidelines and approach to the identification of the route options, and the scope of topics used to appraise the options.
- **Chapter 7:** explains the engagement which has taken place with both statutory and non-statutory stakeholders during the development and selection of route options.
- **Chapter 8:** describes the identification of all considered route options and the approach to selecting the route options for consultation in the area between Wylfa and the Menai approach.
- **Chapters 9 to 12:** describes the baseline considerations, identification and appraisal of route options between Wylfa and the Menai approach, which lead to selection of those route options being presented for consultation in Autumn 2015.
- **Chapters 13 to 15:** describes the baseline considerations, feasibility studies and appraisals to identify options for the non-overhead crossing of Anglesey AONB and the Menai Strait plus the respective overhead connection options back to the Anglesey route options presented in Chapters 9 to 12 and Pentir substation on the mainland in Gwynedd.
- **Chapter 16:** presents a summary of the next steps for the North Wales Connection project.



## 2 NATIONAL GRID DUTIES AND POLICIES

### 2.1 Introduction

- 2.1.1 National Grid is the owner of the high-voltage electricity transmission system in England and Wales and operates the transmission system across the whole of Great Britain. The transmission system carries electricity from power generators (e.g. nuclear power stations and wind farms) to regional substations.
- 2.1.2 The transmission system in England and Wales consists of approximately 7,200 kilometres (km) of overhead lines and a further 700km of underground cabling, operating mainly at 400kV and 275kV. The overhead lines and cables connect around 340 substations to form a highly interconnected network. The substations provide points of connection to the local distribution networks that operate at lower voltages, from 132kV down to 240V for distribution to domestic consumers. These local distribution networks are owned by Distribution Network Operators, such as SP Manweb (Scottish Power Energy Networks) in north Wales.
- 2.1.3 National Grid has duties placed upon it by the Electricity Act 1989, and operates under the terms of its transmission licence. Those duties and terms relevant to the proposed Wylfa to Pentir connection are set out below.

### 2.2 Duty to Provide a Connection

- 2.2.1 Under Section 9(2) of the Electricity Act 1989, National Grid has a duty to “*facilitate competition in the supply and generation of electricity*”. Therefore, National Grid must do what it can to provide the connection of new power generation to the transmission system.
- 2.2.2 When a power generation developer applies for a connection to the national transmission system, National Grid has a statutory obligation under the terms of its transmission licence to offer a new connection, or to modify an existing connection.
- 2.2.3 Condition C8 (requirement to offer terms) of National Grid’s operating licence also requires the connection agreement to set a date by when any works required to permit access to the transmission system (including any works to reinforce or extend the transmission system) shall be completed.
- 2.2.4 As a result of an application by Horizon Nuclear Power for the connection of their proposed Wylfa Newydd Power Station, National Grid’s subsequent offer and the completed ‘Connection Agreement’ contract, National Grid has a contractual obligation to endeavour to provide a transmission connection to the proposed new power station by 2024/25.

### 2.3 Economic Duties

- 2.3.1 Section 9(2) of the Electricity Act 1989 also requires National Grid to “*develop and maintain an efficient, co-ordinated and economical system of electricity transmission*”. National Grid is also regulated by the Office of Gas and Electricity Markets (OfGEM), which sets the level of charges that National Grid is allowed to make for the use of the transmission system. These charges are indirectly passed on to consumer bills, so OfGEM also seeks to prevent unnecessarily high levels of cost when developing the transmission system. These statutory and licence obligations to develop the transmission system economically and efficiently are necessarily important considerations for National Grid.

## 2.4 Duty to Protect the Environment

2.4.1 As the holder of the electricity transmission licence for England and Wales, National Grid has a statutory duty to consider the amenity impacts of its work. When formulating a proposal to develop an overhead electricity line, or carry out other works to the transmission system, Schedule 9(1) in Section 38 of the Electricity Act 1989 specifically requires National Grid to:

*“have regard to the desirability of preserving natural beauty, of conserving flora, fauna and geological or physiographical features of special interest and or protecting sites, buildings and objects of architectural, historic or archaeological interest; and shall do what it reasonably can to mitigate any effect which the proposals would have on the natural beauty of the countryside on such flora, fauna, features, sites, buildings or objects.”*

2.4.2 When determining any application for consent to undertake works to the transmission system, the Secretary of State for Energy and Climate Change must also consider the extent to which National Grid has complied with these duties.

2.4.3 As a statutory undertaker, National Grid also has other duties relating to amenity and environmental considerations. In relation to designated landscapes, the National Parks and Access to the Countryside Act 1949 and the Countryside and Rights of Way Act 2000, require all statutory undertakers to have regard to the purposes of National Parks and AONBs respectively when carrying out their statutory duties. Government guidance acknowledges that *“the duties do not override particular obligations or considerations which have to be taken into account by relevant authorities in carrying out any function”*, but goes on to explain that the purposes of designating nationally protected landscapes need to be *“recognised as an essential consideration in reaching decisions or undertaking activities that impact on those areas”*.

## 2.5 Stakeholder, Community and Amenity Policy

2.5.1 National Grid's Stakeholder, Community and Amenity Policy<sup>6</sup> sets out how the company will work with stakeholders and communities to meet the environmental duties placed on it by Schedule 9 of the Electricity Act and includes ten commitments. Of particular relevance to this stage of project development are the following:

- Establishing need.
- Involving stakeholders and communities.
- Routeing of networks and site selection – seeking to avoid areas which are nationally or internationally designated for their landscape, wildlife or cultural significance.
- Minimising the effects of works and new infrastructure on communities, by having particular regard to safety, noise and construction traffic, and on areas which are nationally or internationally designated for their landscape, wildlife or cultural significance and other sites valued for their amenity such as listed buildings, conservation areas, areas of archaeological interest, local wildlife sites, historic parks and gardens and historic battlefields (taking into account the significance of these and other areas through consultation with local authorities and other stakeholders with particular interests in such sites).

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<sup>6</sup> **National Grid (2010)** *National Grid's commitments when undertaking works in the UK: Our stakeholder, community and amenity policy* [on-line] Available at: <http://northwalesconnection.com/supporting-information-and-factsheets.aspx>

- Mitigating adverse effects of works – through the application of environmental assessment techniques.

## 2.6 Transmission Line Route Options Appraisal Process

- 2.6.1 In 2012, National Grid published a document entitled '*Our Approach to the design and routeing of new electricity transmission lines*<sup>7</sup>', which sets out how the most appropriate route and technology for any new transmission line should be identified in order to best satisfy society's needs. It also sets out how National Grid will collect data, undertake research and analysis, consult stakeholders and communities and listen to feedback to inform National Grid's judgements.
- 2.6.2 Further guidance on how the appraisal of competing design options should be undertaken is explained in a second National Grid document: '*Our Approach to Options Appraisal*<sup>8</sup>'. A summary of the stages that have been undertaken to date and the stages to be undertaken are illustrated in Figure 2.1.
- 2.6.3 The Strategic Options and route corridor options appraisal studies represent the first stages in the consenting process for the Wylfa to Pentir transmission connection project. Once a preferred route corridor and alignment is selected, National Grid will proceed through the Environmental Impact Assessment (EIA) stages of the process before submitting a DCO application. Many activities will need to be planned and delivered, but these will be undertaken in consultation with statutory consultees, non-statutory stakeholders and local communities before an application for development consent is made to the Secretary of State alongside any other applications for required consents.

## 2.7 Other Legislation

- 2.7.1 In addition to the Electricity Act 1989, during development of the Wylfa to Pentir transmission connection, National Grid will have to comply with other national legislation and regulations relating to consenting works and protecting the environment; for example (but not limited to):
- The Planning Act 2008.
  - The Infrastructure Planning (Environmental Impact Assessment) Regulations 2009.
  - The Conservation of Habitats and Species Regulations 2010 (as amended).
  - The Countryside and Rights of Way Act 2000.
  - The Wildlife and Countryside Act 1981 (as amended).
  - The Heritage Bill – planned to be implemented in Wales in 2015.
- 2.7.2 Chapter 4 considers in further detail those planning policies relevant to this project.

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<sup>7</sup> **National Grid (2010)** *Our approach to the design and routeing of new electricity transmission lines* [on-line] Available at: <http://northwalesconnection.com/supporting-information-and-factsheets.aspx>

<sup>8</sup> **National Grid (2010)** *Our approach to options appraisal* [on-line] Available at: <http://northwalesconnection.com/supporting-information-and-factsheets.aspx>

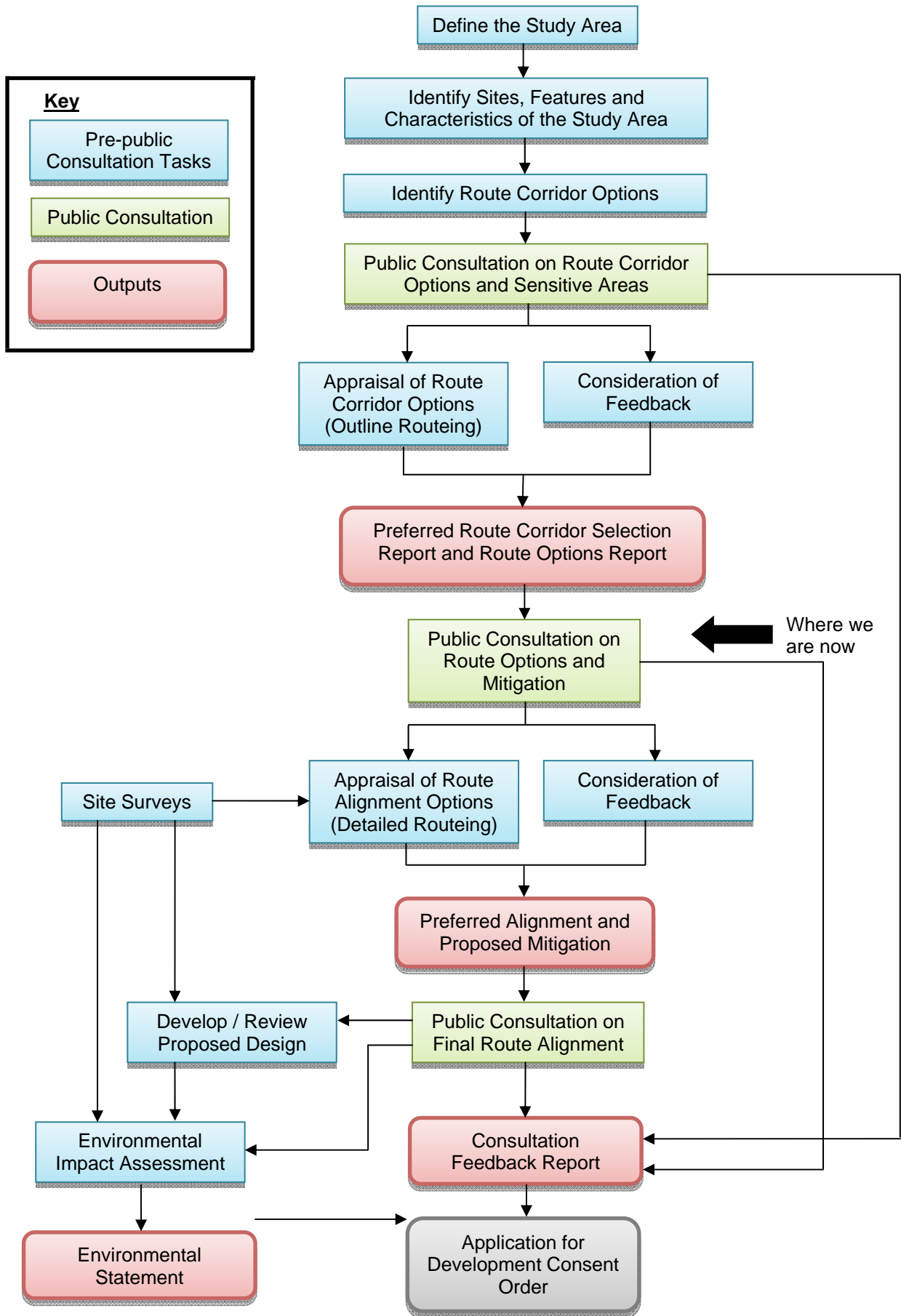


Figure 2.1 Route Selection Methodology

## 3 PROJECT BACKGROUND

### 3.1 The UK Energy Challenge

- 3.1.1 The UK is facing a major challenge to meet projected energy needs over the coming decades, while at the same time tackling climate change. A significant challenge for National Grid and the UK energy industry is to deliver low carbon energy in an affordable, secure and sustainable way. This is a challenge that will require an estimated £110 billion of investment in electricity generation and transmission up to 2020 to transform the UK's energy infrastructure.
- 3.1.2 The majority of electricity is currently generated by burning gas or coal and by nuclear power stations. However, there is potential for around 20 per cent of generating capacity to be removed from the electricity transmission network by 2020, as a proportion of existing power stations close because they have reached the end of their operating lives or are unable to meet the requirements of climate change legislation. This means that a major investment in new electricity generation is needed to replace power stations due for closure to meet future electricity demand.
- 3.1.3 At the same time, North Sea oil and gas are in decline, so Britain's gas-fired power stations are becoming increasingly dependent on imports. Even if existing coal-fired power stations could meet EU emissions legislation, the domestic coal industry is no longer the major force it once was. Therefore, Britain is no longer self-sufficient in energy and is increasingly reliant on imports. The movements in global energy markets have underlined concerns about the price and security of future electricity supplies
- 3.1.4 Tackling climate change will also have a significant influence on the electricity industry. Burning fossil fuels, such as gas and coal, to generate electricity creates large quantities of carbon dioxide (CO<sub>2</sub>), which is a major greenhouse gas. The UK government is committed to reducing emissions by 34% from 1990 levels by 2020 and this will mean a move from 4% of energy being produced from renewable sources (in 2012) to 15% from renewable sources by 2020.
- 3.1.5 The UK energy market needs electricity from renewable sources such as wind power, and also from nuclear power, to help tackle climate change and enable the country to meet its national and international obligations. The introduction of new wind and nuclear power generation over the next few years will require a reinforcement and extension of the existing electricity transmission system.

### 3.2 North Wales Transmission System

- 3.2.1 Electricity generation in North Wales is currently conveyed to the main interconnected transmission system in England and Wales via three 400kV transmission lines:
- Wylfa to Pentir (across Anglesey and Menai Strait);
  - Pentir to Connaught Quay (running parallel to the North Wales coast); and
  - Pentir to Trawsfynydd and Trawsfynydd to Connaught Quay / Legacy (Wrexham).
- 3.2.2 All of the overhead lines carry two transmission circuits, with the exception of the route between Pentir and Trawsfynydd which carries a single transmission circuit, limiting the transmission capacity of the whole North Wales area. This capacity is further limited by the three underground transmission cables that cross the Glaslyn Estuary at Porthmadog.
- 3.2.3 A new, additional electricity transmission connection to the mainland transmission system is needed to facilitate the connection of the proposed Wylfa Newydd Power

Station. The NPS for Energy (EN-1<sup>9</sup>) acknowledges the need for new lines to be built to connect new nuclear power stations.

- 3.2.4 Further information on the North Wales transmission system and the project need case is provided in the *North Wales Connection Project: Project Need Case* (National Grid 2015)<sup>10</sup>.

### 3.3 Strategic Options Appraisal

- 3.3.1 In 2012, National Grid identified a range of options for the locations where the power from the proposed Wylfa Newydd Power Station could be connected to the main interconnected transmission system, and how that power might be transmitted there. Five 'strategic options' were identified as a result; four involving sub-sea cabling to either Pentir, Deeside (Connahs Quay) or Pembroke. The option involving an onshore connection to Pentir, and crossing the Menai Strait, considered employing a range of possible transmission technologies, including both overhead line and buried cables for the whole of the distance. These five strategic options were appraised against a range of environmental, socio-economic, technical and cost topics, in discussion with officers from statutory consultees. National Grid's appraisal concluded that the 'preliminary preferred option was an overhead line between Wylfa and Pentir with appropriate mitigation, potentially including the use of underground technologies'.

- 3.3.2 The strategic option appraisal and conclusions were reported in National Grid's Strategic Options Report published in October 2012. The report also advised that certain assumptions had been made including:

*"...that adequate mitigation of landscape and visual and other impacts will be possible between Wylfa and Pentir. As indicated such mitigation potentially includes the use of underground technologies for parts of the route. ... In this context early feedback from key statutory consultees has already raised concerns about the sensitivity of the Anglesey AONB to overhead line development which would be considered in more detail at the next stage of options appraisal."*

- 3.3.3 National Grid took forward the overland Wylfa to Pentir connection element of the preliminary preferred Strategic Option to the next stage of appraisal. This sought to identify a potential suitable route for the connection and locations where the use of underground technologies might be appropriate.

- 3.3.4 In parallel with this work, National Grid has: reviewed and taken into account consultation feedback from the consultation stage undertaken in 2012; considered the implications of subsequent changes to the volume and location of new power generation projects seeking to connect to the transmission system in North Wales; and considered the findings of the more detailed appraisal of route corridors summarised in this Preferred Route Corridor Selection Report. As a consequence, National Grid has back-checked and re-evaluated whether the preliminary preferred strategic option remains valid. This included the appraisal of a sixth 'strategic option', identified as a result of consultation, involving a significant length of onshore connection on Anglesey as well as a significant length of sub-sea cable running to a new substation in Gwynedd that would be connected to the existing Pentir to Trawsfynydd overhead line, somewhere south of Caernarfon. The findings of this back-check exercise were captured in the revised Strategic Options Report published in January 2015, which concluded that the preliminary preferred strategic option identified in 2012 remained preferred and that an

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<sup>9</sup> Department for Energy and Climate Change (2011) *Overarching Energy Network Policy Statement*

<sup>10</sup> Available at: <http://northwalesconnection.com/route-corridor-announcement.aspx>

underground cable crossing of the Anglesey AONB and Menai Strait was appropriate and would be taken forward.

- 3.3.5 Both Strategic Options Reports also considered wider reinforcement works that would be required to the existing transmission system on the mainland in North Wales. National Grid is currently contracted to have these works in place by 2020 in order to allow generation projects located in the Republic of Ireland to connect to the transmission system at Pentir. As such, the works on the mainland will already be in place by the time that the Wylfa to Pentir connection is required. As a result, National Grid announced in July 2014 that it would be taking forward the development of these works separately from the Wylfa to Pentir connection, which is solely required to allow the connection of Horizon Nuclear Power's Wylfa Newydd project. National Grid is continuing its appraisal work in respect of those works, and will report separately on the outcomes of that work in due course. Appropriate applications for consent will follow, either separately or as part of the application for development consent.

### 3.4 Wylfa to Pentir Route Corridor Options

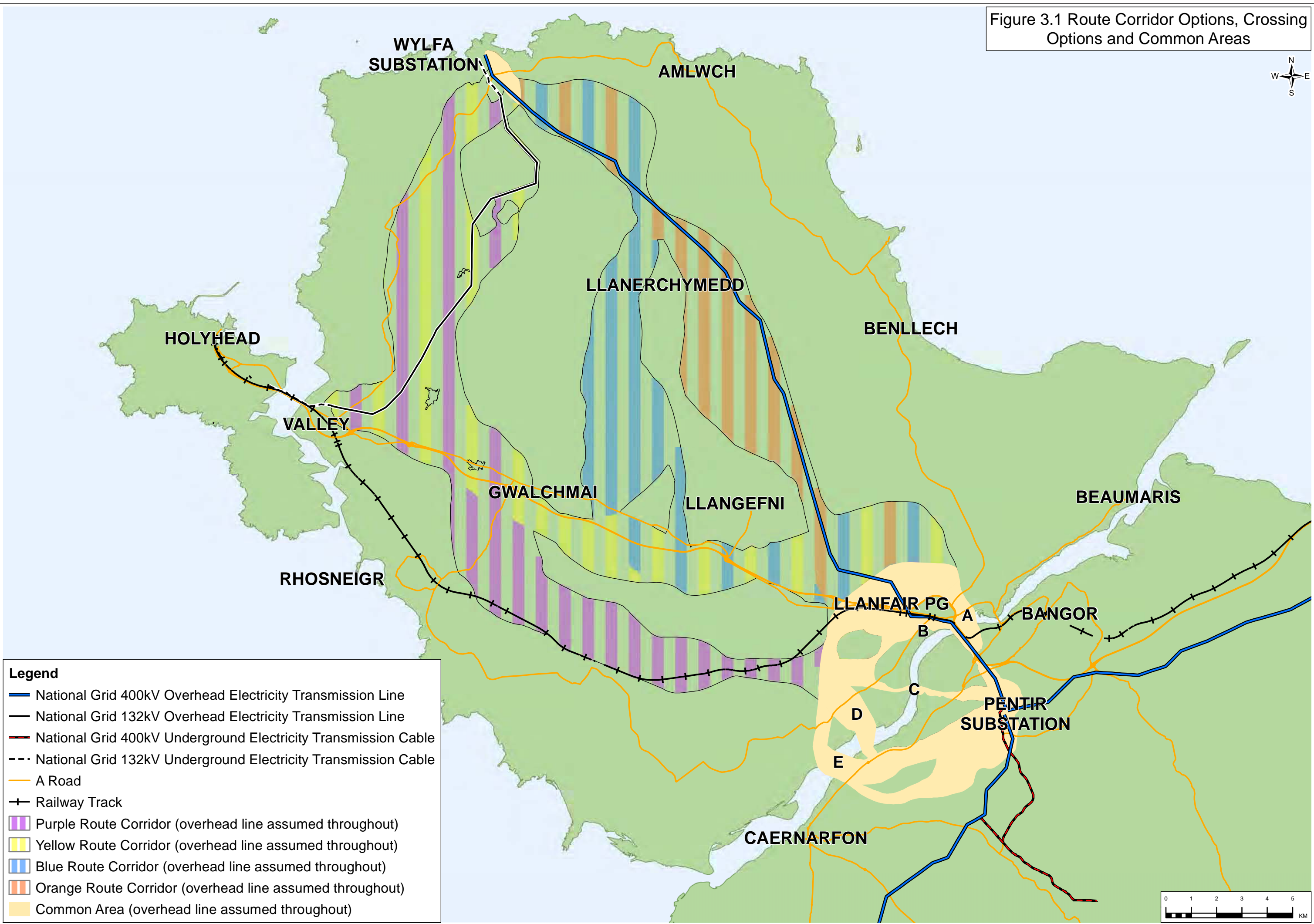
- 3.4.1 National Grid identified initial route corridor options for a new 400kV overhead line between Wylfa and Pentir using a desk-based study, supplemented by specialist surveys of 'baseline' environmental, socio-economic and technical data within the study area (the whole of Anglesey and the north-west coastline of Gwynedd along the Menai Strait). These baseline data were reviewed to identify features or sensitive sites that have the potential to pose significant constraints to the development of a new overhead line (e.g. location of large residential areas, conservation sites or other development such as wind farms). From this review, four potential route corridors that avoided or minimised the potential effects associated with these constraints were identified. Taking account of the data and assessments available at that stage, it was assumed a transmission connection could be achieved with a fully overhead line connection between Wylfa and Pentir.

- 3.4.2 Figure 3.1 illustrates the route corridors and crossing options identified and presented for public consultation in October to December 2012. In summary, the route corridor options comprised:

- **Northern Common Area** – all the route corridors shared a 'common area' around Wylfa and Tregele connecting into the 400kV substation at Wylfa.
- **Orange Route Corridor** – broadly based on the route of the existing 400kV overhead electricity transmission line as it runs from Wylfa Power Station to Llanfair Pwllgwyngyll, (hereafter referred to as Llanfair PG, where it joins the Southern Common Area).
- **Blue Route Corridor** – presented an option running generally north-south through open countryside in the centre of the island before turning east to follow the A55 towards the Southern Common Area.
- **Yellow Route Corridor** – presented an option to route a transmission line to the west of the island. It left Wylfa in a south or south-westerly direction, with an option to largely follow the direction of the existing 132kV overhead electricity transmission line and A5025 that runs along the west of the island down to the area near Valley and the A55. The route corridor then followed the A55 to join the Blue Route Corridor near Royal Air Force (RAF) Mona.
- **Purple Route Corridor** – shared the same route as the Yellow Route Corridor until the A55, from where it took a more southern route away from, but parallel to, the A55 through the centre of Malltraeth Marsh to the Southern Common Area.

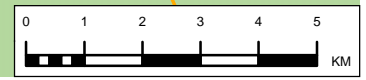


Figure 3.1 Route Corridor Options, Crossing Options and Common Areas



**Legend**

- National Grid 400kV Overhead Electricity Transmission Line
- National Grid 132kV Overhead Electricity Transmission Line
- - - National Grid 400kV Underground Electricity Transmission Cable
- - - National Grid 132kV Underground Electricity Transmission Cable
- A Road
- + + + Railway Track
- Purple Route Corridor (overhead line assumed throughout)
- Yellow Route Corridor (overhead line assumed throughout)
- Blue Route Corridor (overhead line assumed throughout)
- Orange Route Corridor (overhead line assumed throughout)
- Common Area (overhead line assumed throughout)





- **Crossing Options and Southern Common Area** – A number of alternative overhead line crossing options were identified through the AONB and across the Menai Strait, defined largely by environmental considerations; particularly the potential opportunity to reduce adverse landscape and visual amenity effects by routeing close to Britannia Bridge and a wish to avoid the established woodland blocks within Plas Newydd and Vaynol Registered Parks and Gardens. A single search area was established between the four route corridors on Anglesey and Pentir Substation in Gwynedd, which included the crossing points and onward corridors to Pentir, allowing any one of the route corridors to be linked to Pentir via any one of the crossing options. The crossing options were:
  - Crossing Option A – to Pentir from between Llanfair PG and Menai Bridge via a corridor parallel to the A55 over Britannia Bridge and between Parc Menai and western edge of Bangor.
  - Crossing Option B – to Pentir from south-west of Llanfair PG via a corridor parallel to the A55 over Britannia Bridge and between Parc Menai and western edge of Bangor.
  - Crossing Option C – from between Llanedwen and Plas Newydd crossing through southern, less wooded areas of Plas Newydd and Vaynol estates to Pentir, crossing the A487 east of Y-Felinheli.
  - Crossing Option D – from between Brynsiencyn and Llanedwen towards Llanfair Hall on the south bank, then towards Pentir north of Bethel and via Seion.
  - Crossing Option E – from Brynsiencyn to the west side of Plas Menai on the south bank, then towards Pentir, north or south of Bethel, via Seion.

### 3.5 Preferred Route Corridor

3.5.1 In January 2015, National Grid announced the Orange Route Corridor (see Figure 1.1) as the preferred route corridor for a new 400kV electricity transmission connection between Wylfa and Pentir. The selection of the Orange Route Corridor was based on the following considerations:

- **Landscape and Visual Amenity:**
  - The Orange Route Corridor was the shortest route, thus requiring fewer towers, and offered the opportunity to develop within an area already affected by an existing overhead transmission line.
  - The terrain in the Orange Route Corridor offered better natural screening and compliance with Holford Rules compared to the more expansive, long distance views of the Yellow and Purple Route Corridors. Computer modelling indicated that fewer new visual amenity receptors were likely to be affected along the Orange Route Corridor compared with other route corridors.
  - The Yellow and Purple Route Corridors were also visible from long lengths of the Anglesey AONB, whilst there was less visibility of the Orange and Blue Route Corridors from the AONB.
  - Any new line within the Blue, Yellow and Purple Route Corridors would affect undeveloped landscapes and was more likely to affect undeveloped landscapes and panoramic views to Snowdonia; in particular, the Blue and Yellow Route Corridors posed a risk of effects on views for tourists travelling eastwards along the A55 (e.g. those entering Wales from Holyhead).

- It was noted that visual effects upon residential property at some locations within the Orange and Blue Route Corridors might limit opportunities to route further from communities.
- **Ecology:** The route corridor options were broadly similar in terms of their potential effects upon flora and fauna, especially protected species, and all options needed to cross the Y Fenai a Bae Conwy / Menai Strait and Conwy Bay Special Area of Conservation (SAC). The Orange Route Corridor was preferred as it provided opportunities for a line to avoid all other designated nature conservation sites, whilst the Blue, Yellow and Purple Route Corridors provided no opportunity for a line to avoid direct effects upon Malltraeth Marsh SSSI due to airfield low flying zone constraints (RAF Mona).
- **Historic Environment:** There were no potential effects on the historic environment considered to be differentiators between route corridors.
- **Socio-economics (Local Economy):** All route corridors contained sensitive tourism facilities and attractions, with most tourism receptors on the coast near the Menai Strait, which were common risks to all route corridors. Any risk to tourism is intrinsically linked to landscape and visual amenity concerns (see above). From a landscape perspective, the Orange Route Corridor was preferred and, given the lack of other differentiators, this was therefore also preferred from a Socio-economic perspective.
- **Socio-economics (Aviation and Defence):** The Blue and Yellow Route Corridors may need mitigation near RAF Mona in the form of two separate low height lines, whilst the Purple Route Corridor may also require low height towers depending on the final alignment. These risks were avoided by the Orange Route Corridor, which could avoid the need to manage risks of infringement of safeguarding zones, reinforcing the preference for the Orange Route Corridor.
- **Consultation Feedback:** Where members of the public gave feedback on the route corridor options, the majority of the 153 responses (79%) preferred the Orange Route Corridor as it was the shortest, most direct route and follows the existing line (i.e. something is already there). Blue and Yellow Route Corridors were also highlighted as posing a risk of effects on views for tourists entering Wales along the A55 from Holyhead.
- **Technical Constraints:** All the route corridor options had technical risks, but all were manageable so posed no differentiator.
- **Costs:** With no difference in identified risks that might pose significant cost increases between the route corridors, the Orange Route Corridor was preferred as the least cost option, although this wasn't considered a major differentiator, due to the uncertainty surrounding the ultimate costs of the final designs for consent application.

3.5.2 It was acknowledged that further work in the route alignment and detailed design stages would be required in respect of the Orange Route Corridor. However, all the route corridor options would have necessitated such work. Ultimately, it was concluded that the potential cumulative effects of constructing a second overhead line within the Orange Route Corridor, once detailed design and mitigation measures had been developed, would not be so great as to negate the advantages that the Orange Route Corridor offered over the three alternative corridors considered. This conclusion will be back-checked and reviewed as the project progresses.

3.5.3 Following National Grid's announcement in January 2015, there have been ongoing studies and consultations in connection with the Orange Route Corridor. The scope and

outcome of these studies and consultations are described in the later stages of this report. This ongoing work has enabled National Grid to regularly review the outcome of, and conclusions drawn from, the preferred route corridor selection studies. The review, to date, has verified the January 2015 announcement of the Orange Route Corridor as the preferred route corridor to take forward.

### **3.6 Commitment to Avoid Overhead Line Crossing of the AONB and Menai Strait**

- 3.6.1 National Grid announced in January 2015 that a design using underground cables would be progressed through the Anglesey AONB and across the Menai Strait avoiding the development of an overhead line within these sensitive areas. It was considered that the additional cost associated with this mitigation was justified to reduce effects upon the landscape of the AONB and to protect iconic views along the Menai Strait. It was also considered that an overhead line proposal in this area was unlikely to align with relevant national planning policy tests and that the avoidance of an overhead line was the most appropriate way to fulfil National Grid's statutory duty to have regard to the conservation and enhancement of the AONB. It was determined that while technically challenging, a viable means to cross the Menai Strait using buried cables could be found. However, further investigation was required to ascertain the best technology and location to cross the Anglesey AONB and Menai Strait.
- 3.6.2 Communities and stakeholders strongly stated during the consultation the importance of the area around the Menai.

## 4 POLICY CONTEXT

### 4.1 National Policy Statements

#### Introduction

4.1.1 The Planning Act 2008 defines the construction of an above ground transmission connection of 132kV or above and over 2km in length as being a 'Nationally Significant Infrastructure Project' (NSIP). The delivery of energy related NSIPs is covered by NPSs. The Secretary of State determines consent applications for NSIPs in accordance with NPSs.

4.1.2 Six NPSs for energy infrastructure were designated by the Secretary of State for Energy and Climate Change in 2011. The most relevant NPSs for the Wylfa to Pentir transmission connection are the Overarching NPS for Energy (EN-1)<sup>11</sup> and the NPS for Electricity Networks Infrastructure (EN-5)<sup>12</sup>, which should be read in conjunction with EN-1.

#### Overarching NPS for Energy (EN-1)

4.1.3 EN-1 describes the estimates for future electricity demand (59 gigawatt of new capacity required by 2025) and the requirement for diversification of the UK's energy sources, plus greater use of renewable and other low carbon forms of generation. With regard to the new nuclear development at Wylfa and associated need for a new National Grid electricity transmission line, the following paragraphs from EN-1 are particularly relevant:

*"Lack of sufficiently robust electricity networks can cause or contribute to large scale interruptions. Existing transmission and distribution networks will have to evolve and adapt in various ways to handle increases in demand, but construction of new lines of 132kV and above will also be needed to meet the significant national need for expansion and reinforcement of the UK's transmission and distribution networks." (paragraph 3.7.20).*

*"New lines will have to be built, and the location of renewable energy sources and designated sites for new nuclear power stations makes it inevitable that a significant proportion of those new lines will have to cross areas where there is little or no transmission infrastructure at present, or which it may be claimed should be protected from such intrusions." (EN-1, paragraph 3.7.7).*

4.1.4 EN-1 also emphasises that: *"the urgency of need for new generating capacity means that the need for new transmission infrastructure that is required to connect that capacity will be similar"* (paragraph 3.7.7).

4.1.5 In addition EN-1 sets out a number of 'Assessment Principles' (Part 4). It states that in considering any proposed development, and in particular when weighing up the beneficial and adverse effects, the Planning Inspectorate should take into account:

- The potential benefits, including contributions to energy infrastructure, job creation and any long term or wider benefits.
- The potential adverse effects, including any long term and cumulative adverse effects, as well as any mitigation measures incorporated to reduce these adverse effects.

<sup>11</sup> Department for Energy and Climate Change (2011) *Overarching National Policy Statement for Energy*

<sup>12</sup> Department for Energy and Climate Change (2011) *National Policy Statement for Electricity Networks Infrastructure*

### NPS for Electricity Networks Infrastructure (EN-5)

- 4.1.6 NPS EN-5 also highlights that transitioning electricity generation infrastructure in the UK to a low carbon economy, whilst maintaining security of supply, will be dependent on the availability of a reliable electricity network.
- 4.1.7 NPS EN-5 does not direct National Grid to particular sites or routes for new energy network infrastructure. Instead EN-5 states that the route should be chosen based on the location of a generating station in relation to the existing network, or the need for more strategic reinforcement of the network (paragraph 2.2.2). However, EN-5 does acknowledge that the transmission connections may not be via the most direct route as many factors, including engineering and environmental aspects, will need to be taken into account.
- 4.1.8 EN-5 also explains how new proposals will be assessed, and the supporting evidence needed, before being allowed to proceed. Any assessment will also need to cover issues raised in EN-1.
- 4.1.9 The implications of climate change need to be considered and NPS EN-5 requires any proposal to be able to cope with:
- Flooding, particularly for substations that are vital for the electricity transmission and distribution network.
  - Effect of wind and storms on overhead lines.
  - Higher average temperatures leading to increased transmission losses.
  - Earth movement or subsidence caused by flooding and drought affecting underground cables and above ground electricity infrastructure.
- 4.1.10 EN-5 (paragraph 2.8.8) states that the Government expects it would often be appropriate to fulfil the need for new electricity lines of 132kV and above through the development of overhead lines, though there will be cases where this is not so. Paragraph 2.8.7 supports the use of the ‘Holford Rules’ when deciding routes for overhead lines, and in relation to designing a connection NPS EN-5 states that:
- “... wherever the nature or proposed route of an overhead line proposal makes it likely that its visual impact will be particularly significant, the applicant should have given appropriate consideration to the potential costs and benefits of other feasible means of connection or reinforcement, including underground and sub-sea cables where appropriate.” (paragraph 2.8.4).*
- 4.1.11 EN-5 goes on to state:
- “... Government has not laid down any general rule about when an overhead line should be considered unacceptable. The IPC<sup>13</sup> should, however only refuse consent for overhead line proposals in favour of an underground or subsea line if it is satisfied that the benefits from the non-overhead alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable.” (paragraph 2.8.9).*
- 4.1.12 With respect to public concerns relating to electric and magnetic fields (EMFs), EN-5 notes that the International Commission on Non-Ionising Radiation Protection (ICNIRP)

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<sup>13</sup> IPC = Infrastructure Planning Commission, introduced in 2009 under the Planning Act 2008 to examine and decide on NSIP applications. In 2012 the IPC was abolished and the relevant Secretary of State became the decision maker on NSIPs. The Planning Inspectorate took over the functions of the IPC and is responsible for the examination of NSIP proposals.

has developed health protection guidelines<sup>14</sup> for both public and occupational exposure (paragraph 2.10.3), and that the:

*“Government has developed with the electricity industry a Code of Practice, “Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice”, published in February 2011 that specifies the evidence acceptable to show compliance with ICNIRP (1998) in terms of the EU Recommendation.” (paragraph 2.10.9).*

4.1.13 It goes on to advise that:

*“Before granting consent to an overhead line application, the IPC should satisfy itself that the proposal is in accordance with the guidelines, considering the evidence provided by the applicant and any other relevant evidence.” (paragraph 2.10.9).*

## 4.2 Welsh Planning Policy

### Introduction

4.2.1 In Wales, planning policy comprises both national (Welsh) and local policy documents. This part of Chapter 4 outlines the main national and local planning policy documents and policies relevant to a new transmission line connection development between Wylfa and Pentir.

### Wales Spatial Plan

4.2.2 The Welsh Assembly Government (2008) *People, Places, Futures: The Wales Spatial Plan Update* sets out the Welsh Ministers’ policies in relation to the development and use of land in Wales over a 20 year period. It notes that ‘a significant challenge’ is the ability to play a local and national role in adapting to the effects of climate change.

### Planning Policy Wales

4.2.3 The Welsh Government (2014) *Planning Policy Wales (Edition 7)* sets out the land use planning policies of the Welsh Government and is supplemented by a series of Technical Advice Notes (TANs). *Planning Policy Wales* and the TANs, together with circulars and policy clarification letters, form the national planning policy in Wales. Paragraph 4.4.3 of *Planning Policy Wales* states that planning policies and proposals should:

*“...support the need to tackle the causes of climate change by moving towards a low carbon economy. This includes facilitating development that reduces emissions of greenhouse gases in a sustainable manner, provides for renewable and low carbon energy sources at all scales and facilitates low and zero carbon developments.”*

4.2.4 The Welsh Government’s objectives are to promote the generation and use of energy from renewable and low carbon energy sources for all developments in order to meet national targets. The proposed Wylfa Newydd Power Station supports these objectives as a low carbon energy source.

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<sup>14</sup> **International Commission on Non-Ionising Radiation Protection (1998)** *Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields.*

### 4.3 Local Planning Policy

#### *Introduction*

4.3.1 The planning policy functions of Isle of Anglesey County Council and Gwynedd Council are combined and co-ordinated through the Joint Planning Policy Unit (JPPU). Some of the current development plan documents which contribute to the local policy framework pre-date the establishment of the JPPU in 2010 while others, specifically the Joint Local Development Plan (JLDP), are in development.

4.3.2 A review was undertaken of local development plan documents and other planning policy and land use-related publications. The aim of the review was to identify any local policies or land use designations that may influence or preclude the siting of a particular route option along the preferred route corridor between Wylfa and Pentir.

#### *Development Plan Documents*

4.3.3 The current adopted development plan for the Gwynedd local planning authority area is the Gwynedd Unitary Development Plan (UDP) 2001 - 2016, which the Council formally adopted in 2009.

4.3.4 The current adopted development plans for the Anglesey local planning authority area comprise:

- Gwynedd Structure Plan (1993),
- Ynys Môn Local Plan (1996), and
- Stopped Ynys Môn UDP 2005 [*unadopted*].

4.3.5 Anglesey's Stopped UDP is considered by the Council to be a material planning consideration, whilst the current adopted development plans are supported by a series of Supplementary Planning Guidance (SPG).

4.3.6 During the route corridor options appraisal, work was underway on the Anglesey and Gwynedd JLDP, with the Anglesey and Gwynedd JLDP Consultation Draft Preferred Strategy Document<sup>15</sup> having been issued for public consultation in 2013. The JLDP will implement the Welsh Government policies at a local level and present planning policy up to 2026 to:

- Guide the development of housing, retail, employment and other uses.
- Aid the Local Planning Authority's decision with regard to planning applications.
- Protect areas to ensure the maintenance and enrichment of the natural and built environment.

4.3.7 In addition, the following documents were reviewed in support of the identification of planning and development constraints to potential route options:

- New Nuclear Build at Wylfa: Supplementary Planning Guidance - Adopted July 2014.
- AONB Management Plan 2009 -2014.
- Môn a Menai Action Plan (Welsh Assembly Government, 2008).

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<sup>15</sup> **Anglesey and Gwynedd JPPU (2013) Anglesey and Gwynedd JLDP Consultation Draft Preferred Strategy Document** [on-line] Available at: <https://www.gwynedd.gov.uk/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Preferred-Strategy/Preferred-Strategy.pdf>

- Increasing the Economic Benefits of the Môn-Menai Coast: An action Plan (Scott Wilson, 2007).
- Wind Turbines & Pylons Guidance on the Application of Separation Distances from Residential Properties<sup>16</sup>.

#### Local Development Plan Policies - New Electricity Transmission Line

- 4.3.8 The Gwynedd Structure Plan has no policies relating specifically to nuclear energy generation or power transmission.
- 4.3.9 The main planning issues relevant to the proposed Wylfa to Pentir transmission line are identified in Chapter 2 of the Ynys Môn Local Plan:
- “Wylfa Nuclear Power Station: The future life of this important employer could be decided during the plan period. Any major change requires this Plan to be reviewed. Among issues that will need consideration are the decommissioning of the power station, alternative employment schemes and the provision of new infrastructure to support economic development”.*
- 4.3.10 However, the Ynys Môn Local Plan does not mention the potential for new electricity transmission infrastructure associated with any future replacement of the existing Wylfa Power Station.
- 4.3.11 The Stopped Ynys Môn UDP identifies that responding to the changes of energy generation is an important issue. It states that *“there is a need to plan appropriately for energy generation in the light of issues around new power stations; the closure process that will eventually affect Wylfa nuclear power station and the emergence of new wave energy and renewable technologies”* (paragraph 4.11).
- 4.3.12 Objective 12 of the Stopped Ynys Môn UDP is *“to promote and encourage the development and use of renewable and non-renewable sources of energy (where appropriate) and promote energy efficient development and design”*.
- 4.3.13 The Stopped Ynys Môn UDP makes no reference to electricity transmission.
- 4.3.14 Policy C27 in the Gwynedd UDP requires any overhead connection line associated with a renewable or sustainable energy scheme to not cause significant harm to the visual quality of the landscape.
- 4.3.15 Strategic Objective 18 of the draft JLDP is to *“promote renewable and low carbon energy production within the area”*.
- 4.3.16 The draft JLDP acknowledges that major infrastructure projects, including the new nuclear power station at Wylfa, *“could have major infrastructure implications for the Plan area in the form of new electricity transmission lines and associated development”* (paragraph 7.3.1).
- 4.3.17 Strategic Policy PS6 of the emerging JLDP is an overarching policy relating to all Major Infrastructure Projects whether determined by the Secretary of State, the Isle of Anglesey County Council, Gwynedd Council or any other agency. Strategic Policy PS7 applies to the proposed new nuclear power station, including development associated with it. Both of these strategic policies list detailed compliance requirements, including requirements to assess the environmental, social and economic effects of proposals.

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<sup>16</sup> **Gillespies (2014)** *Wind Turbines and Pylons Guidance on the Application of Separation Distances from Residential Properties*, prepared on behalf of Isle of Anglesey County Council, Gwynedd Council and Snowdonia National Park Authority.



- 4.3.18 The New Nuclear Build at Wylfa SPG was adopted by the Council in July 2014 and sets out the County Council's vision and objectives for Wylfa Newydd. It is an important material consideration in assessing other planning applications linked to the project. It provides supplementary advice on significant local direct or indirect matters, and sets out the Council's response to national and local policy and strategies in the context of the Wylfa Newydd project. While the SPG would not be supplemental to the JLDP, it seeks to be consistent with policy in the emerging JLDP.
- 4.3.19 A series of Topic Papers drafted by Isle of Anglesey County Council in support of the Wylfa SPG presented the evidence base and proposed main drivers which were to shape the SPG. Topic Paper 1: Natural Environment and Topic Paper 8: Infrastructure emphasise the need to consider (among other things): i) *“how the natural environment can be managed in an integrated and sustainable way, along with social and economic issues, addressing the intrinsic value of the natural environment alongside the contribution made by it in terms of community well-being, a sense of place, tourism, agriculture and recreation progress”*; and ii) *“the power distribution network required to support nuclear new build development”*.
- 4.3.20 The Môn a Menai Regeneration Area programme was implemented to encourage economic development across Anglesey and north Gwynedd, based on an economic hub centred on the Menai Strait. It was announced in 2006 as a response by the Welsh Government and its stakeholders to the decommissioning of Wylfa Power Station, and the potential closure of the Anglesey Aluminium plant at Penrhos.
- 4.3.21 An action plan, published in 2008, was developed into the strategy framework for a regeneration programme that ran from 2011-14. The action plan's programme focused on main themes including: low carbon energy; innovation, knowledge and skills; infrastructure, mobility and transport; and natural environment, heritage and coastal assets.
- 4.3.22 The Môn - Menai Coast Action Plan centred on optimising the assets provided by Anglesey's coastline to promote economic development. The Action Plan focused mainly on the tourism, leisure and recreation sectors, and, therefore, did not relate specifically to the energy sector or electricity connection projects.
- Local Development Plan Policies – Landscape Designations and Visual Amenity
- 4.3.23 The local policy framework is strongly supportive of preserving the natural landscape and heritage within the AONB, and in particular areas along the Menai Strait adjacent to the Menai Bridge, Plas Newydd and the Vaynol Estate.
- 4.3.24 Under the adopted Ynys Môn Local Plan the whole of Anglesey was classified as a Special Landscape Area (SLA), defined by Natural Resources Wales as 'areas of high landscape importance for their intrinsic physical, environmental, visual, cultural and historical value in the contemporary landscape'. In 2012, the JPPU commissioned independent consultants to undertake a thorough review of local landscape designations (SLAs) in Anglesey and Gwynedd<sup>17</sup>. The review proposed six smaller and more targeted SLAs across Anglesey and ten across Gwynedd, based on a detailed appraisal of landscape quality and value; six of these lie within the Wylfa to Pentir study area (see Figure A1 in Appendix A). These have since been adopted into the JLDP Deposit Plan 2015, which sets out how the Councils will consider development proposals located within or directly outside newly-identified SLAs.

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<sup>17</sup> LUC (2012) *Review of Special Landscape Areas in Gwynedd and Anglesey: Executive Summary* [on-line] Available at: <https://www.gwynedd.gov.uk/en/Council/Documents---Council/Strategies-and-policies/Environment-and-planning/Planning-policy/Supporting-documents/Review-of-Anglesey-and-Gwynedd-Special-Landscape-Areas-Executive-Summary.pdf>

- 4.3.25 During the development of the JLDP, a study was also commissioned by Gwynedd Council, Isle of Anglesey County Council and Snowdonia National Park Authority to determine the appropriateness of applying minimum separation distances between wind turbines or pylons and residential properties, to protect residential visual amenity.
- 4.3.26 The study's report states that it provides an evidence base to inform policies in the emerging Anglesey and Gwynedd JLDP, and may also be a material planning consideration for considering relevant planning applications in the intervening period.
- 4.3.27 Gillespies (2014) Wind Turbines & Pylons Guidance on the Application of Separation Distances from Residential Properties concludes, among other things, that there is "*no conclusive evidence to support the strict application of minimum separation distances between residential properties [and] pylons in terms of visual residential amenity*".

#### Planning Applications and Land Use Designations

- 4.3.28 In support of the route options studies, planning applications within the area occupied by the Orange Route Corridor, submitted to the Gwynedd Council and Isle of Anglesey County Council between 2010 and April 2015, were reviewed. The aim of the review was to identify any consented or potential developments that could inform the route options identification process. Additionally, the latest local development plan documents were reviewed to identify land use allocations that could influence the future development 'landscape' within the Orange Route Corridor.
- 4.3.29 Applications in respect of the following forms of development were considered, so as to assess potential constraints or interactions with the route options:
- Residential property and associated infrastructure.
  - Civic amenities (i.e. schools, playgrounds etc.).
  - Change of land use.
  - Telecommunication masts.
  - New renewable energy developments and associated infrastructure (e.g. wind and solar).
  - New overhead electricity lines.
  - Horizon Nuclear 'associated development'; i.e. development that supports the proposed Wylfa Newydd Power Station, the planning applications for which will be determined by Isle of Anglesey County Council (i.e. town and country planning applications outside the main DCO application to the Secretary of State).
  - Enterprise and tourism.
- 4.3.30 Most potential developments within the Orange Route Corridor were classified as 'Building and Associated Infrastructure', followed by 'Renewable Energy' Developments; most of the developments were understood to have been granted planning permission.
- 4.3.31 The review of land use designations was based on each authority's respective UDP and Local Plan proposals, and the Anglesey and Gwynedd JLDP (Deposit Plan 2015).
- 4.3.32 The majority of the significant land use allocations and planning applications are in proximity to the more densely populated centres of Bangor, Llanfair PG, Llangefni and Llanerchymedd.
- 4.3.33 As part of the JLDP review of potential development sites, Candidate Sites were proposed by members of the public to set aside for community infrastructure, such as housing and employment developments. Though not formally adopted, the Candidate Sites provided an indication of the potential for third party, future development interest risks or opportunities.

#### **4.4 Planning Consent Framework for the Wylfa-Pentir Connection**

- 4.4.1 The proposed new Wylfa to Pentir electricity transmission line is classified as a NSIP under the Planning Act 2008, so requires an application to be submitted to the Secretary of State for a DCO. An EIA would be undertaken in accordance with the Infrastructure Planning (Environmental Impact Assessment) Regulations 2009 (as amended).
- 4.4.2 Consent for works which are not integral to, or do not form part, of the NSIP, such as advance works to improve the connecting substations and wider system improvements may be sought via a Town and Country Planning Act application to the local planning authority (Gwynedd Council or Isle of Anglesey County Council). The consenting regime for every element of the project will need to be carefully considered, in discussion with the relevant authorities, as the project moves forward.
- 4.4.3 For the purposes of this document and assessing and comparing options, given the interdependence of the component parts, the proposed Wylfa to Pentir connection has been considered as a single scheme so potential effects are considered in their entirety.

## 5 ELECTRICITY TRANSMISSION DEVELOPMENTS

### 5.1 Introduction

5.1.1 In order to appraise the potential effects of any new connection, it is important to have an understanding of the potential forms that transmission infrastructure may take and how this would influence the nature of the associated environmental and socio-economic effects. This chapter seeks to provide an overview of these issues, but a detailed understanding of these forms of development has underpinned the whole of the appraisal process and the selection of a preferred route corridor.

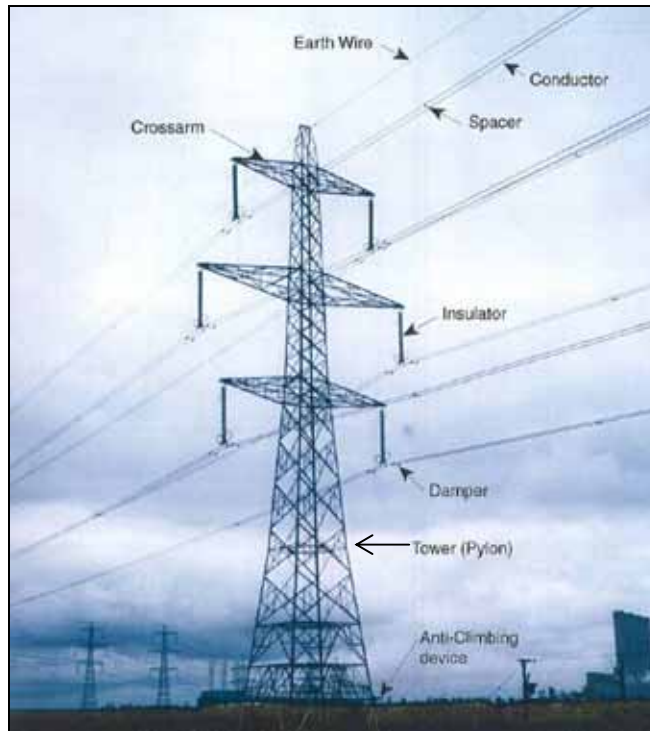
5.1.2 The transmission of electricity at high voltages of 275kV and 400kV allows bulk supplies of electrical power to be efficiently transported over long distances (i.e. with least energy loss) from large power generators to large centres of electrical demand. Electricity transmission systems comprise a series of electricity substations that transform the operating voltage or switch circuits in or out of operation to control the flow of electricity. These substations are connected together by a network of transmission circuits across the country, which are either carried on overhead lines or comprise lengths of underground cable. Due to the amounts of power being transmitted and the operating voltages employed, electricity transmission equipment tends to be large in scale and complex in nature. This chapter provides a generic overview of standard overhead and underground transmission infrastructure and its construction and operation.

### 5.2 Overhead Lines

#### Overhead Line Components

5.2.1 Overhead lines comprise two main components: towers (commonly known as pylons) and the suspended conductors (commonly referred to as the 'wires'). The conductors carry the electrical power flows, whilst the towers are used to ensure that safe clearances are maintained between the live conductors, the ground and the supporting tower itself.

5.2.2 Figure 5.1 shows a Suspension Tower, which is the structure primarily used to support the conductors along a straight section of route. This image also details the various components of an overhead tower.



**Figure 5.1 Suspension Tower - Overhead Line and Tower Components**

5.2.3 The overhead line and tower components are listed below.

- *Earth Wire*: The highest wire supported between the peaks of the towers and connected to the ground in order to protect the conductors during lightning strikes.
- *Conductor*: A continuous wire (normally made from aluminium) suspended from the towers that carries the electrical current. Several conductors may be grouped together to form a bundle. Each circuit comprises three bundles of conductors (one for each electrical phase), each supported by a separate cross arm.
- *Tower*: Typically a lattice steel structure (pylon) that comprises a tower body and six cross arms, normally carrying two discrete electrical circuits.
- *Cross arms*: Arms of the tower that carry the conductors and maintain safe electrical clearances between the live conductors, the ground and the main tower body.
- *Insulator*: Used to maintain a safe clearance between the live conductor and the tower cross arms that support them.
- *Spacers*: Keep a bundle of conductors separated from each other.
- *Dampers*: Reduces vibration in the conductors caused by cross-winds, helping to reduce wear and tear to the conductors and insulators.
- *Anti-Climbing Device*: A barrier fitted to each of the four tower legs to deter individuals from climbing the tower.

5.2.4 Typically, towers are around 50 metres (m) in height, have standard base dimensions of between 7m and 10m wide and are spaced approximately 360m apart. Where an overhead line changes direction, terminates or needs to negotiate more complex terrain, stronger towers are required that have heavier steelwork and larger footprints than the standard towers.

### Tower Types

- 5.2.5 Alternative tower types to the standard lattice towers, used along the existing Wylfa to Pentir line, may be considered for the connection if they offer substantive benefits (e.g. reduction in visual effects). As illustrated in Figure 5.2, a range of tower types could fulfil the technical requirements of the project, including those outlined below.
- *Steel lattice towers* – The current ‘high capacity’ 400kV lattice tower is the L13 design (typically 50m in height). These are similar in design to those used along the existing Wylfa – Pentir overhead line (the L6 design).
  - *T-pylon* – Following a design competition in 2011, a new type of transmission tower was developed that would provide the same transmission capability as the ‘traditional’ steel lattice pylon, but be more compact in height terms. The resultant ‘T-Pylon’ is approximately 33m in height, similar in height to a ‘low height’ lattice steel design. National Grid has recently constructed a five-pylon test section of overhead line near Eakring in Nottinghamshire using the new T-pylon, from which National Grid is evaluating its construction and operation.
  - *Low height towers* – Low height lattice towers (the L12 design) are typically 36m in height, but are wider than ‘traditional’ lattice towers. These towers have generally been used on short lengths through height restriction areas (e.g. low flying zones), but have the potential to offer landscape and visual advantages in some settings.
- 5.2.6 Figure 5.3 provides a visual comparison of an L13, L6 and L12 low height lattice towers and a T-pylon. These are photomontages of each tower type in a generic rural setting, not dissimilar to that found on Anglesey, to provide a visual comparison of the tower differences with all else being equal.

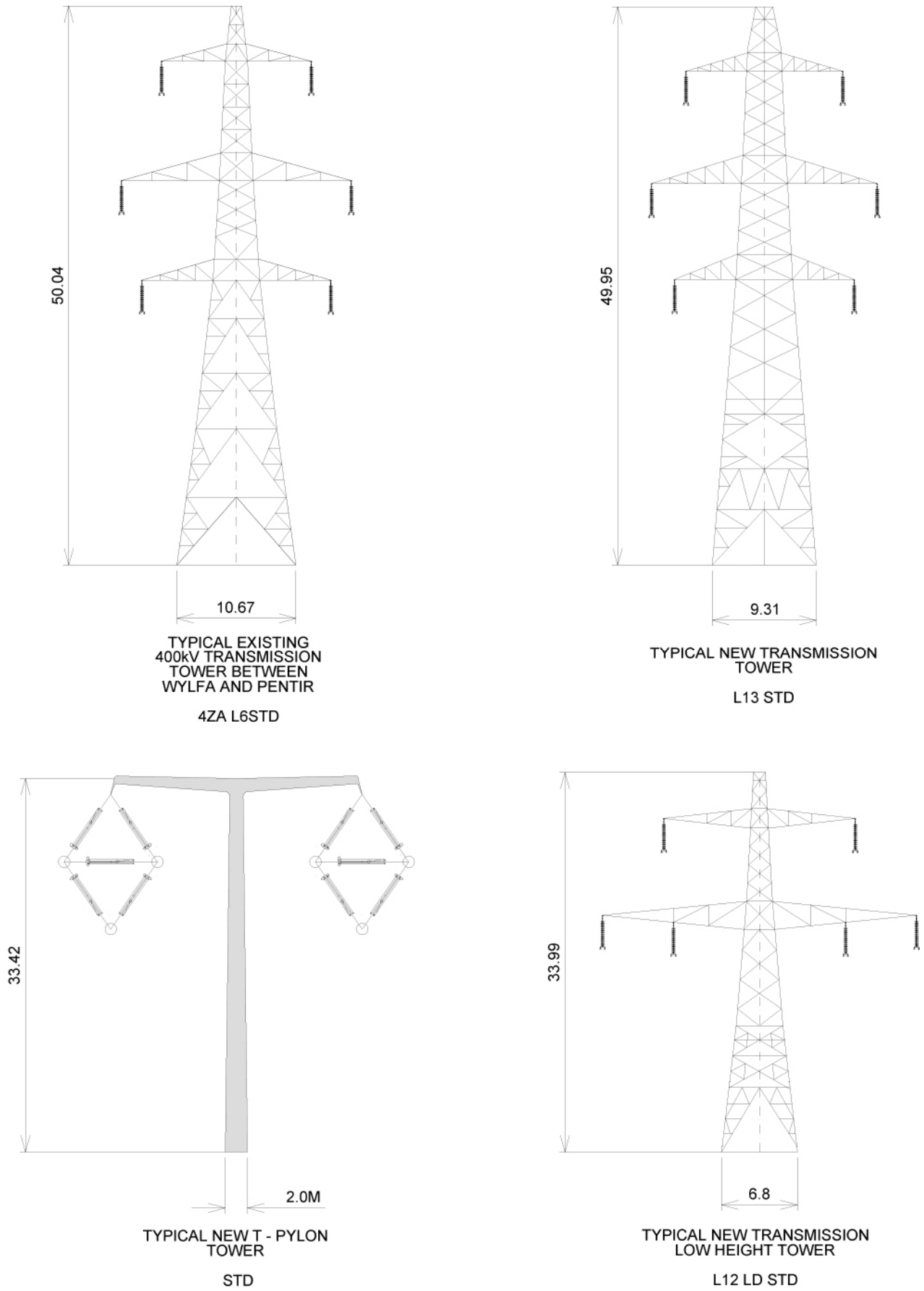


Figure 5.2 400kV Electricity Transmission Tower Types



*Existing L6 Tower*



*L13 Standard Tower*



*L12 Low Height Tower*



*T-Pylon*

**Figure 5.3 Visual Comparisons of Electricity Transmission Tower Types**



- 5.2.7 For all tower types, more robust, stronger angle (or tension) towers are required where the transmission line changes direction. Figure 5.4 shows a lattice suspension tower (on the left) and a tension tower (on the right).



**Figure 5.4 Suspension Tower (left) and Tension Tower (right)**

- 5.2.8 During ongoing consultation on the connection design, National Grid will review pylon design options for the project and consider if alternative pylon designs would provide advantages when compared with the standard lattice tower design. Representations made during consultation regarding pylon design would be considered as the detailed design progresses.

#### Overhead Line Construction

- 5.2.9 Construction of lattice pylons requires the following activities:
- Construction of temporary access tracks and construction areas to every pylon site (metal or stone) where existing roads are not present (e.g. in a farmers field); see Figure 5.5.
  - Localised vegetation clearance and soil excavation, if required, in the area the pylon is to be located.
  - Implementation of drainage works, if required.
  - Creation of site compounds to store materials, equipment and provide welfare facilities for workers during the construction period.
  - Installation of temporary fencing around working areas around the tower bases, the size of which is dependent on tower type (typically 30m x 30m around the base of the suspension towers or 50m x 50m around tension towers).
  - Creation of the foundations for each pylon, which are normally made of concrete, although piles may be needed in certain ground conditions.
  - Construction of the tower (see Figure 5.6) using a range of machinery, such as excavators, cranes, winches and delivery vehicles. The cranes used tend to be large to allow the full height of the tower to be reached with the crane arm.
- 5.2.10 Once the towers are erected, the conductors are brought to site on drums and winched and secured into position. Winches would not be needed at the majority of tower sites, but where needed would be located some distance from the tower itself. Where the overhead line crosses roads, other electricity lines or telephone wires, these are protected; for example, scaffolding and nets are erected over roads, and lower voltage lines are made dead, relocated or protected with scaffolding.



**Figure 5.5** Temporary Stone Access Track with Pylon Construction Area

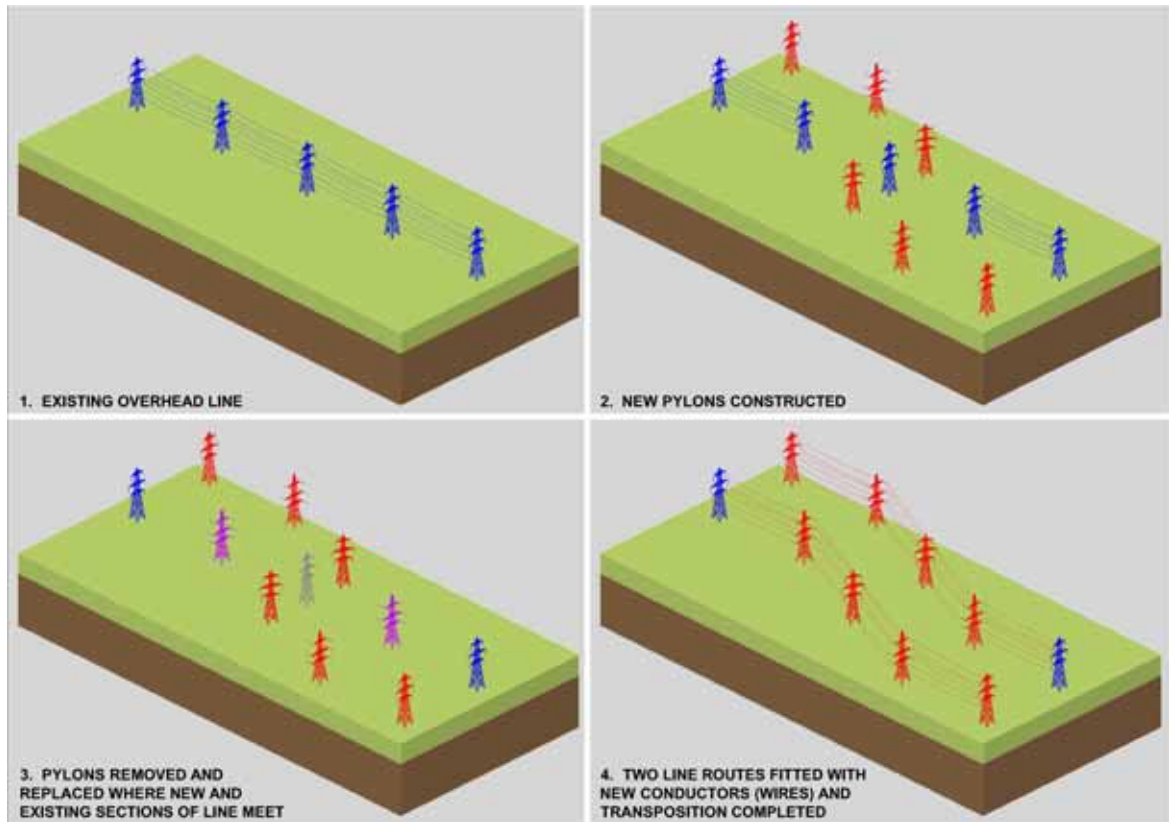


**Figure 5.6** Crane Assembling a Tower

- 5.2.11 Following construction of the towers, all temporary site compounds, access tracks and machinery are removed and the land is returned to its original condition. However, where it is necessary to route across areas of trees or tall shrubs, National Grid may need to clear or trim this back on a regular basis to maintain safety clearances to the conductors above.
- 5.2.12 The construction of the T-pylon follows a similar sequence of activities, but whereas the lattice steel tower is delivered as individual steel members, to be assembled on site, the larger components of the T-pylon tend to be delivered on a long articulated vehicle. This can result in shorter construction periods for each individual tower when compared with the four week sequence typically associated with the erection of a lattice tower.

#### Potential Design Interactions between New and Existing Electricity Lines

- 5.2.13 Where two overhead transmission lines are in close proximity, there may be a need for them to cross, and in those circumstances a number of specific design considerations arise.
- 5.2.14 It may be possible for the two lines to cross each other, with the line operating at the higher voltage tending to be uppermost. Such a crossing requires the upper line to be constructed significantly higher than would otherwise be the case. This would be required to achieve safe electrical clearances to the conductors of the line below, which in turn would need to maintain safe electrical clearance to the ground beneath. Further clearance height might also be needed to give clearance to any scaffolding and nets that might be erected between the two lines as a safety measure during construction and maintenance activities. The resultant towers either side of the crossing can be noticeably taller.
- 5.2.15 A number of alternative design solutions are available that would avoid or reduce these concerns. Where the line being over-sailed is of a relatively low voltage, then it may be cost effective, and desirable in environmental terms to permanently replace a length of the line with buried cables. When this might not be technically feasible or prove prohibitively expensive, the lower voltage line might be replaced with two lengths of lower height towers, each carrying a single circuit. This allows the existing line to pass below ('duck under') the over-sailing line which could then be somewhat lower whilst still maintaining safe electrical clearances.
- 5.2.16 Alternatively where the voltages of the two lines are the same and the direction of power flows across the electricity system allow it, a 'transposition' or 'swap-over' can be achieved. This is done through the removal of a length of the existing line, allowing the two newly formed 'ends' of existing line to be connected to two lengths of new route located on different sides of the existing line. The two resultant routes would then both comprise lengths of newly built and original overhead line. This is illustrated schematically in Figure 5.7.
- 5.2.17 The transposition of a new line route from one side of an existing line to the other can be achieved on adjacent towers, resulting in up to four bulkier angle towers being located in close proximity. Alternatively it may be possible to utilise existing angle towers on the current line to partly form the transposition, or to extend the distance over which a transposition is achieved to make the change of route direction more gradual, with greater separation between the angle towers.



**Figure 5.7 Transposition Process**

### Overhead Line Maintenance

- 5.2.18 During the operation of a line, the pylons are inspected regularly via both walk-through and helicopter inspections. Conductors are replaced after a period of 20 to 60 years, depending upon the local climate, altitude, exposure, and the electrical loads to which they are subjected. The lifespan of a pylon is around 80 years.
- 5.2.19 During this time very little routine maintenance is required other than tower body and cross arm painting approximately every 20 years. Painting of the cross arms and some parts of the tower bodies requires the circuits to be switched off. Fittings can be upgraded during routine inspections if required.

### **5.3 Underground Cables**

- 5.3.1 Where required, connections can be made using underground cables, with a sealing end compound at the interface between an overhead line and underground cable. Each transmission circuit would normally comprise either three or six buried cables, dependent upon the required capacity of the route.
- 5.3.2 In the case of overhead conductors, the air insulates the live conductor from its surroundings and aids the dissipation of heat generated by the electrical current. When operating buried cables at transmission voltages robust insulating materials are needed to surround the conductor, which also needs to be larger to compensate for the reduced heat dissipation when buried. Identifying and accessing faults within cables is also more problematic. Therefore, the use of buried cables at transmission voltages is technically more complex and significantly more expensive than an equivalent overhead line.
- 5.3.3 The following paragraphs provide an overview of the cable installation techniques that might be appropriate in the context of the project. More specific information relating to



cable considerations for crossing the Anglesey AONB and Menai Strait are included in Chapter 14.

#### Cable Sealing End Compound

- 5.3.4 Sealing end compounds (SECs) are secure sites surrounded by a palisade fence where the overhead conductors are connected to the ends of buried cables which are brought vertically upwards out the ground. The cable ends are supported within insulated columns. The site may also accommodate equipment for the protection of the cables that would prevent electrical power surges or allow the cables to be isolated from the transmission system. Small kiosks containing monitoring equipment for the cables may also be located within the compound. A permanent access track is required to the compound, but the surface treatment can vary as maintenance traffic is generally infrequent and light.
- 5.3.5 SECs are generally constructed on relatively flat sites. Their size varies according to the number of cable ends that they accommodate and the nature of the additional equipment that they contain. Generally a SEC occupies a footprint of approximately 60m x 60m (approximately 0.4 hectares), but this can increase to 120m x 60m (approximately 0.7 hectares) for the largest sites. Additional land will also be needed for access development, the creation of a level development platform (dependent upon site topography) and the creation of peripheral landscape screening.
- 5.3.6 The overhead line needs to terminate within or adjacent to the compound fence line with the conductors from the last tower connecting to a gantry structure, normally constructed from lattice steelwork. The gantry can be designed to take the full tension from the overhead line allowing the last tower to be 150 to 300m from the SEC. Alternatively a heavier tower can be located immediately adjacent to the SEC, allowing the conductors to drop nearly vertically onto a slightly lighter gantry structure located within the SEC.

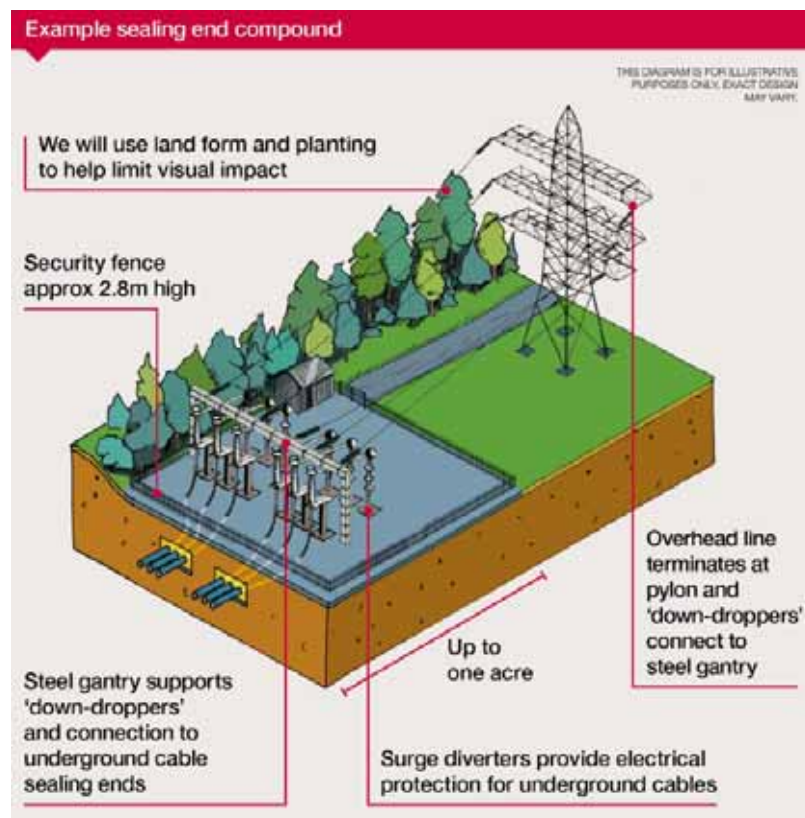


Figure 5.8 Illustration of a SEC for a Directly Buried Cable

5.3.7 Figure 5.8 illustrates an example SEC with a termination tower, steel gantries, supports for cable terminations and earth switches to allow the transition from overhead line conductor to cables. Variations on the compound design can reduce the overall visual effect (e.g. use of gantries instead of a termination tower).

#### Direct Buried Cable Installations

5.3.8 Cable installation can be done using a variety of techniques. The most common method is by open cut trenching. Each trench would be approximately 1.5m wide by 1.2m deep (see Figure 5.9). Typically two or four trenches are required, each accommodating three separate cables (one for each of the three electrical phases). A central construction haul route is established, and peripheral drainage installed along the construction corridor. The soils excavated from the access track and working areas are also stored within the corridor. These requirements result in a typical working width of between 40m and 50m (see Figure 5.9), although this can be reduced significantly in localised areas to avoid sensitive sites or features.

5.3.9 In designing a 400kV cable system, if the electrical performance of the cables is not to be compromised, it is important that the physical environment of the cables enables:

- heat dissipation to prevent overheating and subsequent reduction in cable rating (capacity for carrying current);
- physical protection so that the cable does not become damaged or become a potential danger to third parties; and
- proper access to ensure efficient inspection repairs or replacement.



**Figure 5.9 Construction Working Area during Underground Cable Laying**

- 5.3.10 Where underground cables are used, each circuit typically comprises one or two sets of three separate cables, dependent upon the power flows and ground conditions. For each set of three cables, underground joint bays (concrete lined) are necessary at intervals of 500m to 1000m, to allow joining of individual lengths of cable. To facilitate cable testing, either surface accessible link box chambers or small above ground cabinets would be provided at a number of locations directly adjacent to the joint bays.
- 5.3.11 The main disadvantage with underground cabling buried in trenches is the technical constraints, environmental effects during construction and costs associated with their operation, maintenance and replacement; for example, any faults would necessitate excavation in order to access the cables. Once in place, the construction of buildings, planting of trees and use of deep cultivating equipment are prohibited over the cables. During operation, a corridor of approximately 35m wide encompassing the buried cable would still be required for maintenance access; referred to as an easement.

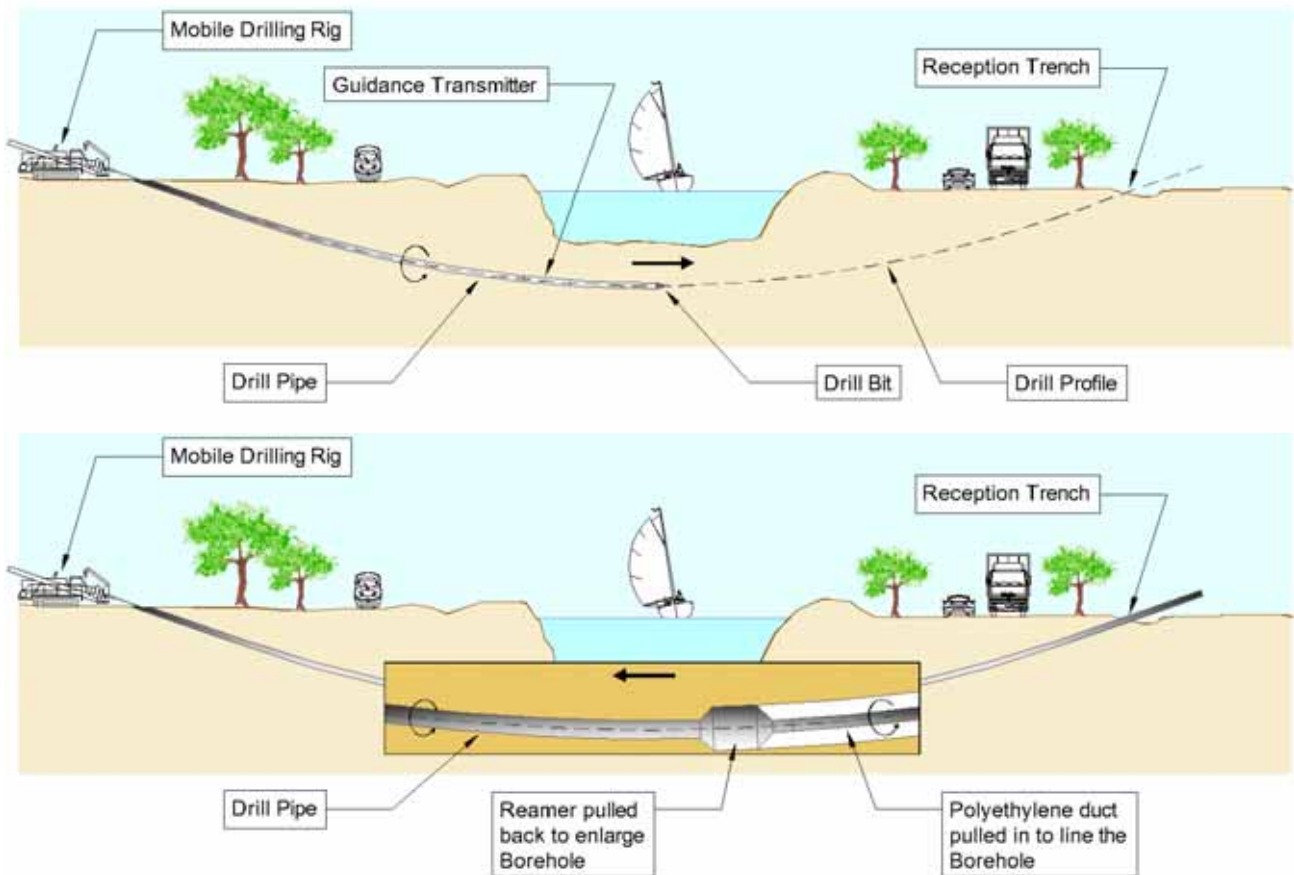
#### Marine Burial

- 5.3.12 In a marine environment it is possible to install direct buried cables in the seabed. A variety of different techniques could be used to achieve this dependent upon the nature of the seabed substrate, water depth, navigational and environmental constraints.
- 5.3.13 Marine cables are generally installed using a specialised cable laying vessel. In suitable conditions these employ a seabed plough that cuts a furrow and buries the cable in a single operation. Where the seabed is less dense, such as in sandy sediments, a high pressure water jet may be used to fluidise the sediments and allow the cable to settle into the jetted trench. Sediments then refill the trench over time. In harder substrates, such as rock, or where space is constrained, a remotely operated trenching vehicle may be employed. This is a submersible, tracked machine with a toothed cutting wheel guided from a surface vessel. The excavated material may either be recovered to the vessel, or deposited adjacent to the cut trench. The cables are then lowered into the trench.
- 5.3.14 With jetting or cutting it is possible to install ducts, before then installing the cables within them, providing the distances are comparatively short (less than 1km).
- 5.3.15 In suitable locations it may also be possible to lay the cables directly onto the surface of the seabed, either within or without enclosing ducts. Cables are then either installed from the shoreline or from a vessel, such as a barge.
- 5.3.16 In the case of shoreline installation a winch is used to draw the cables across the waterway between landfall sites. During the pull, floats are attached to the cable at regular intervals to maintain buoyancy and allow for the adjustment of the cables' position by means of small boats. This position is subsequently fixed by small boats and/or anchor buoys. Once sited, the floats are released and the cable falls to the seabed. Access routes to the shoreline for heavy plant and areas to site a construction compound would be required. A barge installation is similar to a shoreline installation, but in place of a land based winch a barge is used to tow the cable between landfall sites.
- 5.3.17 However, such installations are at significantly greater risk of damage, either through erosion of or deposition on the sea bed, tidal movement or physical damage from human activities such as anchoring or fishing. This risk can be partially mitigated by the installation of protective concrete mattresses or rock filled baskets above the cables.

### Trenchless Techniques for Laying Cables

- 5.3.18 At major crossing points, generally major rivers, main roads and railways, the use of open cut trenches may not be technically, environmentally or economically viable, and trenchless techniques would need to be employed. At these points the cable installation would be at greater depths and the cables would need to be spaced more widely to avoid the risk of overheating when in use.
- 5.3.19 The type and extent of the trenchless technique would be determined by a number of factors which include ground conditions, topography, available working space and stability of existing slopes.
- 5.3.20 There are three main options:
- Horizontal Directional Drilling*
- 5.3.21 Horizontal directional drilling (HDD) is a trenchless tunnelling technique usually used for the installation of pipelines. The main advantages over conventional tunnelling techniques are: the use of relatively lightweight machinery with lower impact of noise and dust; smaller quantities of materials to be delivered to and removed from site; and the ability to bore from the surface, removing the need for construction of deep shafts.
- 5.3.22 Typically an HDD is capable of drive lengths up to 1500m, but is highly dependent on ground conditions, drive profile and in the case of cable installations the permissible pulling tension that can be exerted on the cables.
- 5.3.23 HDD is a multistep process (see Figure 5.10):
- A small diameter pilot bore is drilled along the desired drill path from launch to reception pits.
  - The pilot bore is enlarged by pulling a larger cutting tool (back reamer) from the reception pit to the launch pit connected to the drill rods installed during the pilot boring. The back reamer is rotated during cutting the surrounding ground to create a passage for the permanent ducts. If required, the reaming stage may be repeated at successively larger sizes of cutting head.
  - Lining the borehole with a permanent polyethylene cable duct, which is pulled through the hole enlarged by the reaming process.
- 5.3.24 Throughout all stages of the drilling process a drilling fluid is pumped down the borehole to the drill head. This fluid facilitates the removal of cuttings, stabilises the bore hole, cools the cutting head and transmitter, and lubricates the passage duct. Shallow launch and reception pits are dug at either end of the length to be bored to collect and process the drilling fluid throughout the process
- 5.3.25 Good access links would be essential to operate the site efficiently, with movement of large machinery, material and spoil required throughout the construction works.
- 5.3.26 Cables are then pulled through the installed ducts, which are then filled with a clay-based material (bentonite) to aid heat dissipation. Using this technique there is minimal disturbance to the environment between the site compounds. As sections of cables cannot be joined within a duct, the maximum length of 400kV underground cable that could be pulled through a buried duct is limited by the delivery weight of a single cable drum and the stress placed on the cable when pulling it through the duct. These considerations typically limit maximum lengths to approximately 1km.





**Figure 5.10 Horizontal Directional Drilling (HDD) Cable Laying**

### *Tunnelling*

- 5.3.27 Two different tunnelling methodologies may be relevant to the current project: a large bore tunnel and micro tunnelling.
- 5.3.28 When constructing a large bore tunnel typically two types of excavation machinery could be used:
- A tunnel boring machine, with the ground supported by installed pre-cast concrete segments which progressively line the advancing tunnel.
  - Excavation by road header, or by drill and blast, with sprayed concrete lining to support the ground.
- 5.3.29 By contrast micro tunnelling uses a versatile pipe jacking technique. Here, complete pre-formed lengths of tunnel lining are pushed into place behind the advancing excavation machinery using hydraulic rams located at the start of the tunnel drive. This technique has the capacity to tunnel through hard rock and is capable of coping with varied ground water pressures. Installation lengths of up to 1500m can be achieved depending on the tunnel diameter and ground conditions.
- 5.3.30 Regardless of which of the tunnelling techniques is used, the construction of two shafts would be required, one at either end of the tunnel, which are then used to 'launch' and 'recover' the tunnel boring machine, road header or other excavation equipment.
- 5.3.31 Tunnelling operations require level working areas at the surface, with good access links for movement of heavy machinery, spoil and material during construction.

- 5.3.32 Once the tunnel is completed the cables are typically installed using powered rollers before being clamped to the shaft lining and hung on the walls within the tunnel. A permanent above ground head house would be required above one or more of the tunnel shafts to allow for maintenance access, winching equipment and any cable cooling or ventilation equipment that might be required. The head houses would be in addition to any SECs, which may be located some distance from the tunnel shaft, with direct buried cables typically installed between the two.

#### *Bridge Installation*

- 5.3.33 For shorter distances, to cross a linear feature such as a river or railway, it may be possible to install cables on, in or beneath the deck of existing bridges where this would not conflict with its primary purpose. Alternatively a new purpose-built bridge can be constructed specifically to carry cables across a linear feature. The scale of the bridge would be determined by the form of support chosen, the weight (size and number) of the cables to be carried, and the width of the feature to be crossed. See Chapter 14 for a project specific discussion relating to Britannia Bridge.

#### Cabling Construction Working Areas

- 5.3.34 For all cabling works, vegetation would be cleared and topsoil stripped from the areas of ground to be disturbed in the working area. Where required, drainage improvement works would be implemented to maintain existing land drainage arrangements. Once the cables have been laid and, where necessary, any excavations backfilled, the temporary haul road and access tracks would be removed and soil replaced. Temporary stored topsoil and subsoil would be re-used for surface reinstatement. Where possible, hedgerows would be planted or replaced, although trees cannot be planted on top of the cables.
- 5.3.35 Where the route climbs a steep slope, there may be the need for civil engineering works to reduce the mechanical strain on the cables. In such circumstances, it is normal to lay the cables in a snake formation (not straight up the slope), in order to distribute the cable weight. Due to this snaking, these parts can require a greater installation width and a larger amount of excavation.
- 5.3.36 For underground cables, in significant areas of rock different excavation techniques would be required. For areas of large, continuous rock formations, rock-cutting techniques would be required.

#### Cabling Operation and Life Expectancy

- 5.3.37 Cables have a life expectancy of approximately 40 years. After this time, the cables would need to be fully replaced, further adding to significant lifetime cost differences in comparison with an equivalent overhead line. If there is space, a new cable route could be constructed alongside the existing to avoid prolonged non-availability of the circuit. The redundant cables would then normally be removed once the new cables become operational.
- 5.3.38 Monitoring would be carried out via fibre-optic cables installed within the cables.

## **5.4 Substations**

- 5.4.1 National Grid substations are required where power stations connect to the transmission system. They are also required where National Grid can control the direction and quality of power across the transmission system, and where the transmission voltages of 400kV and 275kV need to be transformed to the lower voltages at which the distribution networks or large electricity consumers (such as Network Rail) operate. Equipment within substations generally ranges up to 12m in height. Each circuit that connects to a substation (whether connecting to another National Grid substation or a power station)

requires a dedicated part of electrical equipment. The connection of additional circuits to an existing substation requires the extension of the equipment footprint at the site, which may require the extension of the site boundary to enclose the equipment. National Grid substations vary in size depending on the number of associated connections, but all are surrounded by a metal security fence.

## 6 FACTORS INFLUENCING THE IDENTIFICATION OF ROUTE OPTIONS AND SCOPE OF THE APPRAISAL

### 6.1 Introduction

6.1.1 The environmental, socio-economic, technical and cost considerations used to evaluate and appraise the route corridors have been influenced, amongst others, by:

- National Grid's statutory duties and policies;
- other legislative requirements including the Planning Act 2008 and associated Regulations, including the duties with regard to consultation; and
- planning policy.

6.1.2 Chapter 4 outlines the relevant planning policies, and in this chapter additional information specific to the scoping of appraisal topics is presented. This chapter then outlines the environmental, socio-economic, technical and cost considerations used to evaluate and appraise the route corridors.

### 6.2 Statutory Duties

6.2.1 As outlined earlier in this report, Section 9 of the Electricity Act places an obligation on National Grid to develop and maintain an efficient, co-ordinated and economical system of electricity transmission. In addition, Schedule 9(1) in Section 38 of the Act requires National Grid to consider the effects of its works on amenity by having regard to:

*"the desirability of preserving natural beauty, of conserving flora, fauna, and geological or physiographical features of special interest and of protecting sites, buildings and objects of architectural, historic or archaeological interest".*

### 6.3 Planning Act 2008

6.3.1 The installation of an above ground transmission connection over 132kV and 2km is defined as a NSIP. As such, should any part of a new connection involve overhead lines that exceed these thresholds, an application for a DCO would be required under the Planning Act 2008. The Secretary of State is the determining authority for such applications.

6.3.2 In England, a DCO application would usually also include all additional development associated with the overhead line. In Wales, applications for any associated development, which does not form part of the NSIP, would be determined by the relevant local planning authority. However, development which forms part of the overhead line would be included within the DCO.

6.3.3 In determining an application for development consent by virtue of Sections 104 and 105<sup>18</sup>, there are a number of issues to which the Planning Inspectorate and the Secretary of State must have regard. In summary, these are:

- any relevant NPS;
- any local impact report produced by relevant Local Authorities;
- any matters prescribed by regulations; and
- any other matters which the decision maker considers to be both important and relevant to the decision.

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<sup>18</sup> The Planning Act, 2008; Chapter 29

### National Policy Statements EN1 and EN-5

- 6.3.4 NPS EN-1 provides overarching policy for the consideration of any form of energy-related NSIP. It requires the decision maker to take account of adverse effects (environmental, social and economic) and weigh these against the benefits of the proposal. It identifies the generic issues that should be taken into account in assessing applications for development consent, recognising that these are the issues which are likely to arise most frequently, but that they are not equally applicable to all projects. NPS EN-5 identifies a number of issues specific to proposals for electricity networks infrastructure.
- 6.3.5 The generic issues raised by EN-1 and EN-5 include:
- air quality and emissions;
  - biodiversity and geological conservation, noting particularly the effects on designated sites (EN-5 seeks information on the effects on birds and their flight paths);
  - civil and military aviation and defence interests;
  - coastal change;
  - dust, odour, artificial light, smoke, steam and insect infestation;
  - flood risk and climate change resilience;
  - historic environment, noting particularly the effects on designated sites (and also the statutory preference to preserve such sites in response to any risk of harm);
  - landscape and visual effects, noting particularly the effects on nationally designated landscapes (EN-5 promotes the use of the Holford Rules and outlines the approach to the consideration of undergrounding);
  - land use, including open space, green infrastructure and Green Belt;
  - noise and vibration (EN-5 notes that noise from overhead lines is unlikely to lead the determining authority to refuse an application);
  - socio-economic effects;
  - traffic and transport effects;
  - waste management; and
  - water quality and resources.
- 6.3.6 In addition, EN-5 notes that, with regard to EMFs, the determining authority would need to satisfy itself that ICNIRP<sup>19</sup> guidelines are met.

### Holford Rules

- 6.3.7 The Holford Rules<sup>20</sup>, cited in NPS EN-5, are a set of broad principles developed by Lord Holford in 1959 to assist with choosing overhead line routes. These 'rules' are now used as standard by the industry, and have been tested at public inquiries and at hearings under the Electricity Act 1989. The Holford Rules need to be considered at all stages of

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<sup>19</sup> **International Commission on Non-Ionising Radiation Protection (1998)** *Guidelines for limiting exposure to time varying electric, magnetic and electromagnetic fields*

<sup>20</sup> **National Grid (2003)** *The National Grid Company plc and New High Voltage Transmission Lines – Guidelines for Line Routeing (the Holford Rules) and Undergrounding*

the development of an overhead line, with the following particularly applicable to the route corridor selection stage for the Wylfa to Pentir transmission connection:

- **Rule 1** – Avoid altogether, if possible, the most valued landscapes by planning the route of the line in the first place, even if the route ends up being longer. This applies to nationally important landscapes such as National Parks and AONBs.
- **Rule 3** – Other things being equal, choose the most direct line, with no sharp changes of direction and thus fewer angle pylons.
- **Rule 6** – In countryside which is flat with few trees, keep the high voltage lines as far as possible away from smaller power lines, joining routes, distribution poles and other masts, wires and cables so as to avoid visual clutter.
- **Rule 7** – Approach towns and cities through industrial areas where they exist (noting that where a line needs to pass through a built up area, it should be routed to lessen harmful views and routes should be chosen after considering the effects on the amenity of existing development and on proposals for new development).
- **Supplementary Note A** – Avoid routeing close to housing as far as possible.
- **Supplementary Note B** – Where possible, choose routes which minimise the effect on SLAs, Areas of Great Landscape Value and other similar designations of county, district or local value.

#### Horlock Rules

6.3.8 The Horlock Rules<sup>21</sup> provide National Grid guidance to identify locations for and the design of new substations and other operational sites, which may be required as part of a new transmission connection. This guidance assists National Grid in fulfilling its amenity obligations set out in Schedule 9 of the Electricity Act 1989. Those guidelines most relevant to this stage in the Wylfa to Pentir transmission connection project are:

- **Guideline 2** – The siting of new substations, SECs and line entries should, as far as possible, try to avoid internationally and nationally designated areas of the highest amenity, cultural or scientific value by the overall planning of the connections.
- **Guideline 3** – Areas of local amenity value, important existing habitats and landscape features, including ancient woodland, historic hedgerows, surface and ground water sources and nature conservation areas should be protected as far as practicable.

## 6.4 Route Appraisal Topics

6.4.1 National Grid has developed an approach to options appraisal ('Our Approach to Options Appraisal'<sup>22</sup>), which has been designed to reflect the requirements of the Planning Act 2008 for DCO applications. National Grid carries out options appraisals for new electricity transmission lines because it provides a framework to identify and balance environmental, socio-economic, technical and cost considerations in selecting project options. It also documents, in a transparent manner, the information on which National Grid has based its judgements.

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<sup>21</sup> **National Grid:** *The National Grid Company plc, NGC Substations and the Environment: Guidelines on Siting and Design (Horlock Rules)*

<sup>22</sup> **National Grid (2012)** *Our Approach to Options Appraisal* [on-line] Available at: <http://northwalesconnection.com/supporting-information-and-factsheets.aspx>

6.4.2 At this stage in the project's development, options appraisal topics were used to identify and compare route options to inform the selection of those route options presented for consultation in Autumn 2015.

6.4.3 Taking into account the factors identified in the NPS EN-1 and EN-5, and feedback from stakeholders, the following topics were considered during the appraisal of each route option as those likely to provide a significant differentiator for a high level comparison of route options:

- **Environmental**

- **Landscape and Visual:** the potential effects on designated landscapes, landscape character, landscape sensitivity, open access areas and landscape and visual receptors were particular concerns raised in the NPSs and consultation feedback as needing attention during the routing of the overhead line.
- **Historic Environment:** Holford Rules seek to avoid internationally, nationally and locally designated sites; effects on heritage assets' settings were also considered and may include links to landscape value.
- **Ecology** Holford Rules encourage avoidance of internationally, nationally and locally designated sites and features. Where influential in regard to the decision-making, other undesignated sites and features, such as woodlands, were also considered.
- **Traffic and Transport:** The potential effects are likely to be only temporary and related to construction traffic and other construction activities. National Grid does not believe that the overall traffic and transport effects of developing one route would be significantly different to those associated with another route. However, access constraints have been considered when developing and appraising route options.
- **Water:** The potential effects on water resources (e.g. rivers and other water bodies) and flood risk are likely to be very localised and dependent on the detailed design, but it is recognised that there is a preference to avoid placing pylons and SECs in marshes or areas that are frequently water-logged (e.g. frequent flood risk zones).

- **Socio-economic**

- **Local Economy:** considered potential effects upon settlements and residential areas, tourism features, recreational facilities, commercial forestry and planning development allocations. Tourism is an important employment industry for the area, with concerns about effects on this sector raised in consultation feedback.
- **Aviation and Defence:** considered the proximity of route options to main aviation and defence assets and any associated low fly zones.
- **Engineering:** considered the technical complexity, construction / project delivery issues, suitability of technology, network capacity and network efficiencies / benefits (including energy efficiency).
- **Cost:** considered capital cost to construct the proposed development within each route corridor.

6.4.4 Information relating to these topics was identified through research, site visits, analysis of data and ongoing consultation with stakeholders. Using publicly available information and site visits, maps were produced to show the 'baseline' environmental and socio-economic data within the study area (see Appendix A).

6.4.5 Should consultation responses identify other topics, receptors or concerns that have not been included as part of this appraisal, then these will be considered and, if necessary, a review will be carried out to confirm whether their inclusion would have influenced the route identification and selection process.

6.4.6 Once a preferred route is selected, a detailed design, including the selection of tower designs and the design of a connection alignment within that route option, will be finalised and brought forward for formal statutory consultation. Factors discounted during this route options appraisal stage would be reviewed in the light of any changes and information would be provided within a Scoping Report, for the EIA, submitted to the Secretary of State.

## 6.5 Factors Discounted in Evaluating Route Options

6.5.1 With respect to environmental and socio-economic considerations, the evaluation carried out at this stage has focused on those factors which are likely to provide a differentiator between route options.

6.5.2 A number of factors that appear in the generic list of issues included in the NPS EN-1, and others put forward by stakeholders during consultation, were considered within the route options evaluation but did not assist significantly in comparing the merits of different route options, either because:

- there are no receptors of that type likely to be significantly affected by any of the options; or
- because the magnitude and significance of the effects are likely to be broadly similar for all options.

6.5.3 Should consultation responses or other reasons require additional consideration, we would carry out a back-check and review of these matters. As noted above, factors discounted during this pre-application stage would be re-considered to be assessed in detail during the EIA of the detailed design stage.

6.5.4 The discounted factors were as follows:

- **Air Quality and Emissions to Air:** Potential effects on air quality would be temporary, and related to construction traffic. There is no evidence to suggest that there would be a significant difference between routes / technologies / site locations in terms of effects on air quality and emissions arising from the construction works.
- **Coastal Change:** Although this generic effect is included in NPS EN-1, it has not been considered at this stage as the potential for the proposed development to affect, or be affected by, coastal processes is dependent upon by the detailed design of the Menai Strait crossing, such as technology type and location of working areas / infrastructure, which is not currently defined.
- **Dust, Odour, Artificial Light, Smoke, Steam and Insect Infestation:** It is considered that the scheme would only have the potential to temporarily give rise to dust and artificial light effects during the construction phase. These effects could be avoided or significantly reduced through detailed design and the implementation of a standard construction phase environmental management plan. There is no evidence to suggest that there would be a significant difference between route options with regard to these effects.
- **Electric and Magnetic Fields (EMFs):** The potential effect of EMFs on a range of health issues is often raised as a concern with electricity transmission infrastructure. However, NPS EN5 states that consent should not be withheld for a new overhead line on EMF grounds where the applicant can demonstrate that the line would comply with guideline levels for electric and magnetic field strengths. National Grid



designs all of its system to be compliant with the ICNIRP guidelines on exposure to EMFs, and is confident that compliant overhead line designs could be achieved, whichever route option is selected. An assessment of the potential effect of electric and magnetic fields would be included in the DCO submission for the preferred scheme. EN-5 notes only that the determining authority would need to be satisfied that ICNIRP guidelines are met. EMFs were not therefore considered at this stage.

- **Land Ownership:** In general, land ownership would not affect alternative route options. At this stage, land ownership issues would not influence National Grid in the selection of a preferred route option.
- **Noise and Vibration:** The effects of operational noise can only be assessed once a more detailed alignment, technology, site locations and outline design are identified; therefore, they were not considered at this stage. EN-5 notes that noise from overhead lines is unlikely to lead the determining authority to refuse an application; this is because a variety of mitigation measures could be introduced, such as the positioning of lines and the design and maintenance of conductors. National Grid follows the guidelines on noise set out in EN-5 and would consider these as part of the siting and design of any lengths of overhead lines. Noise assessments would also be undertaken as part of the design process for the new line, as well as any new substation and SECs that may be required. Where required, measures may be incorporated to mitigate the effect of any noise at local properties. The assessment methodology would take account of existing background noise levels and the proximity of residential properties, and would also consider other noise sensitive land uses, for example schools, where necessary. Underground cables do not give rise to operational noise effects.
- **Soils and Geology** – Though Anglesey is an internationally recognised Geopark, the designation applies to all the route options and the geotechnical constraints of the geology have been considered as part of the technical appraisal. The associated impacts on soils and geology are likely to be localised, and could be mitigated through design and the adoption of appropriate good practice mitigation measures for all of the route corridors.
- **Waste Management:** Although this generic effect is included in EN-1, waste would primarily arise from construction operations and would not be distinctly different for alternative routes, technology or site locations.

## 7 STAKEHOLDER CONSULTATION

### 7.1 Introduction

7.1.1 National Grid acknowledges the importance of informing, and seeking the views of statutory consultees and stakeholders, including the general public, and of taking their views into account during the design of connection proposals. Therefore, National Grid has engaged with a number of statutory consultees and stakeholders to inform the identification and refinement of route corridors and the route corridor appraisal.

7.1.2 To date, this consultation process has been 'informal' and feedback from statutory stakeholders was based on the local knowledge, experience and judgements of professional officers of the organisations. It was understood that feedback from individual statutory authority officers did not necessarily represent the views of the stakeholder organisations and general public themselves. In due course National Grid will carry out its 'formal' statutory consultation process under the Planning Act 2008.

### 7.2 Pre 2015 Consultation

#### Route Corridor Consultation

7.2.1 Between October and December 2012 National Grid consulted publicly on the strategic options appraisals and the proposal for a new overhead line connection between Wylfa and Pentir. The consultation included potential route corridors and options for crossing the Menai Strait (see Chapter 3, Part 4), together with work needed at Bryncir and the Glaslyn Estuary in Gwynedd.

7.2.2 Full details of the consultation exercise and responses are available in the Stage One Consultation Feedback Report<sup>23</sup>. In summary:

- National Grid held 35 events, attended by 736 people.
- National Grid received 38 stakeholder responses from community councils and other stakeholders.
- 1,549 pieces of feedback were received from members of the public; of these, 1,057 used a campaign group postcard to submit a response.
- 153 members of the public provided detailed feedback on the route corridors, using the Wylfa-Pentir consultation feedback form.

#### Route Corridor Appraisal Consultation

7.2.3 In 2013 and 2014 National Grid consulted officers from a number of statutory consultees (Isle of Anglesey County Council, Gwynedd Council, Natural Resources Wales and Cadw) on the route corridors and the appraisal process to further inform the selection of the preferred route corridor.

7.2.4 In order to facilitate feedback, National Grid met with representatives of such authorities during the project's development. These were informal meetings with officers to obtain guidance and draw on their local knowledge. It was acknowledged that the feedback provided did not necessarily represent the official views of their respective organisations and Council Members.

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<sup>23</sup> **National Grid (2014)** *North Wales Connection Project: Stage One Consultation Feedback Report* [on-line] Available at: [http://nationalgrid.opendebate.co.uk/files/North\\_Wales\\_Connection\\_-\\_Feedback\\_Report.pdf](http://nationalgrid.opendebate.co.uk/files/North_Wales_Connection_-_Feedback_Report.pdf)

7.2.5 National Grid has also met with other stakeholders with an interest in the project (including several Community Councils, Welsh Government, National Trust, RSPB, University of Bangor, etc.) to improve the understanding of the local environment and the main stakeholder concerns.

#### Summary of Consultation Feedback

7.2.6 The following presents a summary of the consultation responses that have been considered in the selection of the preferred route corridor:

- Of the 153 members of the public who expressed a route corridor preference, 121 expressed a preference for the Orange Route Corridor.
- The Menai Strait area was indicated by stakeholders as a particularly sensitive area to overhead line development due to potential effects on the AONB and many other sites and features located along the coast.
- Where stakeholders expressed a view, they generally preferred the Orange Route Corridor over the other route corridors for a new overhead line as it was the shortest most direct route and followed the existing line (i.e. 'something already there') and avoided introducing new infrastructure in the south-west of the island.
- There were concerns from stakeholders about the perceived effects of an overhead line on views of Snowdonia from the A55; in particular for those arriving through the Port of Holyhead or Anglesey Airport to visit Wales.

### **7.3 2015 Consultation**

7.3.1 During the course of the route options identification and appraisal, since the announcement of the preferred route corridor in January 2015, National Grid has continued to liaise with statutory and non-statutory bodies. The aim of this process has been to brief officers from statutory stakeholders on the route option identification and appraisal process, and offer an opportunity to:

- provide input into route options identification and selection of those for consultation;
- identify the main environmental issues and concerns associated with their remit; and
- provide input on the scope of any additional surveys.

7.3.2 These activities were informal and on the basis that the nature and scope of the feedback itself is non-attributable to a specific organisation. Additionally, these activities were held on the understanding that they are on a 'without prejudice' basis, meaning that the various bodies may wish to amend or update their comments or positions at a later date. Nevertheless, stakeholder feedback continues to play an important role in the development of route options within the Orange Route Corridor.

7.3.3 In no particular order of significance, some of the main issues arising from this process included:

- Recognition of a need to balance the often conflicting interests of impacting the landscape, the physical and cultural environment and visual amenity of residents.
- A strong preference to keep the new overhead line close to the existing line. This was based on seeking to preserve the special character and appearance of those parts of the island currently unaffected by transmission development and other energy infrastructure. Where possible, the adoption of a close parallel overhead line was preferred as this would have a lower level of adverse visual effects on visual receptors overall.
- Seek to avoid encircling whole communities and minimise wider impacts on settlements or the wider landscape.

- Avoid impacts on statutory and non-statutory designated heritage assets and their settings. It was recommended that Registered Parks and Gardens should be treated as having statutory status.
- Consider future potential to underground the existing overhead line at particularly sensitive locations, and try to avoid precluding this option at a later date.
- Planning protection afforded to an AONB should be viewed as equivalent to that of a National Park.
- Preserve the special character and appearance of the island, plus special views and vistas.
- Avoid ecological impacts on Menai Strait. It was suggested that a full Habitat Regulations Assessment may be required if there may be effects on the European designated habitat.
- If going through Vaynol Estate, avoid the deployment of permanent above-ground infrastructure and impacts on parkland features (e.g. mature trees); these features can be difficult to restore.
- The sunrise alignment at the scheduled archaeological site Bryn Celli Ddu was a concern. This site should be treated as an internationally significant location; views towards the site should also be considered as much as from within the site.

7.3.4 More specific feedback on the route options that informed the selection of those for consultation in Autumn 2015 is presented alongside the route option appraisals in Chapters 9 to 15.

## 8 APPROACH TO THE IDENTIFICATION, APPRAISAL AND SELECTION OF ROUTE OPTIONS FOR CONSULTATION

### 8.1 Introduction

8.1.1 The Orange Route Corridor between Wylfa and the Llanfair PG area was identified as preferred for a variety of reasons: it offers the most direct route to Pentir, so would require fewer towers; the landscape and topography is generally considered to offer better opportunities to reduce the extent of visual effects; and it offers opportunities to avoid routeing through designated sites. These benefits also explain the selection of the alignment for the existing 400kV transmission line in the 1960s.

8.1.2 It is noted that the existing 400 kV overhead line needs to be retained to provide sufficient capacity, when combined with the proposed new connection, to serve the electrical output from the proposed Wylfa Newydd Power Station. Therefore, the route corridor will continue to experience landscape and visual effects associated with transmission equipment, regardless of the route selected for the new transmission line.

8.1.3 Chapter 16 presents more information concerning the potential interactions of the two lines and how these considerations might influence: the alignment assumptions; the appraisal of cumulative effects; and ultimately the selection of a preferred route option.

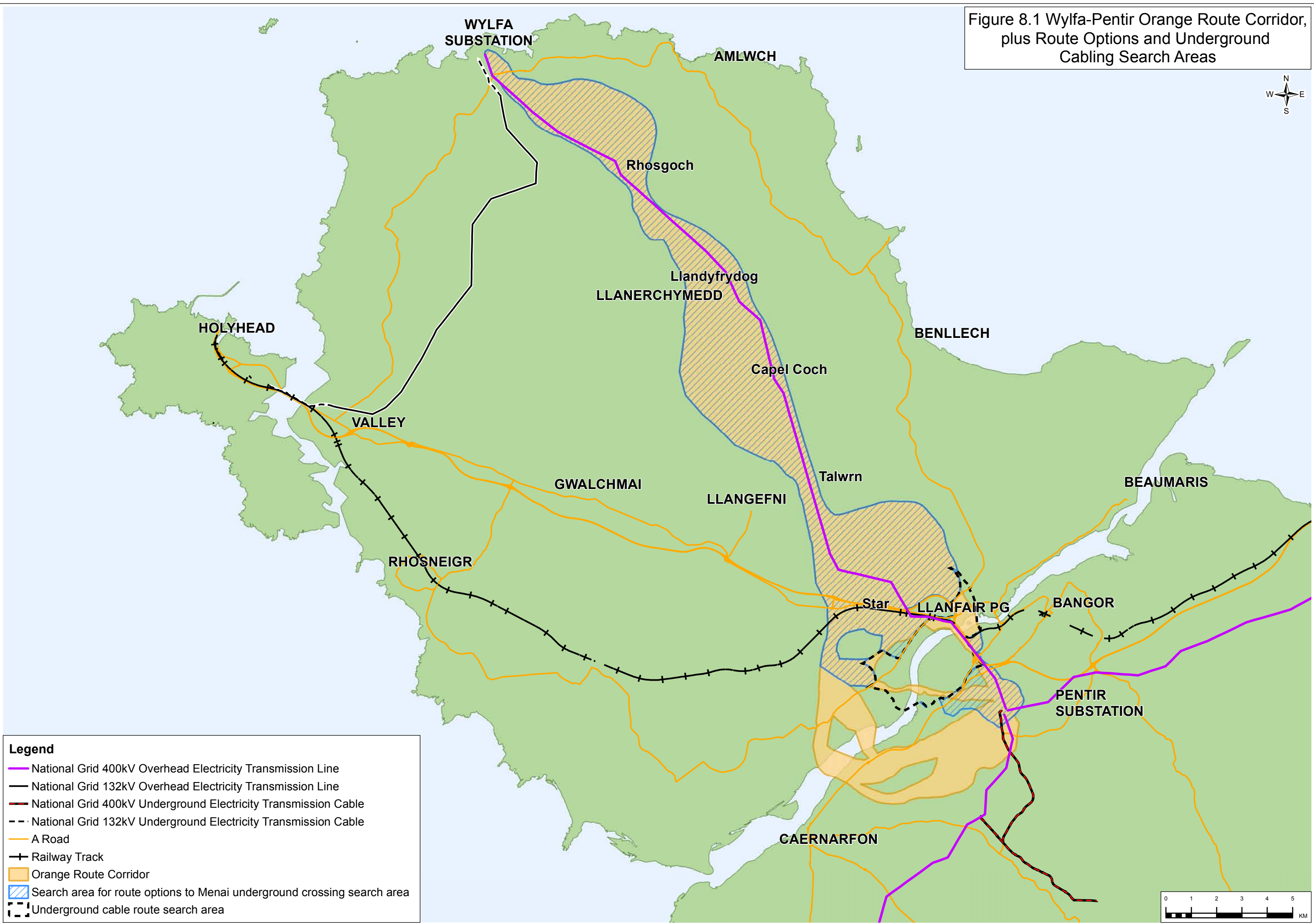
8.1.4 During the preferred route corridor selection, and taking into account national planning policy tests, National Grid committed to take forward the use of an alternative technology to cross the Anglesey AONB and the Menai Strait. As a result, the search area for new transmission line route options logically divided the Orange Route Corridor into three zones (see Figure 8.1), with different factors influencing the identification of route options:

- An overhead line section between Wylfa and the Menai approach, south-east of Llangefni, where a narrow length of the Orange Route Corridor opens up to a broad area to cross the Menai Strait.
- A non-overhead line section around the Anglesey AONB and Menai Strait crossing, within the large area of the Orange Route Corridor around the Menai Strait.
- An onward overhead connection between Menai Strait crossing connection on the Gwynedd side and Pentir Substation.

8.1.5 This chapter describes the approach taken to identify and appraise route options for a new overhead line along the Orange Route Corridor between Wylfa and the Menai approach. Based upon these appraisals, a short-list of preferred overhead route options has been developed and taken forward to public consultation in Autumn 2015. This chapter also provides an overview of how the Wylfa to Menai approach has been divided into discrete sections to facilitate the identification and appraisal of route options. These sections have also been assessed in combination so that the identification of the discrete sections and the boundaries between those sections does not exert influence on the final outcome.

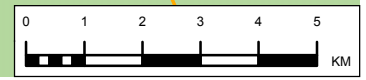
8.1.6 It is important to note that, at this stage in the process, National Grid is maintaining flexibility in the location of route options to enable consultation responses, and further environmental, technical and commercial studies, to inform the selection of a preferred route. Therefore, although the Orange Route Corridor provided an initial guide to a search area, its boundary was not regarded as an absolute constraint to routeing so that options that went slightly outside the Orange Route Corridor could still be considered where it could result in a better option.

Figure 8.1 Wylfa-Pentir Orange Route Corridor, plus Route Options and Underground Cabling Search Areas



**Legend**

- National Grid 400kV Overhead Electricity Transmission Line
- National Grid 132kV Overhead Electricity Transmission Line
- - - National Grid 400kV Underground Electricity Transmission Cable
- - - National Grid 132kV Underground Electricity Transmission Cable
- A Road
- + + Railway Track
- Orange Route Corridor
- Search area for route options to Menai underground crossing search area
- Underground cable route search area



- 8.1.7 The findings of the Wylfa to Menai approach route options identification and appraisal are presented in Chapters 9 to 12. Chapters 13 to 15 describe the current development undertaken in respect of the Anglesey AONB to Pentir section.

## **8.2 The Parallel Alignment Opportunity**

- 8.2.1 The presence of the existing National Grid 400kV line within the Orange Route Corridor provides both an opportunity and a constraint to the development of any new overhead line. By constructing the new overhead line close to the existing line the spread of transmission development, both within the corridor and across the wider island, would be minimised. Whilst this would increase the effects of transmission development within the vicinity, it was generally considered that the cumulative effect would be less than the additional effects of a new overhead line built in one of the alternative route corridors presently unaffected by transmission development.
- 8.2.2 In principle, the more closely that the new overhead line can parallel and mirror the existing overhead line between Wylfa and the Menai approach, the more limited will be the area affected by transmission infrastructure. This opportunity was one of the considerations in selecting the preferred route corridor.
- 8.2.3 For the purposes of the route options identification, base alignment options were adopted comprising two alignments parallel to the existing overhead line, but offset each side by 85m. Standard tower construction techniques involve the use of a mobile crane to lift into place parts of the tower that have been assembled on the ground. If this crane position and working area is to be sited between the new and existing overhead lines, a minimum distance of 85m needs to be maintained between the centres of the two lines (assuming the use of standard 50m tall lattice towers). Therefore, when considering the potential for a close parallel route, and in order to maintain flexibility in design whilst siting the two lines close together, a stand-off distance of 85m was initially assumed. Detailed, site-specific studies would be needed before determining whether a new overhead line could be developed closer than 85m to the existing 400kV overhead line.
- 8.2.4 In identifying the preferred route corridor, desk and field based reviews confirmed the potential to achieve a broadly close parallel line within the Orange Route Corridor. It was also acknowledged that there would be constraints along the Orange Route Corridor, such as designated sites and residential properties, which would likely require deviations from a close parallel route alignment or consideration of wider non-parallel route options. Considerations included: identifying individual properties and their views; understanding the role of vegetation in screening views; appraising views from the A55 (especially towards Snowdonia); identifying recognised cultural heritage assets (e.g. standing stones and listed buildings) and their settings; and significant or protected wildlife habitats (e.g. ancient woodlands and the Anglesey Fens SAC). However, it was considered that the visual and cumulative effects arising from such deviations were not likely to be so significant as to negate the benefits of seeking a close parallel alignment, where possible, or shift the balance in favour of a wholly non-parallel alignment either in this or in another route corridor.
- 8.2.5 The ability to develop routes which offered broadly parallel alignment options alongside the existing overhead line was a factor in selecting the Orange Route Corridor; though routes away from the existing overhead line were not discounted. The principle behind this decision was that, all other things being equal, the introduction of a closely routed overhead line is likely to give rise to a lower magnitude of change than the insertion of a new line into a landscape and views where there is currently no overhead line. This is because the existing overhead line already has an effect on views in the surrounding area and is a significant element in the landscape that exerts influence on local landscape character. National Grid will continue to review and back-check this assumption as the identification and assessment of specific routes progresses.



- 8.2.6 However, it was also considered that even if the existing line did not exist, thereby removing the cumulative effects of two 400kV overhead lines in one route corridor, the Orange Route Corridor would still be preferred. This was due to it being considered to better accord with the Holford Rules due to, for example, the potential for the surrounding landform and vegetation to screen views along lengths of line and the more direct route involved.
- 8.2.7 This assumption was supported by current 'best practice' guidance, such as the third edition of 'Guidelines for Landscape and Visual Impact Assessment' (GLVIA), published by The Landscape Institute and Institute of Environmental Management and Assessment. The GLVIA recommends the consideration of 'sensitivity' of receptors together with the 'magnitude' of effects in order to assess their overall significance. The magnitude of visual effects depends in part on the size or scale of change within a view. Judging the magnitude of effects takes account of: *"the degree of contrast or integration of any new feature or change in the landscape with the existing or remaining landscape elements and characteristics in terms of the form, scale and mass, line, height, colour and texture."*
- 8.2.8 As the existing overhead line follows an alignment that broadly complies with the Holford Rules, especially in the context of the environmental sites designated at the time of its development, much of the route might offer opportunities for the development of a closely routed new line. The Holford Rules (see Chapter 6) set out guidance for appropriate development of overhead power lines. The Preferred Route Corridor Selection Report identifies that the route would avoid areas of highest amenity value (e.g. Anglesey AONB), in accordance with Holford Rule No.1. However, the Holford Rules also state that overhead lines should avoid areas of high amenity value, providing this can be done without using too many angle towers (Rule 2), and be direct, with no sharp changes of direction and thus fewer angle towers (Rule 3). It also states that new overhead lines should be kept clear of other smaller lines, converging routes, poles, masts etc. to avoid a visually confusing 'wirescape' (Rule 6).
- 8.2.9 It is important to note that Rule 6 does not preclude parallel or closely related alignments and offers the following advice:
- "In all locations minimise confusing appearance. Arrange wherever practicable that parallel or closely related routes are planned with tower types, spans and conductors forming a coherent appearance; where routes need to diverge, allow where practicable sufficient separation to limit the effects on properties and features between the lines."*
- 8.2.10 Finally, the existing overhead line passes through three pinch points defined by the proximity of nationally designated sites and existing settlements (Tregel; Rhosgoch and Rhosybol; and Talwrn), which have locally restricted the extent of the Orange Route Corridor. These sites and settlements also limit the route options for a new overhead line within the corridor to the area close to the existing line. Holford Rule 3 advises to choose the most direct line, with no sharp changes of direction and thus with fewer angle towers. Therefore, parallel or closely related route options leading into and out of these pinch points would potentially comply with Holford Rule 3 better than any non-parallel routes that may require sharp changes and angle towers in their approach to these points.
- 8.2.11 Other less important opportunities to reduce the environmental effects of transmission development might also be realised through the adoption of a closely related route, such as the potential for established and agreed access routes, used for the inspection and maintenance of the existing line, to be used for the construction of a new line.



### 8.3 Route Options Identification and Screening

- 8.3.1 It is important to note that, whilst a parallel or closely related alignment may be considered appropriate, other, non-parallel route options were considered within the Orange Route Corridor. If paralleling was adopted, then it was accepted that the process of routeing a parallel line close to an existing one may require deviations or transpositions in order to avoid unacceptable adverse effects on certain receptors.
- 8.3.2 A deviation involves routeing away from a parallel alignment with another overhead line. Deviations may be localised over a short distance to avoid a single constraint, or over longer lengths thereby creating two single, non-parallel overhead lines in a broad corridor. Therefore, even if a close parallel route was pursued, there may be sections along the Orange Route Corridor where a separate, non-parallel overhead line, away from the existing overhead line, may be considered.
- 8.3.3 A ‘transposition’ would be needed where route options are located on opposite sides of the existing line to the other. This involves removing a length of the existing line, and joining the ends of the two route options approaching from either direction to the newly formed ends of the existing line. This allows a parallel line to change sides with the existing overhead line to avoid a constraint that would otherwise require a deviation around, and thereby loss of, the parallel alignment for that section.
- 8.3.4 On the basis of a parallel alignment being preferred and all other things being equal, the following steps were undertaken to identify 100m wide route options for a new 400kV overhead line. In this way a range of potential route options were identified that sought to achieve a close parallel to the existing overhead line, with consideration of non-parallel options, where appropriate.
- **Step 1:** As described, parallel lines were drawn 85m either side of the existing line representing ideal close parallel routes, assuming the absence of any other constraints to routeing, such as residential properties or designated sites.
  - **Step 2:** In practice a rigid 85m separation distance may not be feasible along the entire length of the existing overhead line. Therefore, an additional 50m was added either side of the baseline parallel alignment to enable a margin of flexibility away from the 85m separation distance objective. By identifying broader routes, opportunities still exist for the detailed alignment to avoid nearby constraints such as residential properties and their curtilages. Any such alignment might move to within approximately 65m of the existing line (the minimum allowable distance for a standard lattice tower) or up to, and potentially beyond, the outer edge of the broad route. This flexibility better reflects the degree of design certainty at this stage of the project’s development. It also allows any final design to take account of further appraisal findings, design and consultation feedback without significantly altering the route options presented.
  - **Step 3:** Where these ‘close parallel’ routes would result in significant environmental effects or design complications (such as oversailing properties, significant effects on visual amenity of individual receptors, woodland clearance, effects to heritage assets or their settings, or technical challenges) deviation routes were identified to avoid the site or feature. These deviations were either localised and short to avoid a specific constraint, or longer, forming a discrete new route remote from the existing line. It was considered that any deviation needed to be either localised or remote from the existing line so as to limit the number of receptors experiencing impacts from both lines and the potential for greater cumulative effects associated with moving from the closest parallel alignment. This accords with the advice set out in Holford Rule 6. It was considered that deviation routes would seek to tie back into a parallel route near an existing overhead tower, so as to allow existing and new towers to be closely related.

- **Step 4:** Appraise the environmental, socio-economic, technical and cost constraints of the potential route options identified.
- **Step 5:** Review the potential route options to screen out less well-performing options, informed by:
  - The environmental, socio-economic, technical and cost appraisals of the route options (see Chapter 6).
  - Further research as part of the ongoing project development (see Chapter 8, Part 4 of this report).
  - Feedback from stakeholders (see Chapter 8).
  - Opportunities for transpositions (i.e. repositioning the new parallel line from one side of overhead to the other) to combine sections of a parallel alignment or deviation options on alternate sides of the existing overhead line.

8.3.5 From the above actions, a range of 100m wide route options for a new overhead line along the Orange Route Corridor were identified and appraised. These route options comprise a mixture of close parallel and non-parallel options, and are illustrated in Figures in Appendix B. Chapters 9 to 12 present a summary of the main issues affecting the identification of route options between Wylfa and the Menai approach and selection of the routes for consultation.

## 8.4 Transmission Technology Considerations

8.4.1 At this stage, the route options appear to offer opportunities to identify a fully overhead line connection between Wylfa and the Menai Strait. This would accord with the assumptions and principles set out in:

- NPS EN-5, which advises at paragraph 2.8.8 that the Government expects it would often be appropriate to fulfil the need for new electricity lines of 132kV and above through the development of overhead lines, although it is recognised that there will be cases where this is not so. EN-5 goes on to state:

*“... Government has not laid down any general rule about when an overhead line should be considered unacceptable. The IPC should, however only refuse consent for overhead line proposals in favour of an underground or subsea line if it is satisfied that the benefits from the non-overhead alternative will clearly outweigh any extra economic, social and environmental impacts and the technical difficulties are surmountable”* (paragraph 2.8.9).

- National Grid’s Strategic Options Report, wherein National Grid stated its belief that:
 

*“...new overhead line circuits connecting Wylfa and Pentir (potentially with appropriate mitigation, including the use of underground technologies) would best achieve an appropriate balance between National Grid’s technical, economic, amenity and environmental obligations.”*
- National Grid’s Preferred Route Corridor Selection Report, which identified the preferred route on the assumption that a wholly new overhead line connection could be feasible between Wylfa and the Menai, in accordance with national planning policy tests.

8.4.2 Alternative tower types to the existing 50m high lattice towers (e.g. low height and T-pylons) could be deployed in situations where the lattice towers give rise to significant visual effects. However, there would need to be a demonstrable benefit to the adoption of alternative tower types when taking account of all considerations, including visual amenity effects of different tower types in the landscape and cost. The selection of tower types would be determined during the detailed design stage.

8.4.3 It is considered that the above approach would help to build the evidence needed to justify the development of an overhead line (where such a proposal is ultimately taken forward for consent) and demonstrate compliance with the policy tests set out in NPS EN-1 and EN-5 relating to alternatives. The approach was also guided by the Holford Rules to initially avoid areas of high amenity (e.g. designated landscapes, biodiversity or heritage sites and features) and consideration of visual amenity risks on residential properties, whilst seeking the most direct alignment using existing landscape features to maximise screening effects. Route options away from the default 85m offset sought to avoid oversailing residential properties, but no minimum separation distance between residential properties and the overhead line was prescribed in terms of visual residential amenity. As previously stated, this approach is supported by a study commissioned by Isle of Anglesey County Council, Gwynedd Council and Snowdonia National Park Authority that stated, with regards separation distances between residential properties and an overhead line development, any proposed development should be considered on its own merits, on a case by case basis<sup>24</sup>.

## 8.5 Additional Supporting Activities

### Pre-2015 Route Corridor Appraisal Activities

8.5.1 As part of the studies to inform the selection of the preferred route corridor a number of additional investigations were undertaken to supplement the baseline data presented in the initial Wylfa-Pentir Route Corridor Identification Report<sup>25</sup>, and thereby inform the appraisal of the route corridors. Those aspects of the further investigations relating to the Orange Route Corridor have also been used to inform the identification and short-listing of route options within the corridor, where appropriate. Additional information has also been identified through the ongoing consultations with stakeholders.

8.5.2 Those route corridor investigations relevant to the Orange Route Corridor included:

- Review of socio-economic activity, strategies and guidance, including:
  - Tourism Strategy North Wales (2010 – 2015);
  - Isle of Anglesey Destination Management Plan (2012 – 2016);
  - Review into the socio-economic effects of gas and electricity transmission projects; and
  - A study into the effects of National Grid major infrastructure projects on socio-economic factors<sup>26</sup>.
- Bird strike risk review of vulnerable/sensitive bird species, sites on Anglesey designated for these vulnerable species and known movements of sensitive species on Anglesey to identify locations where construction / operation of overhead line may increase the risk of bird strikes with overhead lines. Birds considered included: Red-throated Diver (*Gavia stellata*), Whooper Swan (*Cygnus cygnus*), Mute Swan (*C. olor*), Pink-footed Goose (*Anser brachyrhynchus*), Greylag Goose (*A. anser*) and European White Fronted Goose (*A. albifrons*).

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<sup>24</sup> **Gillespies (2014)** *Wind Turbines & Pylons: Guidance on the Application of Separate Distance from Residential Properties*

<sup>25</sup> **National Grid (2012)** *Wylfa-Pentir Initial Route Corridor Report* [on-line] Available at: <http://northwalesconnection.com/stage-one-consultation.aspx>

<sup>26</sup> **ERM (2014)** *A study into the effects of National Grid major infrastructure projects on socio-economic factors* [on-line] Available at: [www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=38741](http://www2.nationalgrid.com/WorkArea/DownloadAsset.aspx?id=38741)

- It was recognised that routeing the new transmission line in an area where this infrastructure is already a feature would increase the risk of cumulative effects being so great as to preclude the adoption of the corridor. In order to understand this risk the following work was undertaken:
  - High level review, based on field observations, of visual and residential amenity effects on residential properties within 100m of an indicative close parallel route alignment option within the Orange Route Corridor. This assisted in understanding the potential visual amenity effects of a parallel alignment. The review was informed by a visit to an existing parallel line near Stockton-On-Tees to appreciate the effects of parallel 400kV overhead lines, in particular where there are transpositions that allow the second line to cross to the other side of the existing line.
  - Production of indicative photomontages to aid visualisation of cumulative effects from close parallel alignments, deviations away from close parallel, close proximity to other infrastructure (e.g. wind farms, 132kV line), skylining and natural screening.
  - Review of habitats within the Cors Erddreiniog SSSI and National Nature Reserve (NNR), which is part of the Corsydd Môn (Anglesey Fens) SAC and Corsydd Môn a Llyn (Anglesey and Llyn Fens) Ramsar site, to identify those sensitive to the development of an overhead line, and to identify whether towers for a new overhead line could be positioned within the SAC close to the existing overhead line without directly affecting designated features.
- Development of indicative Zone of Theoretical Visibility (ZTV) models to illustrate how many towers within each corridor might be visible from the lower arms upwards (i.e. from a point on the tower 17m above ground level)<sup>27</sup>.
- Review of Local Development Plan policies and proposed development sites relevant to the Wylfa-Pentir route corridors to identify potential for future constraints or opportunities.
- Review of potential visual effects on views from the Anglesey AONB and A55 corridor, especially on panoramic views of Snowdonia, through site visits by landscape and visual amenity specialists.
- Review of possible cable crossing locations and technology options, informed by:
  - Bangor University's Menai Strait bathymetry data to understand the depth of the Menai Strait.
  - Site visit to the north and south sides of the Menai Strait to identify landscape considerations and inform the identification of SEC search areas and review viability for underground cabling technology options. The visit considered potential visual effects from: sensitive / designated sites; topography; existing woodland and scope for replanting; open ground for cabling; and sensitive local landscape and visual receptors.

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<sup>27</sup> At 17m the ZTV avoided being distorted by towers where only the top few metres may be visible. In addition, it would also shows visibility of low height towers, thus was representative of any overhead alignment

### 2015 Route Options Appraisal Activities

8.5.3 In addition to updating the historical, publicly available baseline information previously gathered, the following activities were undertaken in 2015 to inform the identification of route options within the preferred Orange Route Corridor:

- Updating existing mapping datasets previously acquired from publicly available datasets, such as designated sites and flood risk mapping data published by statutory authorities, to enable a review of the latest mapping information within the study area.
- Acquisition of additional mapping datasets for the new local land use allocations published in the JLDP (Deposit Plan 2015) in order to overlay onto maps emerging land use proposals that might influence the identification of route options. The data included that proposed to be adopted for development or specified land uses, such as housing and employment developments. Although many were not taken forward in the JLDP Deposit Plan, the Candidate Sites, proposed by members of the public for consideration during the development of the JLDP Deposit Plan, provided an indication of the potential for third party, future development interest risks and opportunities.
- Review of planning applications within the corridor between Wylfa and Pentir submitted to Gwynedd Council and Isle of Anglesey County Council between 2010 and April 2015. The aim of the review was to identify any consented or potential developments that might influence the route options identification process.
- Review of statutory and non-statutory heritage asset records obtained from the following sources in May 2015:
  - The Royal Commission on the Historic Monuments of Wales – for data on designated heritage assets comprising: scheduled monuments, listed buildings, conservation areas, registered parks and gardens, historic battlefields, registered landscapes of historic interest, heritage coasts and protected wrecks.
  - Gwynedd Archaeological Trust – for data on locally designated and non-designated heritage assets.
- A site visit in May 2015 to examine the designated heritage assets, with the aim of identifying those with settings that may be most at risk of experiencing adverse effects from a new overhead line. This included visits to assets around: the Vaynol Estate and the south side of the Menai Strait; Llanddaniel Fab, Llanedwen and Llanfair PG; Llangefni; Capel Coch; Clorach; Rhosybol; Llanfechell; and Tregele.
- Review of biological records acquired in 2015 from Cofnod and the Red Squirrels Trust Wales, plus results of an adjacent developer's 2013 GCN surveys results.
- Additional site visits to inform the consideration of landscape and visual amenity receptors, such as residential properties and designated landscapes, when identifying and appraising route options along the corridor between Wylfa and Pentir. This assisted in understanding the potential close and long range visual amenity effects of close parallel and non-parallel alignments, plus potential effects of transposition and cumulative effects with other developments.

## 8.6 Presentation of Route Options

- 8.6.1 For the purposes of providing a structure to the options appraisal process, the Orange Route Corridor between Wylfa and the Menai approach has been divided into four sections, referred to as Sections 1 – 4:
- **Section 1:** Wylfa Power Station to Rhosgoch, comprising a predominantly linear route corridor along the route of the existing overhead line and passing Tregede, Cemaes and Llanfechell.
  - **Section 2:** Rhosgoch to Llandyfydog, passing between Rhosybol and Capel Parc to the east and Llyn Alaw reservoir to the west.
  - **Section 3:** Llandyfydog to the B5110 north of Talwrn, encompassing the Capel Coch area and keeping east of Llanerchymedd.
  - **Section 4:** B5110 north of Talwrn to west of Star, generally following a corridor around the existing overhead line between Llangefni and Talwrn to a point where the existing overhead line turns sharply eastward, at a location west of Star.
- 8.6.2 The route options (as detailed in Chapters 9 to 12) taken forward for consultation have been colour coded according to the section of the corridor that they are located within, and have also been given specific alpha-numeric references. For example, the two route options presented in Section 1 have been identified as Route Options 1A and 1B and are both coloured purple. At this stage, the route options have been shown as 100m wide bands as described in Chapter 8, Part 3.
- 8.6.3 Route Options identified, appraised and not short-listed for consultation are shown in grey on the section plans, but have not been given specific route identifiers.
- 8.6.4 Where changes may need to be made to the existing overhead line to achieve a route transposition (i.e. to combine two route options located on either side of the existing line), a linear search area has been identified based on initial engineering reviews, within which the changes might be made. Four such areas are shown hatched on the section plans, and all lie between one or more of the close route options and the existing overhead line.
- 8.6.1 At the Menai Strait and Anglesey AONB, a revised search area has been identified within which National Grid is seeking to identify feasible routes for the installation of underground cables through or beneath this area (see Figure 8.1). This search area differs from the five crossing options presented in 2012 for public consultation. The cable route search area extends along a shorter stretch of the Menai Strait, defined to the north by the eastern limit of Crossing Option A (as presented in 2012) and to the south by the northern edge of the built up area at Port Dinorwig and Y Felinheli. This more limited search area would reduce the length of route between the Orange Route Corridor and Pentir (whether overhead line or buried cables) and take the development further from settlements, such as Y Felinheli and Bethel, and the Greenwood Forest Park visitor attraction. The revised search area includes additional land within these boundaries, where constraints to the routeing of underground cables are being investigated, but continues to exclude the area around Llanddaniel Fab / Bryn Celli Ddu, and Llanfair PG itself from the overhead line route options search area.

## 9 SECTION 1 ROUTE OPTIONS: WYLFA TO RHOSGOCH

### 9.1 Introduction

9.1.1 Section 1 of the route corridor extends in a south-east direction along the route of the existing overhead line towards Rhosgoch, between Wylfa Power Station to a location south-west of Bodewryd, where Section 1 becomes Section 2.

9.1.2 This chapter outlines the main considerations within Section 1 and the rationale for the selection of consultation Route Options 1A and 1B.

### 9.2 Main Routeing Considerations

9.2.1 Figures B1-1, B1-2 and B1-3, in Appendix B, illustrate the main sites and features that might constrain the routeing of a line within the vicinity of Section 1.

9.2.2 Wylfa Power Station has a strong visual influence on the landscape at the northern end of this section. The development area for the proposed new power station covers the majority of the land around the existing line north of the A5025.

9.2.3 The Anglesey AONB lies along the coastline to the east of Cemaes and west of Wylfa, and has distant views of Section 1. The other notable landscape feature is the proposed Mynydd Mechell SLAs, in the draft JLDP, which lies south of Llanfechell and west of the existing overhead line. The existing overhead line intermittently passes through the eastern edge of this SLA.

9.2.4 The Grade II Registered Cestyll Garden (GD45) lies to the west of Wylfa, whilst there are a number of scheduled monuments near Section 1 with the most notable being:

- Standing stone (AN080) beside the existing line north of Llanfechell.
- Standing stones (AN030) in an open area north-west of Llanfechell (see Figure 9.1).
- Pen-y-Morwyd Round Barrow (AN110) and Llifad Enclosure (AN079), due east of Llanfechell and the overhead line.



Figure 9.1 Standing Stones north-west of Llanfechell (AN30)



- 9.2.5 Llanfechell has many Listed Buildings and a Conservation Area, plus scheduled monuments in the surrounding area. Llanfechell is noted for its important heritage setting, reflected by the links between the settings of many of these assets with the wider landscape. For example, the Standing Stones Scheduled Monument AN030 stands in an open field in a prominent position on high ground to north of Llanfechell, plus the twisted tower of the Grade II\* Church of St Mechell is visible from the higher ground surrounding Llanfechell.
- 9.2.6 Bodewryd also has a cluster of listed buildings, though only the Grade II Church of St Mary has open views westward towards the existing overhead line.
- 9.2.7 Tre'r Gof SSSI lies to the east of Wylfa Power Station and is designated for its wide range of fenland plant species. Elsewhere within Section 1 there are areas of ancient woodland and local wildlife sites, with two ancient woodland sites beside the existing overhead line (east of Llanfechell and south of Bodewryd). There is also the large Cors Cromlech Wildlife Site north-west of Llanfechell, comprising a mosaic of open water streams, wetland, acidic grassland and heathland habitats.
- 9.2.8 The main settlements are Cemaes, Treglele (see Figure 9.2) and Llanfechell, but the wider area contains many scattered rural hamlets and individual properties served by a network of minor roads. A number of properties offer bed and breakfast (B&B) facilities, in particular around Llanfechell and in Cemaes. There is also a mobile caravan site north of Llanfechell close to the existing overhead line.



**Figure 9.2 Looking West Towards Treglele**

- 9.2.9 The Isle of Anglesey Coastal Path, a national trail, passes around the landward side of Wylfa Power Station, whilst National Cycle Route No. 566 crosses the middle of Section 1 from the east, before travelling north through Llanfechell towards Wylfa on the west side of the existing overhead line.



### 9.3 Identification of Route Options for Appraisal

- 9.3.1 Figures B1-1, B1-2 and B1-3, in Appendix B, also show all of the route options that have been considered in Section 1 before selecting Route Options 1A and 1B for consultation. The following outlines how the full set of route options in Section 1 was identified for appraisal, including those that have been discounted at this stage.
- 9.3.2 It was anticipated that all new equipment required at the northern end of the National Grid connection can be accommodated in the existing substation building; although, depending on further scheme development, there may still be a need for an extension to this facility. In addition to potential works at National Grid's substation, any interactions with the existing SP Manweb electricity network would need to be considered. Studies are ongoing to identify exactly where within the substation the new line would need to connect, which in turn may necessitate minor changes to the final 1 to 3 spans of the existing line. This possible requirement is indicated by the widening fan of the route options as the overhead line approaches Wylfa, as shown on Figure C1 in Appendix C.
- 9.3.3 Most of the route options that have been considered keep close to the existing overhead line. The reasons for this are described below.
- 9.3.4 The presence of Tre'r Gof SSSI, and residential properties on the outskirts of Cemaes, limited options to the east of the Horizon Wylfa Newydd site. Whilst final details of the Horizon layout remained under development, consideration was given to a non-parallel route to the west as an alternative to close parallel options north of the A5025.
- 9.3.5 The settlements of Cemaes (to the north-east) and Treglele (to the west) combined with the scattered residential properties and the AONB to the north-east led to only close parallel options being proposed, east of Treglele. This aligned with Holford Rules, and thereby NPS EN-5, to avoid routing close to areas of highest amenity value and residential areas, as far as possible.
- 9.3.6 North and south-east of Llanfechell, deviation options to the west of the existing overhead line were considered, as the western parallel option posed a risk of oversailing or affecting the visual amenity / settings of residential properties, a scheduled monument, a listed building in Brynddu and an ancient woodland.
- 9.3.7 The town of Llanfechell, the proposed Mynydd Mechell SLA (on high ground) and the Cors Cromlech Wildlife Site meant the only potential western deviations from a parallel route option were short routes with sharp turns; wider deviations were dismissed to avoid encircling Llanfechell and to reflect consultation feedback to keep close to the existing overhead line.
- 9.3.8 There were few constraints to routing close to the east side of the existing overhead line in this section, but the risk of significantly affecting the visual amenity of residential properties north and east of Llanfechell gave rise to considering eastern deviation options. The properties at Carrog, areas of woodland (including one classified as ancient woodland and others with tree preservation orders) and scheduled monuments to the east of Llanfechell all constrained the route of eastern deviation options.
- 9.3.9 The large open area further to the east of Carrog, with rolling hills, could offer some natural screening from the cumulative effect of two 400kV overhead lines in a wider landscape. However, wider eastern deviations were not proposed as such route options would risk adversely affecting the visual amenity of residential properties and settings of listed buildings and scheduled monuments currently at a distance from the existing overhead line. In addition, there was also a risk of cumulative landscape and visual amenity effects with wind farms to the east of Cemaes.
- 9.3.10 With the existing overhead line offering the most direct route to the route corridor pinch-point at Rhosgoch, north of Llyn Alaw, a close parallel was preferred, in line with Holford

Rule 3; this also reflected consultation feedback to keep close to the existing overhead line.

## 9.4 Appraisal of Route Options

9.4.1 The interaction with the new nuclear development was a factor in appraising the route options to the north of the A5025; in particular the constraints posed by the existing landscaping mounds along the south-east side of the existing power station. The non-parallel western route option into Wylfa was later identified as falling within an area of proposed development for the power station, so was not taken forward for consultation. Therefore, between the A5025 and Wylfa Substation broadly parallel routes, either side of the existing overhead line, would be preferred to avoid conflict with the SSSI to the east and the layout of the proposed power station development to the west.

9.4.2 The following presents the topic by topic review of the route options between Tregale (to the south of the A5025) and Rhosgoch.

### Consultation Feedback

9.4.3 Consultation feedback highlighted the sensitivity of Llanfechell, to the west of the existing line, due to the large number of potential residential receptors and need to preserve and enhance the heritage setting associated with many listed buildings, scheduled monuments and the conservation area. Risks to the two ancient woodland sites located to the west of the existing line were also noted.

9.4.4 Feedback from consultation indicated a preference to keep the new overhead line close to the existing line in order to preserve the special character and appearance of the wider island. It was also indicated that, in principle, the adoption of a close parallel overhead line to the east would be preferred as this would have a lower level of adverse visual effects on visual receptors overall. Options to route the new line further from the existing line may result in enclosing larger areas and encircling properties.

9.4.5 Stakeholders were aware there may be adverse effects on other environmental receptors to achieve the correct balance and minimise adverse visual amenity effects on the majority of residential properties. It was acknowledged that overall the balance, taking into account adverse effects on closer range residential properties, may be deemed acceptable if more widespread effects were reduced.

### Landscape and Visual Amenity

9.4.6 A parallel route option through Section 1 would provide the opportunity to create a simpler view of the new overhead line, as long as pylons and spans can be lined up and synchronised to a reasonable degree. This has been observed in other cases, such as at Stockton where National Grid's landscape advisers visited a similar parallel arrangement to gain an appreciation of potential effects and issues. Although following the existing overhead line may result in cumulative effects, in principle the potential landscape and visual effects were considered to be less than adding a new overhead line into another area that would result in more widespread change.

9.4.7 Using parallel route options and keeping away from settlements would maximise the distance from Llanfechell and its associated heritage landscape setting, and would reduce residential visual impacts. The eastern parallel route option would further avoid effects on the ancient woodlands (and associated effects on their landscape contribution) and reduce effects on the character of the proposed Mynydd Mechell SLA, which was also visited to gain an appreciation of potential effects. The parallel route options would also serve to minimise effects on views from the AONB to the north.

9.4.8 There are properties just east of the existing overhead line at risk of potentially being oversailed or having very close views of a parallel overhead line. The option to move

eastwards with a close parallel deviation would provide some separation, but would enclose these and other properties between two 400kV overhead lines. Site visits indicated that the eastern route options (1A and 1B) would potentially affect visual amenity for residents of these properties by either: a parallel overhead line viewed from one side of those properties close to the eastern side of existing overhead line; or two lines encircling several properties and thereby affecting views in all directions. This would need to be further considered following more detailed site-based assessment of existing screening elements, such as areas of woodland and smaller groups of mature trees.

9.4.9 Overall, at this stage, there was a landscape and visual amenity preference for a route option east of the existing overhead line in order to:

- Minimise effects on views from the AONB.
- Maximise the distance from the proposed Mynydd Mechell SLA
- Keep the new overhead line further from larger residential areas (Tregele and Llanfechell).
- Maximise the distance from historic landscape settings, such as around Llanfechell.
- Avoid effects on notable landscape features, such as well-established woodlands.

#### Historic Environment

9.4.10 Heading south-east from Wylfa, the parallel route options would not affect the setting of the Grade II Registered Cestyll Garden (GD45) or a number of Grade II listed buildings. Site visits, to gain an appreciation of cultural heritage assets and their settings, indicated that keeping east of the existing overhead line north-east of Llanfechell would avoid encirclement of a Standing Stone Scheduled Monument (AN080) and minimise the effect on its setting, as well as on the setting of a group of standing stones (Scheduled Monument AN030) north of Llanfechell.

9.4.11 South-east of Llanfechell the parallel east and west route options would minimise effects on the setting of the Pen-y-Morwyd Round Barrow (AN110) and Llifad Enclosure (AN079) Scheduled Monuments, as well as on the setting of the Grade II\* Listed Church of St Mechell (5383), the neighbouring Grade II Listed Rectory (5384) and Grade II Bryn Ddu house (25171). In contrast, as well as being closer to Llanfechell the non-parallel western route option, south of Llanfechell, would encircle the Grade II Bryn Ddu house (25171); although this property is well screened by mature vegetation.

9.4.12 Holford Rule No.2 seeks routes that minimise the effects on the setting of areas of architectural, historic and archaeological interest. As well as avoiding designated features, it is important to note that Llanfechell was identified as an important heritage area, due to its many listed buildings and a conservation area and nearby scheduled monuments.

9.4.13 Therefore, at this stage from a cultural heritage perspective, options east of the existing overhead line were preferred to those route options to the west. The preference was also to keep tight to the eastern side of the existing overhead line (i.e. Route Option 1A) as this would keep the new overhead line furthest away from the Pen-y-Morwyd Round Barrow (AN110) and Llifad Enclosure (AN079) Scheduled Monuments.

#### Ecology

9.4.14 Having avoided the Tre'r Gof SSSI and Cors Cromlech Wildlife Site, the main ecological concerns with regards all the route options in Section 1 was the potential risk of direct effects on the woodland sites, as these habitats are not very common on Anglesey.

- 9.4.15 Of particular note were the two ancient woodland sites adjacent to the existing overhead line that would be unavoidably oversailed by the western parallel route option, thus requiring woodland clearance. Ancient woodland sites are relatively rare on Anglesey and effects on this habitat type cannot be fully mitigated.
- 9.4.16 Therefore, at this stage route options to the east of the existing overhead line, which avoided impacts on the ancient woodland, were preferred along Section 1 from an ecological perspective; even though there remained woodland habitats within Route Options 1A and 1B. Direct effects on these woodlands could potentially be avoided at detailed design stage.

#### Local Economy

- 9.4.17 Residential properties, B&B establishments and holiday lets are all potential receptors, and were present around Llanfechell. The western non-parallel route option north of Llanfechell would enclose a mobile caravan site between two 400kV overhead lines.
- 9.4.18 The Isle of Anglesey Coastal Path, a national trail, would only be affected by the connection into Wylfa Substation, and any effects would be overshadowed by the new Wylfa Newydd Power Station development.
- 9.4.19 National Cycle Route No. 566 runs relatively parallel and within approximately 0.5km of the existing overhead line from south of Llanfechell to north of Tregel. A complete route option to the west of the existing overhead line would oversail this National Cycle Route three times and be within a few hundred metres for approximately 3km. In contrast, Route Options 1A and 1B would be on the far side of the existing overhead line and only encounter the National Cycle Route briefly as it crosses east of Llanfechell before then turning due east.
- 9.4.20 At this stage, from a socio-economic 'local economy' perspective, route options that keep away from Llanfechell and east of the existing overhead line were preferred.

#### Technical

- 9.4.21 The western parallel route option would be in close proximity to some properties so would need to seek an alignment either closer to the existing overhead line, if feasible, or further away to reduce the effect of enclosing these properties.
- 9.4.22 Vegetation clearance may be needed for route options encompassing woodland areas, but the risk would be unavoidable along the western parallel route option. The western deviation options would also not be preferred due to the angles required, including some close to the existing line that could complicate the installation of conductors compared to the long lengths of straight lines offered by the other route options.
- 9.4.23 Although each route option within Section 1 is constrained, all are constructible and none have any significant technical challenges to favour one over another.

#### Other Design Considerations

- 9.4.24 The following factors were not deemed to be differentiating factors for Section 1:
- Cost – variations in the number of angle towers required would affect the overall cost, but no significant cost variation was anticipated.
  - Traffic and Transport – no variation in road access constraints between the options.
  - Water Resources / Flood Risk – the Afon Wygyr and its flood zone was crossed by all the route options, but were sufficiently narrow to explore options to oversail without the need for pylons in the high risk areas.
  - Aviation and Defence – no assets at risk.

## 9.5 Route Options for Consultation

- 9.5.1 Route Options 1A and 1B were selected for consultation (see Figure C1 in Appendix C) and offer two options for a broadly close parallel route along the eastern side of the existing overhead line. Route options to the east of the existing overhead line were preferred, at this stage, in order to:
- Maximise the distance from Llanfechell, with its large number of residential properties, socio-economic receptors, listed buildings and conservation area.
  - Maximise the distance from the draft JLDP's proposed Mynydd Mechell SLA; this is also an area of higher ground that rises towards the west from the existing line.
  - Avoid encircling Scheduled Monuments AN030 and AN080.
  - Avoid the need for felling or other woodland management within the ancient woodland, which is relatively rare on Anglesey and where the loss of this type of habitat cannot be fully mitigated.
- 9.5.2 Both options keep a close parallel alignment between Wylfa and Llanfechell, reflecting stakeholder feedback and the need to minimise adverse landscape and visual amenity effects, although this does pass close to several residential properties. The broad expansion of the route options at the northern end, beside Wylfa, reflects the uncertainty about the alignment of an overhead connection into the substation north of the A5025, whilst the design of the Wylfa Newydd Power Station remains under development.
- 9.5.3 However, the difference between the route options occurs north-east of Llanfechell. Route Option 1A encompasses or touches six properties close to the east side of the existing overhead line, which, if a new route were to avoid through detailed design would nevertheless have very close views of it. Option 1B offers the opportunity to provide some separation between the existing and new overhead lines, but would enclose those properties close to Route Option 1A plus other properties between two 400kV overhead lines.
- 9.5.4 Route Option 1A would also be closer to the Standing Stone Scheduled Monument AN080. Although the existing overhead line already affects its setting, the cumulative effect would need to be carefully considered. In contrast, Route Option 1B would encroach closer than Route Option 1A to the setting of the Pen-y-Morwyd Round Barrow (AN110) and Llifad Enclosure (AN079) Scheduled Monuments.
- 9.5.5 Of these two options, only Route Option 1B passes close to an ancient woodland. Woodland habitat is uncommon on Anglesey, but during the detailed design of both route options it should be possible to minimise the risk of direct effects on woodland habitat.

## 10 SECTION 2 ROUTE OPTIONS: RHOSGOCH TO LLANDYFRYDOG

### 10.1 Introduction

- 10.1.1 Section 2 comprises a corridor running in a north-west to south-east direction along the route of the existing overhead line from a location south of Bodewryd, where Section 1 changes into Section 2, then heading south-east to pass immediately south of Rhosgoch and Rhosybol before reaching Llandyrydog where Section 2 changes into Section 3.
- 10.1.2 This chapter outlines the main constraints within Section 2 and the rationale for the selection of consultation Route Options 2A, 2B, 2C and 2D.

### 10.2 Main Routeing Considerations

- 10.2.1 Figures B2-1, B2-2 and B2-3, in Appendix B, illustrate the main sites and features that might constrain the routeing of a line within the vicinity of Section 2.
- 10.2.2 There are several landscapes within or around Section 2 designated as areas of highest amenity value. Anglesey AONB lies along the coastline to the east, but extends inland south-east of Llandyrydog, at Mynydd Bodafon, which affords extensive views over the surrounding landscape. The south-east corner of the proposed Mynydd Mechell SLA overlaps the existing overhead line at the northern end of Section 2, around Hafodol-ganol, whilst the proposed Parys Mountain SLA lies to the north of Rhosybol.
- 10.2.3 These areas also cover high ground, so properties in these areas and on the raised ground between these areas and the existing overhead line could look down on any new overhead line proposed south of Rhosgoch and Rhosybol.
- 10.2.4 There are few known cultural heritage constraints, with five scheduled monuments in three groups:
- Bodewryd Standing Stone (AN078), north-west of Rhosgoch;
  - Pen-y-Fynwent Enclosure (AN124) and Pen-y-Fynwent Barrow (AN125) east of Rhosybol; and
  - Lllys Einion Standing Stone (AN077) and Maen Chwyf Chambered Tomb (AN076) Scheduled Monuments north-west of Llandyrydog.
- 10.2.5 There are a number of listed buildings in the surrounding area, such as Grade II buildings near Hafodol-ganol and Capel Parc. At the very southern end of Section 2, Llandyrydog's heritage setting is noted due to the Grade II\* Church of Tyfrydog (5360) and five Grade II listed buildings in the Llandyrydog area. There is also the Grade II Melin Escob (24834) north-east of Llandyrydog.
- 10.2.6 Llyn Alaw SSSI is located to the south-west of both Rhosybol and the existing overhead line. This SSSI is designated for its overwintering populations of Whooper Swans and other wildfowl and waders.
- 10.2.7 Llyn Alaw reservoir is also promoted as a visitor attraction, with two car parks and picnic sites along the southern side of the lake. Bryn Goleu Caravan Park is oversailed by the existing overhead line, north of Llandyrydog and east of Bodneithior. The Visit Wales website also records a B&B west of Llandyrydog. National Cycle Route No.566 runs north-east to south-west from Penysarn to Llanerchymedd, along the boundary of Sections 2 and 3.
- 10.2.8 Individual wind turbines are known to be scattered throughout this area, including some close to the existing overhead line (e.g. near Hafodol-ganol). The southern end of Parys Mountain has a history of metal mining, with a line of metal mines between Rhosgoch and Parys Mountain.

### 10.3 Identification of Route Options for Appraisal

- 10.3.1 Figures B2-1, B2-2 and B2-3, in Appendix B, show all of the route options that have been considered in Section 2 before selecting the Route Options 2A, 2B, 2C and 2D for consultation. The following outlines how all route options appraised in Section 2 were identified.
- 10.3.2 The existing overhead line runs north-west to south-east, and passes between the settlements of Rhosgoch and Rhosybol to the north and Llyn Alaw SSSI to the south. In addition, there are elevated and highest amenity value landscapes around Section 2 to the north and east (Anglesey AONB and the proposed Parys Mountain and Mynydd Mechell SLAs); Holford Rule No.1, and thereby NPS EN-5, seek to avoid significant adverse effects on residential properties and such designated landscapes. The potential for an overhead line collision risk for the populations of Whooper Swans and other wildfowl using Llyn Alaw also depend on the location of their feeding grounds, which was unknown, so keeping away from Llyn Alaw was considered the best means to minimise that risk.
- 10.3.3 Therefore, route options were identified to offer a complete overhead alignment that would remain close to and broadly parallel to the existing overhead line. Such route options reduced the extent of the landscape affected by transmission development and the effect on the panoramic views from the surrounding elevated residential and designated areas, whilst also reducing the risk to the wildfowl using Llyn Alaw.
- 10.3.4 However, there were many individual properties close to the existing overhead line that were at risk of being oversailed, thus it was considered necessary to identify deviation options to the west and east of the existing overhead line.
- 10.3.5 At the north end, around Hafodol-ganol and Rhosgoch, the properties lining the road through Rhosgoch limited route options that both minimised intrusion within the proposed Mynydd Mechell SLA and connected to the parallel route options in Section 1. As the preference for the eastern parallel route option at the southern end of Section 1 emerged, the addition of a transposition around Rhosgoch was developed to enable a new overhead line east of the existing overhead line in Section 1 to reach route options west of the existing overhead line in Section 2.
- 10.3.6 Elsewhere within Section 2, to the east of the existing overhead line the close proximity of Rhosgoch and Rhosybol, the risk of being unable to find a route that could avoid oversailing properties and the above need to avoid encroaching upon the designated landscape to the north-east influenced the identification of several alternative route options close to the east side of the existing overhead line.
- 10.3.7 On the western side there was one section of the parallel route option that posed a risk of oversailing. A short deviation option was proposed, but in order to avoid sharp angled, non-parallel options, in accordance with Holford Rule No.3, both longer lengths of non-parallel or broadly parallel options at a distance from the existing overhead line were also considered. These wider options were developed bearing in mind the need to avoid encroaching too close to Llyn Alaw and the objective to limit the number of properties encircled, whilst taking into consideration the presence of the large flood zone east of Llyn Alaw and woodlands south of Rhosybol.
- 10.3.8 To allow for consideration of combinations of the eastern and western route options, transposition zones were created between the western and eastern parallel route options in this section.

## 10.4 Appraisal of Route Options

### Consultation Feedback

- 10.4.1 Landscape and views were a concern in this area, in particular long distance views towards Four Crosses, towards Snowdonia and from Parys Mountain. Consultation feedback indicated a desire not to see Rhosgoch encircled, with underground cabling raised as an option that may need to be considered in detail in this area. Equally, there was concern regarding a wider spread of development across the open landscape from Rhosybol.
- 10.4.2 Preservation of special views and vistas was also stated as a concern.
- 10.4.3 Stakeholders also highlighted that overwintering populations of Whooper swans and other wildfowl and waders that reside within Llyn Alaw SSSI may be affected by the risk of collisions with the overhead line conductors if their foraging areas were to the east of the lake.

### Landscape and Visual Amenity

- 10.4.4 The more deviations from a route that parallels the existing overhead line, the more significant the effects upon the multiple landscape designations between Rhosgoch and Llandyfrydog could be. This would be due to a more 'discordant' appearance between the two overhead lines. In addition, the AONB and draft JLDP's proposed SLAs cover high ground, and it was identified during site visits that properties in these more elevated positions, and between these areas and the existing line, look down on the existing overhead line. As a consequence, there may be a corresponding increase in visual amenity effects on panoramic views from these elevated locations (e.g. towards Llyn Alaw) as route options move further east or west from the existing overhead line south of Rhosybol.
- 10.4.5 There were several properties at risk of oversailing from a western parallel route option, west of Rhosgoch. Llyn Alaw Reservoir, also to the west, is a promoted visitor attraction, so long distance panoramic views from this area would also need to be assessed in detail. However, deviations to the east of the existing overhead line to reduce these effects would take the route closer to the AONB and proposed Parys Mountain SLA.
- 10.4.6 Non-parallel options to the east and west of Rhosgoch to avoid oversailing effects would also surround properties with 400kV overhead lines. A site visit considered potential effects of close parallel route options on residential properties close to the existing overhead line. This informed the decision that the western non-parallel route option might be preferred from a visual perspective over the eastern non-parallel route option, as it would maintain a wider separation from properties, in line with Holford Rule No.2.
- 10.4.7 There were several properties to the east of the existing overhead line that could be oversailed by the eastern parallel route option. A broadly parallel eastern route option, with a larger gap between the new and existing overhead lines, would provide some separation, but this would enclose these plus additional properties.
- 10.4.8 Similarly, south of Rhosybol a cluster of properties at Lletty were at risk of being oversailed or being closely enclosed by the western parallel route option, thus a western deviation option was created to achieve a better separation, although this would still enclose these properties between the two overhead lines.
- 10.4.9 North of Llandyfrydog the parallel route option to the west would oversail a caravan park, but both deviation route options to the east would need to balance the benefit of greater separation between the overhead lines enclosing the caravan park versus the effects of moving a new overhead line closer to the AONB; both outcomes would accord Holford Rule No.2.



### Historic Environment

- 10.4.10 At the northern end, the route options around Rhosgoch may affect the settings of the Bodewryd Standing Stone (AN078) Scheduled Monument and Grade II listed buildings at Pant-y-Gist, west of Hafodol-ganol, and Gwredog.
- 10.4.11 At the southern end, the Section 2 route options may affect Llandyfydog's heritage setting composed of the Grade II\* Church of Tyfrydog (5360) and five Grade II listed buildings. There is also the Grade II Listed Melin Escob (24834) north-east of Llandyfydog and Grade II Listed Tyn y Pwll (24832) at Capel Parc, the settings of which would be affected by the eastern route options.
- 10.4.12 In between these points, the western most route option passes close to and poses a risk to the setting of the Llys Einion Standing Stone (AN077) and Maen Chwyf Chambered Tomb (AN076) Scheduled Monuments, north-west of Llandyfydog.
- 10.4.13 All other designated cultural heritage assets are generally over 1km away from any route options, including the two scheduled monuments, Pen-y-Fynwent Enclosure (AN124) and Pen-y-Fynwent Barrow (AN125) east of Rhosybol.
- 10.4.14 At this stage, the preference would be to keep to the west of the existing line, where possible, to avoid or reduce potential effects upon the settings of these cultural heritage assets, as per Holford Rule No.2.

### Ecology

- 10.4.15 Llyn Alaw SSSI, to the south-west of Rhosybol, was the main ecological constraint on the route options in Section 2 as all other notable features (e.g. Wildlife Sites and woodland habitat) have been avoided.
- 10.4.16 None of the route options directly affect the SSSI, but route options to the west of the existing overhead line would bring a new overhead line closer to the reservoir. Llyn Alaw SSSI is designated for its overwintering populations of Whooper Swans and other wildfowl and waders, and Holford Rule No.2 (and thereby NPS EN-5) requires consideration of potential effects on ecology of SSSIs (e.g. to their flora and fauna).
- 10.4.17 The overwintering populations of Whooper Swans and other wildfowl and waders that reside within the SSSI may be affected by the risk of collisions with the overhead line conductors if their foraging areas are to the east of the reservoir. Further survey work and consultation with local ornithological groups is needed to confirm the risk of this effect. Mitigation in the form of flight diverters fitted to the upper conductors, which increase the visibility of the line, might be possible, but these would add to the visual effects. Therefore, by applying the precautionary principle at this stage, route options to the east of the existing overhead line would be preferred from an ecological perspective.

### Local Economy

- 10.4.18 Though the Llyn Alaw visitor car parks and picnic sites lie over 1km from the nearest route option, route options to the west of the existing overhead line do bring the new line closer to the reservoir and pose a risk of affecting the tourist attraction setting at the eastern end of the reservoir, although on inspection this area appeared to be less frequented.
- 10.4.19 Bryn Goleu Caravan Park would be either oversailed or enclosed by the route options east of the existing overhead line, north of Llandyfydog. The B&B west of Llandyfydog would be close to the southern end of the long western deviation option (Route Option 2A). It is also acknowledged there may be other B&B facilities throughout Section 2 not on the Visit Wales website.

10.4.20 National Cycle Route No.566 crosses the route options at the southern end of Section 2, but the effect on cyclists using this route is the same for all the options, with no significant lengths of the cycle route at this location exposed to the new overhead line.

10.4.21 Therefore, from a socio-economic 'Local Economy' perspective there was no strong socio-economic preference at this stage, though keeping away from Llyn Alaw would reduce any risk of adverse effects on visitors to the reservoir.

#### Technical

10.4.22 A close parallel overhead line would not be possible along the entire length of this section due to the presence of existing properties, but options were available to achieve a broadly parallel route that could be constructed.

10.4.23 Potential complexities exist with the range of possible transpositions designs that might be taken forward in this section, dependent upon the combination of route options finally taken forward. The construction of transpositions may also require the installation of one or more temporary overhead lines whilst the works are undertaken.

#### Other Design Considerations

10.4.24 The following factors were not deemed to be differentiating factors for this area:

- Cost – variations in the number of angle towers required would affect the overall cost, but no significant cost variation was anticipated.
- Traffic and Transport – there was no variation in road access constraints between the options.
- Water Resources / Flood Risk – the flood zones were avoided by all the route options.
- Aviation and Defence – no assets at risk.

### **10.5 Route Options for Consultation**

10.5.1 Route Options 2A, 2B, 2C and 2D were selected for consultation (see Figure C2, in Appendix C) and present four different route options through the full length of Section 2. All the route options are broadly parallel to the existing overhead line, but differ in proximity and the number of localised deviations and thereby number of angle towers required.

10.5.2 At the northern end of Section 2, all four route options continue the theme from Section 1: to keep close to the east side of the existing overhead in order to minimise effects on the proposed Mynydd Mechell SLA and receptors to the east of the existing overhead line. This is maintained until Rhosgoch and Hafodol-ganol where either a close parallel to the east is maintained or a transposition provides a connection to the route options west of the existing overhead line. The eastern deviation encircling Rhosgoch was discounted to also avoid encroaching upon the proposed Parys Mountain SLA, and in recognition of stakeholder feedback to avoid enclosing communities with overhead lines, where possible. Remaining close to the existing overhead line past Rhosgoch also avoids a transposition and route options within the proposed Mynydd Mechell SLA west of Hafodol-ganol. Overall, the route options taken forward at Rhosgoch were the most compliant with the Holford Rules, and thereby NPS EN-5.

10.5.3 Further south, the positions of Rhosgoch and Rhosybol on more elevated ground close to designated landscapes favoured route options that were broadly parallel and close to the existing overhead line through this section, to reduce the effect of overhead lines extending across the landscape and affecting panoramic views from these surrounding areas. However, the ability to achieve close parallel route options was limited by the risk

of oversailing or passing close to residential properties beside the existing overhead line. Where wider deviations from the existing overhead line were required, there was a preference for those to the west whilst not encroaching too close to Llyn Alaw SSSI due to the uncertainty, at this stage of scheme development, regarding overhead line collision risk to its wildfowl populations.

- 10.5.4 As a result, route options that posed a high risk of oversailing properties or encroaching too far east of the existing overhead line were discounted due to wider landscape effects, even where this means the alternative would closely encircle individual properties. It also avoided encroaching towards the settings of scheduled monuments and listed buildings to the east. As a consequence, a close, but not quite parallel, route option east of the existing overhead line was taken forward for consultation. However, this option was separated into two route options (Route Options 2C and 2D) due to the uncertain acceptability of a close parallel alignment oversailing Bryn Goleu Caravan Park north of Llandyfrydog and west of Bodneithior. More detailed design, assessment and consultation is needed to better understand this issue.
- 10.5.5 West of the existing overhead line, the need for a deviation south of Rhosybol to avoid oversailing the properties at Lletty led to two very different western route options:
- Route Option 2A - a long and relatively straight line route, upwards of 700m west of the existing overhead line, that would be noticeably separated in the wider landscape yet broadly parallel to the existing overhead line.
  - Route Option 2B - a close parallel to the western side of the existing overhead line, with a localised deviation to the west around Lletty requiring noticeable angle pylons.
- 10.5.6 The opportunity to develop a preferred final alignment that swaps between the east and west sides of the existing overhead line within this section could be achieved by the use of transpositions between Rhosybol and Llandyfrydog.

## **11 SECTION 3 ROUTE OPTIONS: LLANDYFRYDOG TO B5110 NORTH OF TALWRN (CAPEL COCH AREA OPTIONS)**

### **11.1 Introduction**

11.1.1 Section 3 comprises a wide area of relatively undeveloped landscape between Llandyfydog, in the north, and the B5110 in the south, north-west of Talwrn, near Neuadd Wen Farm. The settlement of Capel Coch lies near the centre of Section 3, while the town of Llanerchymedd forms the north-west corner. The existing overhead line indicates the general location of the eastern edge of Section 3 due to the Anglesey AONB and draft JLDP's proposed Parciau Estatelands SLA overriding any benefit of exploring options much further east. A north-south road between Llanerchymedd and Llangefni indicates the western edge.

11.1.2 This chapter outlines the main constraints within Section 3 and the rationale for the selection of Route Options 3A, 3B and 3C.

### **11.2 Main Routeing Considerations**

11.2.1 Figures B3-1A/B, B3-2A/B and B3-3A/B, in Appendix B, illustrate the main sites and features that might constrain the routeing of a line within the vicinity of Section 3.

11.2.2 Section 3 comprises a rolling landscape of high and low ground defined by the north-east to south-west orientation of a ridge of high ground (see Figures 3-2A/B, in Appendix B) with a road running along the crest, along which Capel Coch is located. North-east of Capel Coch lies Mynydd Bodafon, which forms an inland extension of the Anglesey AONB along this natural ridge of high ground that rises to over 130m above sea level as it approaches the coast. The low lying area in the valley between Mynydd Bodafon in the west and the AONB in the east (both east of the existing line) is covered by the proposed JLDP's Parciau Estatelands SLA.

11.2.3 The main settlements close to the existing overhead line through Section 3 are Llandyfydog, Hebron, Maenaddwyn and Capel Coch, with the largest nearby town being Llanerchymedd in the north-east corner of Section 3.

11.2.4 There are listed buildings and scheduled monuments distributed throughout this area, including:

- Grade II\* Church of Tyfrydog (5360) and five Grade II listed buildings in the Llandyfydog area, plus Grade II Listed Melin Escob to the north-east (24834).
- Llys Einion Standing Stone (AN077) and Maen Chwyf Chambered Tomb (AN076) Scheduled Monuments, north-west of Llandyfydog.
- Carreg Leidr Standing Stone Scheduled Monument (AN067), north of Clorach.
- Four Grade II\* listed buildings at Llwydiarth Esgol Farm (24866 – 24839).
- Maen Addwyn Standing Stone Scheduled Monument (AN069) and Grade II Listed Church of St Michael (5390) close to the existing overhead line near Cae Fabli.
- Llech Golman Standing Stone Scheduled Monument (AN070), north-west of Capel Coch.
- Listed buildings along the B5111 and Grade II Listed Windmill nearer the centre of Capel Coch.
- Grade II\* Church of St Caian (5403), the nearby Grade II Listed Plas Tregayan house (5404) plus a further nine Grade II listed buildings which make up elements of the Tregayan estate.

- 11.2.5 A large, open area of low lying land, south-east of Capel Coch, contains the Corsydd Môn (Anglesey Fens) SAC, Corsydd Môn a Llyn (Anglesey and Llyn Fens) Ramsar site and Cors Erddreiniog SSSI and NNR. The SAC is designated for a variety of fen and flush habitats and a population of Geyer's whorl snail (*Vertigo geyeri*). These habitats and the invertebrate species that they support are very sensitive to hydrological change.
- 11.2.6 Woodland habitat is relatively rare across Anglesey, but a belt of scattered woodlands crosses Section 3 to the south of Capel Coch. The value of these woodlands is reflected by the multiple ancient woodland designations to the south-west of Capel Coch and around Tre-Ysgawen, plus the Maen Eryr Wildlife Site designation assigned to large woodland south-east of Capel Coch.
- 11.2.7 The Tre-Ysgawen Hall Country Hotel and Spa is one of only two 4-star hotels on Anglesey and is located south-east of Capel Coch. This hotel is relatively well screened by woodland to the west and north.
- 11.2.8 B&B businesses are located in the Clorach, Llanerchymedd and Capel Coch areas. The National Cycle Route No.5 runs west to east from Llanerchymedd to Llandyfydog before continuing south through Capel Coch, along the length of Section 3 into Section 4. National Cycle Route No.556 runs north-east to south-west from Penysarn to Llanerchymedd, just north of the boundary of between Sections 2 and 3.
- 11.2.9 Wind turbines are located north of Plas-Llanfihangel.

### 11.3 Identification of Route Options for Appraisal

- 11.3.1 Figures B3-1A/B, B3-2A/B and B3-3A/B, in Appendix B, show all of the route options that have been considered in Section 3 before selecting Route Options 3A, 3B and 3C for consultation. The following outlines how all route options appraised in Section 3 were identified.
- 11.3.2 A set of options were developed close to the existing line for several reasons, but primarily to avoid adverse landscape and visual amenity effects on: the AONB and proposed Parciau Estatelands SLA to the east; the currently unaffected landscape to the west; and heritage assets, which are largely concentrated to the west of the existing overhead line.
- 11.3.3 In considering parallel route options, the main sites and features near the existing overhead line included:
- the Anglesey Fens SAC, Anglesey and Llyn Fens Ramsar site and Cors Erddreiniog SSSI / NNR, which the existing overhead line passes through; and
  - the risk of oversailing a property at Cae Fabli, north of Capel Coch.
- 11.3.4 With the designated landscapes north and east of Anglesey Fens, large deviations towards the east and closer to these areas were discounted; this was supported by observations made during site visits to consider views from the Anglesey AONB and Holford Rule No.1.
- 11.3.5 Therefore, at a localised level, a small eastern deviation option was proposed around the at-risk property in Cae Fabli, north of Capel Coch; though it did result in encircling four residential properties and the Grade II Listed Church of St Michael between overhead lines. For the Anglesey Fens, a further deviation option was identified along the western and southern boundaries of the site, where the only constraint was the presence of an existing wood pole based overhead line. This area was remote from residential property and comparatively low lying.
- 11.3.6 If the Llandyfydog to Capel Coch connection was east of the existing overhead line, the localised Anglesey Fen deviation would be dependent upon the above residential

property deviation plus a transposition north of Anglesey Fens. With no alternative route options east of Capel Coch, non-parallel route options extending the majority of the length of Section 3 were sought west of Capel Coch.

11.3.7 With a larger, relatively undeveloped area to the west of Capel Coch, with no public rights of way, it was possible to identify several possible route options taking into account the following constraints, whilst avoiding sharp changes of direction and seeking as few angle towers as possible in accordance with Holford Rule No.3:

- The setting of the scheduled monuments and listed buildings.
- The belt of woodlands across the southern part of Section 3, comprising ancient woodlands and Maen Eryr Wildlife Site.
- The setting of Tre-Ysgawen Hall Country Hotel and Spa.
- Wind turbines north of Plas-Llanfihangel.
- Connections into the route options in Sections 2 and 4, such as Route Option 2A that is still approximately 700m from the existing overhead line, west of Llandfrydog, when it connects into Section 3.
- Need for sufficient separation to develop parts of the new line in a separate zone of visual influence to that affected by the existing line.

## 11.4 Appraisal of Route Options

### Consultation Feedback

11.4.1 Consultation feedback supported non-parallel options so as to avoid the need to route through the SAC. The feedback also noted the risks to the SAC and the need to avoid designated features and apply construction mitigation. Stakeholders recognised the need to balance the risks to the ecological features of the SAC against the desire to keep the proposed new overhead line close to the existing overhead line. More detail was required about the construction methods and specific locations of any towers within the SAC before the stakeholders felt able to offer a more definitive opinion on the acceptability and policy compliance risks associated with routing through the SAC.

11.4.2 Feedback also stated a need to be sensitive around Capel Coch and to avoid encircling communities with 400kV overhead lines, including large deviations that created a large gap between the new and existing overhead lines. With regard to route options in the western part of Section 3, concern was also raised relating to the introduction of a new overhead line to a new group of receptors and users of the road to the west; this may have greater effects on views than a new overhead line near the existing overhead line.

11.4.3 Preservation of special views and vistas, plus effects upon designated listed buildings and their respective settings, were also concerns expressed.

11.4.4 The Tre-Ysgawen Hall Country Hotel and Spa, one of only two 4-star hotels on Anglesey, is located south-east of Capel Coch. The hotel itself is relatively well screened by woodland, but consultation feedback indicated that the drive up to the hotel and its setting are also important considerations.

### Landscape and Visual Amenity

11.4.5 The location of properties and their proximity to potential alignments at Cae Fabli, north of Capel Coch, posed a risk of oversailing or enclosing properties or significantly affecting their views, which was confirmed during site visits. The SAC east of Capel Coch and the standing stone to the north both posed constraints to routing in this area. A transposition may be required to allow use of an eastern route option to avoid properties, then to access the western route option around the edge of the SAC. This

arrangement and use of angle towers may give rise to further adverse visual amenity effects, although the potential transposition area would be relatively remote from public viewpoints.

- 11.4.6 Route options between Capel Coch and the SAC may create cumulative effects with other types of lines, such as the existing 33kV lines on wooden poles. However, in selected cases, short sections of the 33kV lines could be placed underground to avoid this effect.
- 11.4.7 The wider western deviation options would avoid the constraints described above around Cae Fabli and the Anglesey Fens, but the most westerly non-parallel route option (Route Option 3A) would be less than a kilometre from the B5111 highway and associated properties / settlements. Therefore, Route Option 3A would result in visual amenity effects within a wider and currently unaffected landscape, although these may be less significant than those experienced by residential properties to the north of Capel Coch. The non-parallel route options to the west, between Route Option 3A and Capel Coch, posed a risk of surrounding Capel Coch with views of overhead lines from both sides of the settlement.
- 11.4.8 The Tre-Ysgawen Hall 4-star Country Hotel and Spa lies to the south-west of Capel Coch and was relatively well screened by woodland to the west and north. However, the access roads were not well screened. All of the route options west of Capel Coch would affect the views from the roads leading to the Tre-Ysgawen Hall Country Hotel.
- 11.4.9 The landscape and visual amenity preference at this stage was for the proposed overhead line to be as parallel as possible to the existing overhead line. However, due to the SAC constraining close parallel route options to the existing overhead line, the alternative landscape and visual amenity preference would be for western deviations that maximise their distance from residential properties at Capel Coch in order to reduce the risk of adverse visual effects, taking into account the risk of cumulative effects that would result. The wide diversion Route Option 3A would prevent the new overhead line being in close proximity to residential properties to the east of Capel Coch or closely surrounding Capel Coch to the west. However, site visits to Section 3 indicated that this would affect a larger area of landscape to the west, currently unaffected by an overhead line, due to the wider views.

#### Historic Environment

- 11.4.10 At Llandyfydog, a parallel east route option would reduce the potential for impact on the setting of the Grade II\* Listed Church of St Tyfrydog (5360) and a further six Grade II listed buildings. A parallel east route option was preferable until Maenaddwyn where a deviation option eastwards could adversely affect the setting of the Maen Addwyn Standing Stone Scheduled Monument (AN069) to the north and encircle the Grade II Listed Church of St Michael (5390) between two 400kV overhead lines.
- 11.4.11 The non-parallel route options west of Capel Coch were not preferred, at this stage, because of their potential to cause adverse effects on the setting of the Scheduled Carreg Leidr (AN067) and Llech Golman (AN070) standing stones, both of which are highly visible in the wider landscape due to their prominent positions in open fields. A number of Grade II\* and Grade II listed buildings in Section 3 have varying degrees of setting connectivity with the wider landscape; for example, the Grade II\* Church of St Caian (5403) has views of the surrounding area, but the nearby Grade II Listed Plas Tregayan house (5404) and associated nine Grade II listed buildings that make up elements of the Tregayan estate look inward and are screened in several directions by ancient woodland.
- 11.4.12 In summary, there are listed buildings and scheduled monuments distributed throughout this area and the potential effects from the different route options depend on the

individual features and settings of these heritage assets. After reviewing the heritage asset records and visiting the area, there was a cultural heritage preference at this stage to keep the new route as close as possible to the existing overhead line in Section 3.

### Ecology

- 11.4.13 East of Capel Coch the parallel route options and existing overhead line pass through the Corsydd Môn (Anglesey Fens) SAC, Corsydd Môn a Llyn (Anglesey and Llyn Fens) Ramsar site / Cors Erddreiniog SSSI and NNR. The SAC features include fen communities and three main invertebrate species that are very sensitive to hydrological change. Therefore, the potential indirect effects of pylon construction (e.g. local changes to the groundwater regime) would need to be fully assessed as well as direct effects (i.e. habitat loss).
- 11.4.14 The Conservation of Habitats and Species Regulations 2010 plus UK and Welsh Planning Policies (EN-1, EN-5, TAN 5 and the emerging JLDP) seek to avoid development on internationally important nature conservation sites. It should also be noted that the SAC is designated for a variety of fen and flush habitats and a population of Geyer's whorl snail that are all sensitive to the indirect effects of hydrological change.
- 11.4.15 There was a need to balance the risks to the ecological features of the SAC against the desire to keep the proposed new overhead line close to the existing overhead line in landscape and visual terms. However, more detail was required prior to arriving at a considered opinion on the ability to create a new overhead line through the SAC.
- 11.4.16 In light of the above, from an ecology perspective at this stage, route options outside of the SAC and as far from the SAC as possible were preferred (i.e. a non-parallel route option west of Capel Coch), so as to avoid the risk of any significant effect on the SAC. The risk of not being able to accurately predict the risk and scale of significant effects that might be caused to the Fen, and the consequent confidence around the statutory tests pertaining to effects upon the integrity of the site, were causes of concern.

### Local Economy

- 11.4.17 The western deviation route options could be close to and potentially affect the visual amenity of the B&B properties in the Clorach, Llanerchymedd and Capel Coch areas.
- 11.4.18 Tre-Ysgawen Hall Country Hotel and Spa was relatively well screened by ancient woodland to the west and north; however, the access roads were not. All the western non-parallel options would cross the approach roads, and thus may affect the associated setting of the hotel.
- 11.4.19 The road through Capel Coch also forms part of National Cycle Route No.556 and the western route options close to Capel Coch may be seen by cyclists along long lengths of this cycle route.
- 11.4.20 Based on the above and the number of individual receptors that could be affected, the socio-economic 'Local Economy' preference at this stage was to route the new overhead line to the east of Capel Coch rather than to the west.

### Engineering Design

- 11.4.21 There was a preference to avoid using complicated transpositions and avoid or minimise the distance of any route options through the SAC.
- 11.4.22 The parallel route options through the SAC posed several concerns:
- Potential for challenging ground conditions.
  - Peat is regarded as an important natural resource that should be preserved.



- There could be issues with the span lengths if a SAC alignment were adopted as these may have to be variable to avoid designated habitat features.
- Drainage would be an important consideration for construction within the SAC.

11.4.23 There were no engineering issues with the deviation route options.

#### Traffic and Transport

11.4.24 There may be complexities with regard to access into the SAC as the general road network in this part of Section 3 may not be suitable for construction vehicles. In addition, it may not be feasible to avoid designated habitat features with a construction access track through the site to reach the less sensitive habitats for a tower construction. This was a differentiating factor for the parallel route options through the SAC.

11.4.25 There were no significant traffic and transport differences for the other route options.

#### Aviation and Defence

11.4.26 Route Option 3A passes the north-eastern extent of the RAF Mona safeguarding zone, as the route passes south-west of Tre-Ysgawen Hall Country Hotel. Safeguarding zones are where development of tall structures is controlled to protect low flying aircraft. Confirmation of the risks and measures to manage this risk would need to be explored further at the detailed design stage.

11.4.27 All other route options are outside the safeguarding zone.

#### Other Design Considerations

11.4.28 The following factors were deemed as not differentiating factors for Section 3:

- Cost – although the route options comprised a different mix of factors that would influence the overall cost (e.g. number of transpositions or angle towers, challenging ground conditions, etc.), the variation was not significant enough to justify this being a differentiating factor.
- Water Resources / Flood Risk – although Section 3 has several watercourses with flood risk areas, their extent would allow for oversailing, with pylons positioned to avoid high risk areas.

## **11.5 Route Options for Consultation**

11.5.1 Route Options 3A, 3B and 3C were selected for consultation (see Figures C3A/B, in Appendix C) and present three different route options through Section 3.

11.5.2 Parallel route options through the SAC were discounted due to the uncertainty about the ability to demonstrate no significant effect on the SAC at Stage 1 or in respect of effects on integrity at Stage 2 of the HRA process, and that alternative viable options were available.

11.5.3 With regard to the remaining route options, in order to reduce the number of route options for consultation it was decided to present the two discrete routing 'approaches': route options that broadly follow as closely parallel to the existing overhead line as possible (Route Options 3B and 3C); and the most western non-parallel Route Option 3A. This approach also reflected consultation feedback to avoid 400kV overhead lines being seen in all directions from Capel Coch, which the western route options through the centre of Section 3 would more likely create.

11.5.4 In this way Route Options 3A, 3B and 3C allow a discussion between constrained, yet closely parallel, options versus a new, non-parallel overhead line in a relatively undeveloped landscape. However, National Grid remains open to discuss the route

options not currently presented as consultation options if feedback indicates preferences for, or advantages of, these alternatives.

- 11.5.5 Route Option 3A would affect landscape and views currently unaffected by large overhead lines, and would also take a new overhead line close to the setting of listed buildings along the length of the B5111 and around Tregaian. Route option 3A would also introduce a 400kV overhead line to the west and south of Tre-Ysgawen Hall Country Hotel, crossing the access roads to the hotel from the south.
- 11.5.6 Route Option 3B offers a fully western route option following the existing overhead line, where possible, but deviating westward around Llandyfrydog and the Anglesey Fens. The need to avoid the Anglesey Fens is outlined above, with the westerly deviation keeping tight to the SAC western boundary to maximise the distance from residential properties in Capel Coch; though this retains a risk of changes to the local hydrogeology affecting the SAC designated habitats.
- 11.5.7 At Llandyfrydog, the western parallel route option could not avoid oversailing the curtilage of the Grade II Listed Rectory at Llandyfrydog. Therefore, a more westerly deviation route option has been taken forward for consultation even though it would encircle the residential community of Llandyfrydog and its multiple listed buildings. In order to avoid sharp angles, in accordance with Holford Rule No.3, the western deviation around Llandyfrydog passes close to the north side of Clorach, and the settings of the Carrog Leidr Standing Stones Scheduled Monument and two Grade II listed buildings. This approach also allows for the mostly westerly route option within Section 2 to connect back to the close parallel route options in Section 3.
- 11.5.8 In order to avoid encircling Llandyfrydog, whilst retaining the option to connect to both the western and eastern route options close to the existing overhead line in Section 2, the eastern parallel route option between Llandyfrydog and the Anglesey Fens was taken forward for consultation, with a transposition option north of Llandyfrydog.
- 11.5.9 Between Hebron and the Anglesey Fens, both parallel Route Options 3B and 3C retain the risk of adversely affecting the setting of a designated heritage asset near Cae Fabli, north of Capel Coch. The localised deviation Route Option 3C, east of the existing overhead line, was taken forward to avoid oversailing the Grade II Listed Church of St Michael (5390). This would enclose the Church of St Michael between two 400kV overhead lines, and move the new overhead line closer to the AONB. However, the western parallel Route Option 3B would enclose the Maen Addwyn Standing Stone Scheduled Monument (AN069). Therefore, to retain the opportunity to explore all designs to achieve the most acceptable close parallel route option between Hebron and the Anglesey Fens, a transposition zone has been presented to allow movement across the existing overhead line at any point in this area to avoid entering the SAC.

## **12 SECTION 4 ROUTE OPTIONS: B5110 NORTH OF TALWRN TO WEST OF STAR**

### **12.1 Introduction**

- 12.1.1 Section 4 follows the existing overhead line north to south through a 'pinch point' between Talwrn and Llangefni, starting at a point north of the A5110 at Neuadd Wen Farm, where the Section 3 non-parallel Route Option 3A re-joins the existing overhead line parallel route Options 3B and 3C. The southern end of Section 4 is where the existing overhead line turns sharply towards the east, at a point west of Star.
- 12.1.2 This chapter outlines the main constraints within Section 4 and the rationale for the selection of consultation Route Options 4A and 4B.

### **12.2 Main Routing Considerations**

- 12.2.1 Figures B4-1, B4-2 and B4-3, in Appendix B, illustrate the main sites and features that might constrain the routing of a line within the vicinity of Section 4.
- 12.2.2 Between the most northerly extent of Section 4 and a point south of Ceint, the topography reaches a high point north-east of Llangefni, at Talwrn, and then falls towards the valley of the Afon Ceint to the south, before again rising to a marked plateau at an elevation of between 80m and 100m above ordnance datum (AOD) between Star and Penmynydd. The views from properties at Talwrn are mostly orientated away from the existing overhead line, towards the east, apart from those at the western edge.
- 12.2.3 A Grade II listed building is located at Hendre Hywel, whilst south-east of Llangefni lies the Hirdre-Faig Standing Stone Scheduled Monument (AN155), in an open and prominent setting.
- 12.2.4 There are several nature conservation sites throughout the northern end of Section 4:
- Caeau Talwrn SSSI encompasses large parts of the Tir Pori Talwrn, Clegyrdy Bach and Neuadd Wen Wildlife Sites, north-west and south of Talwrn with the existing overhead line passing between. Caeau Talwrn SSSI part of the Clegyrdy Bach and Neuadd Wen Wildlife Sites, west of the existing overhead line, also forms part of the Corsydd Mon (Anglesey Fens) SAC network.
  - Clegyrdy-bach / Neuadd Wen Wildlife Sites – two areas north-west Talwrn and west of the existing overhead line, comprising marshy grassland, valley mire, basic flush and a small area of woodland.
  - Ty'n Beudy Wildlife Site – north of Talwrn and east of the existing overhead line, comprising marshy grassland, valley mire, basic flush and a small area of woodland.
  - Gylched Covert Wildlife Site – a woodland east of Llangefni and adjacent to the western side of the existing overhead line.
  - Tir Pori / Talwrn Pastures Wildlife Site – a large site, south of Talwrn, designated for its dry neutral grassland, rich-fen, fen-meadow and rush pasture.
- 12.2.5 The main settlements within this section are Llangefni to the west and Talwrn to the east, with scattered, individual properties and farmsteads throughout Section 4. The Angora Rabbit Farm lies mid-way along the road between Llangefni and Talwrn.

## 12.3 Identification of Route Options for Appraisal

- 12.3.1 Figures B4-1, B4-2 and B4-3, in Appendix B, show the route options that have been considered in Section 4 before selecting the Route Options 4A and 4B for consultation. The following outlines how all route options appraised in Section 4 were identified.
- 12.3.2 A review of the parallel route options noted residential properties on each side of the existing overhead line considered to be at risk of potentially being oversailed or having very close views of a parallel overhead line.
- 12.3.3 Route options to the east that could avoid oversailing the residential properties close to the existing overhead line were constrained by the need to avoid Talwrn, Caeau Talwrn SSSI and Tir Pori Talwrn Wildlife Site. This restricted the eastern deviation route options to a single short, sharp, non-parallel deviation option around Cefn Poeth Bach.
- 12.3.4 The western route options were identified to avoid residential properties and Gylched Covert Wildlife Site, with short and long, non-parallel route options linking back into the parallel route either north or south of Gylched Covert. At the stage of identifying route options the ability to route a close parallel overhead line past Gylched Covert without significant woodland clearance needed further detailed assessment.
- 12.3.5 South of these route options, there were no constraints to the routing of parallel options. Deviation options to the east or west were also discounted due to the:
- Objective to avoid encroaching upon the heritage setting of Hirdre-Faig Standing Stone Scheduled Monument (AN155) to the west.
  - Objective to avoid effects upon views from the proposed Malltraeth Marsh & Surrounds SLA, west of Hirdre-Faig Standing Stone.
  - Absence of a justification for encircling all the properties at Ceint with a deviation around the property at Pen Ceint, in conflict with the Holford Rules and NPS EN-5, when a parallel alignment between Pen Ceint and the existing overhead line appeared feasible.

## 12.4 Appraisal of Route Options

### Consultation Feedback

- 12.4.1 Consultation feedback indicated a preference for route options to the west of the existing overhead line through Section 4 to keep the new overhead line as far away from Talwrn as possible. The proposed new business park and bypass east of Llangefni were also highlighted, although these developments would be located almost a kilometre from the edge of the route corridor.
- 12.4.2 Potential effects on Llangefni and the Gylched Covert Wildlife Site were highlighted for consideration. There was a preference to avoid route options through wildlife sites.

### Landscape and Visual Amenity

- 12.4.3 The eastern parallel route option would encroach upon the visual amenity of properties along the western edge of Talwrn. The western parallel route option posed a visual amenity risk for a residential property adjacent to the existing overhead line, with either a parallel line close on one side or overhead lines either side of the property. The western parallel route option could also affect the local landscape character through oversailing and loss of woodland adjacent to the existing overhead line.
- 12.4.4 All the western deviation route options would reduce the effect of the parallel route option on the residential property, but encircle additional properties between the two 400kV overhead lines. However, only the longer western deviation option (Route Option 4A) would also avoid the loss of woodland at Gylched Covert. This would also comply

better with Holford Rule No.3 by avoiding a sharp turn back into the parallel route option, which would be associated with the shorter deviation.

- 12.4.5 Further south, keeping close to the existing overhead line would limit the extent of the wider landscape affected by transmission development and could limit the significance of that effect, with a preference at this stage for the western parallel route option to the south of Ceint. This would maximise the distance of the new overhead line from residential properties in Ceint, in accordance with the Holford Rules and thereby NPS EN-5.
- 12.4.6 The landscape and visual amenity preference at this stage was to use the western, non-parallel Route Option 4A with a shallow approach back to join the western parallel Route Option 4B. This would avoid or reduce the above adverse visual amenity and landscape character effects within Section 4.

#### Historic Environment

- 12.4.7 The setting of the Grade II listed building at Hendre Hywel would be affected by all the western route options, due to the new overhead line either encroaching near or encircling the listed building.
- 12.4.8 Further south in Section 4, south-east of Llangefni, the western parallel route option would bring an overhead line closer to the setting of the Hirdre-Faig Standing Stone Scheduled Monument (AN155), whereas the eastern parallel route option would be seen on the far side of the existing overhead line.
- 12.4.9 Therefore, from a cultural heritage perspective, the eastern parallel route options would be preferred at this stage to minimise potential effects on the setting of the Grade II listed building at Hendre Hywel and Hirdre-Faig Standing Stone Scheduled Monument (AN155).

#### Ecology

- 12.4.10 North-west of Talwrn the western deviation route options adjoin the boundary of the Neuadd Wen Wildlife Site, which is also part of the Anglesey Fens SAC and Caeau Talwrn SSSI. Neuadd Wen covers part of an area comprising marshy grassland, valley mire, basic flush and a small area of woodland. Whilst direct effects upon the site could be avoided (i.e. avoiding construction activities within the site), the potential for indirect effects (e.g. local changes to the groundwater regime from pylon construction) would need to be fully assessed to confirm whether indirect effects upon the SAC features would also be avoided. However, at this stage, it was assumed that such effects could be avoided, during the detailed design stage, through careful positioning of the towers as far as practicable away from the SAC.
- 12.4.11 Towards Llangefni, the western parallel route option would oversail the Gylched Covert Wildlife Site, which is a broad-leaved semi-natural woodland of county-level importance. The woodland potentially supports a population of red squirrels (a protected species); this would have to be confirmed via appropriate survey at later stages in the project development. A site visit to understand the potential effect on the woodland from an overhead line indicated that the permanent removal of mature trees would be likely. Therefore, route options in Section 4 that avoided the need for mature tree removal were preferred on ecology grounds.
- 12.4.12 An overhead line along the eastern parallel route option might oversail the Caeau Talwrn SSSI, south of Talwrn, but opportunities may exist through routing to avoid direct impacts. The site is designated for its dry neutral grassland, rich-fen, fen-meadow and rush pasture, so effects may also be avoided through careful positioning of towers.

### Local Economy

- 12.4.13 Business development around the Llangefni area was noted, including a proposed new business park and bypass east of Llangefni. This would be located over a kilometre from the closest route option. The closest route option to the Angora Farm, which is open for visitors, was approximately 0.5km east of the farm. There were no local economy effects of the route options considered to be differentiators.

### Technical

- 12.4.14 The only technical concern at this stage of the project was the risk of a line in the western route option oversailing a property beside the existing overhead line. Oversailing Gylched Covert woodland would require vegetation clearance, including tree felling.

### Other Design Considerations

- 12.4.15 The following factors were not deemed to be differentiating factors for this area:
- Cost – apart from a variation in the number of angle towers, the likely cost for each of the route options was similar.
  - Traffic and Transport – all the route options passed along the same narrow corridor, so were considered to have the same traffic and transport access constraints at this stage of the project development.
  - Water Resources / Flood Risk – no large water features or flood risk areas were affected by any of the route options.
  - Aviation and Defence – no assets at risk.

## **12.5 Route Options for Consultation**

- 12.5.1 Route Options 4A and 4B were selected for consultation in Section 4 (see Figure C4, in Appendix C) and offer two options west of the existing overhead line.
- 12.5.2 These were identified in response to the objective of increasing the distance of the preferred route options from Talwrn and avoiding encircling Cefn Poeth Bach and passing close to the properties near the east side of the existing overhead line. Although the eastern parallel route option was preferred from a heritage perspective at this stage, the effects of the western options on the setting of the Hirdre-Faig Standing Stone Scheduled Monument (AN155) and Hendre Hywel Grade II Listed Building would be reduced by maintaining a stand-off from the standing stone and the presence of an existing overhead line that has already affected the heritage setting in that locality.
- 12.5.3 Further design and assessment is needed to confirm the significance of the likely effects upon the residential property and the Gylched Covert woodland from an overhead line along the western parallel route corridor 4B. Therefore, the route option has been retained pending this further work. The slightly longer western deviation of Route Option 4A has also been presented for consultation as a feasible alternative. Shorter deviation options were dismissed to avoid sharp changes in the direction of the route and the larger pylons that this would necessitate.
- 12.5.4 There were no constraints preventing a close parallel on the west or east side of the existing overhead line south of Ceint. Therefore, in order to allow either option to be considered, route options in Section 5 and a transposition zone in this area have been identified and presented for consultation.

## **13 SECTION 5 ROUTE OPTIONS (NORTH OF MENAI STRAIT): NORTH-WEST OF STAR TO ANGLESEY AONB**

### **13.1 Introduction**

13.1.1 Section 5 extends (from north to south) between the B5420, west of Penmynydd (overlapping with Section 4 in this area), to Pentir Substation, south of Penrhos Garnedd and the A4087. Section 5 includes the Anglesey AONB and Menai Strait crossing. This section of the Orange Route Corridor introduces many additional complexities to the design of the connection, including the need to identify onshore routes for the proposed buried cables, technically and environmentally acceptable means of crossing the Menai Strait using cables, and the need to site permanent above ground facilities in the form of the secure SECs. Considerations regarding these forms of transmission equipment are set out in Chapter 14.

13.1.2 This chapter covers a sub-section of Section 5 that considers the options for SEC search areas and overhead connections between the B5420, west of Penmynydd, and the northern boundary of the Anglesey AONB. The crossing of the Anglesey AONB and Menai Strait is discussed in Chapter 14, whilst the SEC search area and overhead connection options to Pentir, within Gwynedd, are considered in Chapter 15.

13.1.3 Within the following text, the SEC search areas and route options have been grouped to show which route options could connect to a SEC within each SEC search area. From east to west, these groupings are as follows:

- Anglesey North and Route Options 5D and 5E.
- Anglesey Central and Route Options 5B and 5C.
- Anglesey South and Route Option 5A.

### **13.2 Main Overhead Line Routeing and SEC Siting Considerations**

13.2.1 Figures B5.1A, B5.1B, B5.2 and B5.3, in Appendix B, illustrate the main sites and features that might constrain the routeing of an overhead line and underground cables together with the siting of a SEC within Section 5. The following is a summary of those constraints within Section 5 on Anglesey.

13.2.2 The Anglesey AONB covers much of the coast around the island, and at the Menai Strait extends along the coastal zone up to a distance of approximately 2km inland, narrowing to the north as it approaches the town of Menai Bridge. The Grade I Plas Newydd Park and Garden lies within the AONB. Areas of ancient woodland are dispersed throughout the AONB, adding to the mature and scenic landscape quality which extends down to the tidal waters of the Menai Strait. The Southern Anglesey Estatelands SLA, proposed in the draft JLDP, forms an approximately 1km wide band between Llanfair PG and Brynsiencyn immediately to the west of the AONB boundary.

13.2.3 South-east of Llanddaniel Fab is Bryn Celli Ddu Burial Chamber, which is a scheduled monument and Cadw guardianship site with extensive views of the surrounding area. The burial chamber is particularly sensitive to development towards the east as the chamber entrance is aligned to receive the sunlight of the summer solstice sunrise.

13.2.4 The Grade I Registered Plas Newydd Park and the Grade I Listed Plas Newydd House (see Figure 13.1) and other associated Grade II listed buildings lie close to the Anglesey shoreline of the Menai Strait. Views north and west to and from the Plas Newydd House are well screened by rising ground and woodlands and mature trees lining the length of the A4080 past the Plas Newydd Estate. The Estate is owned, in part, by the National Trust and is an important tourist attraction on Anglesey.



**Figure 13.1 Plas Newydd Grade I Listed Hall**

- 13.2.5 South-east of Llanfair PG is the Grade II\* Listed Anglesey Column. This is a notable feature when approaching the island over Britannia Bridge.
- 13.2.6 There are several Wildlife Sites north of the A4080, including:
- Coed Braint / Syglen / Dyfnia Wildlife Site wetland site known for a variety of breeding birds and located north of Llanfair PG, along the Afon Rhyd-Eilian.
  - Cors Bod-Ynys Wildlife Site south-east of Penmynydd.
  - Bryn Celli Ddu Wildlife Site and Ancient Woodland, east of Llanddaniel Fab.
  - Coed Glanyrafon Wildlife Site and Ancient Woodland, south of Llanddaniel Fab.
  - Gwydryn grassland Wildlife Site, south of Llanddaniel Fab.
- 13.2.7 Ecological constraints to routeing are also posed by ancient woodland sites; woodlands are rare on Anglesey and effects on ancient woodlands are difficult to mitigate. There are also records of red squirrel (a protected species) in some of these woodlands.
- 13.2.8 The largest settlement on the Anglesey side of the Menai in Section 5 is Llanfair PG, which has been excluded from the underground search area due to the technical challenges of identifying a route for multiple transmission cables through heavily built-up areas, as well as the disruption that any such routeing would inevitably cause to the community. Other notable settlements within Section 5 on Anglesey are Star, in the centre, and Llanddaniel Fab and Gaerwen, to the west.
- 13.2.9 Plas Newydd House and Gardens is a National Trust visitor attraction, and consultation feedback has indicated that the A4080 is a tourist route leading from the A55, past Plas Newydd and on to tourism destinations on the south and west coasts of Anglesey. The National Trust has also commissioned a pilot 'Settings Study' that highlights the importance of these approaches to the Plas Newydd Estate and House. Local tourist



accommodation on the Anglesey side of Section 5 includes the Plas Coch Lodge Homes Site and Leisure Club, south of Plas Newydd, between the A4080 and Menai Strait.

- 13.2.10 Bryn Celli Ddu is a Cadw Guardianship site, and is seen as a gateway site to the archaeology of Anglesey. Other tourist attractions include Penrhyn Golf Course south-west of Llanddaniel Fab, the railway station at Llanfair PG and a National Cycle Trail (Route 8) that travels east to west around the north side of Llanfair PG and through Star and Llanddaniel Fab. The Nuffield Trust sailing centre at HMS Indefatigable lies on the shores of the Menai Strait. There is also a major arts and outdoor education facility at the 'Conway Centres: Anglesey', based on the Plas Newydd Estate, that attracts more than 18,000 pupil and teacher residential visits each year<sup>28</sup>.
- 13.2.11 The main transport infrastructure serving the Menai Strait comprises the A55 trunk road to Holyhead, and the Chester to Holyhead railway. Both the A55 trunk road and the railway are carried over the Menai Strait on the Britannia Bridge, while further east is the Menai Suspension Bridge.
- 13.2.12 The sloping topography on the north side of the Menai Strait supports effective drainage of the local watercourses, which discharge southwards into the Strait. Localised flooding risks remain a characteristic of any land situated adjacent to watercourses, for example the Afon Braint and Afon Rhyd-Eilian on Anglesey have notable flood zones.

### 13.3 Identification of SEC Search Areas and Connecting Route Options

- 13.3.1 Figures B5.1A, B5.1B, B5.2 and B5.3, in Appendix B, show the proposed SEC search areas (Anglesey North, Anglesey Central and Anglesey South) and all the overhead connection route options considered in this chapter. The following text outlines how all these options were identified and appraised.
- 13.3.2 At this stage it was not feasible to undertake a detailed SEC options siting study, as the Menai crossing technology and cable and overhead line route options will influence the identification and selection of sites for SECs within each of the search areas. Therefore, at this stage National Grid has only identified search areas for SEC sites for later consideration, once the routeing and crossing options can be more clearly defined. The identification of these search areas has also been informed by multiple site visits to identify potential effects to wildlife, cultural heritage and landscape and visual receptors, as well as through discussions with stakeholders. Attention has also been paid to the potential role of vegetation to screen views as well as the potential for long range views, such as from the mainland. This has involved field surveys to sites on the mainland, in Gwynedd, as well as desk study using 3D topographical data to understand the likely visibility of SECs and approaching overhead lines.
- 13.3.3 When identifying suitable SEC search areas, a major objective was to end the overhead line at a point that would avoid the most significant landscape and visual effects that the line would otherwise have had upon the many sites and features along the Menai Strait; and especially upon views to and from the AONB and Registered Parks and Gardens. However, there is a legal requirement not to extend the length of the buried cables for a greater distance than is absolutely necessary to achieve these objectives. These conflicting considerations, in terms of the relative lengths of overhead line and underground cable, need to be balanced with the need to maximise the use of landscape features (e.g. topography or vegetation) to screen views of the SEC, particularly from the area of the Menai Strait and AONB. Notable residential areas, such as Llanfair PG, and infrastructure constraints (e.g. a major road or railway line) were also

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<sup>28</sup> **Conway Centres (2015) *About Us*** - Conway Centres: Anglesey [on-line] Available at <http://www.conwaycentres.co.uk/anglesey/about-us/>

avoided. With permanent access required to any compound site for occasional maintenance and inspection, high level consideration was given to the proximity of main roads for access.

13.3.4 On this basis, the following factors helped identify the SEC search areas on Anglesey:

- Avoid SEC or overhead route options within the following, although underground cabling through open areas may be required to reach identified SECs:
  - Anglesey AONB, which includes the Plas Newydd Grade I Registered Park and Garden.
  - Llanfair PG due to the dense built-up residential areas.
- For Menai Strait crossing options across or west of Britannia Bridge, identify SEC search areas south of the railway line (i.e. cross the A55 and main railway line with the overhead line) to avoid the significant technical challenges of crossing this major transport corridor with underground cables.
- For Menai Strait crossing options across or east of Britannia Bridge, focus on fields south of the B5420, east of the existing overhead line and north / north-east of Llanfair PG for SEC options.

13.3.5 The review led to the identification of three search areas for consideration of potential SEC sites on Anglesey, north of the Anglesey AONB:

- **Anglesey North:** lying north of Llanfair PG, east of the existing overhead line and north of the Isle of Anglesey AONB, the Anglesey North SEC Search Area offers opportunities to identify SECs north of Llanfair PG and avoid the need to cross the A55 with a new overhead line.
- **Anglesey Central:** a triangular area adjacent to the west side of Llanfair PG, between the Isle of Anglesey AONB and Plas Newydd to the south, with the railway line to the north and Bryn Celli Ddu Scheduled Monument and Cadw Guardianship site to the west. The potential Southern Anglesey Estatelands SLA also covers most of the Anglesey Central SEC Search Area. However, the search area was selected as it offers opportunities to locate a SEC that could benefit from the woodland blocks in the area that would offer immediate screening or be located close to existing infrastructure, potentially reducing the effects on the landscape and views.
- **Anglesey South:** this search area lies at the western side of the Orange Route Corridor, north of the A4080 on Anglesey. This search area would support an overhead connection to Section 4 that passes west of Llanddaniel Fab.

13.3.6 Once the potential SEC search areas were defined, National Grid identified potential route options for an overhead line connection between these and the route options identified in Section 4 of the corridor. The overhead connection routes considered the Holford Rules to avoid designated areas, large residential areas and other routeing considerations; for example, the need to avoid unacceptable effects upon the setting of Bryn Celli Ddu Scheduled Monument. From this review, the following route options were identified:

- **Route Option 5A:** consideration of the high value heritage setting associated with the three scheduled monuments, around Bryn Celli Ddu, and the settlements of Llanddaniel Fab and Gaerwen, with their listed buildings, led to the identification of a route option between Llanddaniel Fab and Gaerwen to the Anglesey South SEC. The close proximity of residential properties along the interconnecting road network also limited options for a route that maximised the distance from residential properties, while minimising the number of sharp turns; both objectives of the

Holford Rules. The presence of residential properties meant the route option had to cross Gwydryn Wildlife Site. In order to reduce potential effects upon the Capel Eithin (site of) and Cemetery Scheduled Monument at the northern end, the route option passes as far east as possible.

- **Route Options 5B and 5C:** connect the Anglesey Central SEC Search Area via the west and south of Star, with Route Option 5C taking the most direct and least sharply angled route, as per the Holford Rule No.3. However, Route Option 5B offers a more westerly alignment, with a sharper angle turn to increase the distance from residential properties (in this case at Garnedd-fawr) and achieving a more perpendicular crossing of the main rail line. A close parallel route option via Llanfair PG into Anglesey Central SEC Search Area was considered. However, this area is quite constrained and a transposition with four angle towers would be required in close proximity to Star and Llanfair PG, whereas the Holford Rules seek to avoid routeing close to residential areas as far as practicable on grounds of general amenity. In addition, such a connection would cross the panoramic views eastwards towards Snowdonia from many residential properties located on higher ground in Star. The towers would also be particularly prominent above the horizon within views from the south, which includes from the proposed Southern Anglesey Estatelands SLA and Bryn Celli Ddu, as well as from mainland viewpoints such as Glan Faenol. Due to this combination of adverse effects, the parallel route options to Llanfair PG and into the Anglesey Central SEC Search Area were discounted.
- **Route Options 5D and 5E:** provide a connection to the Anglesey North SEC Search Area that follows either the western (Route Option 5D) or the eastern (Route Option 5E) side of the existing overhead line to north of Star. From Star the route options run in a relatively straight line towards the SEC search area taking into account the need to maximise distance from residential properties. A parallel route option on the western side of the existing overhead line allows consideration of a transposition anywhere between Section 4 and north of Star, where the existing overhead line turns south-east. Route Option 5E would require a transposition south of Ceint to connect to the eastern route options in Section 4.

13.3.7 It is acknowledged that there could be further alternatives to the above overhead route options. However, at this stage the purpose of identifying a potential overhead connection was to determine a feasible route option and understand the potential effects of an overhead connection associated with each of the potential SEC search areas. The route options will also aide the consultation process to identify further matters that should be taken into account.

13.3.8 Therefore, there has been no comparison of options for overhead line routes into the SEC search areas, as was done for those route options considered in Sections 1 to 4 (see Chapters 9 to 12). Following a more detailed SEC siting study and the selection of a preferred SEC search area, National Grid will be better able to assess Route Options 5A to 5E (and any beneficial revisions thereto) in the context of the associated effects of the SEC and buried cable routes.

## 13.4 Appraisal of SEC Search Areas and Route Options

### Consultation Feedback

13.4.1 Consultation feedback identified the importance of the Anglesey AONB and the iconic views of the Menai Strait and the need to avoid potential significant adverse effects upon these assets.

13.4.2 The draft JLDP proposes the Southern Anglesey Estatelands SLA that covers the Anglesey Central and South SEC Search Areas. The A4080, which passes between the

AONB and SLA, was identified as a tourist route from the A55, past Plas Newydd and onto some of the tourist areas on the south and west coasts of Anglesey.

- 13.4.3 The sunrise alignment at Bryn Celli Ddu was also raised as a concern with regards a potential SEC in the Anglesey Central SEC Search Area. It was recommended that this site be treated as an internationally significant location, with views towards the site considered as much as from within the site.
- 13.4.4 The Afon Braint flood risk area was also highlighted as a risk in the northern part of the Anglesey Central SEC Search Area.
- 13.4.5 Consultation feedback supported keeping the new overhead line close to the existing overhead line for the route option connections into Anglesey North. Risks to the wildlife sites were also a concern in the Anglesey North SEC Search Area.

### ***Anglesey North SEC Search Area and Route Options 5D and 5E***

#### Landscape and Visual Amenity

- 13.4.6 The B5420 road stretches around the Anglesey North SEC Search Area and vegetation alongside offers established screening from the nearby settlements. The search area lies in a relatively low lying area, with land rising up to the east before it falls towards the Menai Strait. Site visits indicated that potential SEC sites could be relatively well screened from the AONB and Menai Strait area, although the connecting overhead line would be visible from some local properties. There is potential for the lower level SEC structures to be screened with additional surrounding planting.
- 13.4.7 Anglesey North SEC Search Area contains scattered residential properties and farmsteads, whilst the main nearby towns are Llanfair PG to the south-west and Menai Bridge to the south-east. However, main roads and topography limit views from these towns.
- 13.4.8 Route Options 5D and 5E cross a relatively unconstrained area. An overhead line to the north / east of the existing overhead line (Route Option 5E) would keep the new line further from the residential properties to the south. The adjoining connection to the Anglesey North SEC Search Area could also be made while being some distance from residential properties, in compliance with the Holford Rules and thereby NPS EN-5. However, the line of overhead pylons would be visible from the opposite side of the Menai Strait, as would any temporary construction activity associated with cabling construction works down to the Menai Strait. Route Option 5D has the potential to oversail two farmsteads, but this could be avoided at the detailed routeing stage.

#### Historic Environment

- 13.4.9 There are several listed buildings within the Anglesey North SEC Search Area, but these are mainly farmsteads and relatively well screened so their setting is not specifically connected to the surrounding landscape. A burial chamber just off the A5025 is a scheduled monument, but this has collapsed and its setting is already encroached on by other development. More detailed archaeology consideration would be required for any development close to this scheduled monument. However, it is likely that potential effects on cultural heritage assets could be managed, such as visual screening of the SEC.
- 13.4.10 Route Options 5D and 5E would be visible from a small number of Grade II listed buildings, so could have an adverse effect on their settings and context. Route Option 5E would be located closer to these buildings, so would likely have a greater adverse effect.

### Ecology

- 13.4.11 Anglesey North SEC Search Area contains the Coed Braint / Syglen / Dyfnia Wildlife Sites, which is a wetland site known for a variety of breeding birds. Afon Rhyd-Eilian passes through the centre of Anglesey North, from north-east to south-west, and its associated flood zones support the wetland sites. A SEC could be positioned to avoid these constraints, although consideration would need to be given to the indirect risks posed by flood and groundwater effects. A SEC closer to the Menai would allow an overhead line to oversail these sites and minimise the risk of direct adverse effects.
- 13.4.12 Route Options 5D and 5E pass the Cors Bod-Ynys Wildlife Site; Route Option 5E is the closest, but still several hundred metres away.

### Local Economy

- 13.4.13 The Pili Palas Nature World butterfly farm is located on the eastern edge of Anglesey North SEC Search Area and a National Cycle Route No.8 passes through the southern and western edges, albeit along the main roads. However, vegetation and topography would help screen views of a SEC from users of these tourism features.
- 13.4.14 Both Route Options 5D and 5E would pass over the National Cycle Route No.8. Neither route option is located within the vicinity of the butterfly farm.
- 13.4.15 To the south, between Anglesey North and the Menai Strait, is a viewing point offering panoramic views of the Grade I Listed Menai Suspension Bridge. Anglesey North SEC Search Area is located on high ground north of this viewing point, providing a natural screen.

### Technical

- 13.4.16 An SP Manweb local electricity distribution substation is within the south-western part of the Anglesey North SEC Search Area. The presence of the substation offers a potential opportunity to position a new SEC near similar infrastructure. There have previously been proposals for a large mixed use development on a small previously-developed site between the substation and the A5025 to the south-east.
- 13.4.17 The solid geology and shallow rock in this area may require the use of modified foundation designs to create suitable foundations.

### Other Design Considerations

- 13.4.18 Costs could not be considered until specific SEC sites have been identified, but, given the significantly higher costs of using transmission cables, route length to the SECs (and hence cost) may weigh heavily in the overall balance of judgement.
- 13.4.19 With regards 'Traffic and Transport', although Anglesey North SEC Search Area could be accessed, it was not the most preferred at this stage from an engineering perspective. There were no known aviation related risks.
- 13.4.20 Afon Rhyd-Eilian passes through the centre of the Anglesey North SEC Search Area, from north-east to south-west, and has a large flood zone within the Anglesey North SEC Search Area. A SEC could be positioned to avoid the flood zone.

### ***Anglesey Central SEC Search Area and Route Options 5B and 5C***

#### Landscape and Visual Amenity

- 13.4.21 The Anglesey Central SEC Search Area offers opportunities for locating a SEC that minimises visual amenity and landscape setting effects using: the large, scattered woodland blocks; the area of higher ground at Llwyn-onn farm falling towards the Afon Braint away from the AONB; or keeping close to the A55 / railway and existing corridor of infrastructure. Additional screening could be used, but appropriate site selection will be more effective in reducing effects in the short and medium term.

- 13.4.22 A site visit identified that the non-parallel Route Options 5B and 5C west and south of Star could use low lying ground and the existing A55 / railway transport corridor to reduce the potential for adverse visual amenity and landscape effects. The combination of a SEC and overhead connection in the northern part of the Anglesey Central SEC Search Area is also likely to give rise to lesser adverse environmental effects compared to the southern part of this search area. In the southern part there is potential to more significantly affect the proposed Southern Anglesey Estate lands SLA and setting of Bryn Celli Ddu, and associated scheduled monuments.
- 13.4.23 The topography would minimise effects on the setting of Plas Newydd Registered Park and Garden, with the tree lined A4080 running above the parkland at Plas Newydd. There may be potential for cumulative effects with other lower voltage overhead lines passing through this SEC search area, and whilst these effects could be mitigated a SEC close to the A55 / railway corridor would be preferred in landscape terms, at this stage, due to the existing presence of infrastructure.

#### Historic Environment

- 13.4.24 In addition to needing to give consideration to remove or minimise the potential for adverse heritage setting effects described above under 'Landscape and Visual Amenity', the multiple, nationally important cultural heritage features in the vicinity of Anglesey Central SEC Search Area mean the area is likely to be rich in unrecorded heritage assets. Routing an overhead connection to the southern part of Anglesey Central SEC Search Area would be challenging, especially if there is any risk of significantly affecting the views from Bryn Celli Ddu; this scheduled monument's setting is associated with its alignment so the summer solstice sunrise shines into this chambered tomb. The site's status as a Guardianship site and promoted visitor attraction further add to these concerns.
- 13.4.25 Llanfair PG Railway Station is a heritage and tourist attraction due to the appeal of its long name. A SEC in the northern part of Anglesey Central SEC Search Area could potentially be visible from the railway station, but keeping to the north-west of the search area would allow development of vegetation screening between the SEC and the station.
- 13.4.26 Route Option 5B would take a new overhead line close to the Grade II Listed milestone, east of Gaerwen. The milepost is situated on the A5, which is a major road, so its setting and context is already likely to have changed. Both options would pass relatively close to the Capel Eithin (site of) and Cemetery Scheduled Monument, which could affect its setting and context. Route Option 5B would be closer for a longer length.

#### Ecology

- 13.4.27 The only ecological constraints are the Bryn Celli Ddu Wildlife Site and Ancient Woodland in the north-west corner and five other ancient woodland sites scattered throughout the southern half of Anglesey Central SEC Search Area. Woodlands are rare on Anglesey and effects on ancient woodlands are difficult to mitigate. There are also records of red squirrel (a protected species) in some of these woodlands.
- 13.4.28 Neither of the route options would pass through or near to an ancient woodland.

#### Local Economy

- 13.4.29 Plas Newydd House and Gardens is a National Trust visitor attraction, with the main entrance located beside the southern corner of Anglesey Central SEC Search Area. The A4080 is a tourist route from the A55, past Plas Newydd and onwards to some of the tourist areas on the south and west coasts of Anglesey. In addition, Bryn Celli Ddu is being promoted as a site gateway to the archaeology of Anglesey. The Nuffield Trust Centre at HMS Indefatigable, which provides holiday accommodation for armed forces

families, lies on the shores of the Menai Strait close to the north-east corner of Anglesey Central SEC Search Area. Therefore, tourism receptors lie adjacent to this search area's southern and eastern boundaries. A SEC and overhead connection within this search area would need to minimise any visual amenity effects on tourists using these sites. The Conway Centres (Anglesey) is also an important Art and Outdoor education centre.

- 13.4.30 Neither of the proposed route options is located in the vicinity of the identified tourism receptors.

#### Technical

- 13.4.31 At this stage, a SEC in the Anglesey Central SEC Search Area and Route Options 5B or 5C all appear to be feasible from a technical perspective. Route Option 5B would cross the A55 and the railway line at a more technically preferred perpendicular angle.

#### Flood Risk

- 13.4.32 The presence of the Afon Braint in the northern part of Anglesey Central SEC Search Area introduces a flood risk in the low lying areas, mostly in the north of this search area. However, a more detailed analysis would be required to understand the nature of the risk to an SEC in the northern area, any resultant flood consequences and whether these would be manageable.
- 13.4.33 Both Route Options 5B and 5C would pass through a small part of the Afon Braint floodplain, but the detailed route alignment would determine if a tower is required within the floodplain.

#### Other Design Considerations

- 13.4.34 Costs could not be considered until specific SEC sites have been identified, but, given the significantly higher costs of using transmission cables, route length to the SECs (and hence cost) may weigh heavily in the overall balance of judgement.
- 13.4.35 The A4080 would provide transport access to the Anglesey Central and South SEC Search Areas. Route Options 5C and 5B would cross the A55 and Bangor to Holyhead mainline railway, but these would be manageable constraints.
- 13.4.36 There were no known aviation related risks.

### ***Anglesey South SEC Search Area and Route Option 5A***

#### Landscape and Visual Amenity

- 13.4.37 Anglesey South SEC Search Area would be almost entirely located in the proposed JLDP Southern Anglesey Estatelands SLA. The southern end of the search area is located immediately to the north of the Anglesey AONB.
- 13.4.38 Route Option 5A would pass close to several properties, especially at Llanddaniel Fab, and introduce a 400kV overhead line into a landscape with limited development. However, the pylons for this overhead connection may be less visible from the mainland side of the Menai Strait.

#### Historic Environment

- 13.4.39 The general area around the Anglesey South SEC Search Area and Route Option 5A contains a rich historic environment due to its proximity to important heritage features, such as the scheduled monuments around Bryn Celli Ddu to the east, Plas Newydd Registered Park and Garden to the south-east and Capel Eithin (site of) and Cemetery Scheduled Monument (AN120), and Grade II listed buildings at Llanddaniel Fab. Consideration would need to be given to any potential effect on / harm to the settings of these assets, although the Llanddaniel Fab listed buildings face inwards which may reduce the risk of effects upon their settings.

### Ecology

- 13.4.40 Coed Glanyrafon Wildlife Site and Ancient Woodland is located in the middle of Anglesey South SEC Search Area, whilst Route Option 5A crosses the Gwydryn grassland Wildlife Site. A SEC could be sited to avoid the woodland, but may also benefit from using it as established visual screening. Route Option 5A could possibly be designed to oversail the grassland Wildlife Site without the need for pylons to be located within it as it is less than 200m wide where crossed.

### Local Economy

- 13.4.41 The A4080 is a tourist route from the A55, past Plas Newydd and onto to some of the tourist areas on the south and west coasts of Anglesey. In addition, Bryn Celli Ddu is being promoted as a gateway site to the archaeology of Anglesey. To the south of Anglesey South SEC Search Area lies the Plas Coch Lodge Homes Site and Leisure Club, whilst the overhead connection corridor crosses Penryhn Golf Course. Therefore, siting a SEC within this search area would need to consider any potential effects on these tourism receptors.

### Technical

- 13.4.42 A SEC in the Anglesey South SEC Search Area and the connecting overhead line along Route Option 5A are all considered technically feasible at this stage.

### Other Design Considerations

- 13.4.43 Costs could not be considered until specific SEC sites have been identified, but, given the significantly higher costs of using transmission cables, route length to the SECs (and hence cost) may weigh heavily in the overall balance of judgement.
- 13.4.1 The A4080 would provide transport access to the Anglesey South SEC Search Area. Route Option 5A would cross the A55 and Bangor to Holyhead mainline railway, but these would be manageable constraints. There were no known aviation related risks.
- 13.4.2 The Afon Braint and its associated flood zone could be oversailed by Route Option 5A.

## **13.5 Summary**

- 13.5.1 Figure C5, in Appendix C, illustrates the search areas and route options in Section 5 on Anglesey presented for consultation (Anglesey North, Central and South SEC Search Areas and Route Options 5A, 5B, 5C, 5D and 5E). All the route options need to be revised following a more detailed SEC siting study to better connect to any SEC sites identified within the SEC Search Areas.
- 13.5.2 The main merits and constraints of these search areas and associated overhead connection route options are summarised as follows:
- **Anglesey North SEC Search Area and Route Options 5D and 5E:**
    - This search area is relatively well screened from the Anglesey AONB and the Menai Strait.
    - This is the only search area not located within the proposed JLDP Southern Anglesey Estatelands SLA.
    - Route Option 5E is located at a reasonable distance from residential properties, whereas Route Option 5D may come closer to two farmsteads.
    - There are listed buildings and a scheduled monument within this search area, but at this stage it was assumed the risk of adverse effects on their settings could be appropriately managed.



- This search area contains the Coed Braint / Syglen / Dyfnia Wildlife Site, so careful SEC siting would be required to avoid potential adverse effects on this site.
- Part of this search area lies within a floodplain of the Afon Rhyd Eilian.
- The Pili Palas Nature World butterfly farm lies adjacent to the north-east side of this SEC zone, but a SEC could be screened to avoid or mitigate visual effects upon this site.
- **Anglesey Central SEC Search Area and Route Options 5B and 5C:**
  - There are landscape features (e.g. established woodlands) within this search area that offer opportunities to locate the SEC so as to reduce the level of adverse visual or landscape effects.
  - Both Route Options 5B and 5C could use low lying ground and the existing infrastructure (A55 / railway corridor) to reduce the potential for adverse visual amenity and landscape effects.
  - An overhead connection in the south of this search area would affect the proposed JLDP Southern Anglesey Estatelands SLA and may affect the setting of Bryn Celli Ddu Scheduled Monument.
  - From a landscape perspective, a SEC close to the A55 / railway corridor (to the north of this search area) would be preferred at this stage due to the existing presence of infrastructure.
  - Route Option 5B is located closer to a scheduled monument and listed building near Gaerwen than Route Option 5C.
  - This search area contains a number of ancient woodlands. These woodlands are rare on Anglesey and the potential effects are difficult to mitigate. Red squirrel (a protected species) has been recorded in some of these woodlands.
  - This search area is traversed by various floodplains, especially in the north. More assessment is needed to determine whether the flood risk in this search area is manageable.
  - The entrance to the Plas Newydd Park and Garden visitor attraction and the A4080 route to the south-west of the island lie beside the southern and eastern boundaries of this search area. The National Trust is known to be concerned about visual and landscape effects upon the approaches to the Plas Newydd Estate.
- **Anglesey South SEC Search Area and Route Option 5A:**
  - Anglesey South SEC Search Area would be almost entirely located in the proposed Southern Anglesey Estatelands SLA, whilst a SEC in the southern part of this search area would be close to the Anglesey AONB.
  - Route Option 5A would unavoidably pass close to several properties, but maximises its distance from the settlements of Gaerwen and Llanddaniel Fab.
  - The pylons associated with Route Option 5A may be less visible from the mainland, compared to Route Options 5B to 5E. However, Route Option 5A would introduce a new overhead line into a landscape with limited development, and has the potential for local cumulative landscape and visual effects with other lower voltage overhead lines.

- Route Option 5A takes a long approach to avoid impacts on the Bryn Celli Ddu Scheduled Monument and Cadw Guardianship Site. However, Route Option 5A still passes an area rich in cultural heritage.
- The long approach is not direct and would result in the need for several large angle towers.
- Route Option 5A would oversail the Gwydryn grassland Wildlife Site, whilst the SEC siting would need to avoid the Coed Glanyrafon Wildlife Site and Ancient Woodland in the middle of Anglesey South SEC Search Area.
- Anglesey South SEC Search Area and Route Option 5A are located near a number of tourism receptors, such as the Plas Coch Lodge Homes Site and Leisure Club.

## 14 SECTION 5 ROUTE OPTIONS: MENAI STRAIT CROSSING

### 14.1 Introduction

14.1.1 This chapter covers the Section 5 crossing of the Menai Strait between the northern edge of Anglesey AONB to a SEC outside the Vaynol Estate Registered Park and Garden on the Gwynedd side of the Menai Strait.

### 14.2 Main Overhead Line Routeing and SEC Siting Considerations

14.2.1 Figures B5.1A, B5.1B, B5.2 and B5.3, in Appendix B, illustrate the main sites and features that might constrain the routeing of underground cables within Section 5. The following is a summary of those constraints within this part of Section 5.

#### Landscape

14.2.2 The Anglesey AONB forms a coastal fringe around the island, extending between 0.4km and 1.7km inland along the Menai Strait coastline. The Grade I Plas Newydd Park and Garden lies within the AONB. The Park and Garden includes areas of formal lawn and gardens, arboretum and natural woodland, and was in part designed by Humphry Repton. Areas of ancient woodland are dispersed throughout the AONB, adding to the mature and scenic landscape quality which extends down to the tidal waters of the Menai Strait. The proposed JLDP Southern Anglesey Estatelands SLA forms an approximately 1km-wide band between Llanfair PG and Brynsiencyn, outside the AONB.

14.2.3 On the southern side of the Menai, close to the Menai Strait, there are long distance views towards the AONB (see Figure 14.1). This area on the mainland falls within the proposed JLDP Menai SLA and lies within the Vaynol Estate Grade I Registered Park and Garden. The existing overhead line traversing the Menai Strait forms a prominent feature and a highly visible landscape component in this area.



Figure 14.1 View Over the Menai Strait from the Vaynol Estate towards Plas Newydd

- 14.2.4 The extensive Vaynol Estate is the main landscape component on the south side of the Menai Strait, comprising a Registered Park and Garden bounded by a distinctive wall. The landscape is shaped by approximately 400 hectares of walled parkland, gardens and agricultural land uses.
- 14.2.5 To the south of the search area, but forming a panoramic backdrop to long distance views from Anglesey, is the Snowdonia National Park.

#### Historic Environment

- 14.2.6 Grade I Registered Plas Newydd Park and the Grade I Listed Plas Newydd House and other associated Grade II listed buildings lie close to the Anglesey shoreline of the Menai Strait. Plas Newydd contains extensive elements designed in the late 18th century to complement changes made to the house. This work included realignment of the driveway so that visitors experience a dramatic view of the house against the backdrop of the Menai Strait, Vaynol Park (also Grade I Registered) on the opposite shore and the mountains of Snowdonia beyond. Views out from Plas Newydd and certain views towards it, particularly from Vaynol Park, contribute to its setting and are considered particularly sensitive to change.
- 14.2.7 Vaynol Park has its origins in the 16th century, although much of what can be seen today is the result of extensive landscaping undertaken in the 18th and 19th centuries. Its landward side is largely screened by dense woodland planting and its imposing 11km of stone boundary walls topped with slate, whilst its northern and north-eastern aspects overlooking the Menai Strait and Plas Newydd on the opposite bank form an important element in its wider landscape setting.
- 14.2.8 On the Gwynedd side of the Menai Strait, Vaynol Hall (4173), Vaynol Old Hall (4166) and St Mary's Chapel (4172) and the Menai Suspension Bridge (19545+18572) are all Grade I listed structures.
- 14.2.9 On the Menai Strait shoreline, at the southern end of the Vaynol Estate, lies the historic Port Dinorwig. Most of the underground search area in Gwynedd (as well as Pentir Substation itself) lies within the Dinorwig Registered Outstanding Landscape of Historic Interest.
- 14.2.10 South-east of Llanfair PG is the Grade II\* Listed Anglesey Column and in the centre and on the north shores of the Menai Strait, east of the Britannia Bridge, lie several scheduled monuments related to fish weirs.

#### Ecology

- 14.2.11 The Menai Strait forms part of the Y Fenai a Bae Conwy / Menai Strait and Conwy Bay SAC comprising some 26,400 hectares of European designated habitats. The SAC features include: large shallow inlets and bays; mudflats and sandflats not covered by seawater at low tide; reefs; sandbanks that are slightly covered by sea water all the time; and submerged or partially submerged sea caves. Within the cable search area, reef habitat encompasses the majority of subtidal habitat between Y Felinheli and Menai Bridge, while further west this habitat is limited to the shallow subtidal areas. Intertidal mudflats and sandflats and subtidal sandbanks are present in the south, particularly towards the north shore.
- 14.2.12 Several SSSIs are also found along the Menai Strait, including: Glannau Porthaethwy which extends along 4km of the shore and supports a significant diversity of marine plants and animals; and Coedydd Afon Menai, a woodland on the Gwynedd shoreline of the Menai Strait, west of Britannia Bridge, comprising narrow strips of broadleaved woodland.
- 14.2.13 The western end of the search area includes the eastern part of the Glannau Porthaethwy SSSI, which was selected for its marine biological features and is the only

part of the intertidal zone to be incorporated in the SAC. Features here include: five marine communities of restricted national distribution; five diverse rockpool and overhang communities; and comprehensive examples of community zonation characteristic of sheltered rocky shores.

#### Local Economy

- 14.2.14 The main settlement on the Anglesey side close to the Menai Strait crossing area is Llanfair PG, which has been excluded from the underground search due to the technical challenges of identifying a route for multiple transmission cables through heavily built-up areas and the disruption that any such routeing would inevitably cause to the community. In Gwynedd, the Menai Strait crossing would lie between Bangor and Y-Felinheli, with the Vaynol Estate and Parc Menai Business Park as the main economic areas.
- 14.2.1 There is tourist accommodation located within the Menai Strait crossing search area, most notably Gwesty Carreg Bran Hotel at Llanfair PG and the Premier Inn at Parc Menai. The Nuffield Trust Centre, at HMS Indefatigable, lies on the shores of the Menai Strait within the crossing search area and provides holiday accommodation for armed forces families. Other accommodation adjoins the cable search area, including the Plas Coch Lodge Homes Site and Leisure Club on Anglesey, west of Plas Newydd, and Hotel Port Dinorwic on the Gwynedd side.
- 14.2.2 National Cycle Route No.8 also runs along the A487 past the south side of the Vaynol Estate. The Wales Coast Path currently runs around the landward side of the Vaynol Estate, but it is understood that there are plans to connect it to the Vaynol Estate's paths, allowing the coastal path to keep to the shoreline between Britannia Bridge and Port Dinorwig. There are also circular public routes around the Vaynol Estate overlooking the Anglesey AONB.
- 14.2.3 Plas Newydd House and Gardens is a major National Trust visitor attraction, and consultation feedback has indicated that the A4080 is a tourist route from the A55, past Plas Newydd and on to some of the tourist areas on the south and west coasts of Anglesey.

#### Transport

- 14.2.4 The main transport infrastructure serving the Menai Strait comprises the A55 trunk road to Holyhead and its ferry port, and the Chester to Holyhead railway. Both the A55 trunk road and the railway are carried over the Menai Strait on the Britannia Bridge, while further east is the Menai Suspension Bridge, which carries road traffic on the A5 between Bangor and the town of Menai Bridge.
- 14.2.5 The A4080 crosses the Menai Strait cable search area, running adjacent to the northern edge of the Anglesey AONB, whilst similarly in Gwynedd the A487 crosses the area along the southern edge of the Vaynol Estate, linking Bangor to Caernarfon.

#### Flood Risk

- 14.2.6 The sloping topography on both the north and south side of the Menai Strait supports effective drainage of the local watercourses, which discharge northwards and southwards into the Strait. Localised flooding risks remain a characteristic of any land situated adjacent to watercourses.

#### Geology

- 14.2.7 Solid geology is of importance when considering the installation of HDDs or tunnels.
- 14.2.8 Within much of the search area, either side of the Menai Strait, the solid geology comprises carboniferous limestone, with notable sandstone strata interspersed on the mainland side within the northern part of the Vaynol Estate. This limestone gives way to sedimentary mudstones and sandstones (the 'Menai Straits formation') on the mainland,

either side of Britannia Bridge. Older metamorphic rocks are found in the Anglesey Shear Zone on Anglesey around Britannia Bridge and underlying Llanfair PG. On Anglesey there are igneous intrusions recorded that form a dyke south of Plas Newydd, and smaller intrusions around Britannia Bridge

- 14.2.9 The area is known to be heavily faulted, and the varied and transformed nature of the solid geology could represent technical challenges to the installation of buried cables using HDD or certain tunnelling techniques.

#### Topography and Bathymetry

- 14.2.10 Topography and seabed bathymetry is of importance when routeing underground cables, especially when considering direct burial or the use of HDD or tunnelling techniques.
- 14.2.11 South and west of Britannia Bridge the topography on Anglesey within the search area rises to a maximum local elevation of around 35 – 40m AOD. Whilst generally sloping gently eastwards, along the Plas Newydd shoreline there is a notable section of steeper ground which in places forms low cliffs to the foreshore. Further south, the ground profile then slackens to form a larger area of lower-lying ground north of Moel-y-don. There is also an area of shallower slopes to the south of Llanfair PG, with larger areas of flatter ground adjacent to the Menai Strait beside HMS Indefatigable.
- 14.2.12 East of Britannia Bridge on Anglesey the ground profile is steeper and more even, with an average slope of around 1:7, rising to a maximum elevation of more than 60m AOD.
- 14.2.13 On the mainland side of the Menai Strait the profiles are generally shallower, with maximum elevations of around 50m set further back from the Menai Strait. The Gwynedd shoreline steepens significantly to the east of Britannia Bridge, where again low cliffs can be found. The levelled profiles of Bangor University's sports ground, south-east of Britannia Bridge, are also a notable topographical feature.
- 14.2.14 Based upon detailed bathymetric surveys provided by the University of Bangor (see Figure B5.2 in Appendix B), it is clear that the depth of the Strait also varies throughout the cable search area. The deepest area of the Menai Strait within the area, known as the Swellies, is located immediately south-west of Britannia Bridge and is approximately 28m in depth within the centre of the channel. This is in marked contrast to the area around Yns Gored Goch to the east of the Bridge where the maximum seabed depth is around 12m. The remainder of the Menai Strait within the cable search area varies in depth between around 13m and 20m, with the deeper area located between Plas Newydd and Port Dinorwig.
- 14.2.15 The southern part of the Menai Strait in the search area is marked by steeper subtidal edge profiles, particularly on the Anglesey side, whilst slopes on the bed of the main channel do not exceed 10 degrees. In contrast, the rocky nature of the seabed either side of Britannia Bridge has resulted in a far more uneven seabed profile. South of the Swellies the profile of the Menai Strait close to the Gwynedd shoreline is also steep.

#### Seabed Morphology

- 14.2.16 Towards the north-eastern end of the cable search area the seabed is a mosaic of coarse sediments and rocky outcrops with appreciable variation in depth profile across the waterway, particularly in the Swellies. Towards the south-western half of the search area, bed characteristics are more sedimentary with a more even bed profile that would provide better substrate for cable laying. However, the inherently high tidal currents are of note in relation to the routeing of buried cables as the bed profile within sedimentary areas of the Menai Strait can vary appreciably over short periods of time. Patterns of erosion and deposition could result in the risk of over-burial and excessive heating or exposure and mechanical stressing of cables.

### 14.3 Menai Strait Crossing Search Area

14.3.1 Figure C5, in Appendix C, shows the search area for crossing the Anglesey AONB and Menai Strait with cables between the SEC search areas identified in Chapters 13 and 15.

14.3.2 The common area and crossing options' boundaries presented at the 2012 public consultation were reviewed so as to ascertain a suitable search area for the routeing of underground cables. Having carried out this review, the search area was defined at the eastern end by the boundary of Crossing Option A, extended slightly to the edge of the built-up area of Menai Bridge. At the western end, the search area ended at Moel-y-Don on Anglesey and Port Dinorwig on the mainland. This was for several reasons:

- It was not felt necessary to consider routeing underground cables beneath or through residential areas in this instance, given the geography of the search area. Y Felinheli occupies a long length (approximately 1.8km) of the Gwynedd foreshore from Port Dinorwig westwards, so a significant extension of the search area westwards would have been required to avoid the settlement.
- The technical constraints for HDD and open cut trenching technology west of Y Felinheli imposed by the mobile sediments and rapidly changing bed profiles associated with this part of the Menai Strait and the length of the crossing that would be required (as noted in the Preferred Route Corridor Selection Report).
- The risk of potential adverse effects of skylining panoramic views of Snowdonia from the north due to extending the overhead line and cabling connections through the Dinorwig Registered Outstanding Landscape of Historic Interest west of Pentir (as noted in the Preferred Route Corridor Selection Report).
- The longer connection that a route south of Y Felinheli would represent (connecting the Orange Route Corridor to the north-west of Llanfair PG and Pentir Substation). This longer route length would result in risk of greater adverse effects upon communities that would otherwise be largely unaffected, such as Y Felinheli and Bethel, and other environmental and socio-economic receptors, such as Greenwood Forest Park. A longer route length would also result in a potentially significant increase in cost, especially where buried cables needed to be employed.

14.3.3 This reasoning will be back-checked and confirmed as more detailed design and assessment work continues to progress.

### 14.4 Route Options and Underground Crossing Techniques Considered

14.4.1 Identification of the preferred Menai Strait crossing is dependent upon a review of feasible undergrounding technologies (including cabling routes and potential drilling locations), SEC locations and overhead routes to the SECs. Each of these components comprise several options and the overall preferred combination will be based on a balance of environmental, socio-economic, technical and cost factors, informed by a detailed consideration of consultation responses.

14.4.2 Each component needs to be initially considered to understand the environmental, socio-economic, technical and cost acceptability of each component option. With this understanding, an overall combination can be identified that has taken into account the balance of all environmental, socio-economic, technical and cost considerations plus consultation feedback.

14.4.3 At this stage, National Grid has commenced feasibility studies into potential undergrounding technologies (including cabling routes and potential drilling locations), SEC locations and overhead routes to the SECs. However, at the time of this report's publication these studies remain on-going.

14.4.4 This chapter explains the work that is currently underway. When the Menai Strait crossing studies have been completed, further information will be provided on those findings.

#### Basis of Feasibility Studies

14.4.5 As outlined in Chapter 5, Part 3, there are several underground cabling methods. All other things being equal the laying of underground cables in open cut trenches (or directly on the seabed for marine crossings) is the preferred technique due to significantly lower installation costs. However, where environmental considerations or physical obstructions might preclude this approach, as is the case at the Menai Strait, alternative techniques to install underground cables, such as HDD, are also considered.

14.4.6 The ability of the rock or soil that surrounds underground cables to dissipate the heat emitted by the cables could determine the number of cables required. This is because heat build-up reduces the current that the cables are able to carry, potentially requiring the installation of further cables to make up for any capacity shortfall. At this stage, feasibility studies are seeking to identify cable routes and techniques for the installation of up to 12 cables, which would represent a worst case scenario in this instance.

14.4.7 At the start and end of an underground section, a SEC would be required to change from an underground cable to overhead line (see Chapter 5). To inform the studies it has been assumed that a worst case SEC size of 120m x 60m would be required, which would be capable of accommodating two 400kV circuits, each comprising six cables (i.e. the maximum 12 cables that could be required).

14.4.8 The Preferred Route Corridor Selection Report considered six cables for the underground crossing options, as this would be the minimum requirement if the local geology could provide efficient heat dissipation. This approach avoided distorting the cost appraisal compared to overhead technology options. Once the Menai studies have been concluded, the final cable requirements will inform a review and back-check of the assumptions contained in the Preferred Route Corridor Selection Report.

#### Scope of Feasibility Studies

14.4.9 The review of feasible technology options to cross the Menai Strait and associated crossing locations is currently exploring the following methods:

- Open cut trenching.
- Horizontal directional drilling.
- Use of Britannia Bridge.

14.4.10 The principle of tunnelling is also being considered, but is unlikely to be favoured on costs grounds if the above options prove viable.

14.4.11 To date, detailed bathymetric and sonar surveys have been completed by Bangor University. These have informed a better understanding of the profiles of the seabed, superficial deposits and the rock head of the underlying solid geology in the Menai Strait. This has been supplemented by the acquisition of detailed laser survey data of the local topography along both shorelines.

14.4.12 Environmental surveys are underway and will continue through 2016. Due to the European nature conservation designations along the Menai Strait, it is important to understand the potential effects on the seabed habitats of any crossing option, especially those involving direct burial. To this end, surveys already undertaken included ecological surveys of the inter-tidal and sub-tidal areas of the Menai Strait, comprising walk-over surveys, grab sampling of seabed sediments and drop-down camera surveys. The results of these surveys (which are awaited at the time of this



report) will supplement and update the existing intertidal habitats/communities data already provided by Natural Resources Wales.

- 14.4.13 Feasibility studies looking at the challenges associated with the installation of HDD, including potential borehole lengths and profiles, are also underway. More detailed ground investigations, including the use of trial boreholes, will be required to verify the underlying geology and associated geotechnical constraints.
- 14.4.14 Discussions with Network Rail are ongoing concerning the technical constraints and opportunities that installing cables on the rail deck of Britannia Bridge might present.
- 14.4.15 Studies to identify feasible site options for temporary construction areas either side of the Menai Strait and for SECs, as well as for possible cable route corridors, have also commenced. These studies are taking into account recorded sites and known features, and the constraints or opportunities that they might represent to site and route options. This will be supplemented in future by further information gained from site-based assessments and consultation feedback.
- 14.4.16 When completed, the findings of these studies will form part of a later stage of consultation.

## **14.5 Summary**

- 14.5.1 Figure C5, in Appendix C, illustrates the cable search area between the identified SEC search areas on either side of the Menai Strait. At the time of producing this Report the process of gathering baseline information, identifying possible means of crossing the Menai Strait and appraising the resultant options is ongoing. Therefore, given the complexity of the environmental, socio-economic, technical and cost considerations associated with routing transmission cables in this area, and the current gaps in knowledge that National Grid is working to address, cable route options have not been presented for consultation in Autumn 2015.
- 14.5.2 Notwithstanding the above comments, some of the primary considerations have been outlined in this chapter and in Chapter 5 of this report. These may help to inform consultation feedback on this aspect of the project. As work becomes more advanced, further information will be presented in 2016 as part of a later stage of consultation.

## **15 SECTION 5 ROUTE OPTIONS (SOUTH OF MENAI STRAIT): PENTIR SUBSTATION CONNECTION**

### **15.1 Introduction**

15.1.1 This chapter covers that part of Section 5 of the route located in the triangle between: the northern end of Port Dinorwig; Fferm Treborth Uchaf, north-west of Penrhos-Garnedd; and Pentir Substation, located within Coed Rhos-Fawr woodland, south of Penrhos Garnedd and the A4087.

15.1.2 Within the following text, the SEC search areas and overhead line route options have been grouped to show which route options could connect two SEC search areas. From east to west, these groupings are as follows: Gwynedd North and Route Option 5H; and Gwynedd South and route options 5F, 5G and 5H.

### **15.2 Main Overhead Line Routeing and SEC Siting Considerations**

15.2.1 Figures B5.1A, B5.1B, B5.2 and B5.3, in Appendix B, illustrate the main constraints within Section 5. The following is a summary of those sites and features that might constrain the routeing of an overhead line and the siting of a SEC within Section 5 on the Gwynedd side of the Menai Strait.

15.2.2 The extensive Vaynol Estate is the main landscape component on the south side of the Menai Strait, comprising a Registered Park and Garden bounded by a distinctive wall. The landscape is shaped by approximately 400 hectares of walled parkland, gardens and agricultural land uses. The Vaynol Estate plus the area to the north-west of the A487, but excluding the Parc Menai Business Park, lies within the proposed JLDP Menai SLA.

15.2.3 To the south-east of the Vaynol Estate, the landform rises rapidly to where the Pentir Substation lies at an elevation of approximately 108m AOD. Further to the south, Snowdonia National Park forms a panoramic backdrop to long distance views from high ground throughout Section 5.

15.2.4 There are three scheduled monuments in the area between the Vaynol Estate boundary and Pentir Substation: Coed Nant-y-garth Standing Stone (CN375); Fodol Ganol Enclosed Hut Group (CN175); and Gors y Brithdir Enclosed Hut Group & Ancient Fields (CN203).

15.2.5 The Grade I Registered Vaynol Estate Registered Park and Garden (GD52) has its origins in the 16th century, although much of what can be seen today is the result of extensive landscaping undertaken in the 18th and 19th centuries. Its landward side is largely screened by dense woodland planting and its imposing 11km of stone boundary walls topped with slate, whilst the northern and north-eastern aspects overlook the Menai Strait and Plas Newydd. The estate contains the Grade I listed Vaynol Hall (4173), Vaynol Old Hall (4166) and St Mary's Chapel (4172), along with many other listed buildings.

15.2.6 On the Menai Strait shoreline, at the southern end of the Vaynol Estate, lies the historic Port Dinorwig, with many other Grade II listed buildings. At the northern end of the search areas lies the Grade II Listed Britannia Bridge (3674 + 5488).

15.2.7 Most of Gwynedd SEC search areas and connecting overhead route options search area, including Pentir Substation, lie in the Dinorwig Registered Outstanding Landscape of Historic Interest.

- 15.2.8 The main ecological constraints are the local Wildlife Sites, some with ancient woodland status. One example is the Coed Rhos Fawr Wildlife Site and Ancient Woodland beside Pentir Substation. Effects upon ancient woodlands are difficult to mitigate.
- 15.2.9 Within the search area, the Vaynol Estate and Parc Menai Business Park form the main areas of economic activity. The sole hotel and B&B business located within this part of the corridor is the Premier Inn at Parc Menai.
- 15.2.10 The A55 trunk road and the Chester to Holyhead railway lie at the northern end of the search area, while the A487 between Bangor and Caernarfon passes through the search area along the south-east side of the Vaynol Estate. National Cycle Route No.8 also runs along the A487.
- 15.2.11 The Wales Coast Path runs along the coast either side of Britannia Bridge, before turning to head inland through the estate buildings at Vaynol Hall and Parc Menai to then follow the A487 and B5457 roads towards Y Felinheli. It is understood that there are plans to divert the path from this inland alignment onto the Vaynol Estate paths, allowing the path to keep to the coastline. Additionally, there are circular public paths around the Vaynol Estate overlooking the Anglesey AONB.
- 15.2.12 There are no notable flood risk areas, though there are watercourses draining through the search area to Port Dinorwig that may pose localised flood risks, which in turn may influence future SEC siting studies.

### 15.3 Identification of SEC Search Areas and Connecting Route Options

- 15.3.1 Figure C5, in Appendix C, shows the proposed SEC search areas (Gwynedd North and Gwynedd South) and the overhead connection route options (5F, 5G and 5H) considered in this chapter.
- 15.3.2 The approach to identifying the SEC search areas in Gwynedd and route option connections to Pentir Substation followed the same principles as on Anglesey (see Chapter 13, Part 3). However, in Gwynedd the main factor defining the potential SEC search area was the need to avoid SEC sites or overhead route options within the Vaynol Estate due to its setting links with the AONB, its Grade I Registered Park and Garden status and the many listed buildings that it contains. In addition, the basic geography of the crossing search area, bounded by the northern limit of the built up area of Port Dinorwig, meant that extending the crossing search area south of a line level with the north of Y Felinheli, would only have served to make routes to Pentir longer and less direct. This helped define the southern boundary of the crossing search area.
- 15.3.3 The review of sites and features that might constrain or offer opportunities for the siting of SECs led to the identification of two search areas for potential SEC sites on the Gwynedd side of the Menai Strait:
- **Gwynedd North:** a small area, located beside a water treatment works and the A55 corridor on the northern edge of the Parc Menai Business Park, which could connect a Menai Strait crossing near Britannia Bridge to an overhead line route to Pentir.
  - **Gwynedd South:** this ovoid area is broadly centred on the A4087 and is bounded along much of its north-western limit by the Vaynol Estate boundary. The north-eastern limit is defined by the A55 trunk road. The south-eastern boundary of the search area runs broadly parallel to the Vaynol Estate boundary, resulting in a long but narrow search area varying in width between approximately 400m and 800m. At its closest the search area lies within approximately 1.2km of Pentir Substation. A number of the residential properties at Capel-y-Graig lie just within the search area, as do a small number of other individual properties and farmsteads to the east and south. The search area has been developed to accommodate all potential crossing options over the Menai Strait.

- 15.3.4 Once the potential SEC search areas were known, National Grid identified potential route options for an overhead line connection between a future SEC and Pentir Substation, taking into consideration the Holford Rules.
- 15.3.5 From this review, the following route options were identified:
- **Route Option 5H:** From Gwynedd North SEC Search Area, a close parallel route option to the existing overhead line was the only viable option to keep away from the Vaynol Estate Registered Park and Garden and minimise any effect on receptors in the relatively undeveloped landscape to the south. The proximity of the existing line to the SEC search area and the comparatively short distance to Pentir also favour such a route. The presence of existing infrastructure, including the A55 and 400kV overhead transmission line, and the southern extent of the built-up area of Penrhos Garnedd to the north, combined with a preference to avoid a transposition in the landscape east of the Vaynol Estate and north of the Dinorwig Registered Outstanding Landscape of Historic Interest, led to the preference for a route option located to the west of the existing line.
  - **Route Option 5F and 5G:** With uncertainty on the location of a SEC within the larger Gwynedd South SEC Search Area, two additional route options were added to supplement the northern Route Option 5H, by offering a southern (5F) and central (5G) route option.
- 15.3.6 It was acknowledged that there could be alternatives to the above overhead route options. However, at this stage the purpose of identifying a potential overhead connection was to determine a feasible route option to understand the potential overhead connection risks associated with each of the potential SEC search areas. The route options would also aid the consultation process to identify further matters that should be taken into account.
- 15.3.7 Therefore, there has been no options comparison for overhead line route options into the SEC search areas, as was done for those route options considered in Sections 1 to 4 (see Chapters 9 to 12). Route Options 5F to 5H may need to be revised following a more detailed SEC siting study to better connect to any SEC sites identified within the search areas.

## 15.4 Appraisal of SEC Search Areas and Route Options

### Consultation Feedback

- 15.4.1 Consultation feedback identified the importance of Anglesey AONB and the iconic views of the Menai Strait, and the need to avoid potential significant adverse effects on these receptors. It also identified the importance of protecting the Vaynol Registered Park and Garden and the many other heritage features that it contains.
- 15.4.2 Consultation feedback also identified an application that is being considered for inclusion of a North Wales Slate Mining Landscape on the UNESCO World Heritage List. The area covered could include some elements of the Dinorwig Registered Outstanding Landscape of Historic Interest, which have demonstrable cultural connections with assets in the area such as the Vaynol Estate and the port towns of Y Felinheli and Port Dinorwig.

### ***Gwynedd North SEC Search Area and Route Option 5H***

#### Landscape and Visual Amenity

- 15.4.3 Gwynedd North SEC Search Area is potentially a good site for a SEC in landscape terms due to its context, being bounded by existing utility infrastructure including: a water treatment works, a 132kV electricity substation, the A55 trunk road and Parc

Menai Business Park. However, the SEC would be located just within the boundary of the proposed JLDP Menai SLA.

- 15.4.4 Route Option 5H's close proximity to the existing overhead line would contribute to integrating a new overhead line into the surrounding landscape and minimising the potential for effects on the setting of the Grade I Registered Vaynol Park and distant views from Anglesey. However, Route Option 5H would also be clearly visible against the skyline from the Anglesey AONB and from the Vaynol Estate Registered Park and Garden, as it passes through the edge of Parc Menai Business Parc.
- 15.4.5 There is some mature woodland adjacent to the SEC search area and around the Parc Menai Business Park, some of which may require removal to enable the construction and operation of an overhead connection. This could further increase the local landscape and visual effects of any new overhead line. Users of the A55 crossing Britannia Bridge would experience close proximity views of the two lines, with the existing and new lines located on either side of the dual carriageway around the Penrhos Garnedd junction. This could result in a significant and dominant visual effect for road users.
- 15.4.6 As the route option runs south-east from the SEC search area towards Pentir, it deviates away from a close parallel alignment with the existing line to avoid residential properties at Bryniau-heulog and Tydynn Solomon. This would result in overhead transmission lines being located on both sides of the properties, potentially giving rise to far greater cumulative visual effects. The significance of these effects would need to be considered following more detailed design and assessment, including consideration of possible measures to mitigate any such effects.

#### Historic Environment

- 15.4.7 Given its relatively close proximity to the Menai Strait and Britannia Bridge, the Gwynedd North SEC Search Area and Route Option 5H may pose a risk to the setting of the Grade I Registered Vaynol Park and Garden (GD52), as well as the Grade II Listed Britannia Bridge (3674 + 5488). The landform, existing development and mature vegetation may partially help integrate the development into the setting.
- 15.4.8 Route Option 5H oversails Gors y Brithdir Enclosed Hut Group and Ancient Fields Scheduled Monument (CN203) on its approach to Pentir Substation, but the route predominantly avoids the Dinorwig Registered Outstanding Landscape of Historic Interest until it approaches Pentir Substation. The alternative would be to either encircle the site, which would also take the new overhead line closer to the Dinorwig Registered Outstanding Landscape of Historic Interest, or undertake a transposition to the east that would introduce into the landscape multiple heavy angle towers and sharp angle changes in the overhead line direction. Therefore, all route options within this proximity would pose a risk of harm to the setting of the monument, although a direct impact could be avoided through careful siting of the towers. As the scheduled monument designation is preserving the location of a feature rather than a specific above ground feature (e.g. a standing stone), the importance of the site's connection to the wider landscape setting is likely to be reduced. Therefore, at this stage, it was deemed that oversailing would cause the least effect on the setting of this feature.
- 15.4.9 A close parallel route option would also minimise the potential for more distant impacts on the setting of assets on either side of the Menai Strait by reducing the tendency for skylining as it crosses the ridge of high ground running south from Penrhos Garnedd and higher ground on the approach to Pentir Substation. It would also reduce the risk of affecting the settings of the Coed Nant-y-garth Standing Stone (CN375) and Fodol Ganol Enclosed Hut Group (CN175) Scheduled Monuments.

### Ecology

- 15.4.10 Gwynedd North SEC Search Area lies on the northern edge of the Parc Menai Wildlife Site and Ancient Woodland, which would need to be crossed by Route Option 5H. Route Option 5H also crosses the Coed Rhos Fawr Wildlife Site and Ancient Woodland on its approach to Pentir Substation. Oversailing these sites may require vegetation clearance, and there is no suitable mitigation for loss of ancient woodland. It should be noted that red squirrels (a protected species) are also present in some of the woodlands located in this part of Gwynedd.

### Local Economy

- 15.4.11 A SEC would be relatively well screened from view, but the overhead line along Route Option 5H would be visible to visitors to the Vaynol Estate, Parc Menai Business Park and those using the local road network and the A55 trunk road. Of particular note would be the addition of a second overhead line into the backdrop to panoramic views of the Grade II Listed Britannia Bridge from the viewing point located on the A5 within Anglesey AONB, between Llanfair PG and Menai Bridge.

### Technical

- 15.4.12 Construction access to the site may pose a risk of disrupting the operational access to the existing wastewater treatment works. There is the potential for a number of services to be present in the vicinity of the site, which may further restrict the land available for development. The construction of overhead line towers in close proximity to the A55 junction could also present technical challenges.

### Other Design Considerations

- 15.4.13 Costs could not be considered until specific SEC sites have been identified, but given the significantly higher costs of using transmission cables, route length to the SECs (and hence cost) may weigh heavily in the overall balance of judgement.
- 15.4.14 There were no known flood risk concerns zone within the Gwynedd North SEC Search Area or along Route Option 5H. There were no known aviation related risks.

### ***Gwynedd South SEC Search Area and Route Options 5F, 5G and 5H***

#### Landscape and Visual Amenity

- 15.4.15 Gwynedd South SEC Search Area lies adjacent to the Grade I Registered Vaynol Park and Garden and proposed JLDP Menai SLA. Although the eastern perimeter of the Estate is largely screened by dense woodland planting, as previously stated, the estate has an imposing 11km of listed stone boundary walls topped with slate, which adjoins the search area.
- 15.4.16 The central and western ends of Gwynedd South SEC Search Area, plus the whole of Route Options 5F and 5G, lie within the Dinorwig Registered Outstanding Landscape of Historic Interest; Route Option 5H only enters as it approaches Pentir.
- 15.4.17 Throughout the Gwynedd South SEC Search Area, the presence of existing development, localised topography or mature vegetation offers the potential to identify a SEC site that could in part be screened locally. However, some residential properties may still have adverse views of a SEC dependent upon site options subsequently identified.
- 15.4.18 Route Option 5H's close proximity to the existing overhead line would contribute to integrating a new overhead line into the surrounding landscape and minimising the potential for effects on the setting of the Grade I Registered Vaynol Park and distant views from Anglesey. However, Route Option 5H would also be clearly visible against the skyline from the Anglesey AONB and from parts of the Vaynol Estate Registered Park and Garden, as it climbs onto higher ground on the approach to Pentir Substation.

15.4.19 To the south and east of the Gwynedd South SEC Search Area the land rises in an escarpment to a height of approximately 100m above sea level, with Pentir set on the higher plateau. Route options 5F and 5G would also need to approach Pentir across this higher ground and may be visible from the Anglesey AONB and the Plas Newydd Estate, depending on how far to the north within the search area a SEC would be located. There is also a risk of long distance views from the north of overhead lines set against panoramic views of Snowdonia.

#### Historic Environment

15.4.20 Gwynedd South SEC Search Area would introduce a SEC outside the Grade I Registered Vaynol Park and Garden (GD52). There are several Grade II listed buildings located along the estate's south-eastern boundary, with the majority at the western end near Port Dinorwig. The landform, existing development and mature vegetation may partially help integrate a SEC development into the landscape, potentially avoiding impacts upon the setting of heritage assets. The opportunity to do this is perhaps greatest at the eastern end of the search area, closer to Penrhos Garnedd.

15.4.21 Route Option 5H oversails Gors y Brithdir Enclosed Hut Group and Ancient Fields Scheduled Monument (CN203) on its approach to Pentir Substation, but the route predominantly avoids the registered Dinorwig Registered Outstanding Landscape of Historic Interest until it nears the Pentir Substation. Considerations relating to how route alternatives might affect the scheduled monument are the same as those discussed in paragraph 15.4.8 above.

15.4.22 In contrast, Route Options 5G and 5H introduce a new overhead line into an undeveloped landscape and would potentially affect the settings of the Coed Nant-y-garth Standing Stone (CN375) and Fodol Ganol Enclosed Hut Group (CN175) Scheduled Monuments and Dinorwig Registered Outstanding Landscape of Historic Interest, as well as potentially introducing further overhead line development into views to the south-east from parts of the Vaynol and Plas Newydd estates.

#### Ecology

15.4.23 Wildlife sites and ancient woodland are scattered throughout Gwynedd South SEC Search Area and all route options would have to pass through the Coed Rhos Fawr Wildlife Site and Ancient Woodland beside Pentir Substation. Oversailing these sites may require vegetation clearance, and there is no suitable mitigation for loss of ancient woodland. Red squirrels (a protected species) have also been recorded in some of the woodlands in this locality.

#### Local Economy

15.4.24 There are no known tourist attractions within or immediately adjacent to the Gwynedd South SEC Search Area. Greenwood Forest Park lies approximately 1km beyond the southern boundary of the search area. Local roads, including the A487 trunk road, the A4087 and the B4366, form some of the main access routes to tourist attractions to the south, including Caernarfon, Porthmadog, the Lleyrn Peninsula and Snowdonia National Park.

15.4.25 The Wales Coast Path currently runs around the landward side of the Vaynol Estate and National Cycle Route No.8 runs along the A487. As both of these national trails pass along the length of Anglesey South SEC Search Area, they would be near any potential SEC site. However, it is understood that there are proposals to divert the Wales Coast Path closer to the Menai Strait shoreline by connecting to the Vaynol Estate paths.

#### Technical

15.4.26 There were no specific technical restrictions with regards to developing a SEC within, or an overhead line connection option to, the Anglesey South SEC Search Area.

### Other Design Considerations

- 15.4.27 Costs could not be considered until specific SEC sites have been identified, but given the significantly higher costs of using transmission cables, route length to the SECs (and hence cost) may weigh heavily in the overall balance of judgement.
- 15.4.1 While transport and access have not been considered fully in relation to the Gwynedd South SEC Search Area, the proximity of a well-serviced highway network would facilitate vehicle movements to and from specific SEC locations. There were no known aviation related risks.
- 15.4.2 There were no notable flood risk areas, although there are watercourses draining through the search area towards Port Dinorwig which may pose localised flood risks that in turn may influence future SEC siting studies.

## **15.5 Summary**

15.5.1 Figure C5, in Appendix C, illustrates the SEC search areas and route options in Section 5 on Anglesey presented for consultation (Gwynedd North and South SEC Search Areas and Route Options 5F, 5G and 5H).

15.5.2 The main relative merits and constraints of these SEC search areas and associated overhead line route options are summarised as follows:

- **Gwynedd North SEC Search Area and Route Option 5H:**
  - This search area is surrounded by existing development, which reduces the potential for adverse landscape and visual effects.
  - However, the Route Option 5H overhead line would be visible from the Anglesey AONB, parts of the Grade I Registered Vaynol Park and Garden, the Grade II Listed Britannia Bridge and Parc Menai Business Park.
  - Route Option 5H would result in: a number of residential properties being encircled by overhead transmission lines; and overhead transmission lines running in close proximity, on both sides of the A55 dual carriageway as it approaches the Britannia Bridge. This would result in a high potential for significant visual effects.
  - Route Option 5H would oversail the Gors y Brithdir Enclosed Hut Group and Ancient Fields Scheduled Monument.
  - Route Option 5H would need to cross both the Parc Menai Wildlife Site and Ancient Woodland and the Coed Rhos Fawr Wildlife Site and Ancient Woodland beside Pentir Substation. Loss of ancient woodland cannot be appropriately mitigated. Red squirrels (a protected species) may also be present.
- **Gwynedd South SEC Search Area and Route Options 5F, 5G and 5H:**
  - Gwynedd South SEC Search Area lies adjacent to the Grade I Registered Vaynol Park and Garden and the proposed JLDP Menai SLA.
  - The central and western ends of Anglesey South SEC Search Area, plus the whole of Route Options 5F and 5G, lie within the Dinorwig Registered Outstanding Landscape of Historic Interest.
  - Throughout Gwynedd South SEC Search Area the presence of existing development, localised topography and mature vegetation offers the potential to identify a SEC site that could be partially screened locally.
  - All the overhead lines connecting eastwards from the Gwynedd South SEC Search Area may be visible from parts of the Vaynol Estate, Anglesey AONB and the Plas Newydd Estate, with possible long distance views from the north of



overhead lines set against panoramic views of Snowdonia; the effect would vary between each route option.

- Route Option 5H would oversail Gors y Brithdir Enclosed Hut Group & Ancient Fields Scheduled Monument, but the route predominantly avoids the Dinorwig Registered Outstanding Landscape of Historic Interest until it approaches Pentir Substation.
- Route Options 5G and 5H would introduce a new overhead line into an undeveloped landscape within the settings of the Coed Nant-y-garth Standing Stone (CN375) and Fodol Ganol Enclosed Hut Group (CN175) Scheduled Monuments and Dinorwig Registered Outstanding Landscape of Historic Interest, and would potentially also adversely affect views to the south from parts of the Vaynol and Plas Newydd estates.
- All the route options would need to cross the Coed Rhos Fawr Wildlife Site and Ancient Woodland beside Pentir Substation. Loss of ancient woodland cannot be appropriately mitigated whilst red squirrels (a protected species) may also be present.
- There are no known tourism facilities / attractions within Gwynedd South SEC Search Area, but the roads are well used to access tourist attractions to the south including Snowdonia National Park. The Wales Coast Path and National Cycle Route No.8 run along the length of Anglesey South SEC Search Area.
- Route Options 5F, 5G and 5H may need to be revised following a more detailed SEC siting study to better connect to any SEC sites identified within the Gwynedd South SEC Search Area.

## **16 WAY FORWARD, INCLUDING SELECTION OF THE PREFERRED ROUTE OPTION**

### **16.1 Next Steps and Project Timeline**

- 16.1.1 National Grid is seeking consultation feedback on the route options presented in this report. This feedback will help inform the identification of a preferred route option between Wylfa and Pentir, within which a more detailed design proposal for a new transmission connection can be developed. The consultation feedback will be considered alongside the findings of environmental, socio-economic, technical and cost appraisals, in the context of the policies set out in NPS EN-1 and EN-5, as well as National Grid's statutory duties.
- 16.1.2 This report supports the public consultation in Autumn 2015 on the overhead line route options between: i) Wylfa and the landward edge of the Anglesey AONB; and ii) the Menai Strait coastline in Gwynedd and Pentir Substation. Further information on the technology and location of the underground crossing of the Anglesey AONB and Menai Strait will be provided following completion of the options feasibility studies.
- 16.1.3 The preferred alignment would be taken forward for detailed design and environmental assessment prior to statutory consultation on the proposals (described further in the following text), and then subsequent submission of appropriate applications for consent to build. Throughout the next stages, there will be a review process to confirm that the preceding decisions (e.g. identification of the preferred route corridor) remain valid.

### **16.2 Selection of a Preferred Route Option and Final Alignment**

- 16.2.1 The following text describes the design factors that will be considered when selecting a preferred route option and final alignment. It also details further appraisal and survey work that will need to be completed.

#### Design Approaches to Limit Effects of the Route Options

- 16.2.2 The new overhead line will be designed having regard to the policy tests set out in NPSs EN-1 and EN-5 and the guidelines to line routeing, set out in the 'Holford Rules'.
- 16.2.3 Applying 'good design' to energy projects should produce sustainable infrastructure that is: sensitive to place; efficient in the use of natural resources and energy used in their construction and operation; and matched by an architectural and engineering design, which is sympathetic to and reflects of the local context.
- 16.2.4 The DCO application will demonstrate that National Grid has taken into account both the functionality (including fitness for purpose and sustainability) and aesthetics (including its contribution to the quality of the area in which it would be located) as far as practicable.
- 16.2.5 Specific design considerations are discussed in more detail below.

#### Route Selection and Transpositions

- 16.2.6 The most effective means of reducing the local impact of the new connection is by first identifying and then selecting the combination of route options that would result in the lowest overall level of adverse environmental and social-economic effects, albeit noting the need to balance those factors alongside consultation feedback, technical considerations and cost.
- 16.2.7 The combination of route options will also dictate the number and broad location of the transpositions required, which will also be factored into the judgement to be made. This selection will be informed by more detailed appraisal, extensive site surveys and the feedback received from stakeholders, including the public, in response to the next round

of consultation in Autumn 2015. Cost and technical considerations will also form an important part of this overall appraisal.

- 16.2.8 Where an enhanced / optimised design might be achieved through modification to the route options presented, such modifications would be considered taking account of environmental, socio-economic technical and cost considerations, and having regard to consultation responses. In these circumstances, any revised design proposal will be carefully considered, but not constrained by the corridors presented for consultation in Autumn 2015.

#### New Tower Design

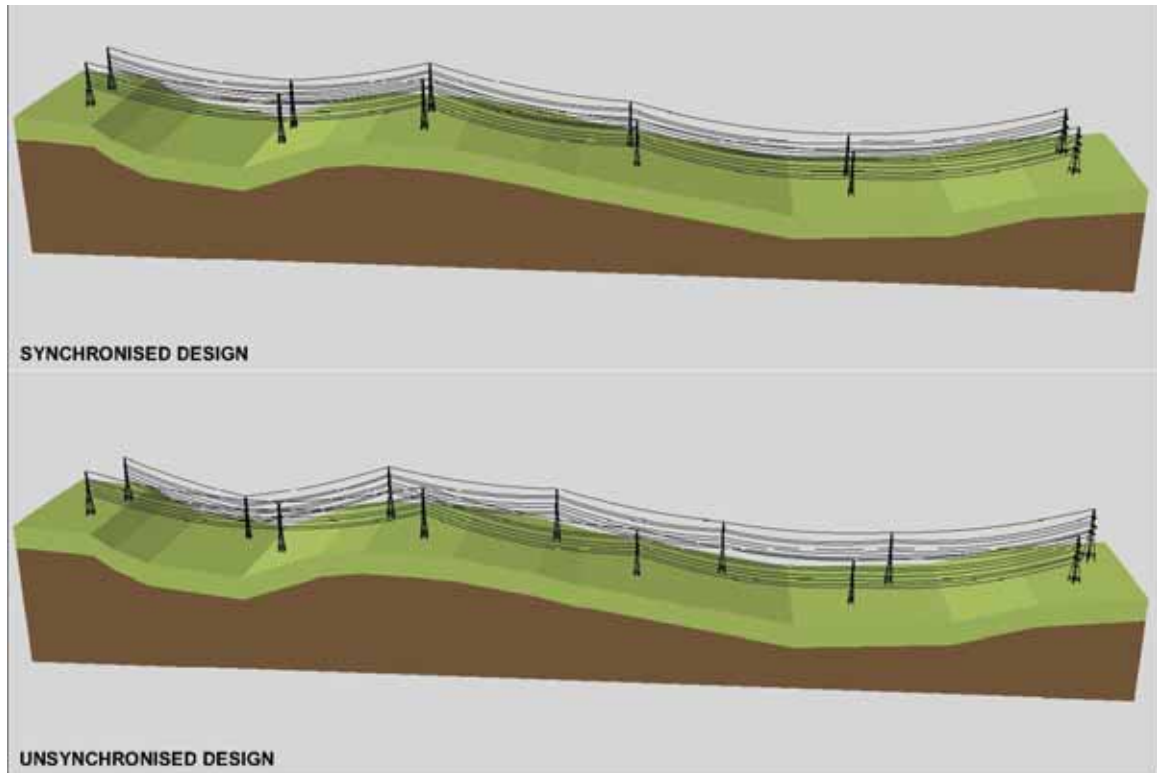
- 16.2.9 The towers used on the existing overhead line route are lattice steel towers with a typical height of around 50m. This design is typical of pylons across Wales and is a regular feature within Welsh landscapes. As described in Chapter 5, a variety of alternative tower designs are available that would achieve the technical requirements for the new connection; these are shown on Figure 5.2 and represented in the photomontages shown on Figure 5.3 in Chapter 5. The tower types range in form from a lattice tower, which is the modern equivalent of the towers used on the existing route, to low height lattice towers and the newly developed 'T-pylon'. The low height lattice tower carries the conductors that would be suspended from the third set of cross arms on wider bottom cross arms, allowing the height of the standard tower to be reduced to 34m. The T-pylon uses a steel monopole and a single set of cross arms that carry all three sets of conductors that would normally be carried by separate cross arms. This allows the height of a typical pylon to be reduced to around 33m. This is a very different form of tower in terms of its visual appearance, particularly so at locations where there is a sharp change in route direction, where a double monopole construction would be required.

- 16.2.10 The choice of tower design for the new route will be an important consideration in the overall design and appraisal of the new connection. At this route options identification stage it is assumed that a standard lattice tower design might achieve a more harmonious design when seen in the context of, or close parallel to, the existing line. In comparison alternative designs might contrast with the existing towers, introducing a discordant element that serves to emphasise the presence of the new line. This may especially be true of a monopole design. The degree to which this is an important consideration will depend upon the proximity of the two lines, and whether they are visible in the same view.

- 16.2.11 The choice of tower design will need to be considered in more detail before finalising a design proposal. It may be that different parts of the route would be more suited to one form of tower rather than another. However, frequent changes in tower design along the route could itself result in a confusing and visually complex design and is likely to be avoided, in accordance with the Holford Rules and thereby NPS EN-5.

#### New Line Design

- 16.2.12 Where the existing and new overhead lines would run in close proximity or parallel to each other, the siting and heights of the new towers relative to the existing become particularly important in visual terms. If the towers and sag of the conductor in each span are significantly out of step, then the visual 'flow' of the two lines would be discordant, potentially resulting in significantly greater visual effects. This effect is illustrated in the sketch in Figure 16.1. This visually 'jarring' effect could be reduced or avoided if new towers are located adjacent to the existing towers and are of a similar height, synchronising the rise and fall of the two lines across the landscape. This would be considered in detail for those route options where it is relevant.



**Figure 16.1 Illustration of Synchronised vs Unsynchronised Parallel Overhead Lines**

#### Transposition Design

- 16.2.13 The interaction of the existing line and the route options presented could require a number of route transpositions, or 'swap-overs'. These are locations where a length of the existing line is removed, allowing the two newly formed 'ends' of the existing line to be connected to two sections of new route located on different sides of the existing line. In so doing the need to cross below ('duck-under') or over the existing line would be avoided. The resultant new and existing connections would both comprise lengths of newly built and original overhead line. This is illustrated schematically in Figure 5.7, in Chapter 5.
- 16.2.14 The switch of route option from one side of the existing route to the other can be achieved on adjacent towers, resulting in up to four bulkier angle towers being located in close proximity. Dependent upon the local environment and location of sensitive receptors, this can result in particularly significant landscape and visual effects. Detailed design and appraisal of the options for these transpositions will need to be undertaken in order to reduce these effects. For example, it may be possible to reduce these effects by utilising existing angle towers on the current line where the line already changes direction. Alternatively, the effects may be reduced or avoided by extending the distance over which the transposition is achieved to make the change of route direction more gradual, with greater separation between the angle towers, thereby reducing the visual prominence of the transposition. Opportunities to reduce or avoid the additional adverse effects associated with route transpositions would be a consideration when selecting the combination of preferred route options along the five sections of corridor.

#### Other Localised Modifications to Electricity Infrastructure

- 16.2.15 NPS EN-5 recognises that "*sometimes positive landscape and visual benefits can arise through the reconfiguration or rationalisation of existing electricity network infrastructure*". The route transpositions described above are likely to require several of the existing

towers to be replaced, with a number of existing towers being removed. In a similar vein, there may be opportunities to discuss with the distribution network operator the realignment or undergrounding of smaller, wood pole based overhead line infrastructure. This might help mitigate or avoid the creation of discordant wirescapes when viewed in combination with the new 400kV overhead line.

### **16.3 Mitigation Measures to Limit Effects of the Route Options**

16.3.1 A full range of mitigation measures would be developed to reduce all aspects of the environmental and social-economic effects of the final proposal. This would include, for example, the application of detailed construction phase environmental management and traffic management plans. Other measures would be developed in discussion with statutory and other stakeholders on topics including cultural heritage, ecology and socio-economic effects. Most of these measures would be appropriate regardless of the route option selected. However, some would be particularly important when addressing the cumulative effects that would arise if the new line were developed in close proximity to the existing. These are described in more detail below.

#### Screen Planting

16.3.2 Where particularly sensitive or adversely-affected viewpoints are identified, the planting of vegetation to screen or break-up the view may be appropriate. This may be effective, for example, to screen individual towers that would be visible from the principal outlook of residential properties or associated gardens. Such landscaping might be carried out within the residential curtilage in agreement with the householder, or could take place on third party land with appropriate landowner agreement. Examples might include the establishment of hedgerows and hedgerow trees in the highway boundary opposite the property or small copses in adjoining field corners.

#### Landscape Enhancement / Restoration Strategies

16.3.3 Where screen planting is undesirable or cannot be effectively implemented, the development and implementation of landscape enhancement could prove effective to reduce the effects of any new line. At the small scale this could simply involve introducing new focal points into garden landscaping. On a wider scale, landscaping strategies might include extensive planting initiatives involving the creation, enhancement and management of woodland blocks, hedgerows and other habitats. Any such initiative would need to take account of the landscape characteristics and management objectives for the area, as set out in the Councils' landscape strategies, but could be effective in the medium and long-term to better accommodate the line within the surrounding landscape.

#### Residential Amenity

16.3.4 The Isle of Anglesey and Gwynedd Councils, together with the Snowdonia National Park Authority, have commissioned a study to consider whether it would be appropriate, to maintain residential amenity, for the Councils to establish a minimum separation distance between wind turbines or pylons and residential properties. This report, published in July 2014 as part of the evidence base for the new JLDP, concluded that *"...there is no conclusive evidence to support the application of a strict separation distance...in terms of visual residential amenity. For this reason it is recommended that each proposed development should be considered on its own merits on a case by case basis"*. However, the report did suggest that the Councils may wish to adopt a 'trigger distance' within which the developer should carry out a 'visual residential impact assessment' for those affected properties. National Grid would expect to carry out such an assessment as part of the wider EIA of any final overhead line proposal.

- 16.3.5 When selecting and refining any final route proposal, National Grid will strive not to oversail the curtilages of any residential property with the new line except where prior agreement could be voluntarily reached with the affected householder. Even in these circumstances an oversail would only be proposed where:
- such a design might offer clear advantages over alternatives that would avoid any such oversail; and
  - any resultant impact upon residential amenity could be justified in accordance with NPS EN-1 and EN-5.

#### **16.4 Use of Alternative Technologies to Avoid Effects of Route Options**

- 16.4.1 The use of underground technologies as an alternative to an overhead line within any section of the route has not been discounted. The use of buried cables, or other non-overhead technologies, would be assessed in detail for those areas where the selection of the optimum overhead route option and the application of good design principles or detailed mitigation measures would still result in an overhead line design conflicting with national planning policy or other statutory considerations. A careful judgement would be made as to the appropriateness of the alternative technologies, in accordance with the balance of considerations set out in paragraphs 2.8.8 and 2.8.9 of NPS EN-5. This is in addition to the already acknowledged need to use underground technology for the AONB and Menai Strait crossing.

#### **16.5 DCO Application and Timeline**

- 16.5.1 A high level summary of the DCO programme is presented in Table 16.1. The following text provides further explanation about the process.
- 16.5.2 The DCO pre-application process is a significant component of the application programme. It involves the development of a scheme that has been tested and subject to review, consultation and environmental assessment so that, when a DCO application is submitted, the scheme represents the optimum balance of environmental, socio-economic, technical and economic factors, taking account of consultation feedback through statutory and non-statutory routes. It also includes surveys, environmental assessments and the preparation of all DCO application documents.
- 16.5.3 Preliminary environmental studies have already been started in support of the appraisal of the options considered to date and National Grid's ongoing work, and these will continue and be further extended during the EIA stage of the pre-application process. Some advance ecology surveys have commenced in 2015 ahead of the main survey activity during 2016; some surveys may continue up to and beyond the DCO application submission in 2017.
- 16.5.4 After the Autumn 2015 non-statutory consultation, National Grid will prepare a Statement of Community Consultation (SoCC). This will set out how the local community will be consulted in accordance with the Planning Act 2008 on the proposed Wylfa-Pentir connection. The SoCC will be prepared in discussion with the Isle of Anglesey County Council and Gwynedd Council.
- 16.5.5 Formal statutory consultation under the Planning Act 2008, as part of the pre-DCO application process, would commence in 2016 with the identification of the preferred alignment, SEC locations and Menai Strait crossing technology and route. 'Section 42' consultation is directed towards statutory consultees, local authorities, landowners and *significantly affected persons*, while 'Section 47' consultations are carried out with local communities in accordance with the SoCC.
- 16.5.6 The statutory consultation would include communities, local councils, expert consultees and those who may be affected by the proposals. Proposals would be considered in

light of feedback received and if necessary further survey and appraisal work would be carried out. Consultation feedback reports, setting out all of the feedback received, would be published after the Autumn 2015 public consultation and in the latter stages of the DCO pre-application phase, to show how comments from all consultees have been taken in account.

- 16.5.7 The consultation feedback would be used alongside detailed survey and assessment work to assist in optimising the scheme design in relation to the human, built and natural environment, taking account of economic and technical factors.
- 16.5.8 EIA is a process for assessing the likely significant environmental effects of a proposed project. A full EIA would be carried out of the preferred alignment and consultation would take place with stakeholders on the scope of the EIA and on the preliminary results of the study during the statutory consultation stage (through the publication of a 'Preliminary Environmental Information Report'). The assessment of the environmental impacts associated with the final development proposal for which a DCO is being sought would be published in an Environment Statement to accompany the application for development consent. The application is submitted to the Planning Inspectorate for examination before making a recommendation to the Secretary of State, who then issues a final decision on whether to confirm the DCO. Stakeholders have the opportunity to make representations and to register themselves as interested parties as part of the examination process.
- 16.5.9 Table 16.1 presents a high level summary of the Wylfa to Pentir connection DCO programme.

Stage of the Process	Timescale	Indicative Programme Dates	Features
Pre-Application	No time limit	Work in progress, progressing until late 2017, with formal pre-application consultations during 2016.	Applicant develops proposal and carries out pre-application consultation. Includes surveys, environmental assessments and preparation of all DCO application documents.
Application	No time limit	Late 2017	Application for development consent made to the Secretary of State.
Acceptance by the Planning Inspectorate	Up to 28 days	Late 2017	Secretary of State has 28 days to review application and decide whether to accept it for consideration, or reject it.
Pre-examination	Two to four months	Late 2017 – Early 2018	Examining Authority of Government inspectors appointed to assess issues and hold preliminary hearing. Preliminary meeting – procedural decision on how the application is to be examined.
Examination	Up to six months	Mid 2018	Six months to carry out the examination, including all hearings.
Report and recommendation	Up to three months	Late 2018 – Early 2019	Report and recommendations of the Examining Authority drafted and issued to the Secretary of State.
Decision	Up to three months	Early – Mid 2019	Decision and statement of reasons drafted and issued by the Secretary of State.

**Table 16.1 Wylfa to Pentir Connection DCO Summary Programme**

## 17 GLOSSARY

The following is a brief definition to some technical terms that are used in this report:

Areas of Outstanding Natural Beauty (AONBs)	Areas of countryside, in England, Wales and Northern Ireland, designated for conservation due to their significant landscape value.
Bathymetry	The measurement of the depth of lakes or oceans, and the data obtained from this process.
Cadw	The Welsh Government's historic environment service.
Capital Costs	Fixed, one-time expenses incurred as part of a construction project, such as the purchase of land, buildings, materials and equipment.
Circuit	An electrical connection between two points on an electrical system which can be switched in or out of operation. A typical overhead transmission line carries two independently operated circuits, each comprising three separate phases (one on each pylon arm).
Climate Change	The change in climate over time, whether due to natural variability or as a result of human activity.
Consultation Feedback Report	Reports the consultation process for a proposed development along with stakeholder's comments on the proposals, amendments based on these comments and the developer's response to the stakeholders' comments.
Development Consent Order (DCO)	A statutory instrument that grants consent and other rights to build a Nationally Significant Infrastructure Project, as defined by the Planning Act 2008.
Deviation	Where an overhead line moves away from a parallel alignment with another overhead line.
Distribution Network	The regional electricity network that takes power from the national transmission system and smaller generators and distributes it to consumers such as local schools, hospitals, homes and businesses.
Electricity Generation Infrastructure	Facilities and equipment used to generate electricity, such as wind farms, power stations, solar panels.
Electric and Magnetic Field (EMF)	A field of force that consists of both electric and magnetic components, resulting from the motion of an electric charge.
Environmental Impact Assessment (EIA)	A statutory process to investigate and report upon the likely significant effects that a proposed development might have upon the environment. An EIA will usually set out measures that would reduce or mitigate the effects that could otherwise occur.



Environmental Statement	Report that presents the results of the Environmental Impact Assessment and any proposed measures to avoid or ameliorate significant environmental effects.
Excavated Material	Material such as clay, silt, sand, gravel, rock or concrete that has been removed from the ground.
Greenhouse Gas	A gas that contributes to the greenhouse effect (trapping of the Sun's warmth in the Earth's lower atmosphere) by absorbing infrared radiation.
Head House	A secure building that provides access to a tunnel; normally located above ground and covering the tunnel shaft.
Indicative Photomontages	Photos of an existing landscape, with illustrative images of a proposed development superimposed onto the photos.
Link Box Chambers	A kiosk (normally located above ground) that contains equipment used to monitor the performance of buried electricity transmission cables.
Listed Building	A building which has been placed on the Statutory List of Buildings of Special Architectural or Historic Interest
Low Carbon Economy	An economy that is not dependent on fossil fuels as a main source of power, and which has a minimal output of greenhouse gas emissions.
Mitigation Measure	A measure to avoid or reduce adverse effects.
National Grid	The operator of the high-voltage transmission system for the whole of Great Britain, and the owner of the high-voltage transmission network in England and Wales.
Nationally Significant Infrastructure Projects (NSIPs)	Usually a large scale development of national importance that requires development consent from The Secretary of State, under the Planning Act 2008.
National Nature Reserve (NNR)	Sites designated by Natural England as important places for wildlife and natural features.
National Park	National Parks are designated because of their landscapes, wildlife and cultural heritage.
National Policy Statement	Statement of Government policy under The Planning Act 2008.
Natural Resource Wales (NRW)	The statutory Welsh Government body responsible for managing Wales' resources, including nationally protected areas.
New Capacity	Additional ability of the transmission network to transmit electricity under the new service conditions.
Nuclear Power Station	An installation where power is generated by a self-sustaining nuclear reaction in a nuclear reactor.

Overhead Line	Comprise the towers (pylons) and the suspended conductors (wires) used to transport electrical power.
Preferred Route Corridor	The route corridor that is preferred in relation to environmental, socio-economic, technical and cost impacts and taking into account consultation feedback.
Preferred Route Corridor Selection Report	Report that presents the appraisal and reasons for the selection of the Preferred Route Corridor.
Pinch Point	A location at which a number of constraints pose a significant level of influence to narrow a route corridor.
Ramsar Site	Wetlands of international importance designated under the Ramsar Convention.
Registered Park and Garden	Those historic parks and gardens in Wales identified by Cadw as being of national importance have been included on the Register of Parks and Gardens of Special Historic Interest in Wales.
Route Corridor	A broad swathe of land, wider in some parts and narrower in others, within which a transmission line could be built.
Scheduled Monument	Nationally significant archaeological site or historic building, which is legally protected against unauthorised change.
Scoping Report	A report that can be prepared in the early stages of an EIA to describe the nature of the proposed scheme and the scope of the supporting EIA.
Sealing End Compounds (SECs)	A secure site within which overhead conductors ('wires') can be safely connected to the ends of underground cables.
Site of Special Scientific Interest (SSSI)	UK protected nature conservation sites, designated for their wildlife or geological value, under the Wildlife and Countryside Act 1981 (as amended).
Special Areas of Conservation (SACs)	Special Areas of Conservation are strictly protected sites designated under the European Commission Habitats Directive for their ecological importance.
Special Landscape Area	Valued local landscapes that are subject to planning policies that seek to protect or enhance their natural beauty.
Stakeholder	An individual or organisation that has a stake in a proposal.
Transmission Connection	A third party connection to the transmission system. This might allow export of power to the transmission system from a generation source, or allow power to be drawn from the system to supply local distribution networks for onward distribution to local consumers.

Transmission Infrastructure	Any plant and equipment required to transmit electricity at high voltages from a generating station to the distribution system (and to some large customers). For example, pylons and substations (where the voltage may be transformed and power flows controlled).
Transmission Network	That part of a transmission system owned and maintained by an individual transmission company. National Grid owns the transmission network in England and Wales, and operates the system across the whole of Great Britain.
Transmission Losses	Losses in electrical power during transmission between sources of generation and points of demand.
Transmission Projects	Any programme of work to the electricity transmission system that addresses a specific need for change, such as increased power flows or the connection of new sources of electricity generation or demand.
Transmission System	The network of electrical equipment comprising substations (where power flows can be controlled and transformed to different voltages) and the overhead lines and buried cables connecting them. The system moves bulk amounts of electrical power between points of generation and centres of large demand, such as major cities or large industrial consumers and in the UK operates at 275kV and 400kV.
Transposition	Reconfiguration of an existing overhead line to allow overhead line routes to cross without the need for a line 'duck-under' or crossing. Achieved by removing a section of the existing line and connecting the two newly formed 'ends' to two sections of new line approaching from either side.
Transport Networks	The combined network of roads, rails and other transport routes.
Wirescape	Two or more overhead lines within the same view creating multiple layers of wires.
Zone of Theoretical Visibility (ZTV)	The area within which it is predicted that a new development could be seen. Identify the parts of a landscape that will be affected by a development.

- Page Break -

# **APPENDIX A      ORANGE ROUTE CORRIDOR SECTION CONSTRAINTS PLANS**

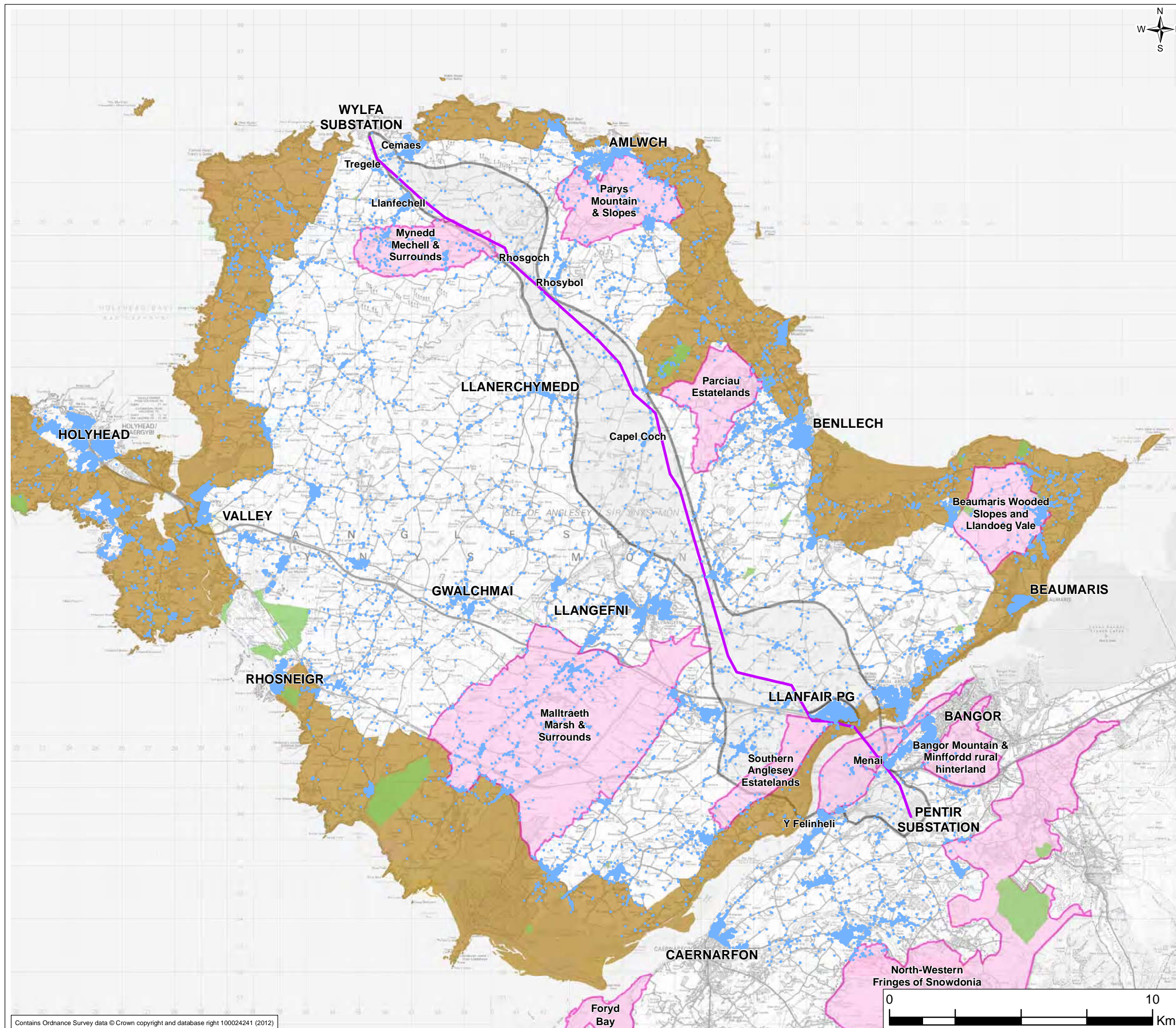
- Page Break -



**FIGURE A1**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Route Search Area
  - Residential Property (Dwelling)
  - Anglesey Area of Outstanding Natural Beauty
  - Proposed JLDP Special Landscape Area
  - Registered Common Land



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0	AUG 15	Initial Issue	AD	MR	SH	MR
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**nationalgrid**

Project  
NORTH WALES CONNECTION PROJECT

Drawing Title  
WYLFA-PENTIR ROUTE  
OPTIONS BASELINE  
LANDSCAPE FEATURES

Drawing Status  
FINAL

Scale @ A3  
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Drawing No.  
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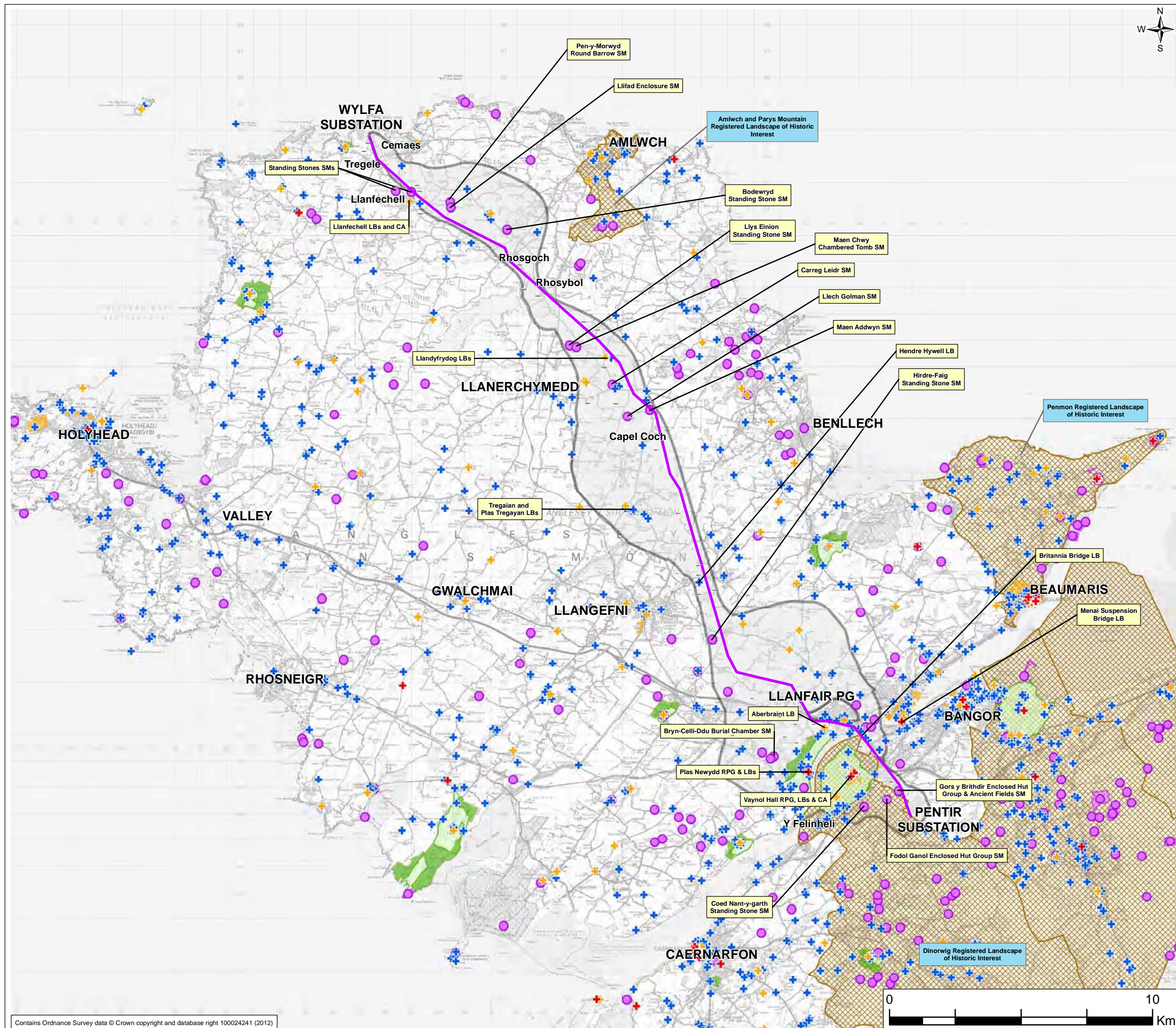


**FIGURE A2**



**Legend**

- Existing National Grid 400kV Overhead Line
- Route Search Area
- + Grade I Listed Building (LB)
- + Grade II\* Listed Building (LB)
- + Grade II Listed Building (LB)
- + Scheduled Monument (SM)
- Conservation Area (CA)
- Registered Park and Garden (RPG)
- RPG Essential Setting
- Registered Landscape of Historic Interest



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OPTIONS BASELINE  
HISTORIC ENVIRONMENT

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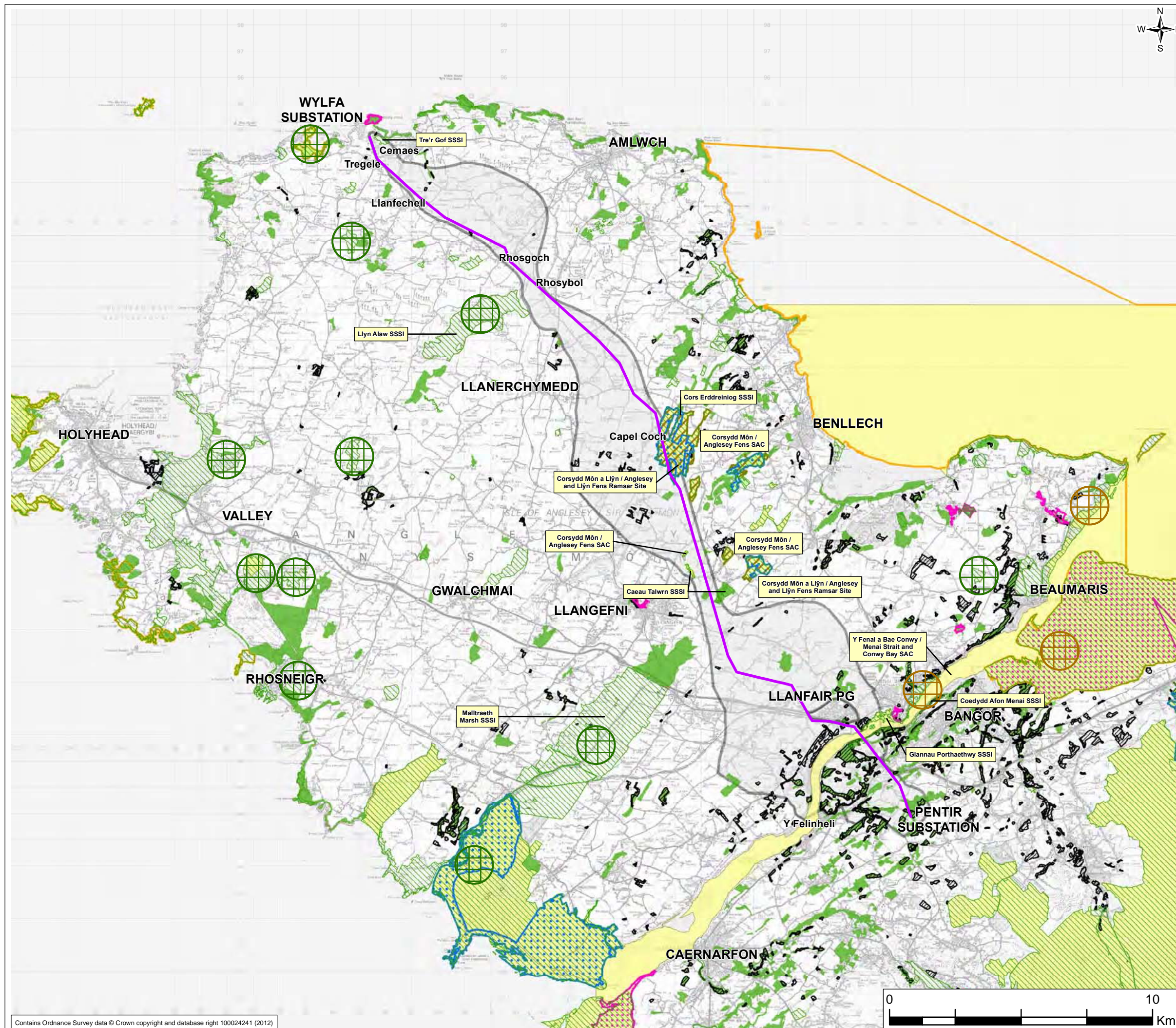


**FIGURE A3**



**Legend**

- Existing National Grid 400kV Overhead Line
- Route Search Area
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)
- Ramsar
- Site of Special Scientific Interest (SSSI)
- National Nature Reserve (NNR)
- Local Nature Reserve (LNR)
- Ancient Woodland
- Local Wildlife Site (where not part of SAC)
- North Wales Wildlife Trust Reserve
- Ecological Sites Designated for Wildfowl
- Ecological Sites Designated for Waders



1	SEP 15	Revised Issue	IM	MR	SH	MR
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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



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Project  
NORTH WALES CONNECTION PROJECT

Drawing Title  
WYLFA-PENTIR ROUTE  
OPTIONS BASELINE  
ECOLOGICAL FEATURES

Drawing Status  
FINAL

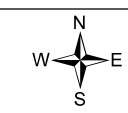
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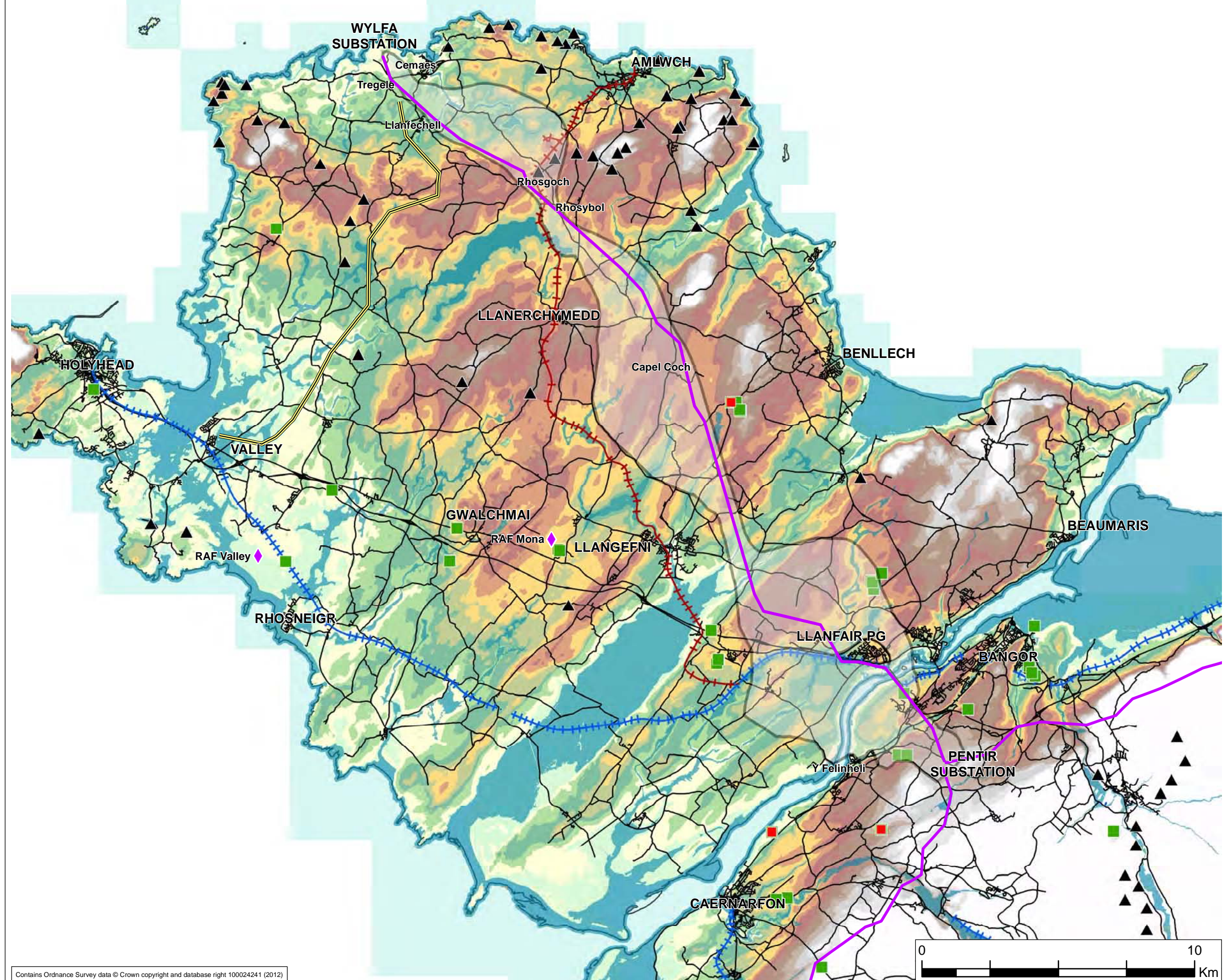
**FIGURE A4**

**Legend**

- Existing National Grid 400kV Overhead Line
- Existing National Grid 132kV Overhead Line
- Route Search Area
- Active Waste Site
- Non Active Waste Site
- ▲ Historic Mine Workings
- ◆ RAF Station
- + Railway
- + Disused Railway
- Main Road
- EAW Flood Zones 2 & 3

**Elevation (m)**

	0 - 10		50 - 60		100 - 110
	10 - 20		60 - 70		110 - 120
	20 - 30		70 - 80		120 - 130
	30 - 40		80 - 90		> 130m
	40 - 50		90 - 100		



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Drawing Title  
WYLFA-PENTIR ROUTE OPTIONS BASELINE ELEVATION, INFRASTRUCTURE AND FLOOD RISK

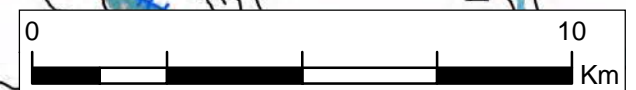
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Drawing No.  
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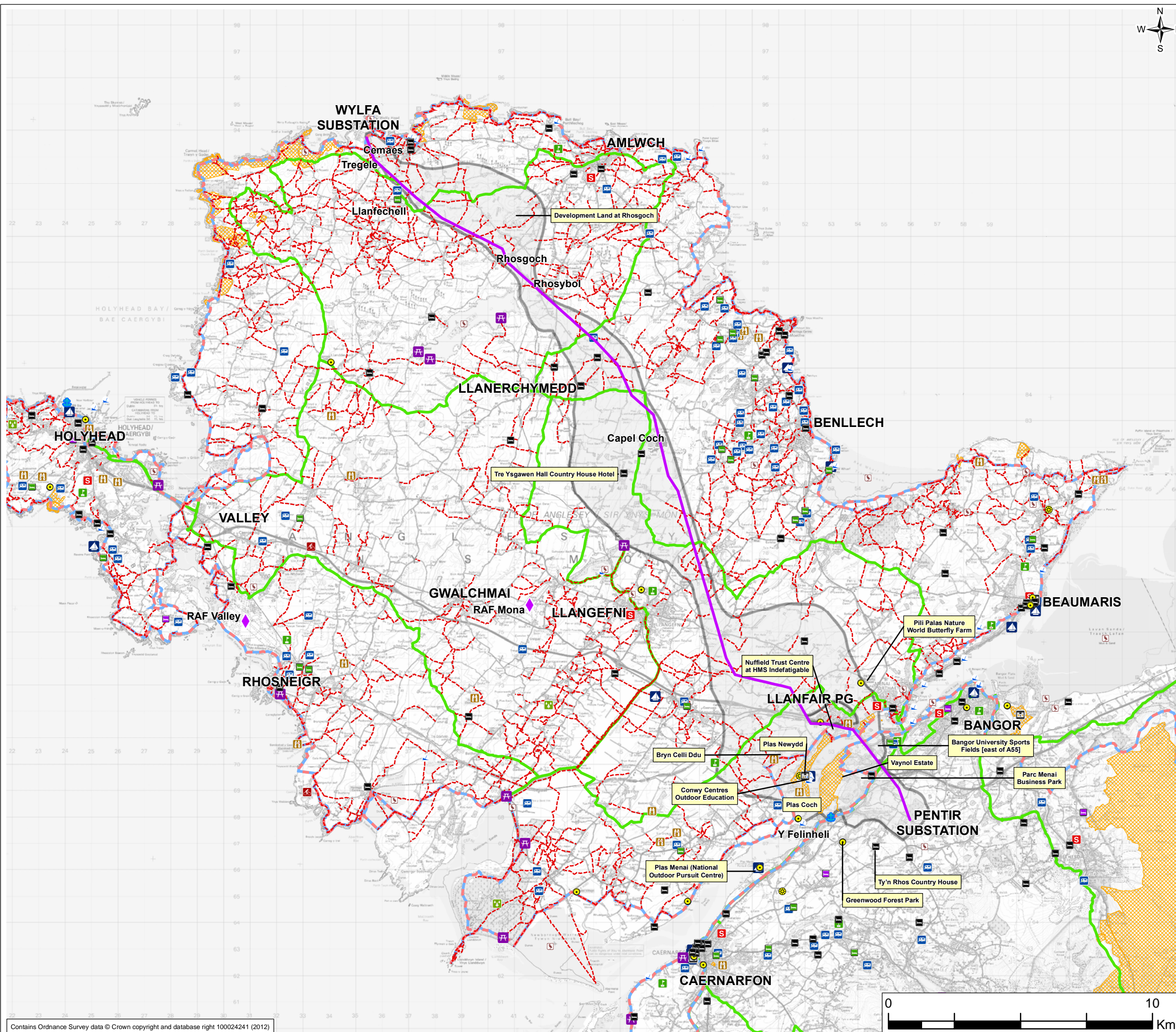
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**FIGURE A5**



**Legend**

- Existing National Grid 400kV Overhead Line
- Route Search Area
- Public Rights Of Way
- National Trail
- National Cycle Route
- National Trust Boundaries
- ◆ RAF Station
- Tourist Points**
- Jacobs Research**
- Caravan/Camping Site
- Castle or Historic House (open to the public)
- Forest and Country Park
- Garden (open to the public)
- Golf Course
- Landmark/Antiquity
- ⚓ Marina
- ⚡ Motor Sports
- Ⓜ Nature Reserve
- Ⓜ Picnic Site
- ⚓ Jetty or Slipway
- Ⓜ Sports or Leisure Centre
- ⚓ Water Activities
- Visit Wales Website Data**
- Hotels, B&B and Apartments
- Ⓜ Hostel and Campus Accommodation
- Caravan, Camping or Holiday Park
- Registered Visitor Attraction

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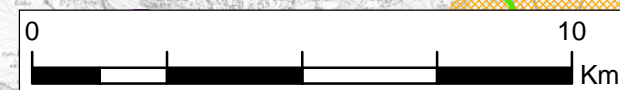
Project  
NORTH WALES CONNECTION PROJECT

Drawing Title  
WYLFA-PENTIR ROUTE  
OPTIONS BASELINE  
SOCIO-ECONOMIC SITES

Drawing Status	FINAL	
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Client No.		
Drawing No.	B2600002-WP-ROR-005	

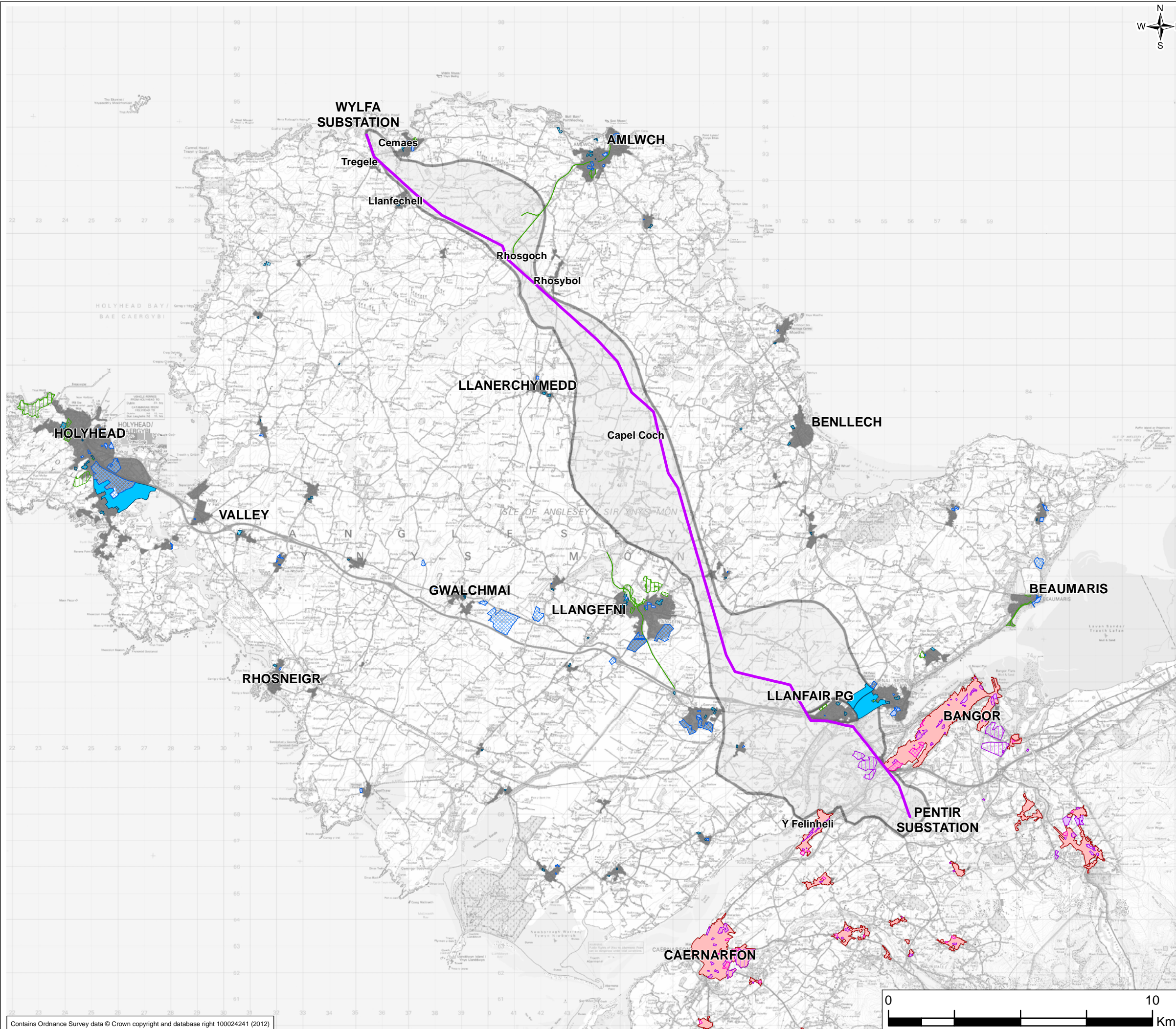
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**FIGURE A6**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Settlement Area
  - Route Search Area
  - Anglesey Stopped Unitary Development Area 2005
  - Amenity
  - Employment
  - Green Wedge
  - Housing
  - Physical Infrastructure Redevelopment Area
  - Gwynedd Unitary Development Area 2001-2016
  - Development Boundary
  - Employment
  - Housing
  - Housing (Phased)
  - Protected Open Space
  - Protected Play Area
  - Safeguarded Employment

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Project  
NORTH WALES CONNECTION PROJECT

Drawing Title  
UDP SITES FROM THE ISLE OF ANGLESEY COUNTY COUNCIL AND GWYNEDD COUNCIL

Drawing Status  
FINAL

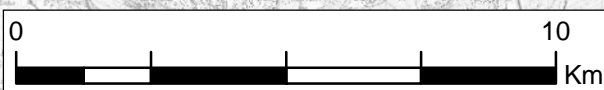
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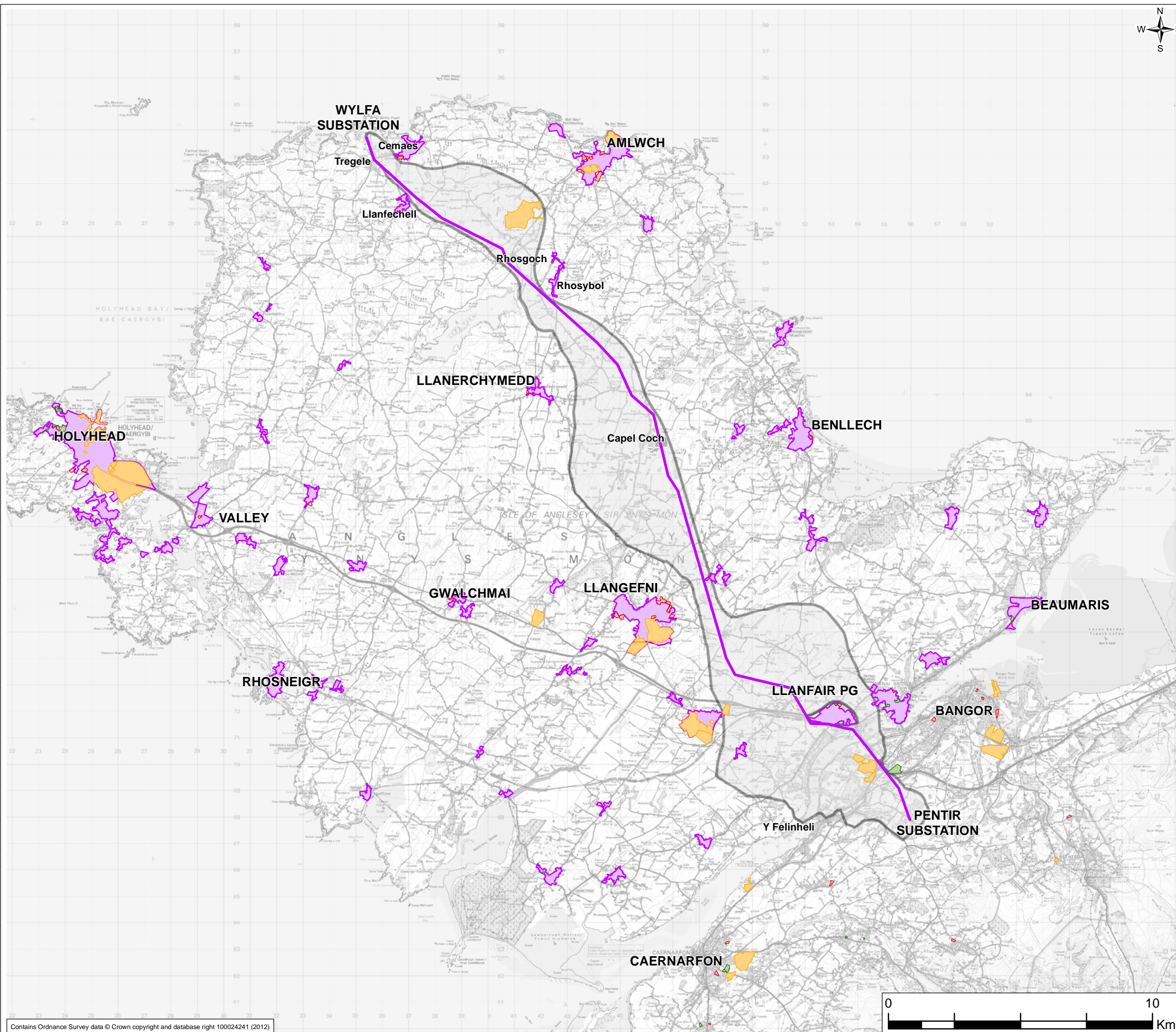


**FIGURE A7**



**Legend**

- Existing National Grid 400kV Overhead Line
- Route Search Area
- Development Boundary
- Housing with Planning Permission
- Housing without Planning Permission
- Employment



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Drawing Title  
ANGLESEY AND GWYNEDD JOINT LOCAL DEVELOPMENT PLAN (DEPOSIT DRAFT, 2015) SITES

Drawing Status  
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## **APPENDIX B      ROUTE CORRIDOR SECTION CONSTRAINTS PLANS**

- Page Break -



**FIGURE B1-1**



- Legend**
- Existing National Grid 400kv Overhead Line
  - Overhead line route options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
  - Designations**
  - Anglesey Area of Outstanding Natural Beauty
  - Proposed JDPD Special Landscape Area (pSLA)
  - Scheduled Monument (SM)
  - + Grade I Listed Building
  - + Grade II\* Listed Building
  - + Grade II Listed Building
  - Registered Park and Garden (RPG)
  - Registered Landscape of Historic Interest
  - Conservation Area
  - Special Area of Conservation (SAC)
  - Ramsar
  - Site of Special Scientific Interest (SSSI)
  - National Nature Reserve (NNR)
  - Ancient Woodland
  - Wildlife Site
  - Tree Preservation Orders (TPOs)
  - + National Trails
  - - - National Cycle Route

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Drawing Title  
 WYLFA-PENTIR SECTION 1 OPTIONS  
 LANDSCAPE, ECOLOGY AND  
 CULTURAL HERITAGE FEATURES

Drawing Status  
 FINAL

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Drawing No.  
 B2600002-WP-ROR-010

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**FIGURE B1-2**

- Legend**
- Existing National Grid 400kV Overhead Line
  - National Grid 132kV Overhead Line
  - National Grid 132kV Underground Electricity Transmission Cable

- Overhead Line Route Options**
- Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over

- Constraints**
- Active Waste Site
  - Non Active Waste Site
  - Historic Mine Workings
  - Railway
  - Disused Railway
  - Main Road
  - EAW Flood Zones 2 & 3

- Elevation (m)**
- |         |          |           |
|---------|----------|-----------|
| 0 - 10  | 50 - 60  | 100 - 110 |
| 10 - 20 | 60 - 70  | 110 - 120 |
| 20 - 30 | 70 - 80  | 120 - 130 |
| 30 - 40 | 80 - 90  | > 130m    |
| 40 - 50 | 90 - 100 |           |

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Drawing Title  
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Drawing Status  
 FINAL

Scale @ A3  
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Jacobs No. B2600002

Client No.

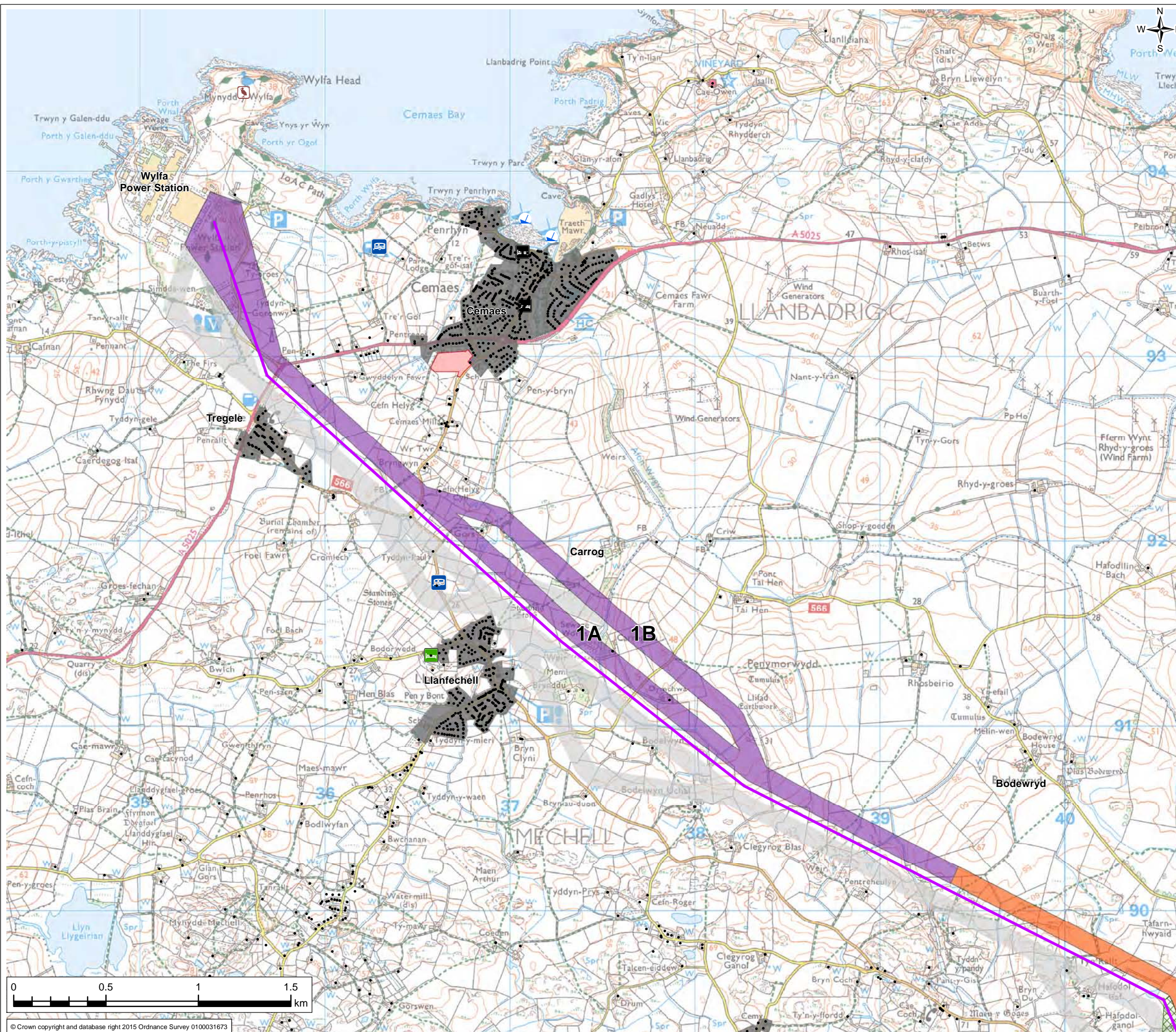
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**FIGURE B1-3**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Residential Property (Dwelling)
  - Settlement Area
- Overhead Line Route Options**
- Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - ⊗ Area of potential line swap over
- Joint Local Development Plan (JLDP), Deposit Draft, 2015**
- Housing with Planning Permission
  - Housing without Planning Permission
  - Employment
- Visit Wales Website**
- Hotels, B&B and Apartments
  - Hostel and Campus
  - Caravan, Camping or Holiday Park
  - ⊕ Registered Visitor Attraction
- Jacobs Research**
- Caravan/Camping Site
  - Nature Reserve
  - Jetty or Slipway

1	SEP 15	Revised Issue	IM	MR	SH	MR
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Project  
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Drawing Title  
WYLFA-PENTIR SECTION 1 OPTIONS  
PLANNING AND TOURISM

Drawing Status  
FINAL

Scale @ A3  
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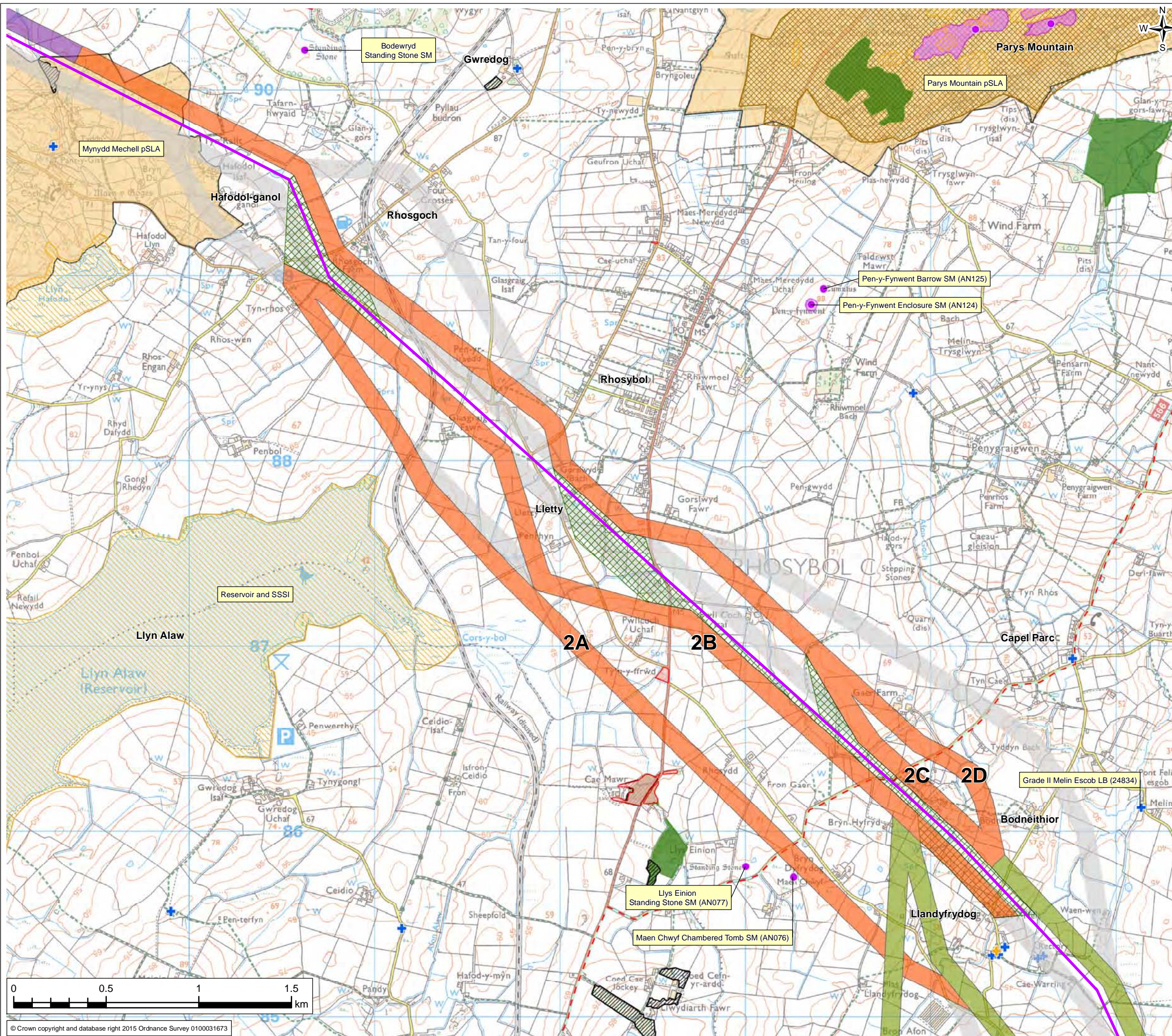
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B2600002-WP-ROR-026

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**FIGURE B2-1**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Overhead Line Route Options**
    - Section 1
    - Section 2
    - Section 3
    - Section 4
    - Section 5
    - Overhead Line Route Options not taken forward
    - Area of potential line swap over
  - Designations**
    - Anglesey Area of Outstanding Natural Beauty
    - Proposed JLDP Special Landscape Area (pSLA)
    - Scheduled Monument (SM)
    - Grade I Listed Building
    - Grade II\* Listed Building
    - Grade II Listed Building
    - Registered Park and Garden (RPG)
    - Registered Landscape of Historic Interest
    - Conservation Area
    - Special Area of Conservation (SAC)
    - Ramsar
    - Site of Special Scientific Interest (SSSI)
    - National Nature Reserve (NNR)
    - Ancient Woodland
    - Wildlife Site
    - Tree Preservation Orders (TPOs)
    - National Trails
    - National Cycle Route

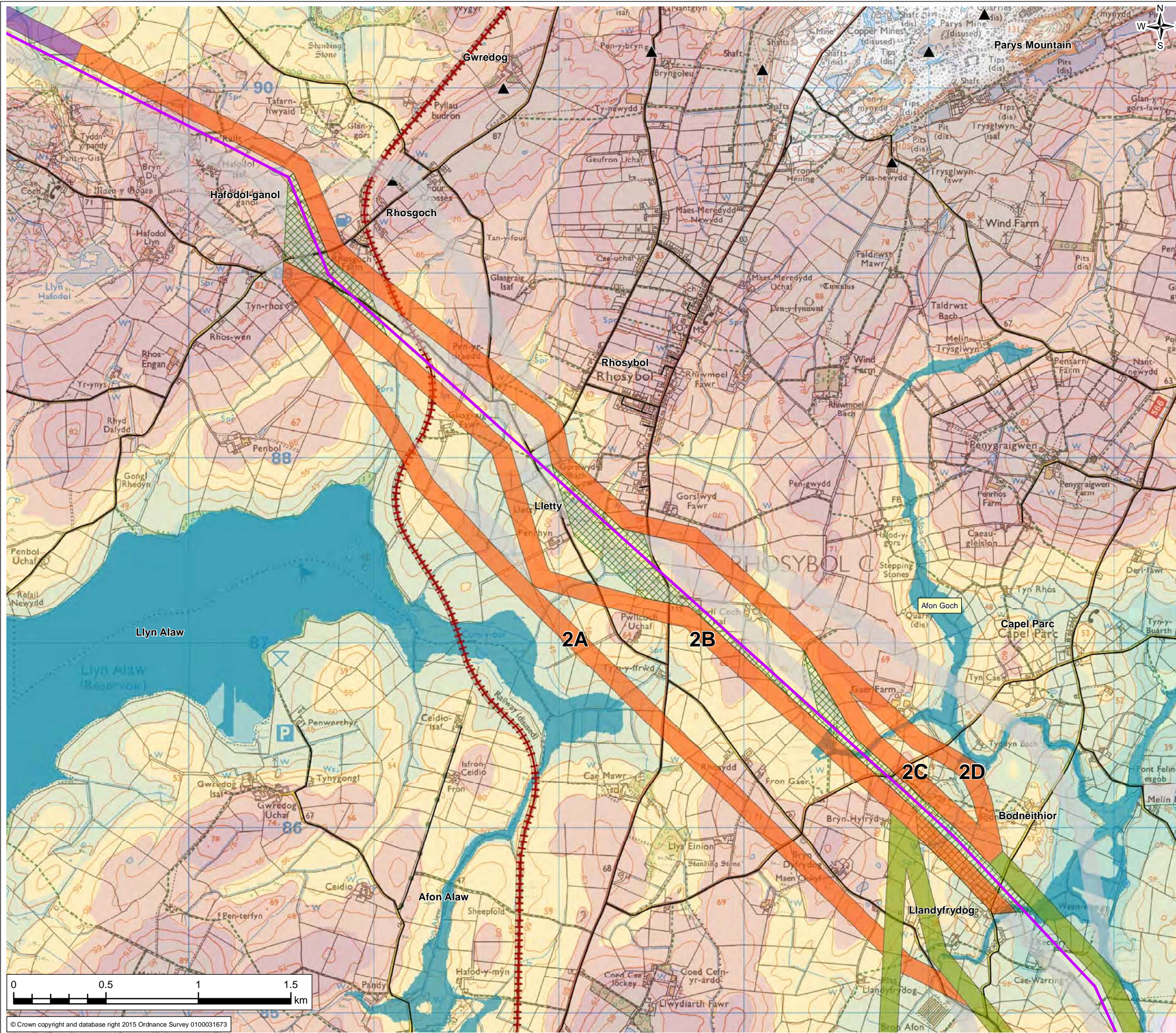
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Project	WYLF A-PENTIR TRANSMISSION CONNECTION					
Drawing Title	WYLF A-PENTIR SECTION 2 OPTIONS LANDSCAPE, ECOLOGY AND CULTURAL HERITAGE FEATURES					
Drawing Status	FINAL					
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Client No.						
Drawing No.	B2600002-WP-ROR-011					
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**FIGURE B2-2**



**Legend**

- Existing National Grid 400kV Overhead Line
- National Grid 132kV Overhead Line
- Overhead Line Route Options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
- Constraints**
  - Active Waste Site
  - Non Active Waste Site
  - Historic Mine Workings
  - Railway
  - Disused Railway
  - Main Road
  - EAW Flood Zone 2 & 3
- Elevation (m)**

0 - 10	50 - 60	100 - 110
10 - 20	60 - 70	110 - 120
20 - 30	70 - 80	120 - 130
30 - 40	80 - 90	> 130m
40 - 50	90 - 100	

1	SEP 15	Revised Issue	IM	MR	SH	MR
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Project: WYLFA-PENTIR TRANSMISSION CONNECTION

Drawing Title: WYLFA-PENTIR SECTION 2 OPTIONS  
 ELEVATION, INFRASTRUCTURE AND FLOOD RISK

Drawing Status: FINAL

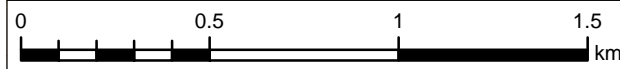
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Client No.

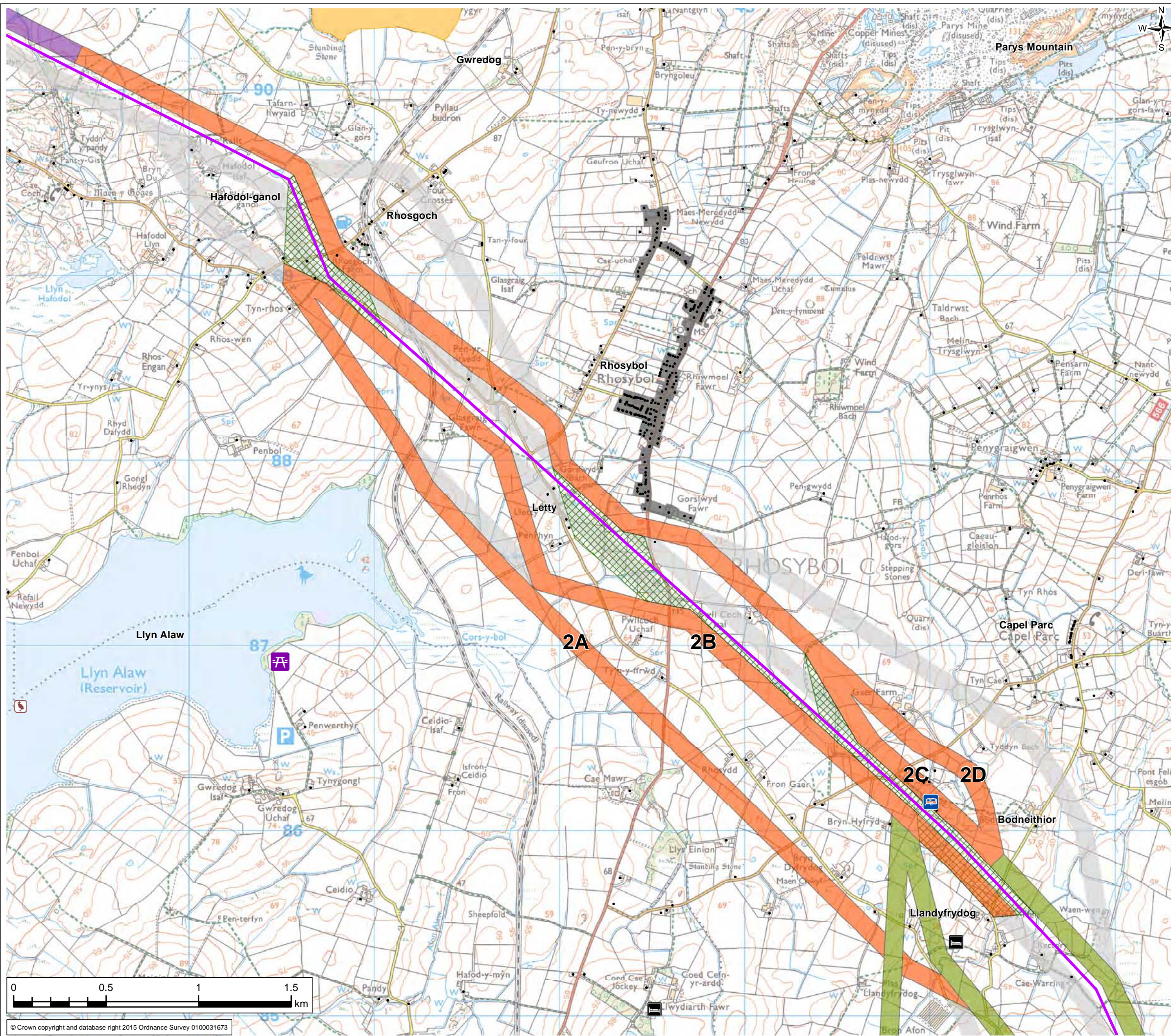
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**FIGURE B2-3**



**Legend**

- Existing National Grid 400kV Overhead Line
- Residential Property (Dwelling)
- Settlement Area
- Overhead Line Route Options**
- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over
- Joint Local Development Plan (JLDP), Deposited Draft, 2015**
- Housing with Planning Permission
- Housing without Planning Permission
- Employment
- Visit Wales Website**
- Hotels, B&B and Apartments
- Hostel and Campus
- Caravan, Camping or Holiday Park
- Registered Visitor Attraction
- Jacobs Research**
- Caravan/Camping Site
- Nature Reserve
- Picnic Site

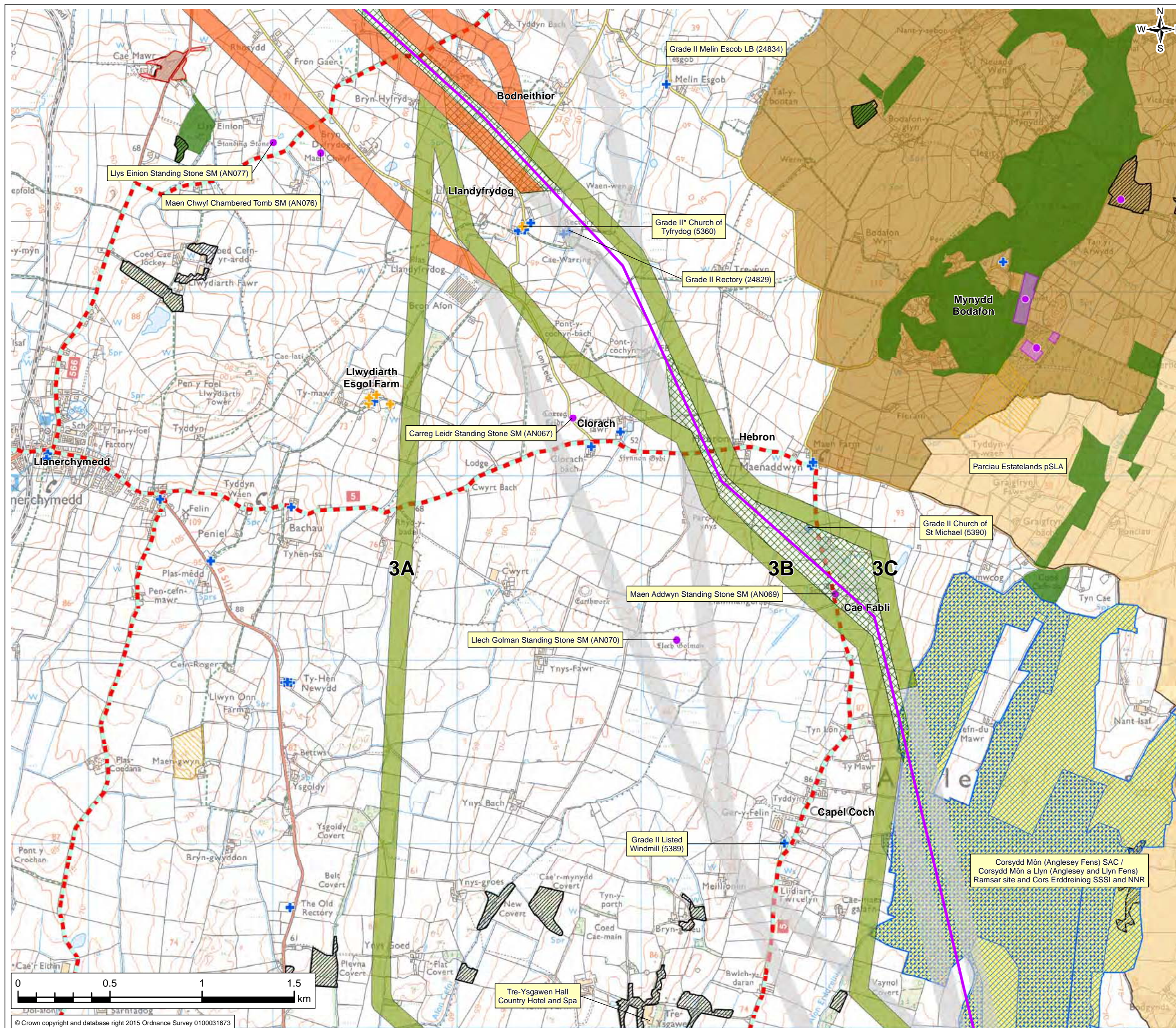
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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client	nationalgrid					
Project	WYLFA-PENTIR TRANSMISSION CONNECTION					
Drawing Title	WYLFA-PENTIR SECTION 2 OPTIONS PLANNING AND TOURISM					
Drawing Status	FINAL					
Scale @ A3	1:20,000	DO NOT SCALE				
Jacobs No.	B2600002					
Client No.						
Drawing No.	B2600002-WP-ROR-027					
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**FIGURE B3-1A**



**Legend**

- Existing National Grid 400kV Overhead Line
- Overhead Line Route Options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
- Designations**
  - Anglesey Area of Outstanding Natural Beauty
  - Proposed JLPD Special Landscape Area (pSLA)
  - Scheduled Monument (SM)
  - Grade I Listed Building
  - Grade II\* Listed Building
  - Grade II Listed Building
  - Registered Park and Garden (RPG)
  - Registered Landscape of Historic Interest
  - Conservation Area
  - Special Area of Conservation (SAC)
  - Ramsar
  - Site of Special Scientific Interest (SSSI)
  - National Nature Reserve (NNR)
  - Ancient Woodland
  - Wildlife Site
  - Tree Preservation Orders (TPOs)
  - National Trails
  - National Cycle Route

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Project  
 WYLFA-PENTIR TRANSMISSION CONNECTION

Drawing Title  
 WYLFA-PENTIR SECTION 3 (NORTH) OPTIONS  
 LANDSCAPE, ECOLOGY AND  
 CULTURAL HERITAGE FEATURES

Drawing Status  
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Scale @ A3  
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Jacobs No.  
 B2600002

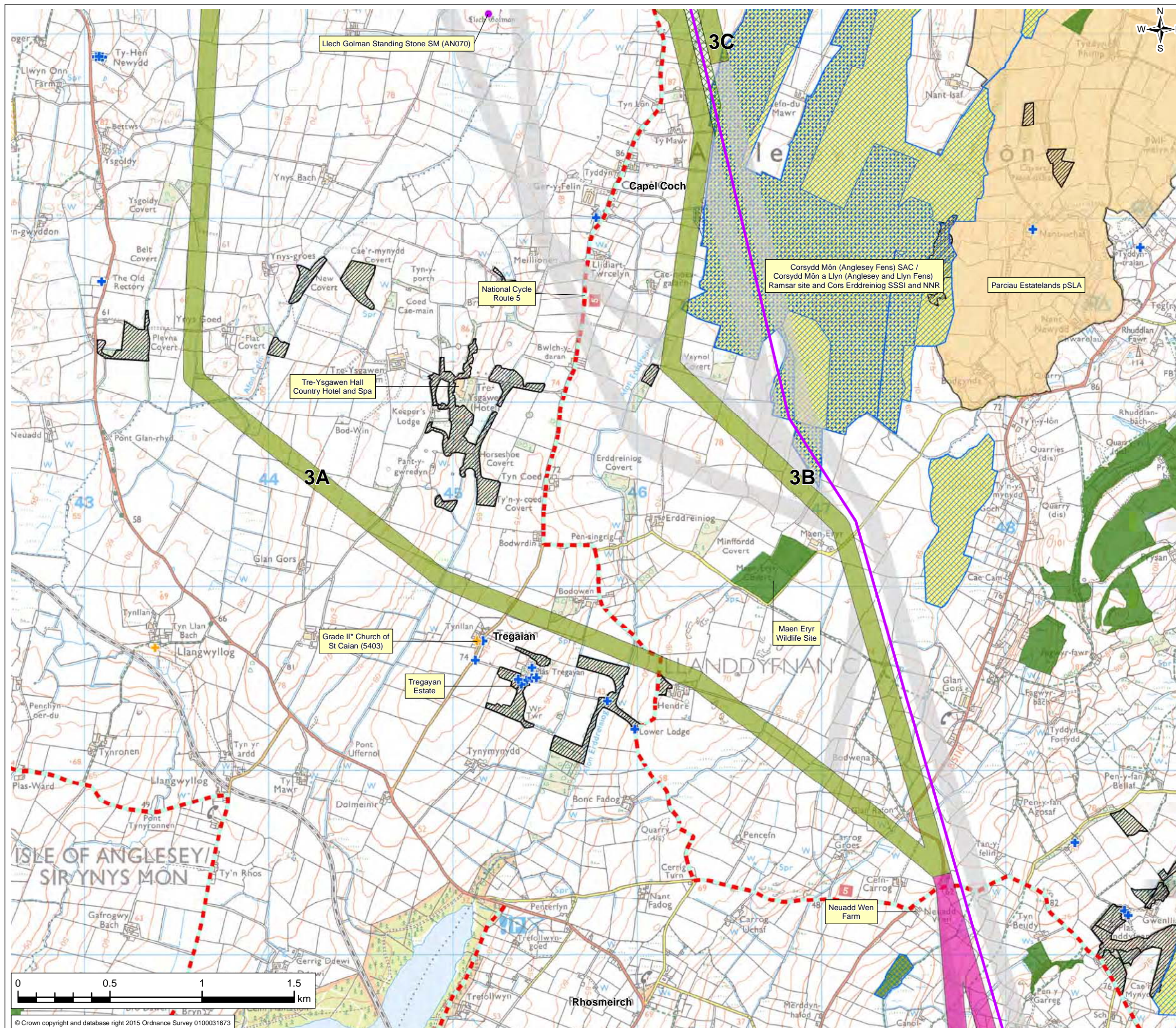
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**FIGURE B3-1B**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Overhead Line Route Options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
  - Constraints**
  - Anglesey Area of Outstanding Natural Beauty
  - Proposed JLDD Special Landscape Area (pSLA)
  - Scheduled Monument (SM)
  - + Grade I Listed Building
  - + Grade II\* Listed Building
  - + Grade II Listed Building
  - Registered Park and Garden (RPG)
  - Registered Landscape of Historic Interest
  - Conservation Area
  - Special Area of Conservation (SAC)
  - Ramsar
  - Site of Special Scientific Interest (SSSI)
  - National Nature Reserve (NNR)
  - Ancient Woodland
  - Wildlife Site
  - Tree Preservation Orders (TPOs)
  - + National Trails
  - - - National Cycle Route

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WYLFA-PENTIR TRANSMISSION CONNECTION

Drawing Title  
WYLFA-PENTIR SECTION 3 (SOUTH) OPTIONS  
LANDSCAPE, ECOLOGY AND  
CULTURAL HERITAGE FEATURES

Drawing Status  
FINAL

Scale @ A3  
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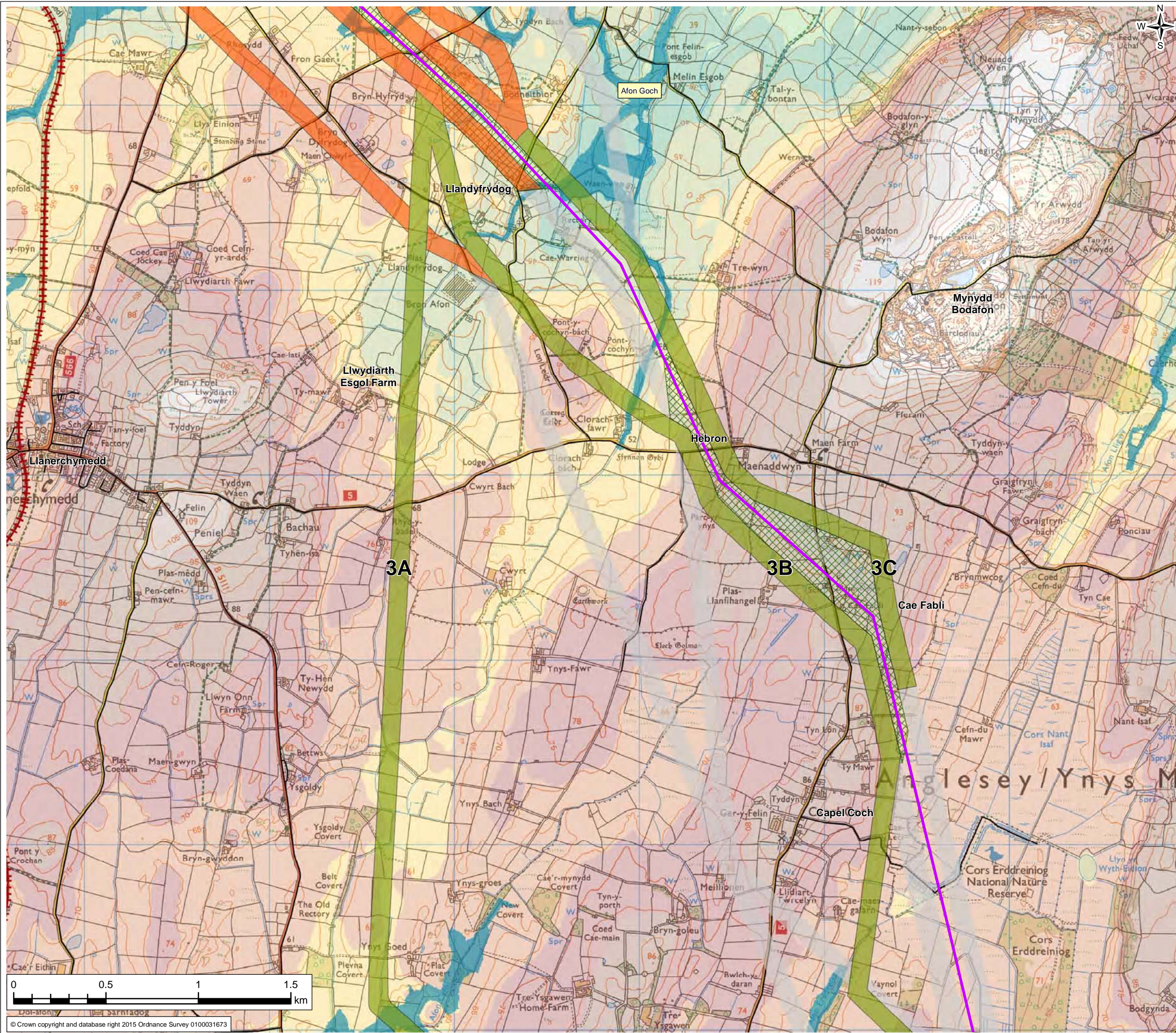
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**FIGURE B3-2A**



- Legend**
- Existing National Grid Overhead Line
  - National Grid 132kV Overhead Line
  - Overhead Line Route Options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
  - Constraints**
  - Active Waste Site
  - Non Active Waste Site
  - ▲ Historic Mine Workings
  - + Railway
  - + Disused Railway
  - Main Road
  - EAW Flood Zones 2 & 3

**Elevation (m)**

0 - 10	50 - 60	100 - 110
10 - 20	60 - 70	110 - 120
20 - 30	70 - 80	120 - 130
30 - 40	80 - 90	> 130m
40 - 50	90 - 100	

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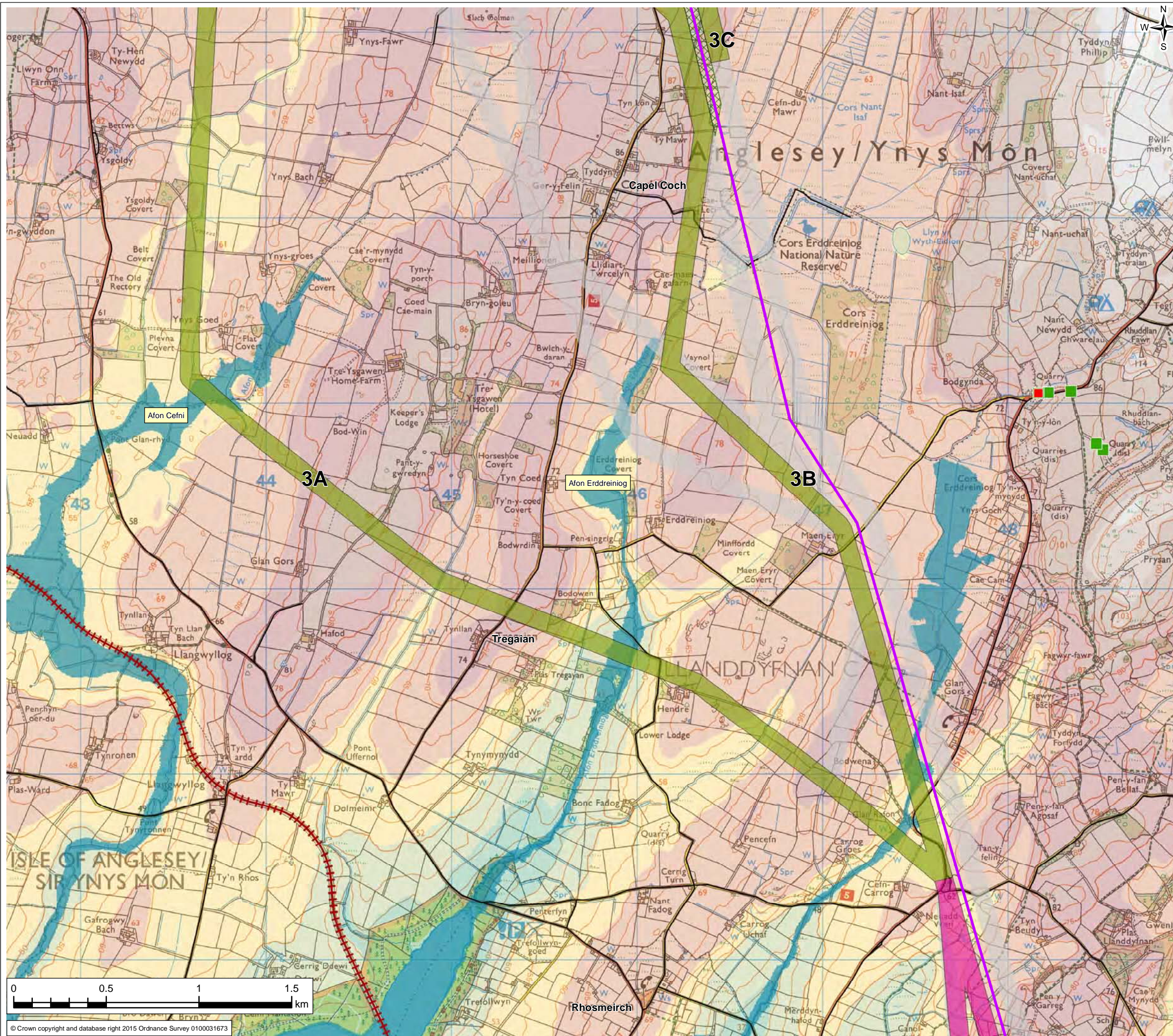
Drawing Title  
 WYLFA-PENTIR SECTION 3 (NORTH) OPTIONS  
 ELEVATION, INFRASTRUCTURE AND FLOOD RISK

Drawing Status	FINAL	
Scale @ A3	1:20,000	DO NOT SCALE
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FIGURE B3-2B



Legend

- Existing National Grid 400kV Overhead Line
- National Grid 132kV Overhead Line
- Overhead Line Route Options**
- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over
- Constraints**
- Active Waste Site
- Non Active Waste Site
- ▲ Historic Mine Workings
- + Railway
- + Disused Railway
- Main Road
- EAW Flood Zones 2 & 3

Elevation (m)

- |  |   |  |
|--|---|--|
| <span style="background-color: #e0ffe0; width: 10px; height: 10px; display: inline-block;"></span> 0 - 10  | <span style="background-color: #fff2cc; width: 10px; height: 10px; display: inline-block;"></span> 50 - 60  | <span style="background-color: #d9ead3; width: 10px; height: 10px; display: inline-block;"></span> 100 - 110                       |
| <span style="background-color: #ffffe0; width: 10px; height: 10px; display: inline-block;"></span> 10 - 20 | <span style="background-color: #f4cccc; width: 10px; height: 10px; display: inline-block;"></span> 60 - 70  | <span style="background-color: #e0e0e0; width: 10px; height: 10px; display: inline-block;"></span> 110 - 120                       |
| <span style="background-color: #cfe2f3; width: 10px; height: 10px; display: inline-block;"></span> 20 - 30 | <span style="background-color: #f08080; width: 10px; height: 10px; display: inline-block;"></span> 70 - 80  | <span style="background-color: #cccccc; width: 10px; height: 10px; display: inline-block;"></span> 120 - 130                       |
| <span style="background-color: #a6c9ec; width: 10px; height: 10px; display: inline-block;"></span> 30 - 40 | <span style="background-color: #b22222; width: 10px; height: 10px; display: inline-block;"></span> 80 - 90  | <span style="background-color: #ffffff; width: 10px; height: 10px; display: inline-block; border: 1px solid black;"></span> > 130m |
| <span style="background-color: #808080; width: 10px; height: 10px; display: inline-block;"></span> 40 - 50 | <span style="background-color: #800000; width: 10px; height: 10px; display: inline-block;"></span> 90 - 100 |  |

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Drawing Title  
WYLF A-PENTIR SECTION 3 (SOUTH) OPTIONS  
ELEVATION, INFRASTRUCTURE AND FLOOD RISK

Drawing Status  
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Scale @ A3  
1:20,000 DO NOT SCALE

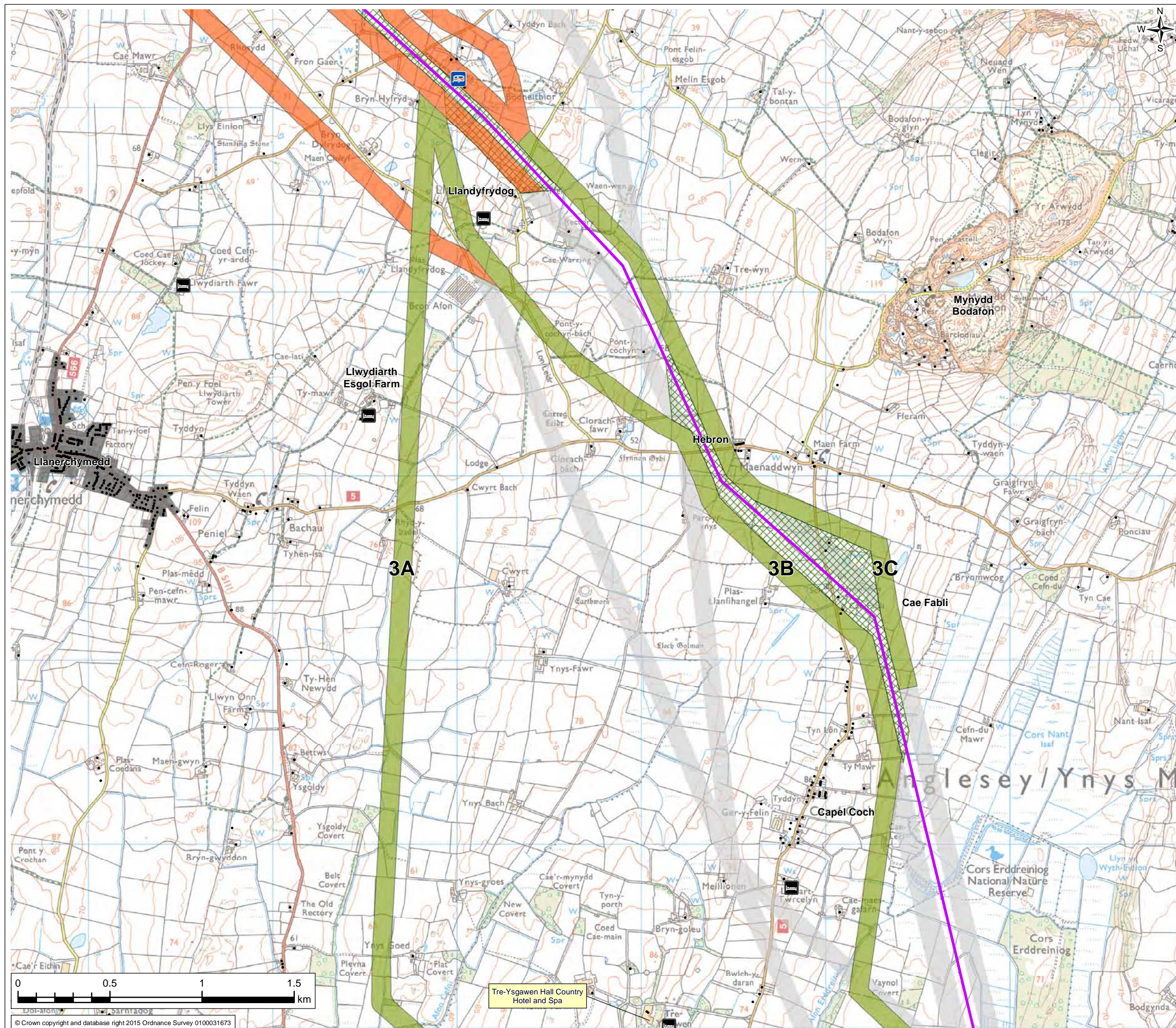
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Client No.  
Drawing No. B2600002-WP-ROR-023

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**FIGURE B3-3A**



**Legend**

- Existing National Grid 400kV Overhead Line
- Residential Property (Dwelling)
- Settlement Area

**Overhead Line Route Options**

- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over

**Joint Local Development Plan (JLDP), Deposit Plan, 2015**

- Housing with Planning Permission
- Housing without Planning Permission
- Employment

**Visit Wales Website**

- Hotels, B&B and Apartments
- Hostel and Campus
- Caravan, Camping or Holiday Park
- ⊕ Registered Visitor Attraction

**Jacobs Research**

- Caravan/Camping Site

1	SEP 15	Revised Issue	IM	MR	SH	MR
0	AUG 15	Initial Issue	AD	MR	SH	MR
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Project  
WYLFA-PENTIR TRANSMISSION CONNECTION

Drawing Title  
WYLFA-PENTIR SECTION 3 OPTIONS PLANNING AND TOURISM

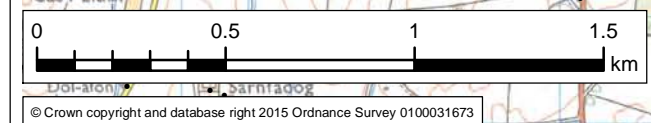
Drawing Status  
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B2600002

Drawing No.  
B2600002-WP-ROR-028

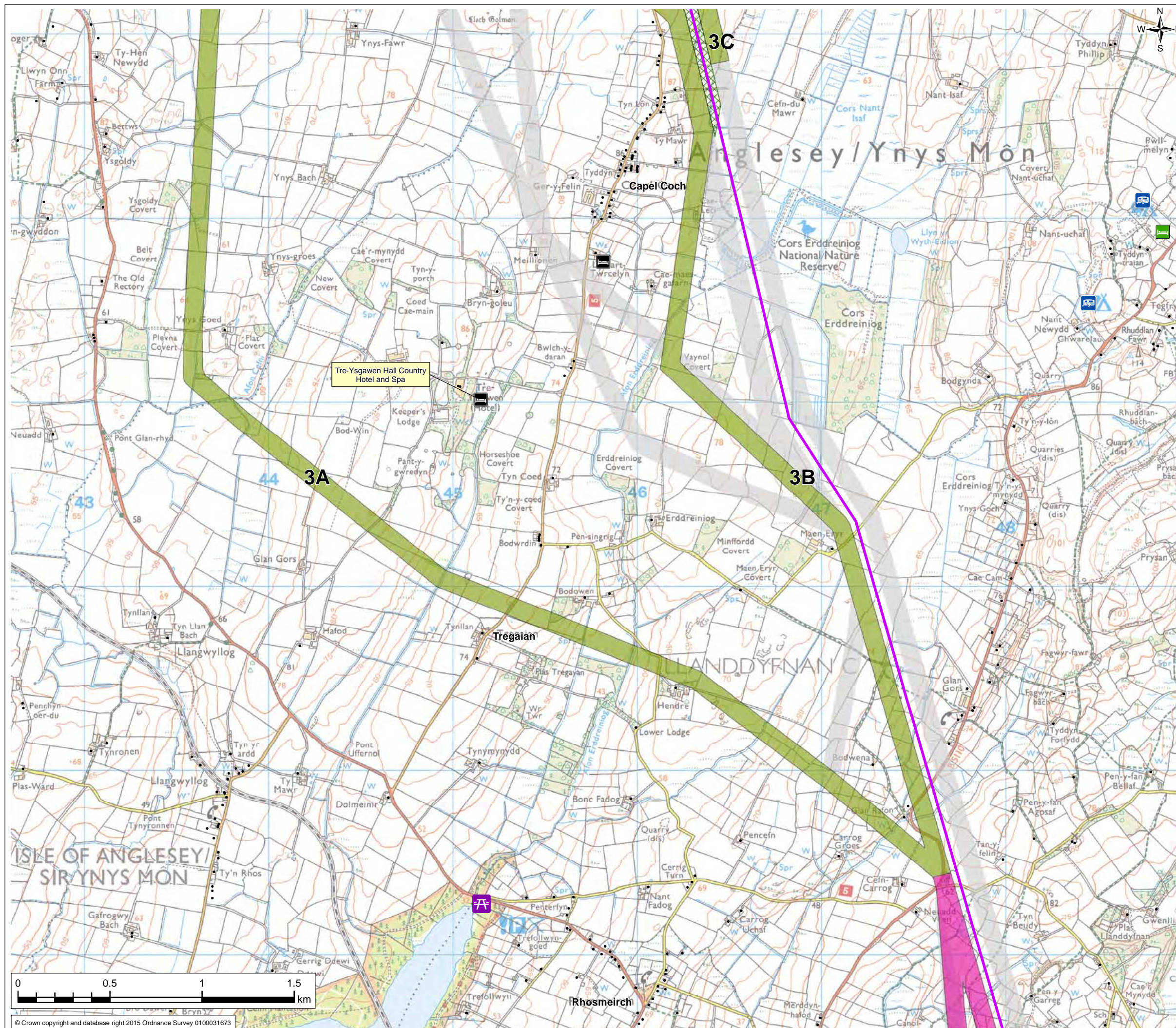
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**FIGURE B3-3B**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Residential Property (Dwelling)
  - Settlement Area
- Overhead Line Route Options**
- Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
- Joint Local Development Plan (JLDP), Deposit Plan, 2015**
- Housing with Planning Permission
  - Housing without Planning Permission
  - Employment
- Visit Wales Website**
- Hotels, B&B and Apartments
  - Hostel and Campus
  - Caravan, Camping or Holiday Park
  - Registered Visitor Attraction
- Jacobs Research**
- Caravan/Camping Site
  - Picnic Site

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Drawing Title  
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 PLANNING AND TOURISM

Drawing Status  
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Scale @ A3  
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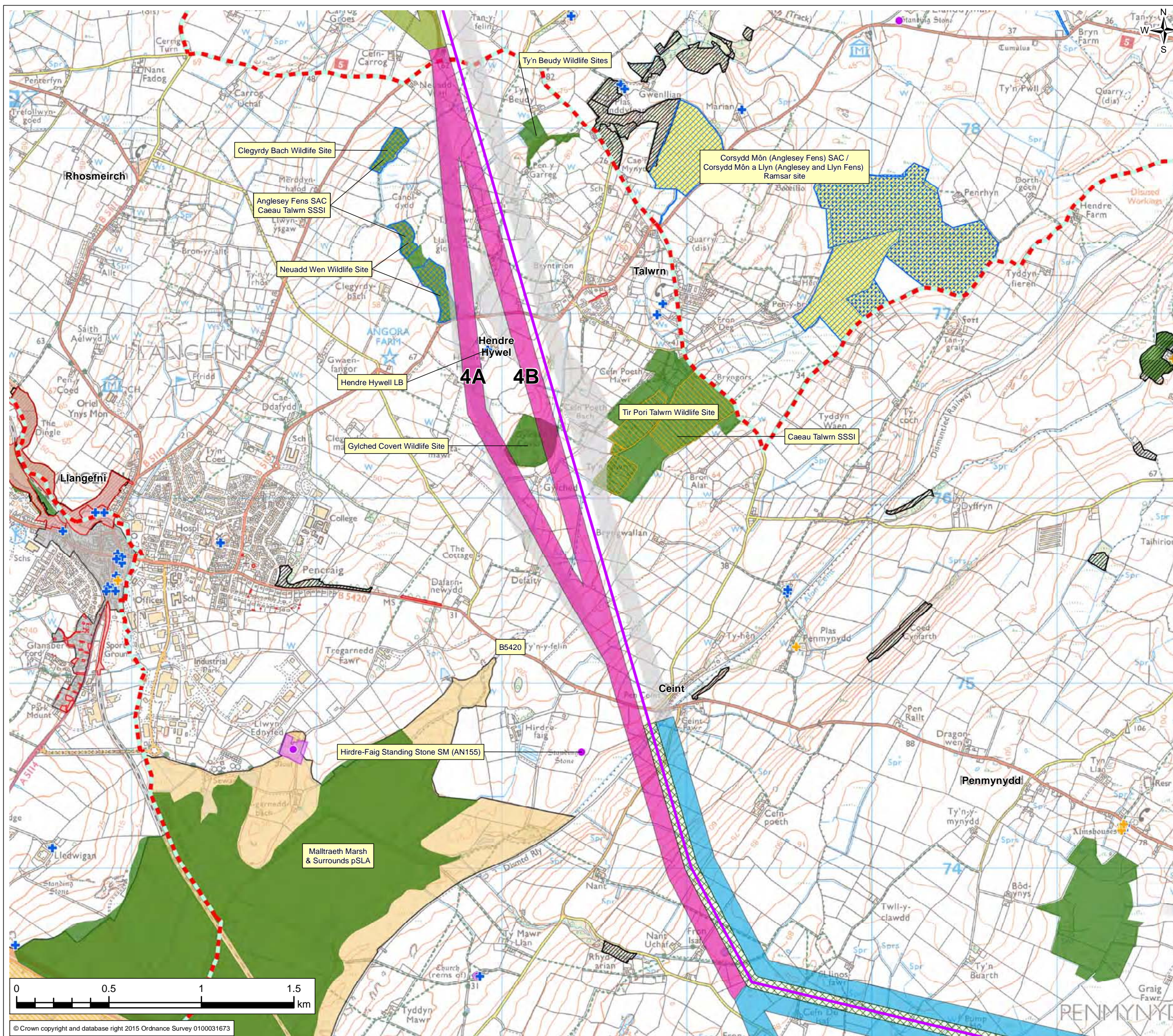
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**FIGURE B4-1**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Overhead Line Route Options**
  - Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
  - Designations**
  - Anglesey Area of Outstanding Natural Beauty
  - Proposed JLDP Special Landscape Area (pSLA)
  - Scheduled Monument (SM)
  - + Grade I Listed Building
  - + Grade II\* Listed Building
  - + Grade II Listed Building
  - Registered Park and Garden (RPG)
  - Registered Landscape of Historic Interest
  - Conservation Area
  - Special Area of Conservation (SAC)
  - Ramsar
  - Site of Special Scientific Interest (SSSI)
  - National Nature Reserve (NNR)
  - Ancient Woodland
  - Wildlife Site
  - Tree Preservation Orders (TPOs)
  - + National Trails
  - National Cycle Route

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Drawing Title  
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 LANDSCAPE, ECOLOGY AND  
 CULTURAL HERITAGE FEATURES

Drawing Status  
 FINAL

Scale @ A3  
 1:20,000 DO NOT SCALE

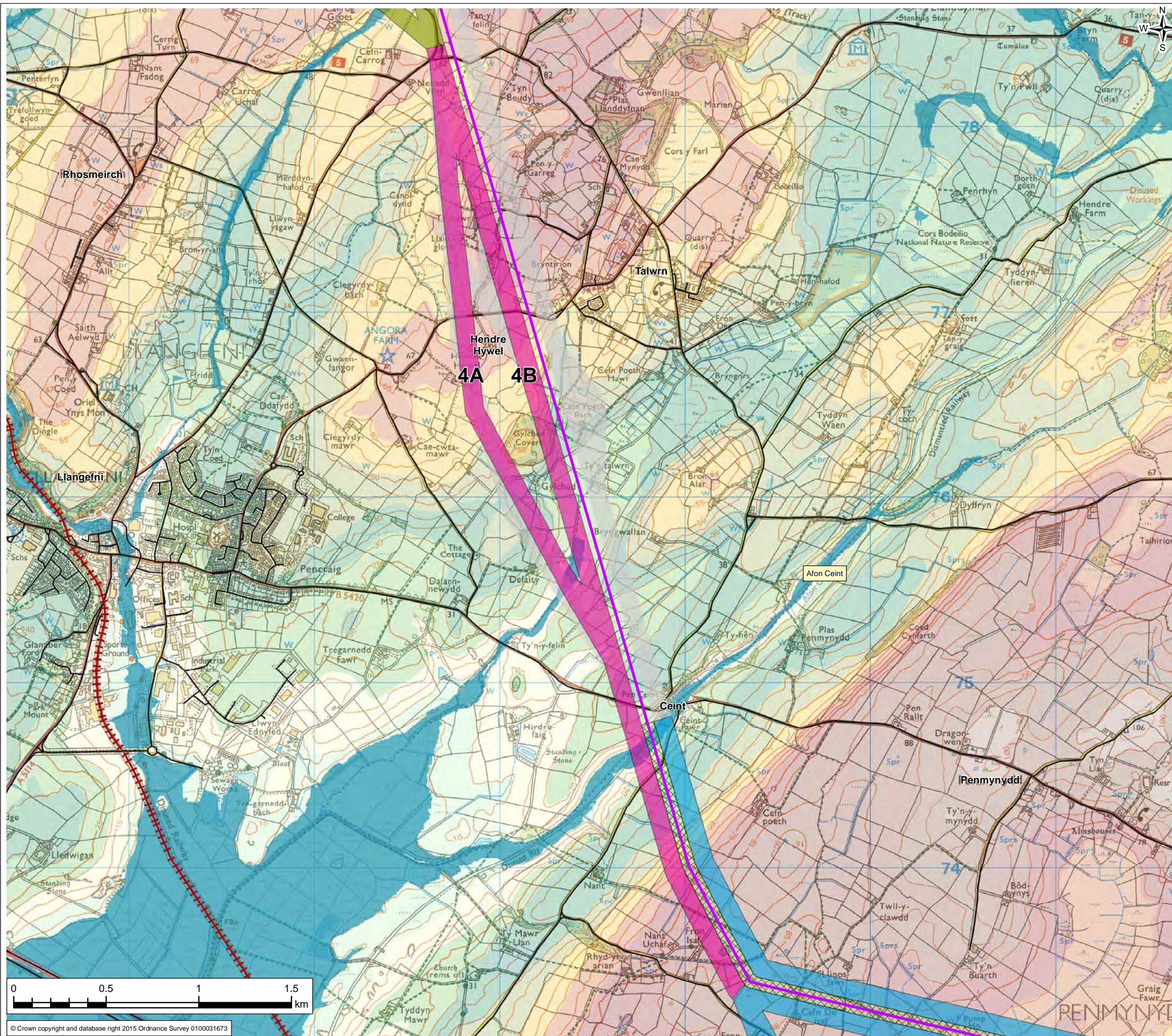
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**FIGURE B4-2**



**Legend**

- Existing National Grid 400kV Overhead Line
- National Grid 132kV Overhead Line
- Overhead Line Route Options**
- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over
- Constraints**
- Active Waste Site
- Non Active Waste Site
- ▲ Historic Mine Workings
- + Railway
- + Disused Railway
- Main Road
- EAW Flood Zones 2 & 3

**Elevation (m)**

0 - 10	50 - 60	100 - 110
10 - 20	60 - 70	110 - 120
20 - 30	70 - 80	120 - 130
30 - 40	80 - 90	> 130m
40 - 50	90 - 100	

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Drawing Title  
WYLF A-PENTIR SECTION 4 OPTIONS  
ELEVATION, INFRASTRUCTURE AND FLOOD RISK

Drawing Status: **FINAL**

Scale @ A3: 1:20,000 DO NOT SCALE

Jacobs No.: B2600002

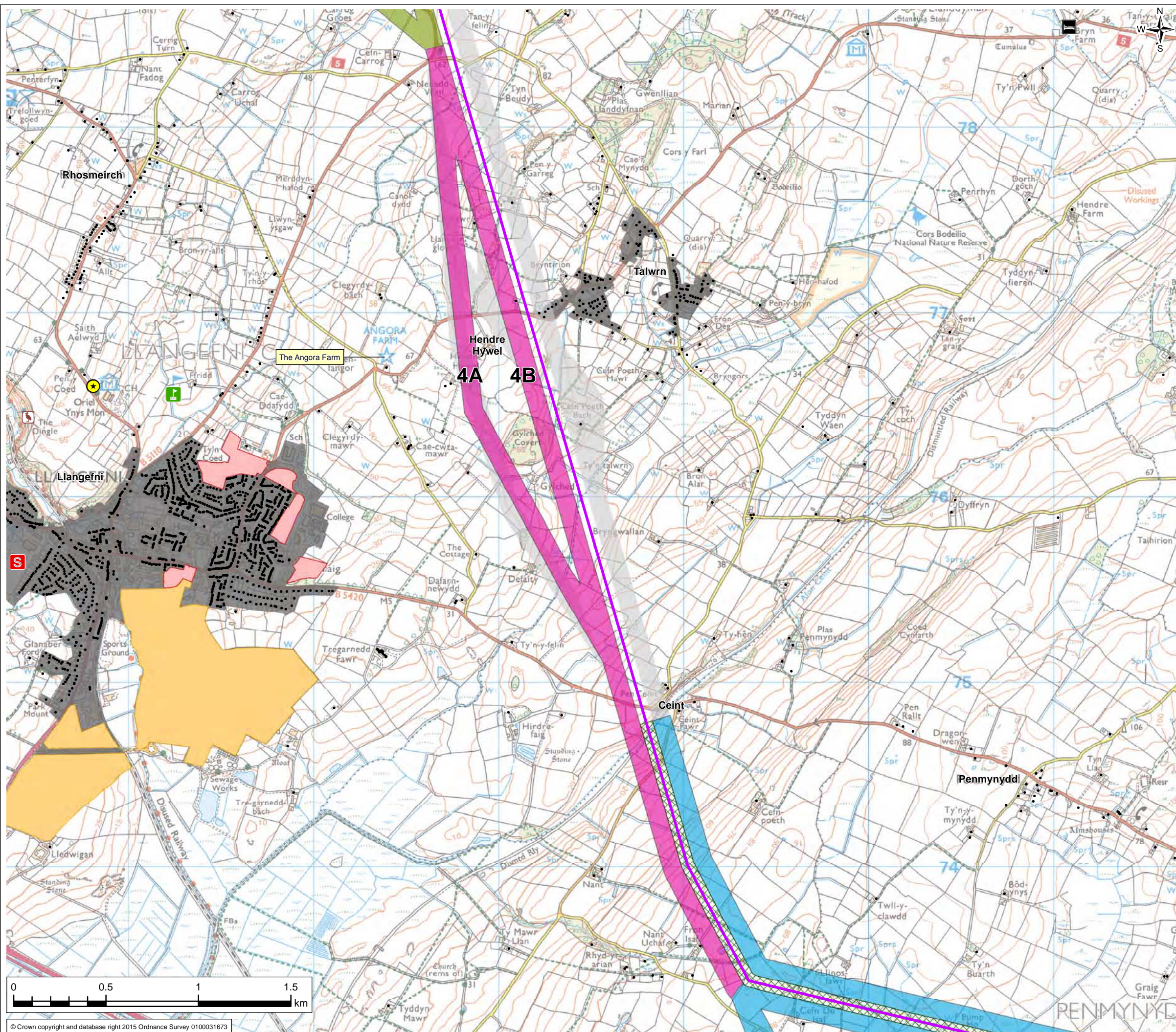
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Drawing No.: **B2600002-WP-ROR-024**

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**FIGURE B4-3**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Residential Property (Dwelling)
- Overhead Line Route Options**
- Section 1
  - Section 2
  - Section 3
  - Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
- Joint Local Development Plan (JLDP), Deposit Plan, 2015**
- Housing with Planning Permission
  - Housing without Planning Permission
  - Employment
- Visit Wales Website**
- Hotels, B&B and Apartments
  - Hostel and Campus
  - Caravan, Camping or Holiday Park
  - ★ Registered Visitor Attraction
- Jacobs Research**
- Golf Course
  - Nature Reserve
  - Sports or Leisure Centre

1	SEP 15	Revised Issue	IM	MR	SH	MR
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Drawing Title  
WYLFA-PENTIR SECTION 4 OPTIONS  
PLANNING AND TOURISM

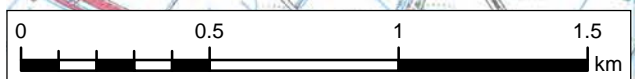
Drawing Status  
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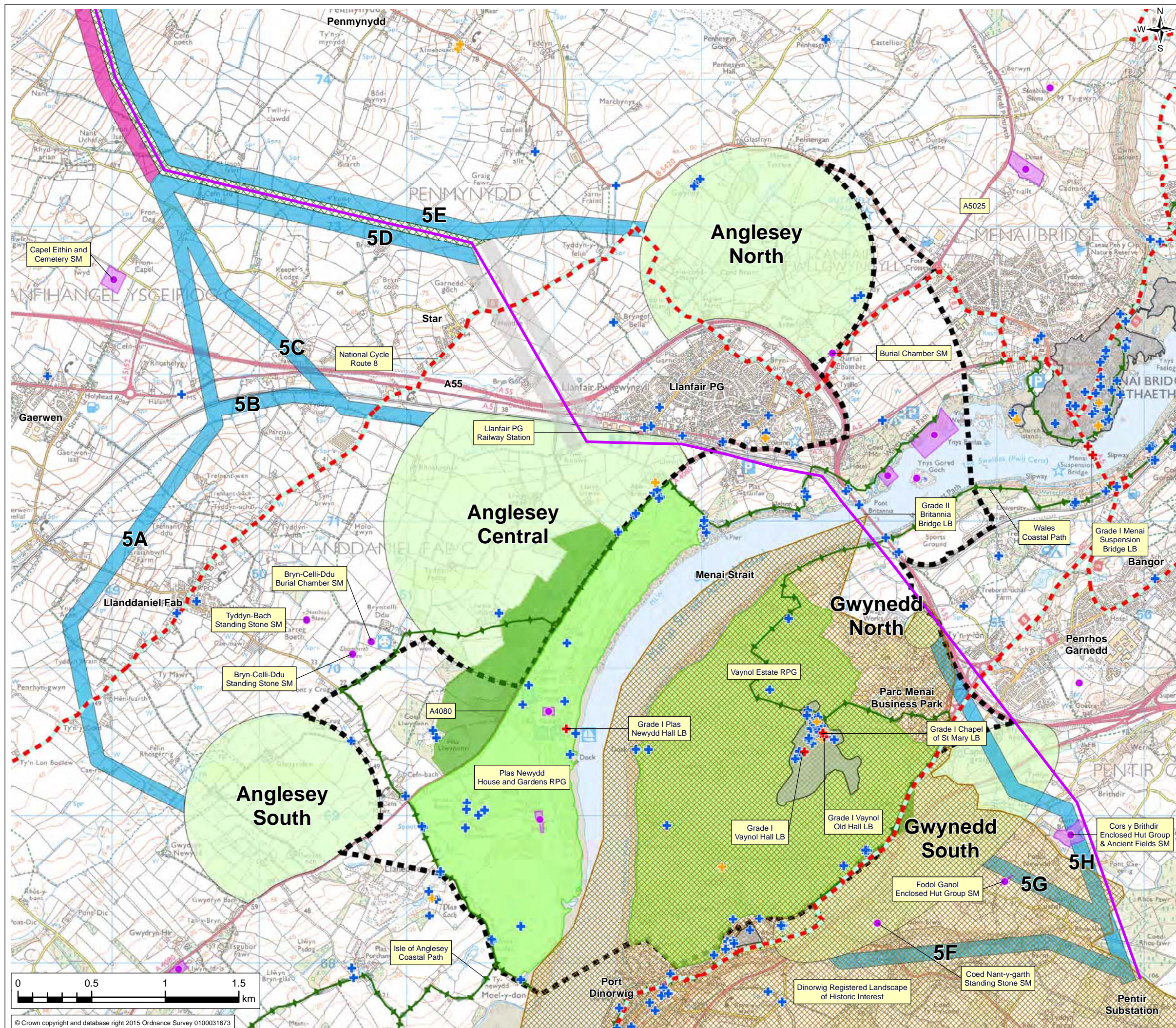




**FIGURE B5-1A**

**Legend**

-  Existing National Grid 400kV Overhead Line
-  Underground Cable Route Search Area
-  Search Area for Sealing End Compound and connecting Overhead Line and Underground Cable Routes
- Overhead Line Route Options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5
-  Overhead Line Route Options not taken forward
-  Area of potential line swap over
- Designations**
-  Scheduled Monument (SM)
-  Grade I Listed Building
-  Grade II\* Listed Building
-  Grade II Listed Building
-  Registered Park and Garden (RPG)
-  RPG Essential Setting
-  Registered Landscape of Historic Interest
-  Conservation Area
-  National Trails
-  National Cycle Route



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Drawing Title  
WYLFA-PENTIR SECTION 5 OPTIONS  
CULTURAL HERITAGE FEATURES

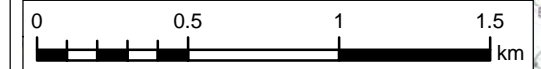
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Drawing No.  
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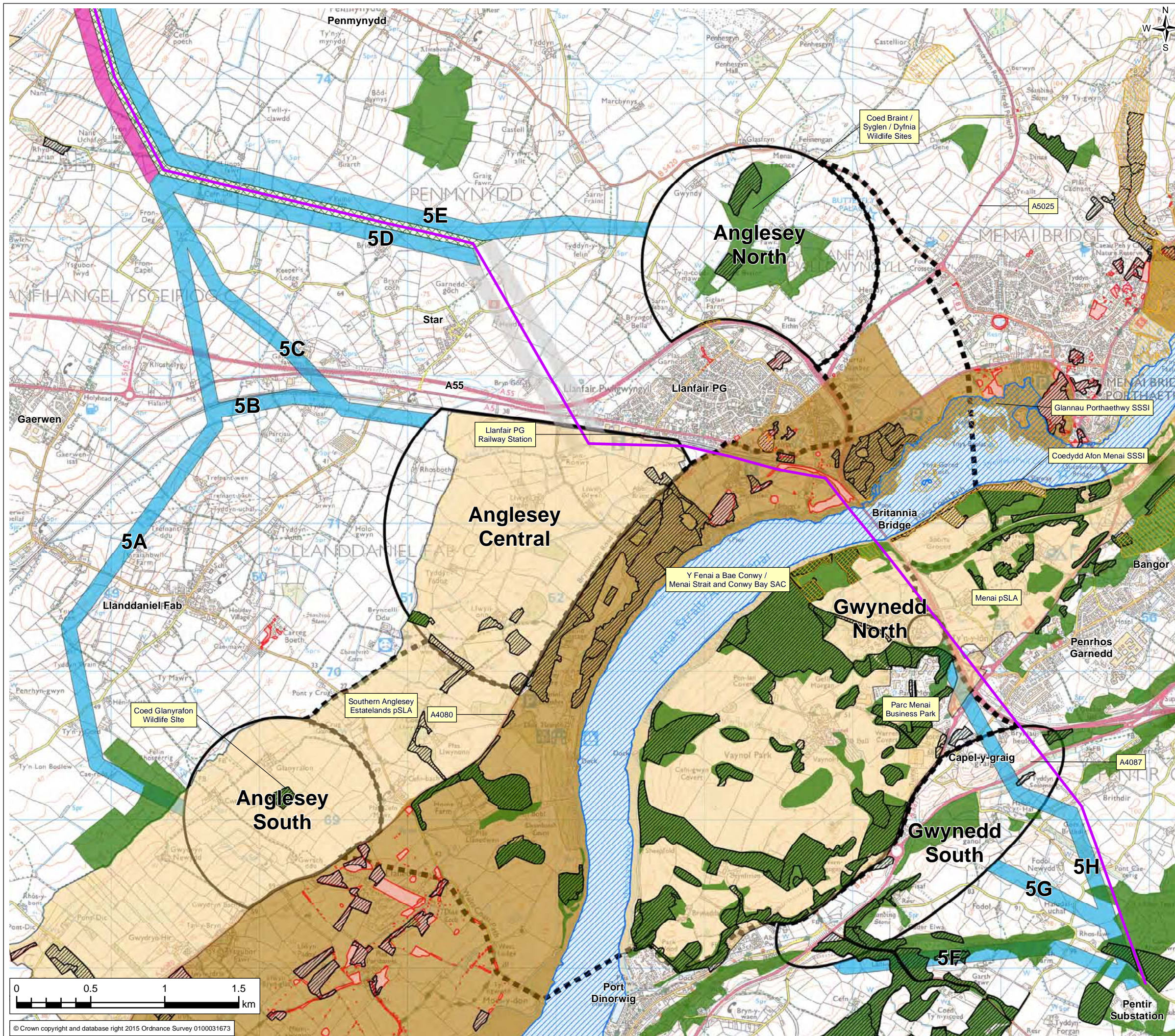
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**FIGURE B5-1B**



**Legend**

- Existing National Grid 400kV Overhead Line
- Underground Cable Route Search Area
- Search Area for Sealing End Compound and connecting Overhead Line and Underground Cable Routes
- Overhead Line Route Options**
- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over
- Designations**
- Anglesey Area of Outstanding Natural Beauty
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- Ancient Woodland
- Tree Preservation Orders (TPOs)
- Wildlife Site
- Proposed JLDP Special Landscape Area (pSLA)

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Drawing Title  
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 LANDSCAPE AND ECOLOGY FEATURES

Drawing Status  
 FINAL

Scale @ A3  
 1:25,000 DO NOT SCALE

Jacobs No.  
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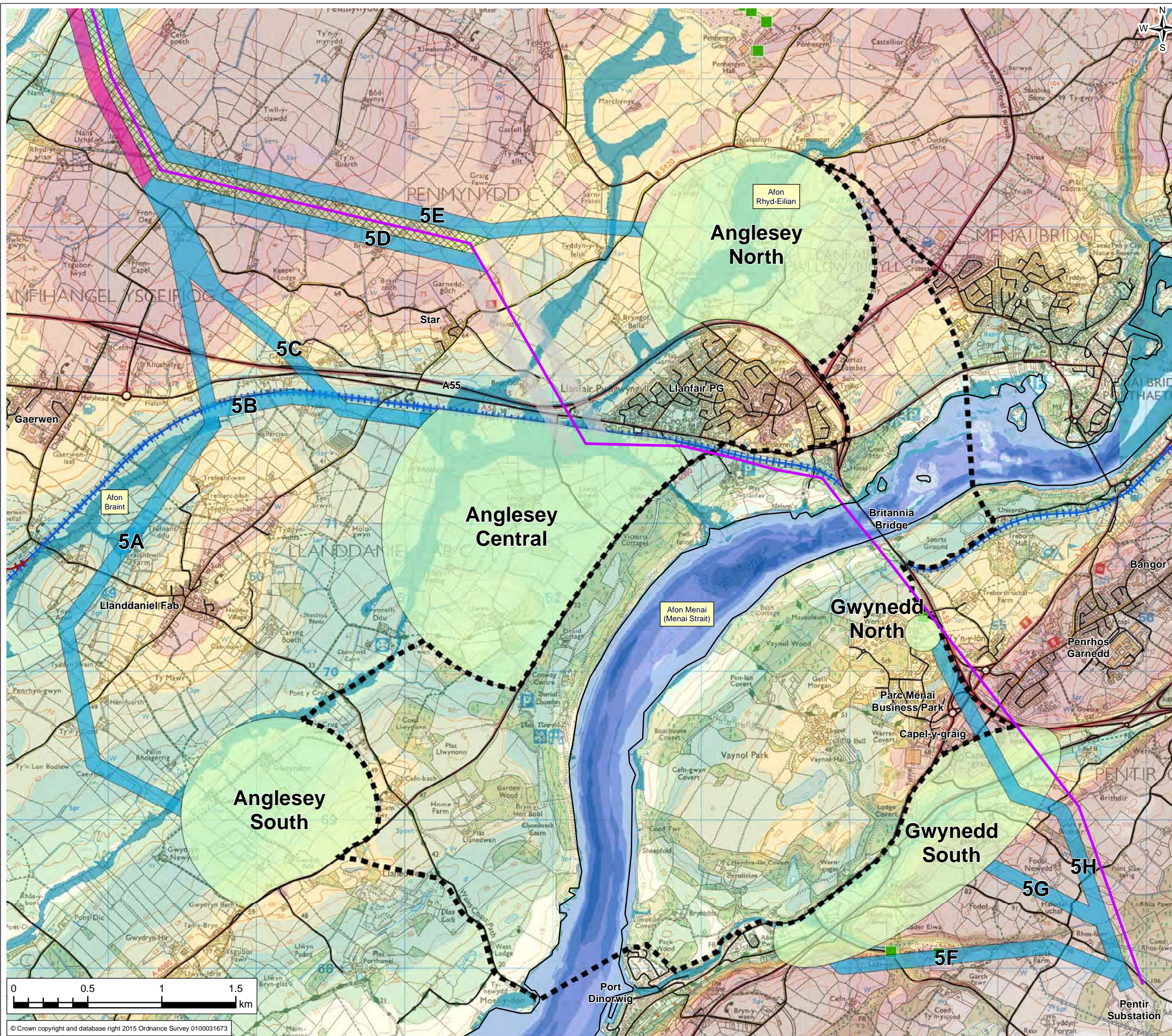
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**FIGURE B5-2**



**Legend**

- Existing National Grid 400kV Overhead Line
- Underground Cable Route Search Area
- Search Area for Sealing End Compound and connecting Overhead Line and Underground Cable Routes

**Overhead Line Route Options**

- Section 1
- Section 2
- Section 3
- Section 4
- Section 5
- Overhead Line Route Options not taken forward
- Area of potential line swap over

**Constraints**

- Active Waste Site
- Railway
- Disused Railway
- Main Road
- EAW Flood Zones 2 & 3

**Bathymetry Data**

- 5 to 0 m
- 10 to -5 m
- 15 to -10 m
- 20 to -15 m
- < -20 m

**Elevation (m)**

- |         |          |           |
|---------|----------|-----------|
| 0 - 10  | 50 - 60  | 100 - 110 |
| 10 - 20 | 60 - 70  | 110 - 120 |
| 20 - 30 | 70 - 80  | 120 - 130 |
| 30 - 40 | 80 - 90  | > 130m    |
| 40 - 50 | 90 - 100 |           |

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Drawing Status  
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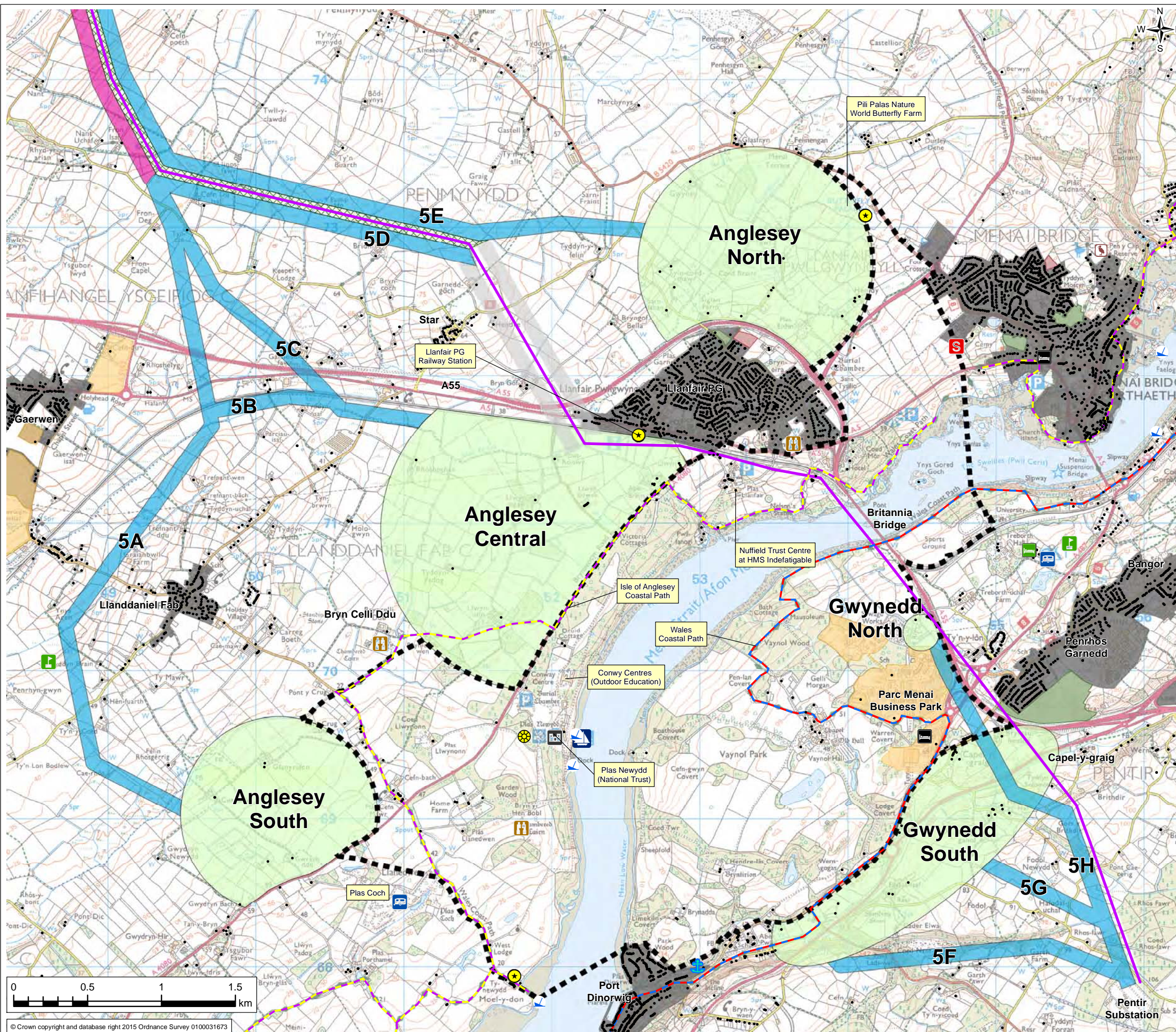
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**FIGURE B5-3**



- Legend**
- Existing National Grid 400kV Overhead Line
  - Residential Property (Dwelling)
  - Settlement Area
  - Isle of Anglesey Coastal Path
  - Wales Coastal Path
  - Underground Cable Route Search
  - Search Area for Sealing End Compound and connecting Overhead Line and Underground Cable Routes
- Overhead Line Route Options**
- Section 4
  - Section 5
  - Overhead Line Route Options not taken forward
  - Area of potential line swap over
- Joint Local Development Plan (JLDP), Deposit Plan, 2015**
- Housing with Planning Permission
  - Housing without Planning Permission
  - Employment
- Visit Wales Website**
- Hotels, B&B and Apartments
  - Caravan, Camping or Holiday Park
  - ★ Registered Visitor Attraction
- Jacobs Research**
- Caravan/Camping Site
  - Castle or Historic House (open to the public)
  - ★ Garden (open to the public)
  - Golf Course
  - Landmark/Antiquity
  - ⚓ Marina
  - ⚓ Nature Reserve
  - ⚓ Jetty or Slipway
  - Sports or Leisure Centre
  - ⚓ Water Activities

1	SEP 15	Revised Issue	IM	MR	SH	MR
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Client  
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Project  
WYLFA-PENTIR TRANSMISSION CONNECTION

Drawing Title  
WYLFA-PENTIR SECTION 5 OPTIONS PLANNING AND TOURISM

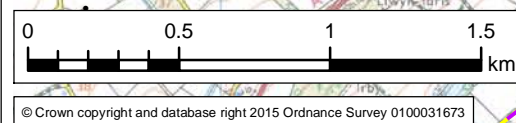
Drawing Status  
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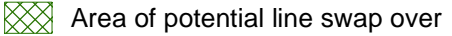





## **APPENDIX C      CONSULTATION ROUTE OPTIONS PLANS**

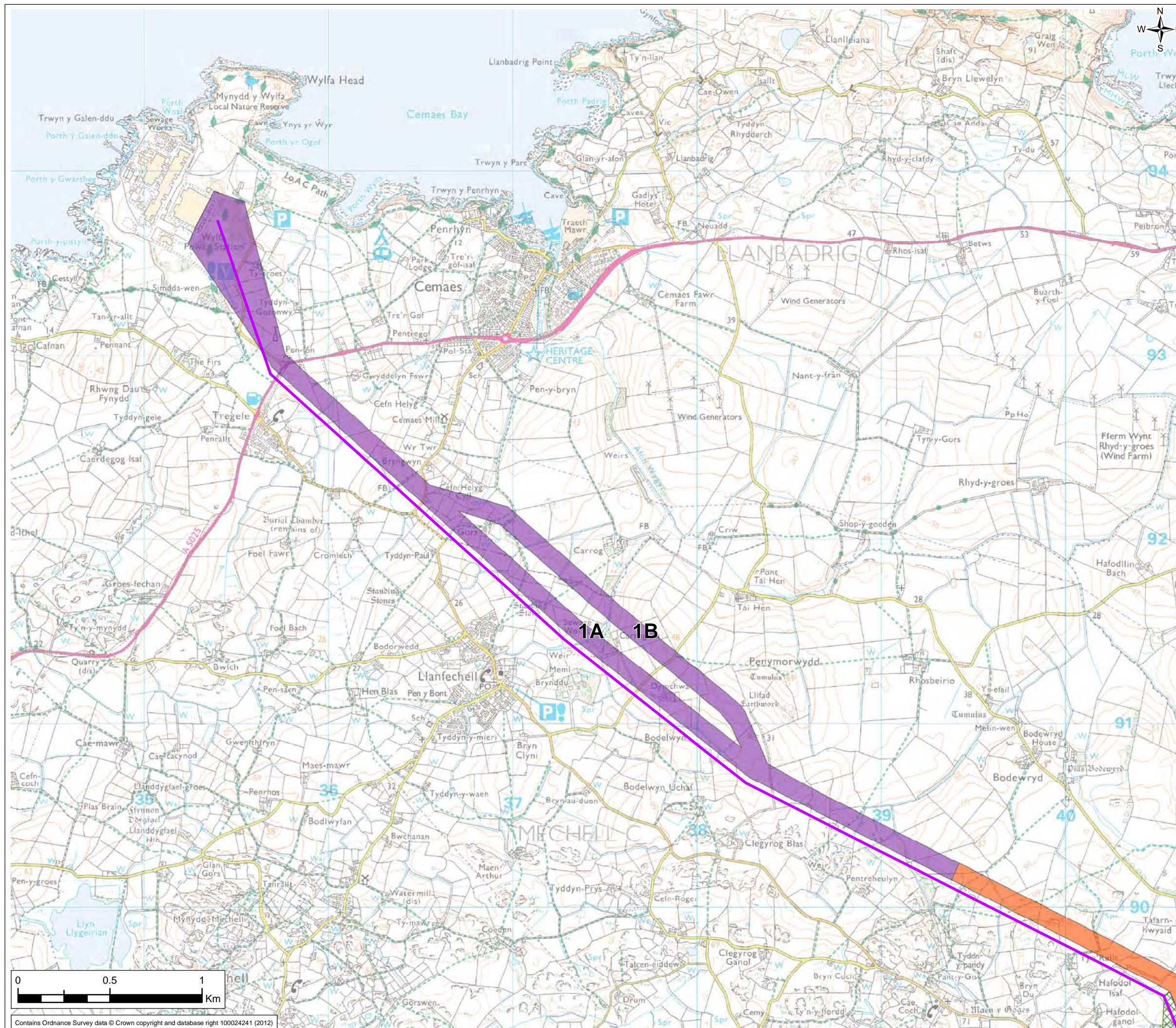
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**FIGURE C1**

**Legend**

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5



**Note:**  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
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Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLFA PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 1: WYLFA - RHOSGOCH

Drawing Status  
FINAL

Scale @ A3  
1:20,000 DO NOT SCALE

Jacobs No.  
B2600002



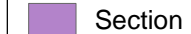
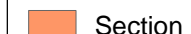

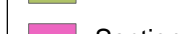
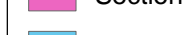
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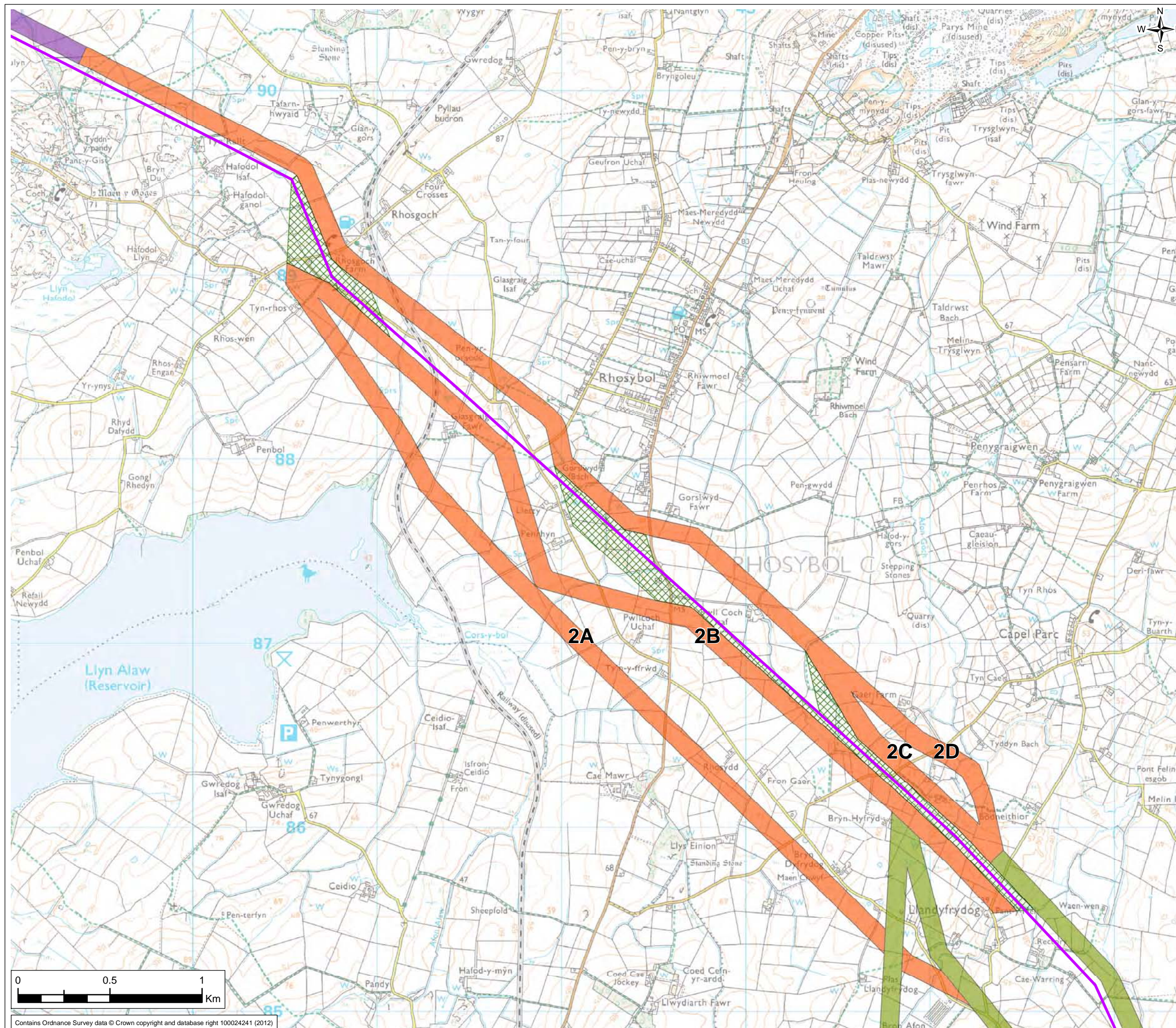
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**FIGURE C2**

**Legend**

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5



**Note:**  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
0	AUG 15	Initial Issue	IM	AD	MR	MR
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLFA PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 2: RHOSGOCH - LLANDYFRYDOG

Drawing Status  
FINAL

Scale @ A3  
1:20,000 DO NOT SCALE

Jacobs No.  
B2600002








Client No.  
Drawing No.  
B2600002-WP-PUB-038A

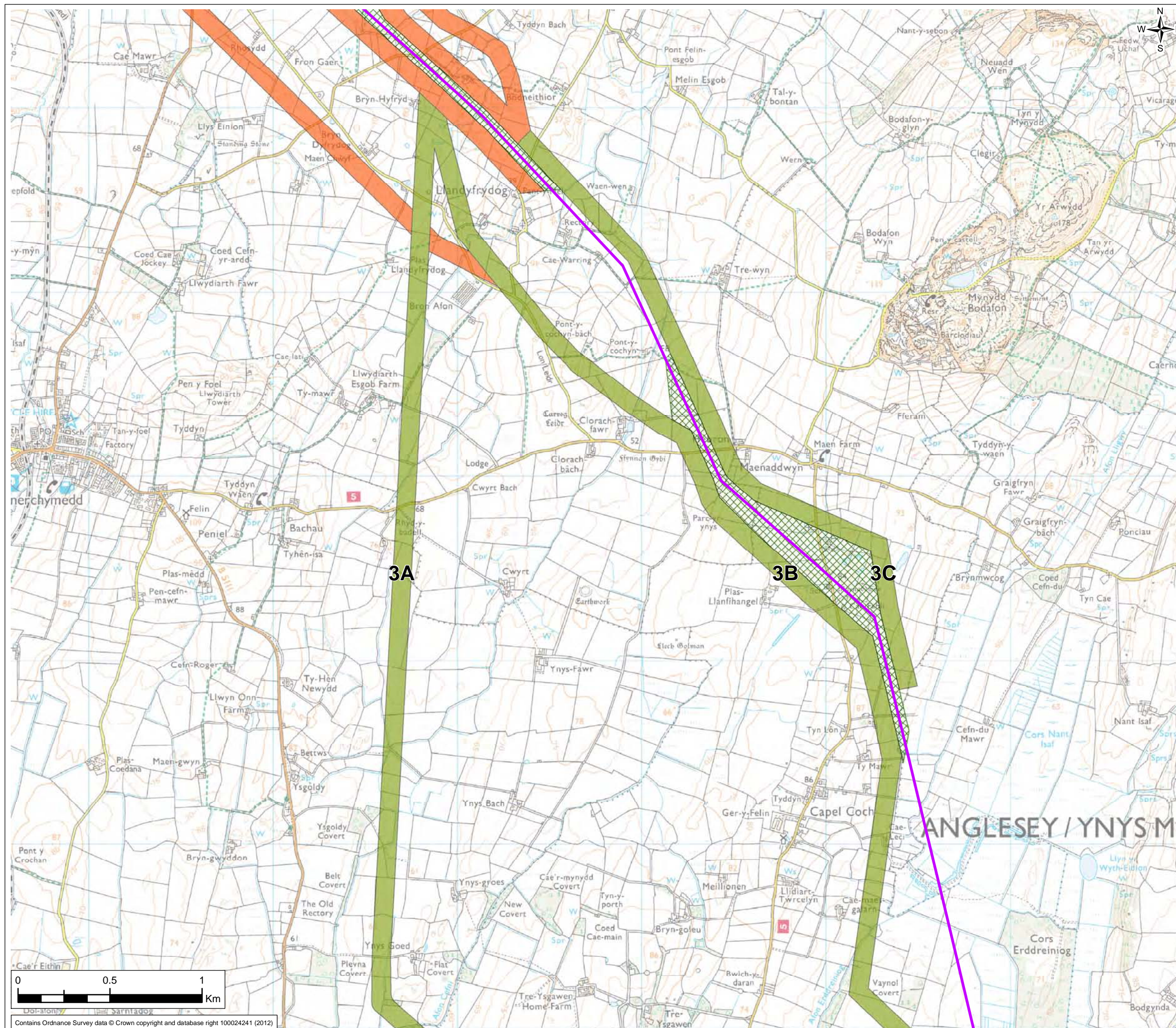
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**FIGURE C3-A**

**Legend**

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5



**Note:**  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
0	AUG 15	Initial Issue	IM	AD	MR	MR
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	App'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLF A PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 3: LLANDYFRYDOG - B5110 NORTH OF TALWRN  
(CAPEL COCH AREA OPTIONS)  
NORTH SHEET

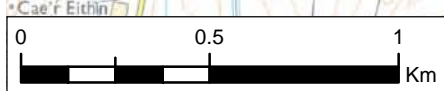
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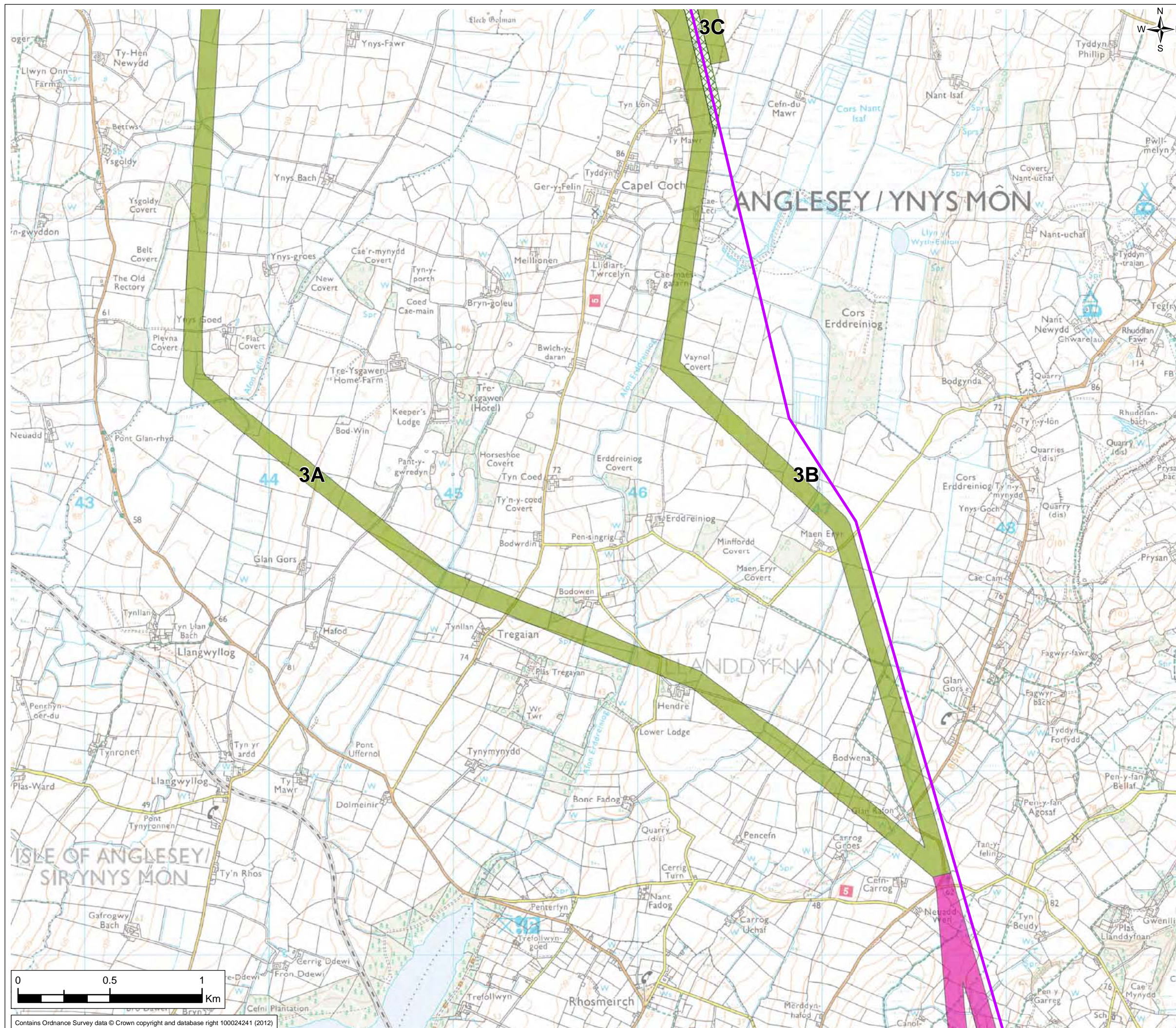
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FIGURE C3-B

Legend

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5



Note:  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
0	AUG 15	Initial Issue	IM	AD	MR	MR
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLF A PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 3: LLANDYFRYDOG - B5110 NORTH OF TALWRN  
(CAPEL COCH AREA OPTIONS)  
SOUTH SHEET

Drawing Status	FINAL	
Scale @ A3	1:20,000	DO NOT SCALE
Jacobs No.	B2600002	
Client No.		
Drawing No.	B2600002-WP-PUB-040A	








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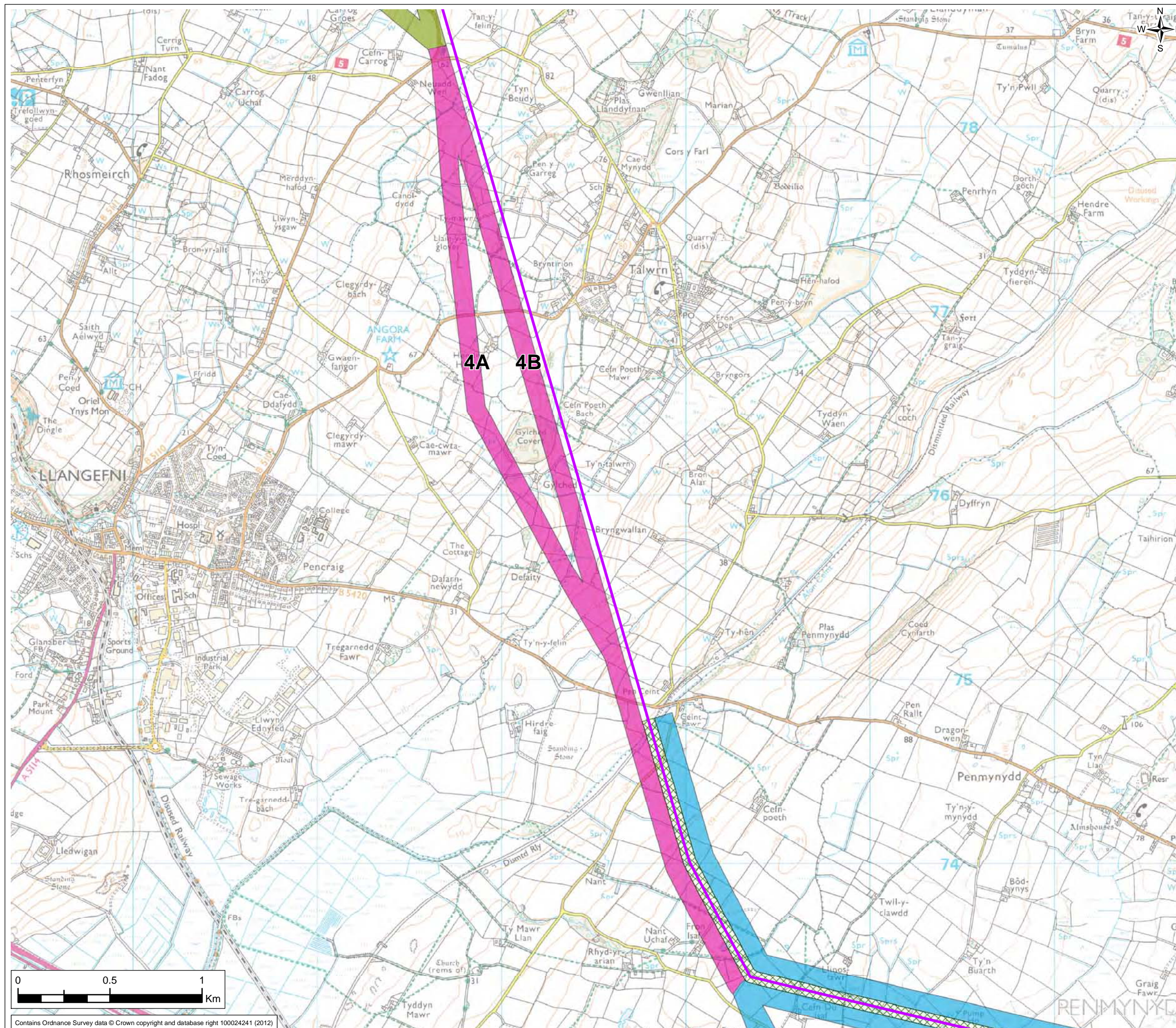
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**FIGURE C4**

**Legend**

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5



**Note:**  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
0	AUG 15	Initial Issue	IM	AD	MR	MR
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLFA PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 4: B5110 NORTH OF TALWRN TO EAST OF STAR

Drawing Status  
FINAL

Scale @ A3  
1:20,000 DO NOT SCALE

Jacobs No.  
B2600002

Drawing No.  
B2600002-WP-PUB-041A










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**FIGURE C5**

**Legend**

-  Existing National Grid 400kV overhead line
-  Area of potential line swap over
- Overhead line route options**
-  Section 1
-  Section 2
-  Section 3
-  Section 4
-  Section 5
-  Search area for sealing end compound and connecting overhead line and underground cable routes
-  Underground cable route search area

**Note:**  
Alpha-Numeric text indicates alternative route options within each section

1	SEP 15	Revised Issue	IM	AD	MR	MR
0	AUG 15	Initial Issue	IM	AD	MR	MR
Rev.	Date	Purpose of revision	Drawn	Check'd	Rev'd	Appr'd



Client  
**nationalgrid**

Project  
NORTH WALES CONNECTION

Drawing Title  
WYLF A PENTIR ROUTE OPTIONS FOR CONSULTATION  
SECTION 5: WEST OF STAR TO PENTIR

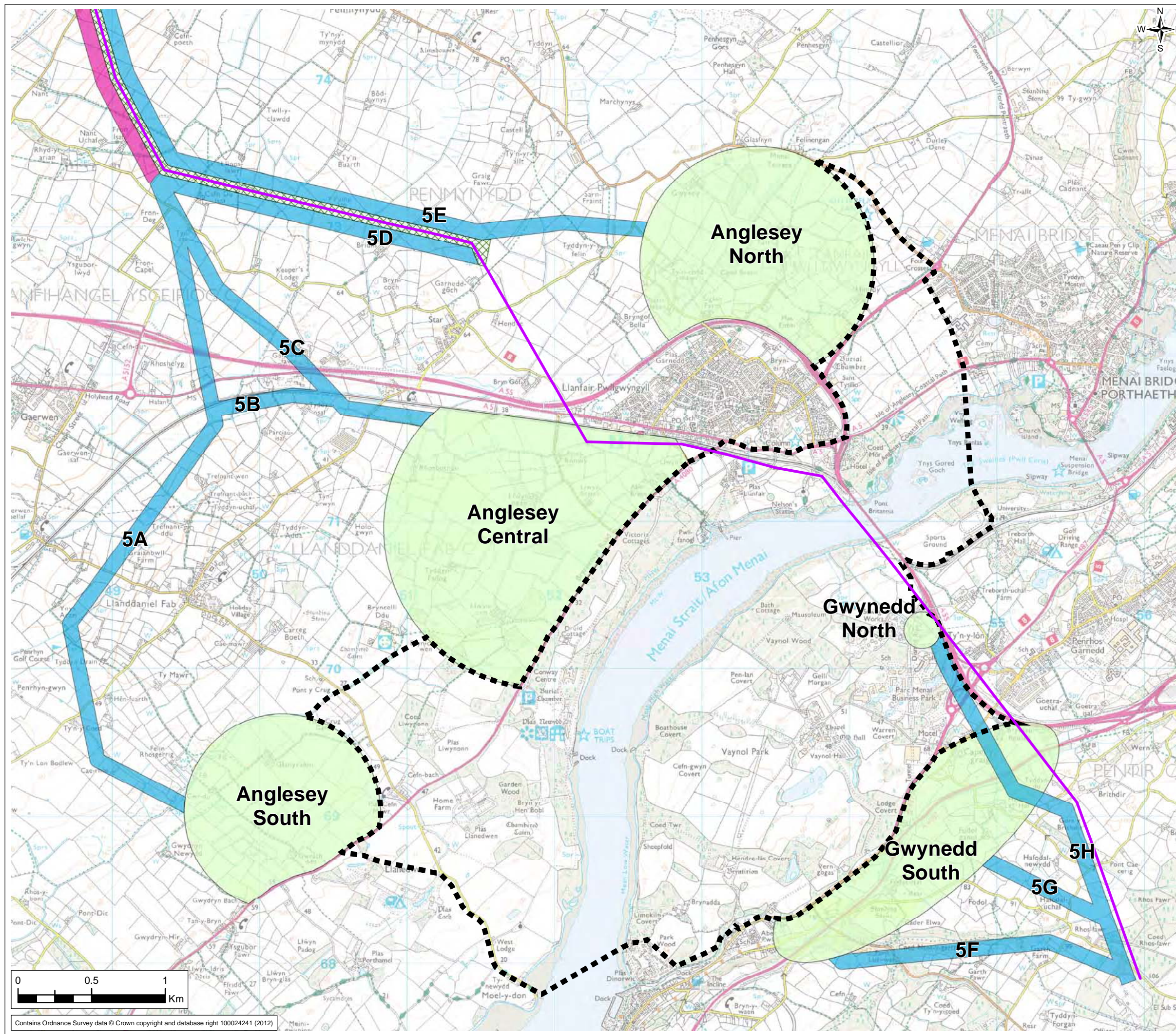
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Drawing No. B2600002-WP-PUB-042A

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