7.1.A Electric and Magnetic Fields Compliance Report

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1. Introduction

1.1 The Applicant

1.1.1 National Grid Electricity Transmission plc (NGET) operates the electricity transmission system in Great Britain and owns the system in England and Wales. NGET 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 a connection.

1.1.2 NGET is making applications for planning permission and section 37 consents to upgrade the transmission network between Pentir and Trawsfynydd Substations in North Wales.

1.1.3 Pentir to Trawsfynydd Reinforcement ('the Project') would consist of the following components:

- Pentir: replacement of existing underground cables; installation of new cross site underground cables in the existing Pentir substation; and ancillary works.
- Bryncir: A new 400/132 kV substation south of Bryncir village ('Bryncir Substation'); replacement of Tower 4ZC067 and new downleads into the Bryncir Substation; construction of a new SPEN 132 kV line (partly overhead and partly underground) between the new Bryncir Substation and the existing SPEN DB route and removal of a redundant section of SPEN DB route.
- Glaslyn Cables: An extension to the existing Wern Cables Sealing End Compound (CSEC), replacement of the Glaslyn Cables with new 400 kV sections ('inland' A circuit and 'coastal' B circuit) between Wern CSEC and Minffordd CSEC. A new CSEC and increase of floor height of the tunnel head house previously consented by the EVIP project at Minffordd; removal of the existing Garth CSEC; removal of some redundant sections of the existing 400 kV and 132 kV cables; and making safe sections of redundant Glaslyn Cables left in-situ.
- Trawsfynydd Substation: Replacement of downleads from Tower 4ZC005, underground cabling works, installation of a shunt reactor and amendments to the Trawsfynydd substation compound fence line.
- 4ZC Works: Reconductoring and replacement of fittings on the 'coastal' circuit B between Towers 4ZC005 (near the Trawsfynydd substation) and Tower 4ZC027 (at the Eryri Visual Impact Provision (EVIP) project) and replacement of the earthwire with Optical Ground Wire (OPGW). Reconductoring and replacement of fittings between Tower 4ZC044 (new the Wern CESC) and Tower 4ZC070 (near the new Bryncir substation) with 400 kV conductors and replacement of the earthwire with OPGW. Installation of fibre optic cables along the existing earthwire on the 4ZC between Towers 4ZC070 and Tower 4ZC140(near the Pentir substation).

1.2 Purpose of this Report

1.2.1 This report provides an assessment and conclusions of the likely significant health and environmental effects of electric and magnetic fields (EMF) associated with the construction, operation and decommissioning of the Project.

1.2.2 NGET has a very clear policy on EMF, as set out in its Public Position Statement[1] which states '…*In all our operations, as a minimum we comply with EMF regulations, guidelines or practices in force in the countries and different jurisdictions in which we operate*', and this policy would be applied to the Project. As is explained in more detail in Chapter 2, compliance with the relevant guidelines and practices in force in the UK ensures that there should be no significant health or environmental effects of EMF.

1.3 Introduction to Electric and Magnetic Fields

1.3.1 Electric and magnetic fields and the electromagnetic forces they represent are an essential part of the physical world. Their sources are the charged fundamental particles of matter (principally electrons and protons). EMF occur naturally within the body in association with nerve and muscle activity, allowing these functions to take place. Humans also experience the natural static magnetic field of the earth (to which a magnetic compass responds) and natural static electric fields in the atmosphere.

1.3.2 Electric and magnetic fields occur in the natural world, and people have been exposed to them for the whole of human evolution. The advent of modern technology and the wider use of electricity and electrical devices have inevitably introduced changes to the naturally occurring EMF patterns. Energised high voltage power-transmission equipment, along with all other uses of electricity, is a source of EMF. The UK power system mainly uses alternating current (AC) so the fields that are produced are likewise alternating. The EMF have the same frequency as the voltages and currents that produce them, which is 50 hertz (Hz) in the UK. The fields are described as power-frequency or extremely-low-frequency (ELF) EMF and exist in addition to the earth's steady natural fields.

1.3.3 Electric fields depend on the operating voltage of the equipment producing them and are measured in volts per metre (symbol V/m). The operating voltage of most equipment is a relatively constant value. Electric fields are shielded by most common building materials, trees and fences, and diminish rapidly with distance from the source.

1.3.4 Magnetic fields are measured in microteslas (symbol μT) and depend on the electrical currents flowing, which vary according to the electrical power requirements at any given time. They are not significantly shielded by most common building materials or trees but do diminish rapidly with distance from the source.

1.3.5 The Project would operate at a voltage of 400 kV although the short connection between the Bryncir substation and the existing SPEN DB route would operate at 132 kV. The proposed components are all assessed in detail in this report, but it can be noted here that above-ground equipment produces both electric and magnetic fields, whereas underground cables produce only a magnetic field, as the electric field is confined within the cable by the metallic sheath of the cable.

1.3.6 EMF at 50 Hz can cause induced currents to occur in the body, which, if high enough, can interfere with nerves. There are Government-adopted exposure guidelines (discussed in Chapter 2), which are set to protect against these known or direct effects of

[1] NGET 's Public Position Statement on Electric and Magnetic Fields see Appendix 1

EMF exposure. There are also ‘indirect’ effects that can occur as a result of exposure to EMF and which are not explicitly covered by the exposure guidelines. Examples of indirect effects are interference with active implantable medical devices (AIMDs), and microshocks (discussed in paragraphs 2.9.1 to 2.10.7). The potential impact of both direct and indirect effects has been assessed using the guidance provided in National Policy Statement (NPS) EN-5 and the codes of practice (discussed in Chapter 2).

1.3.7 Electric and magnetic fields at much higher frequencies, typically hundreds of thousands time higher than those generated by the electricity transmission system, can be generated by other devices, e.g. radio, television transmissions and microwaves. These higher frequencies interact with objects and people in a rather different way to power frequencies, for example by heating the body, so in scientific terms these are a different phenomenon, and it is important to make the distinction.

1.3.8 Electric and magnetic fields produced by electricity transmission systems at 50 Hz (ELF) are termed as non-ionising radiation. Non-ionising radiation is the term given to radiation in the part of the electromagnetic spectrum where there is insufficient energy to cause ionisation. It includes electric and magnetic fields, radio waves, microwaves, infrared, ultraviolet and visible radiation.

1.3.9 Ionising radiation includes X-ray and gamma-ray radiation which present a high risk to human health.

2. Policy and Legislation

2.1 Policy and Assessment Guidelines for the Protection of People

2.1.1 Whilst there are no statutory regulations in the UK that limit the exposure of the general public to power-frequency EMF, responsibility for implementing appropriate measures for the protection of the public lies with the UK Government, which has a clear policy, set out in the Written Ministerial Statement of 2009 (formally, this was the Government's response to SAGE's First Interim Assessment), which was reaffirmed in in NPS EN-5[2] (DESNZ, 2023a). NPS EN-5 provides the details of the Written Ministerial Statement regarding the exposure limits and other policies it expects to see applied to EMFs from electricity infrastructure. Practical details of how the policy is to be implemented are contained in a Code of Practice on Compliance (DECC, 2012a) agreed by the Department of Energy and Climate Change with the Department of Health (now DESNZ), the Energy Networks Association, the Welsh Assembly, the Scottish Executive, the Northern Ireland Executive and the Health and Safety Executive. It sets out what will be regarded as suitable evidence of compliance with the EMF policies as far as the electricity system is concerned. This Code of Practice state that they apply in England, Wales, Scotland and Northern Ireland. The Code of Practices states:

'….where the need for evidence of compliance with exposure limits may arise include applications for development consent for overhead power lines under the Planning Act 2008 and under Section 37 of the Electricity Act 1989, for compulsory purchase under schedule 3 to that Act, for necessary wayleaves under schedule 4 to that Act, and for planning permission for electricity equipment and equivalent situations under the relevant legislation in Scotland and Northern Ireland.'

2.1.2 Therefore, the policies contained withing NPS EN-5 and the associated Code of Practice for demonstrating compliance would be applicable to Planning Applications appliable to this Project.

2.1.3 Government in turn acts on the scientific advice from UK Health Security Agency (UKHSA), which has responsibility for advising on non-ionising radiation protection, including power-frequency EMF in the UK. The National Radiological Protection Board (NRPB) had this responsibility until becoming part of the Health Protection Agency (HPA) on 1 April 2005, which in turn was replaced by Public Health England on 1 April 2013. Public Health England officially became the UK Health Security Agency (UKHSE) in October 2021. This report refers to UKHSE, PHE, NRPB or HPA according to the name of the organisation at the time each statement was issued.

2.1.4 In 2004, following a recommendation by the then NRPB, the UK Government adopted exposure guidelines for the public published in 1998 by the International Commission on Non-Ionizing Radiation Protection (ICNIRP, 1998) in line with the terms of the 1999 European Union (EU) Recommendation (EC, 1999) on public exposure to EMF. In a Written Ministerial Statement in October 2009 (DoH, 2009) (references to the Written

[2] No components of the Project are seeking consent under The Planning Act 2008 in England to which NPS directly apply. However, NPS EN-5 presents UK Government policy on exposure to power frequency EMF in a useful format and so is referenced here.

Ministerial Statement encompass both the Statement itself and the detailed Response that the Statement introduced) the Government restated this policy of compliance with exposure limits. In addition, acting on the recommendations of a stakeholder process, it added a single precautionary measure in relation to high voltage infrastructure, a policy of optimum phasing of some overhead lines. 'Optimum phasing' is an engineering measure that can be incorporated in the design of some overhead lines and which reduces the EMF they produce and is considered in detail in **Section 6.2**. The Government also made clear in the Written Ministerial Statement that no other precautionary measures are appropriate for high voltage infrastructure.

2.1.5 These two policies, compliance with exposure limits plus optimum phasing, are the only ones applying to high voltage infrastructure. NPS EN-1 (DESNZ, 2023b) does not contain any provisions specific to EMF. NPS EN-5 documents these policies, and they are explained below.

2.2 National Policy Statement EN-5

2.2.1 The Government has set out clear policies on control of EMF exposures in general. NPS EN-5 gives clear guidance on the EMF requirements of all electricity infrastructure projects stating:

'*Before granting consent to an overhead line application, the Secretary of State should be satisfied that the proposal is in accordance with the guidelines, considering the evidence provided by the applicant and any other relevant evidence'* (paragraph 2.11.10). '*Where the applicant cannot demonstrate that the line will be compliant … with the exposure guidelines as specified in the Code of Practice on compliance, and with the policy on phasing as specified in the Code of Practice on optimal phasing then the Secretary of State should not grant consent'* (paragraph 2.11.12).

2.2.2 The relevant paragraphs are summarised in **Table 2.1**, with a reference to where they are covered in this report, and a summary of how the project complies with each policy requirement.

Table 2.1 – Summary of NPS EN-5 Requirements Relevant to EMF

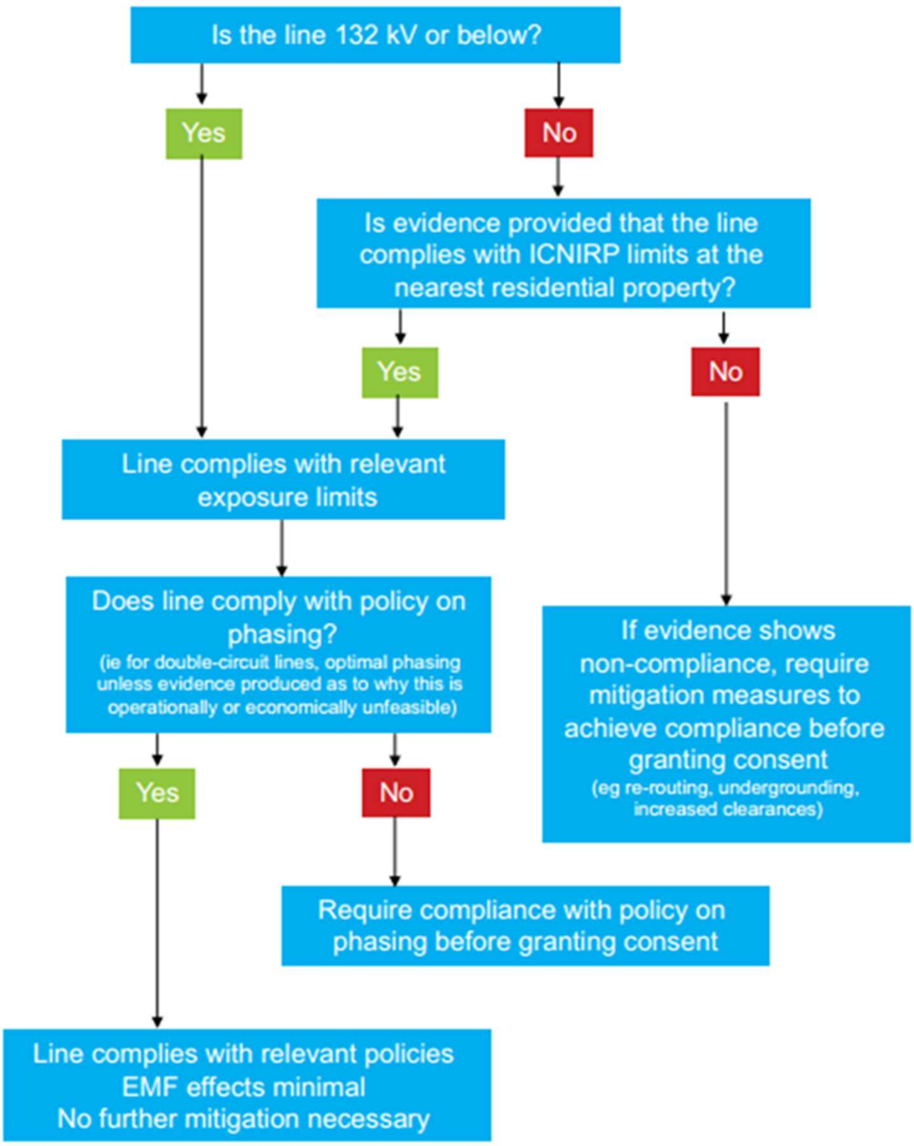
Paragraph	Requirement	Section of this Report	Compliance Assessment
2.10.12	Where it can be shown that the line will comply with the current public exposure guidelines and the policy on phasing, no further mitigation should be necessary	6.2	This report shows that the proposed Project would be compliant with the current public exposure guidelines of ICNIRP 1998 and the policy on phasing using the principles in the Codes of Practice on Compliance and Optimum Phasing.
2.11.10	Before granting consent to an overhead line application, the Secretary of State should be satisfied that the proposal is in accordance with the guidelines, considering the evidence provided by the applicant and any other relevant evidence. It may also need to take expert advice	6	All the EMF produced by the proposed Project would comply with the Government-adopted ICNIRP 1998 guidelines, as demonstrated in this report

Paragraph	Requirement	Section of this Report	Compliance Assessment
	from the Department of Health and Social Care.		
2.11.11	Industry currently applies optimal phasing to 275kV and 400kV overhead lines voluntarily wherever operationally possible, which helps to minimise the effects of EMF. The government has developed with industry a voluntary Code of Practice, 'Optimum Phasing of high voltage double-circuit Power Lines – A Voluntary Code of Practice'30, published in March 2012, that defines the circumstances where industry can and will optimally phase lines with a voltage of 132kV and above.	6.2	The overhead line has been designed in compliance with the policy on optimum phasing as specified in the Code of Practice on Optimum Phasing, as demonstrated in this report.
2.11.16	The diagram at the end of Section 2.11 shows a basic decision tree for dealing with EMF from overhead power lines to which the Secretary of State can refer.	2.2 in **Figure 2.1**	This decision tree has been replicated in **Figure 2.1** and forms the basis for the assessment of EMF from the Project.
2.10.15	The applicant should have considered the following factors: Height, position, insulation and protection (electrical or mechanical as appropriate) measures subject to ensuring compliance with the Electricity Safety, Quality and Continuity Regulations 2002	2.14 and 6.2	The proposed overhead line has been designed to comply with the statutory requirements of the Electricity Safety, Quality and Continuity Regulations 2002 (SQSS, 2002). EMF requirements can, for some designs of overhead line, result in conductor clearances to ground (one of the requirements of these regulations) being increased but never reduced compared to the requirements of the Electricity Safety, Quality and Continuity Regulations 2002. The minimum conductor clearance information provided in this report demonstrates this compliance.
	That optimal phasing of high voltage overhead power lines is introduced wherever possible and practicable in accordance with the Code of Practice to minimise EMFs.	6.2	The overhead line has been designed in line with the policy on optimum phasing as specified in the Code of Practice on Optimum Phasing.
	Any new advice emerging from the Department of Health and Social Care relating to Government policy for EMF exposure guidelines	2 and 6.3	This has been considered in this chapter, and all current advice has been used for the assessment. The assessment has been carried out against the current Government-recommended EMF exposure guidelines and policies.
2.11.13	Underground of a line would reduce the level of EMFs experienced, but high magnetic field levels may still occur immediately above the cable. It is the	6	This report shows that the Project would be compliant with the current public exposure guidelines so re-routing or undergrounding are not proportionate as mitigation for EMF.

Paragraph	Requirement	Section of this Report	Compliance Assessment
	government's policy that power lines should not be undergrounded solely for the purpose of reducing exposure to EMFs.		

2.2.3 A simplified route map for dealing with EMF is provided in NPS EN-5 and is reproduced in **Figure 2.1**.

Figure 2.1 – Simplified Route Map for Dealing With EMF. Reproduced from NPS EN-5 (page 23)



2.2.4 All relevant legislation, policies and guidance, including those contained within NPS EN-1 and EN-5 which detail Government policy in regards to EMF exposure from electricity assets, have been reviewed and applied to this EMF assessment of the Project. These policies, guidance and legislation are explained and documented below including, for openness and transparency, a commentary of the science on which these have been based.

2.2.5 For the assessment of effects on aquatic life, a separate assessment on the impacts has been performed detailed in **Section 7**.

2.3 Public Exposure Limits

2.3.1 In March 2004, the then NRPB provided new advice to Government on public exposure limits, replacing previous advice from 1993, and recommending the adoption in the UK of guidelines published in 1998 by the ICNIRP. The Government subsequently adopted this recommendation, saying that limits for public exposures should be applied in the terms of the 1999 EU Recommendation. This Government policy was subsequently set out more formally in the Written Ministerial Statement and incorporated into NPS EN-5. **Table 2.2** below summarises the relevant values for power frequencies.

Table 2.2 – Exposure Limits for Power-Frequency EMF

Public Exposure Limits	Electric Fields	Magnetic Fields
Basic restriction (induced current density in central nervous system)	2 mA/m^2	
Reference level (external unperturbed field)	5 kV/m	100 µT
Field corresponding to the basic restriction (external unperturbed field)	9 kV/m	360 µT

2.3.2 In recommending these levels, the NRPB considered the evidence for all suggested effects of EMF. They concluded that the evidence for effects on the nervous system of currents induced by the fields was sufficient to justify setting exposure limits, and this is the basis of their quantitative recommendations (NRPB, 2004). They concluded that the evidence for effects at lower fields, for example the evidence relating to childhood leukaemia, was not sufficient to justify setting exposure limits, but was sufficient to justify recommending that Government consider possible precautionary actions. Precautionary measures are considered in more detail below.

2.3.3 The EMF guidelines are documented in NPS EN-5 and practical details of their application are given in the Code of Practice ‘Power Lines: Demonstrating compliance with EMF public exposure guidelines – a voluntary Code of Practice’ published by the then DECC (DECC, 2012a). It is the electricity industry’s policy to comply with Government guidelines on EMF, and this Code of Practice forms an integral part of this policy.

2.3.4 The ICNIRP guidelines are set to limit the currents induced in the body by external exposure to EMF to below the threshold for those currents having any effects. These induced currents can be expressed as a current density, and this is the quantity on which the guidelines are based. Specifically, the ICNIRP guidelines recommend that the general public should not be exposed to levels of EMF able to cause a current density of more than 2 mA/m^2 within the human central nervous system, as shown in **Table 2.2**. This value of the induced current density is described as the ‘basic restriction’. The 1999 EU Recommendation uses the same basic restriction value as ICNIRP.

2.3.5 However, the basic restriction cannot be assessed directly, since *in vivo* measurements of current density are not practicable. Instead, the external fields that have to be applied to the body to produce this current density are calculated by numerical dosimetry. Those calculations are normally performed for uniform fields because this is the most onerous exposure condition; non-uniform fields produce lower induced currents.

2.3.6 Therefore, the ICNIRP guidelines also contain values of the external fields called ‘reference levels’. For the public, the reference level for electric fields is 5 kV/m, and the reference level for magnetic fields is 100 µT. The 1999 EU Recommendation uses the same reference level values as ICNIRP.

2.3.7 In the ICNIRP guidelines and the EU Recommendation, the limit that compliance should be achieved against is the basic restriction. The reference levels are not ‘limits’ but are ‘guides’ to when detailed investigation of compliance with the actual limit, the basic restriction, is required. If the reference level is not exceeded, the basic restriction cannot be exceeded, and no further investigation is needed. If the reference level is exceeded, the basic restriction may or may not be exceeded.

2.3.8 The Code of Practice on Compliance endorses this approach and gives the values of field corresponding to the basic restriction, stating:

‘*The 1998 ICNIRP exposure guidelines specify a basic restriction for the public which is that the induced current density in the central nervous system should not exceed 2 mA m^{-2}. The Health Protection Agency specify that this induced current density equates to uniform unperturbed fields of 360 µT for magnetic fields and 9.0 kV m-1 for electric fields. Where the field is not uniform, more detailed investigation is needed. Accordingly, these are the field levels with which overhead power lines (which produce essentially uniform fields near ground level) shall comply where necessary. For other equipment, such as underground cables, which produce non-uniform fields, the equivalent figures will never be lower but may be higher and will need establishing on a case-by-case basis in accordance with the procedures specified by HPA. Further explanation of basic restrictions, reference levels etc is given by the Health Protection Agency*.’

2.3.9 The Code of Practice on Compliance also specifies the land uses where exposure is deemed to be potentially for a significant period and consequently where the public guidelines apply. These land uses are, broadly, residential uses and schools.

2.3.10 Therefore, if the EMF produced by an item of equipment are lower than 9 kV/m and 360 µT, the fields corresponding to the ICNIRP basic restriction, the equipment is compliant with the ICNIRP guidelines and with PHE recommendations and Government policy. If the fields are greater than these values, the equipment is still compliant with Government policy if the land use falls outside the residential and other uses specified in the Code of Practice, and it may also still be compliant if the fields are non-uniform, which is the case from overhead lines and cables.

2.4 Occupational Exposure Limits

2.4.1 Occupational exposures to EMF in England, Wales and Scotland are controlled by the Control of Electromagnetic Fields at Work Regulations 2016 (CEMFAW Regulations, 2016), which implement a 2013 EU Directive (EC, 2013). For power frequencies, these are based on a more recent ICNIRP publication; it is ICNIRP 2010 rather than the ICNIRP 1998 that is the basis for the public exposure limits.

2.4.2 The CEMFAW Regulations are based on limiting the same underlying physical quantity, the current induced in the body by external exposure to EMF, as for public exposure, but the quantity is expressed in a different way, i.e. as the induced field rather than the induced current density, and different values are given for the head and for the rest of the body. This makes direct comparison between the occupational and public limits difficult, but the occupational limits are always higher than the public limits, typically by factors of two or more. Therefore, where the fields are compliant with the public limits, any occupational activities would also be compliant with the relevant occupational limits.

2.4.3 Employers have a duty of care to their employees. Employers discharge that duty of care in relation to EMF primarily by complying with the relevant exposure limits. As noted above, occupational exposure limits are higher than the public exposure limits which the Project would be compliant with in all areas accessible to the public and to employees of third parties. Therefore, all exposures from the Project would be compliant with the occupational exposure limits, and employers need take no additional action specific to the Project in order to comply. (The CEMFAW Regulations impose certain general duties on all employers which would apply regardless of the project).

2.4.4 In some areas of the Project, accessible only to NGET staff and to contractors of NGET but not to the public or to employees of third parties, e.g. inside substation perimeter fences, higher fields could be found that exceed the public exposure limits. NGET has its own procedures for ensuring that staff do not exceed the occupational exposure limits in these areas.

2.5 Potential Future Changes to Exposure Limits

2.5.1 As discussed, current Government policy for public exposure is based on the limits from the 1998 ICNIRP Guidelines, in the terms of the 1999 EU Recommendation. In 2010, ICNIRP published exposure guidelines (ICNIRP, 2010) for the range of frequencies including power frequencies. These 2010 guidelines do not apply in the UK for public exposure unless and until Government decides to adopt them. This is clear in the Code of Practice on Compliance:

'*Current Government policy on electric and magnetic fields (EMF) is that power lines should comply with the 1998 ICNIRP Guidelines on exposure to EMF in the terms of the 1999 EU Recommendation, and this Code of Practice implements this policy. As and when either ICNIRP issue new Guidelines or the EU revise the Recommendation, it will be for Government to consider those changes and to decide whether to adopt them or not. If Government policy changes, this Code of Practice will also be changed accordingly, but until that happens, the present policy as reflected in this Code of Practice remains in force*.' (Page 2)

2.5.2 In fact, ICNIRP's intention in its 2010 guidelines does not appear to be to make the guidelines either more or less onerous. It takes account of the most recent scientific developments but, having done so, the key scientific effects used as the basis for the guideline levels are unchanged and the safety margins applied are broadly unchanged. The detailed values derived as basic restrictions and reference levels have changed, but this is principally a consequence of a different method of derivation, without representing any change in scientific thinking about the appropriate level of protection. NGET's assessment is that the Project would in fact be compliant with those guidelines were they ever to be introduced.

2.5.3 More generally, if in the future there were other changes to the exposure limits or other policies in relation to EMF, NGET would have a duty to bring the whole transmission system, including the Project, into compliance with whatever new regime was introduced.

2.6 Scientific Evidence

2.6.1 As well as these established effects, over the past 30 years it has been suggested that exposure to power-frequency EMF of the magnitude encountered in the environment could be linked with various health problems, ranging from headaches to Alzheimer's disease and cancer. The most persistent of these suggestions relates to childhood leukaemia. Several epidemiological studies have suggested a statistical association between the incidence of childhood leukaemia and the proximity of homes to power transmission and distribution equipment or the power-frequency magnetic-field strengths found in the homes. However, no causal link has been established between cancer (or any other disease) and magnetic or electric fields and indeed there is no established mechanism by which these fields could cause or promote the disease.

2.6.2 The question of possible health effects of environmental power-frequency fields has been thoroughly reviewed in recent years by several national and international bodies. The principal such bodies that currently have authoritative relevance in the UK are the PHE (formerly the HPA, formerly the NRPB), the International Agency for Research on Cancer (IARC), the World Health Organisation (WHO), and the relevant official scientific advisory committee for the EU, until recently the Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR).

2.6.3 When assessing the scientific evidence on EMF, it is essential to consider all the evidence and to perform an overall assessment of the evidence, weighting each strand of evidence and each individual study as appropriate to its strengths and weaknesses. No single study can ever be conclusive (in either direction). Such reviews have been performed by the authoritative expert bodies, and it is those bodies that provide the most reliable conclusions, and on whose conclusions Government policy is based. The following are summaries of the conclusions of these relevant authoritative review bodies.

The National Radiological Protection Board/The Health Protection Agency/Public Health England

2.6.4 In 2004, the then NRPB published new ‘Advice on Limiting Exposure to Electromagnetic Fields (0-300 GHz)’ and accompanied it with a ‘Review of the Scientific Evidence for Limiting Exposure to Electromagnetic Fields (0-300 GHz)’ (NRPB, 2004b). The former summarises epidemiological evidence as follows (page 15):

54 ‘In the view of NRPB, the epidemiological evidence that time-weighted average exposure to power frequency magnetic fields above 0.4 μT is associated with a small absolute raised risk of leukaemia in children is, at present, an observation for which there is no sound scientific explanation. There is no clear evidence of a carcinogenic effect of ELF EMFs in adults and no plausible biological explanation of the association that can be obtained from experiments with animals or from cellular and molecular studies. Alternative explanations for this epidemiological association are possible: for example, potential bias in the selection of control children with whom leukaemia cases were in some studies and chance variations resulting from small numbers of individuals affected. Thus, any judgements developed on the assumption that the association is causal would be subject to a very high level of uncertainty.

55 ‘Studies of occupational exposure to ELF EMFs do not provide strong evidence of associations with neurodegenerative diseases…

56 ‘Studies of suicide and depressive illness have given inconsistent results in relation to ELF EMF exposure, and evidence for a link with cardiovascular disease is weak.

57 ‘The overall evidence from studies of maternal exposure to ELF EMFs in the workplace does not indicate an association with adverse pregnancy outcomes, while studies of maternal exposure in the home are difficult to interpret.

58 ‘Results from studies of male fertility and of birth outcome and childhood cancer in relation to parental occupational exposure to ELF EMFs have been inconsistent and unconvincing.

59 ‘All these conclusions are consistent with those of AGNIR (2001).[3]

60 ‘NRPB concludes that the results of epidemiological studies, taken individually or as collectively reviewed by expert groups, cannot currently be used as a basis for restrictions on exposure to EMFs.’

International Agency for Research on Cancer (IARC)

2.6.5 The IARC is an agency of the WHO. The IARC’s Unit of Carcinogen Identification and Evaluation has, since 1972, periodically published Monographs that assess the evidence as to whether various agents are carcinogenic and classify the agents accordingly. In June 2001, a Working Group met to consider static and ELF EMFs (IARC, 2002). Power-frequency magnetic fields were classified as “possibly carcinogenic”, based on “limited” evidence from humans concerning childhood leukaemia, “inadequate” evidence from humans concerning all other cancer types, and “inadequate” evidence from animals. Power-frequency electric fields were judged “not classifiable” on the basis of “inadequate” evidence from both humans and animals. These classifications are consistent with the conclusions reached by the NRPB.

World Health Organisation

2.6.6 The WHO published an Environmental Health Criteria Monograph in 2007 on ELF EMF, produced by a Task Group that met in 2005 (WHO, 2007). This concluded, in part:

‘*Chronic effects*

Scientific evidence suggesting that every-day, chronic low-intensity (above 0.3-0.4 μT) power-frequency magnetic field exposure poses a health risk is based on epidemiological studies demonstrating a consistent pattern of increased risk for childhood leukaemia. Uncertainties in the hazard assessment include the role that control selection bias and exposure misclassification might have on the observed relationship between magnetic fields and childhood leukaemia. In addition, virtually all of the laboratory evidence and the mechanistic evidence fail to support a relationship between low-level ELF magnetic fields and changes in biological function or disease status. Thus, on balance, the evidence is not strong enough to be considered causal, but sufficiently strong to remain a concern.

A number of other diseases have been investigated for possible association with ELF magnetic field exposure. These include cancers in both children and adults, depression,

[3] A reference to the previous NRPB review of the science by its Advisory Group on Non-Ionising Radiation.

suicide, reproductive dysfunction, developmental disorders, immunological modifications and neurological disease.

The scientific evidence supporting a linkage between ELF magnetic fields and any of these diseases is much weaker than for childhood leukaemia and in some cases (for example, for cardiovascular disease or breast cancer) the evidence is sufficient to give confidence that magnetic fields do not cause the disease.'

Scientific Committee on Emerging and Newly Identified Health Risks

2.6.7 The Scientific Committee on Emerging and Newly Identified Health Risks (SCENIHR) was, until 2016, the EU's designated source of expert scientific advice on EMF (along with other issues). In March 2015 SCENIHR published its most recent report on EMF, 'Potential Health Effects of Exposure to EMF' (SCENIHR, 2016). The section of the abstract concerned with power-frequency fields states:

'*Overall, existing studies do not provide convincing evidence for a causal relationship between ELF MF exposure and self-reported symptoms.*

The new epidemiological studies are consistent with earlier findings of an increased risk of childhood leukaemia with estimated daily average exposures above 0.3 to 0.4 µT. As stated in the previous Opinions, no mechanisms have been identified and no support is existing from experimental studies that could explain these findings, which, together with shortcomings of the epidemiological studies prevent a causal interpretation.

Studies investigating possible effects of ELF exposure on the power spectra of the waking EEG are too heterogeneous with regard to applied fields, duration of exposure, and number of considered leads, and statistical methods to draw a sound conclusion. The same is true for behavioural outcomes and cortical excitability.

Epidemiological studies do not provide convincing evidence of an increased risk of neurodegenerative diseases, including dementia, related to power frequency MF exposure. Furthermore, they show no evidence for adverse pregnancy outcomes in relation to ELF MF. The studies concerning childhood health outcomes in relation to maternal residential ELF MF exposure during pregnancy involve some methodological issues that need to be addressed. They suggest implausible effects and need to be replicated independently before they can be used for risk assessment.

Recent results do not show an effect of the ELF fields on the reproductive function in humans.'

Conclusions from Reviews of Science

2.6.8 There is some scientific evidence suggesting that electric or, particularly, magnetic fields may have health effects at levels below the current UK exposure guidelines. The authoritative classification is that of the WHO, in 2001 and reiterated in 2007, that power-frequency magnetic fields are 'possibly' a cause of cancer, specifically just of childhood leukaemia, with the evidence relating to any other health effect '*much weaker*'. The scientific evidence in these various reviews has been used to formulate the EMF precautionary policies that the Project have applied.

2.7 Precautionary Policies

2.7.1 The Government has addressed the uncertainty in the scientific evidence by adopting specified precautionary measures relating to various sources of EMF.

2.7.2 The only specific precautionary measure that relates to high-voltage power lines or any other high-voltage transmission equipment is the policy of ‘optimum phasing’. ‘Phasing’ is the order in which the conductors of the two circuits of double-circuit overhead lines are connected relative to each other, and certain phasing arrangements produce lower magnetic fields than others. This policy was introduced in the Written Ministerial Statement of 2009 in response to a recommendation from the Stakeholder Advisory Group on ELF EMF (SAGE) in its First Interim Assessment (SAGE, 2007). The details are given in a second Code of Practice, ‘Optimum Phasing of High Voltage Double-Circuit Power Lines’ (DECC, 2012b). This Code of Practice has been agreed by the Department of Energy and Climate Change with the Department of Health (now DESNZ), the Energy Networks Association, the Welsh Assembly, the Scottish Executive and Northern Ireland Executive. This Code applies in England, Wales, Scotland and Northern Ireland.

2.7.3 ‘Optimum phasing’ is the phasing that produces the lowest magnetic fields to the sides of the line, taking account of the likely current flows in the line. Paragraph 2.10.11 of NPS EN-5 mentions the February 2011 publication ‘Optimum Phasing of high voltage double-circuit Power Lines – A Voluntary Code of Practice’. This has now been replaced by a March 2012 edition with the same name and substantive content. The Code of Practice on Optimum Phasing states that new overhead power lines should have optimum phasing where reasonable. It explains that it will normally be possible to achieve optimum phasing simply by choosing how to order the connections at the end of the overhead line, but that if achieving optimum phasing would either require an extra structure or would conflict with the requirements for power system stability, this would normally be ‘unreasonable’ and is not required. The Code of Practice states that where necessary, ‘unreasonable’ will be interpreted in terms of the cost-benefit analysis presented in the SAGE First Interim Assessment.

2.7.4 All the relevant scientific evidence on EMF was considered fully in the process of establishing the exposure guidelines that apply in the UK. Those exposure guidelines together with the policy on optimum phasing (and other precautionary policies that relate only to low-voltage equipment) are considered by PHE and the Government to be the appropriate response to that evidence.

2.7.5 Government have specifically rejected the introduction of ‘corridors’ around power lines on EMF grounds, stating of this option in the Written Ministerial Statement:

‘*The Government therefore considers this additional option to be disproportionate in the light of the evidence base on the potential health risks arising from exposure to ELF/EMF and has no plans to take forward this action*.’

2.7.6 Having established that it is not Government policy to have restrictions on homes and schools near power lines, the Statement goes on to say (paragraph 38):

‘*It is central Government’s responsibility (rather than individual local authorities) to determine what national measures are necessary to protect public health*.’

2.7.7 This makes it clear that Government has not introduced any restrictions (beyond those that may be created by the EMF exposure limits and the safety clearance distances) on constructing new power lines close to existing properties on grounds of safety or health risks, and neither is it appropriate for individual local authorities to do so.

2.7.8 In relation to undergrounding, the NPS EN-5 states, in paragraph 2.10.12:

'*Undergrounding of a line would reduce the level of EMF experienced, but high magnetic field levels may still occur immediately above the cable. It is not the Government's policy that power lines should be undergrounded solely for the purpose of reducing exposure to EMF. Although there may be circumstances where the costs of undergrounding are justified for a particular development, this is unlikely to be on the basis of EMF exposure alone, for which there are likely to be more cost-efficient mitigation measures*.'

2.7.9 Therefore, the UK has a carefully thought-out set of policies for managing EMF, which includes both numerical exposure guidelines to protect against established, acute effects of EMF, and precautionary policies to provide appropriate protection against the possibility of chronic effects of EMF at lower levels, including, specifically, the possibility of a risk for childhood leukaemia. Compliance with these guidelines and policies means no additional measures or precautions are required .

2.8 Pregnant Women and Other Potentially Sensitive Subgroups

2.8.1 The scientific basis as given by the NRPB (now UKHSE) in their recommendation to Government for setting the public exposure limits lower than the occupational limits is not that the public in general need greater protection; it is that the public contains certain potentially sensitive subgroups, where EMF effects may occur at lower levels than in the population at large. One of those subgroups is pregnant women and the developing embryo (others include people with epilepsy or taking certain drugs).

2.8.2 Therefore, the potential extra sensitivity of pregnant women is already built into the public exposure limits. No additional protective measures are required.

2.9 Microshocks

2.9.1 Under high-voltage overhead lines, conducting objects may become electrically charged if they are isolated from earth. If this charged object is then touched by a person at a different electrical potential, charge is transferred between the person and the object. When the person is very close to the object but before touching it, the voltage difference between the person and the object can be sufficient to cause the air in the gap to break down, and a small spark discharge occurs. This can be perceived by the person and is known as a microshock.

2.9.2 The size of a microshock depends on the size of the electric field, the sizes of the objects concerned, how well grounded or insulated they are, meteorological conditions, and the sensitivity of the skin. All of these factors determine the severity of the perception which can range from barely perceptible through to annoyance and in some rare circumstances even pain. Microshocks are similar to the static shocks that can occur by, for example, walking across a nylon carpet in dry weather. Microshocks have no known long-term health effects and any sensation is normally confined to the momentary spark discharge as contact is made or broken.

2.9.3 In a 2005 Information Sheet (HPA, 2005), HPA (now UKHSA) states:

'*…on the basis of the available evidence, the direct effects of microshocks on the body are not considered capable of producing lasting harm. The response to some extent will depend on the sensitivity of the individual. Although the possibility of microshocks* *cannot be ruled out, in field strengths up to about 5 kV m-1 they are unlikely to be painful to the majority of people*.'

2.9.4 Microshocks are indirect effects and as such are not directly covered by the quantitative exposure limit values that protect against direct effects of electric fields. The ICNIRP guidelines do have a cautionary reference level of 5kV/m but limiting exposure to 5kV/m is not considered the most appropriate way of dealing with microshocks. Reducing electric fields by changes to the design is possible, but will usually result in taller pylons, increasing the visual impact of the overhead line. As there is no threshold of electric field for preventing microshocks, the benefit of reducing the field to 5kV/m may be marginal. Rather than introducing an arbitrary limit the Code of Practice on Compliance states:

'...*there is a suite of measures that may be called upon in particular situations, including provision of information, earthing, and screening, alongside limiting the field which should be used to reduce the risk to the public of indirect effects. In some situations, there may be no reasonable way of eliminating indirect effects, for instance where erecting screening would obstruct the intended use of the land*.'

2.9.5 A separate Code of Practice on Microshocks, developed jointly by Industry and the then DECC, has been adopted (DECC, 2013). This follows the principles for managing microshocks quoted above but contains more details on the practical measures which can be taken. This Code of Practice has been agreed by the Department of Energy and Climate Change (now DESNZ), the Department of Health, the Energy Networks Association, the Welsh Government, the Scottish Government, and the Northern Ireland Executive. This Code of Practice applies in England, Wales, Scotland, and Northern Ireland.

2.9.6 Some areas under the existing 4ZC overhead line have electric fields which could potentially cause microshocks to occur, if the particular set of circumstances required exists. This will be the case after the overhead line is uprating. NGET will ensure that if microshocks are reported these will be investigated and managed in accordance with the provisions of the Code of Practice on Microshocks.

2.9.7 This is only applicable to overhead lines as underground cables produce no external electric fields.

2.10 Active Implantable Medical Devices

2.10.1 EMF can affect AIMDs, such as pacemakers, insulin pumps and Implanted Cardiac Defibrillators (ICDs), if the external field strength exceeds the immunity of the device. EMF can induce voltages in the body which, if high enough, can potentially exceed the immunity of the device and temporarily affect its operation.

2.10.2 All modern AIMDs are expected to be immune from interference from electric and magnetic EMF up to the reference levels for public exposure of the 1999 EU Recommendation where the AIMD has been implanted and programmed in a standard manner. The reference levels at 50 Hz are 100 μT for magnetic fields and 5kV/m for electric fields. However, many AIMDs will have considerably higher immunity to external EMF than the minimum requirements.

2.10.3 Specifically, the Active Implantable Medical Devices Directive (90/385/EEC) (EC, 1990) includes the following provision:

‘*Devices must be designed and manufactured in such a way as to remove or minimize as far as possible: …risks connected with reasonably foreseeable environmental conditions such as magnetic fields, external electrical influences*…’

2.10.4 Neither NGET nor the Medicines and Healthcare Products Regulatory Agency (MHRA) are aware of any instance of a patient with a modern, correctly fitted AIMD experiencing any interference from the electricity transmission system.

2.10.5 The Project would be capable of producing EMF which, while still compliant with the public exposure limits, are in excess of the reference levels for public exposure. Therefore, in theory, some interference of EMF with AIMDs could possibly occur. However, some existing NGET overhead lines and underground cables are likewise theoretically capable of producing fields that exceed the public reference levels, and as noted above neither the MHRA or NGET is aware of any instance of electricity transmission infrastructure interfering with a correctly fitted modern AIMD such as a pacemaker or ICD. The risk of any interference occurring is not significant in practice for the following reasons:

1) While manufacturers have to ensure that AIMDs are immune up to the reference levels for public exposure, many modern AIMDs will be immune to EMF considerably in excess of these levels.

2) The maximum EMF from an overhead line or underground cable as calculated for assessing compliance with the exposure limits represent a worst-case scenario, chosen to demonstrate that exceeding the exposure guidelines is not possible. However, typically, the overhead line or underground cable would produce EMF lower than these levels for two reasons: the circuits are unlikely to operate at the maximum rating routinely, and a typical current on a day-to-day basis would be around 50% or less of this; and for overhead lines typically the conductors would be higher than the minimum design clearance used for assessing compliance, reducing the EMF at ground level, with the minimum clearance found only in a limited area towards the middle of certain spans.

2.10.6 Thus, there is considerable confidence in saying that, based on the absence of reported incidents and on the typical EMF exposures that would occur daily, transmission assets do not appear to interfere with AMIDs in practice. The risk of any interference occurring is assessed as being negligible and does not constitute a significant effect.

2.10.7 This is supported in NPS EN-5, at paragraph 2.10.7, which states that:

‘*The Department of Health’s Medicines and Healthcare Products Regulatory Agency (MHRA) does not consider that transmission line EMFs constitute a significant hazard to the operation of pacemakers.*’

2.11 Farming and Flora

2.11.1 NPS EN-5 provides guidance on the likelihood of impacts on crops, farm animals and the natural ecosystem.

2.11.2 Paragraph 2.10.8 of NPS EN-5 states:

‘*There is little evidence that exposure of crops, farm animals or natural ecosystems to transmission line EMFs has any agriculturally significant consequences.*’

2.11.3 Given this statement, EMF from the Project will not have a significant effect on crops, farm animals or natural ecosystems. Regulatory bodies have raised concern around the impact of EMF on species in the freshwater environment, which has been assessment within this report.

2.12 Policy Framework for the Protection of Aquatic Life

2.12.1 National Policy Statement EN-3[4] for renewable energy infrastructure provides a framework for the assessment of nationally significant renewable energy infrastructure. Although not directly applicable to the is project, and in the absences of applicable policy, NPS EN-3 does provide provisions for the assessment of marine life that may be applied to onshore river crossings. NPS EN-3 does not provide limits or guidelines for EMF exposure in the marine environment but requires the potential impacts on marine life to be assessed.

2.12.2 The key provision in Paragraph 2.8.310 states:

"The use of external cable protection has been suggested as a mitigation for EMF (by increasing the distance between fish species and individual cables). However, the Secretary of State should also consider any negative impacts from external cable protection on benthic habitats, and a balance between protection of various receptors must be made, with all mitigation and alternatives reviewed."

2.12.3 The mitigation methods suggested in NPS EN-3 include the use of armoured cables for interarray and export cables. Armoured cables are proposed for the Project. Burial depth can also reduce the magnetic fields at distance from the cables.

2.12.4 This report will provide the EMF details and the potential impacts on fish and invertebrates located within 5 kilometres (km) of the proposed river crossing.

2.13 Effects on Magnetic Compasses

2.13.1 Magnetic compasses, whether traditional magnetic needle designs or alternatives such as fluxgate magnetometers, operate from the Earth's magnetic field, and are susceptible to any perturbation to the Earth's magnetic field by other sources.

2.13.2 This is a potential issue with direct current (DC) conductors or cables, which produce a static magnetic field that perturbs the geomagnetic field. However, there are no DC cables proposed for use in the Project and no DC fields would be produced.

2.13.3 The AC magnetic fields would also not add or subtract to the Earths Geomagnetic field or change its direction, which may be an important consideration to magnetoreceptive species.

2.13.4 The magnetic fields produced by this Project would be 50 Hz fields. These oscillate far too quickly (50 times per second) for a magnetic compass needle to be affected. Fluxgate magnetometers are capable of responding to 50 Hz fields, but, when used as a compass, always have filtering to eliminate unwanted frequencies including 50 Hz. They can cease working correctly if saturated by a high-enough field, but the field required is orders of magnitude higher than would be produced by the Project.

2.13.5 Therefore, this Project would have no significant effect on magnetic compasses.

[4] Department of Energy and Climate Change. National Policy Statement for Renewable Energy Structure (EN-3). London: The Stationary Office, 2024

2.14 The Electricity Safety, Quality and Continuity Regulations 2002

2.14.1 NPS EN-5 (paragraph 2.10.10) refers to the Electricity Safety, Quality and Continuity Regulations 2002 which set out the minimum height, position, insulation and protection specifications at which conductors can be strung between pylons to ensure safe clearance of objects. Regulation 17(2) and Schedule 2 require the clearances set out in **Table 2.3**.

Table 2.3 – The Electricity Safety, Quality and Continuity Regulations 2002 – Minimum Height above Ground of Overhead Lines

Nominal Voltages	Over Roads (m)	Other Locations (m)
Exceeding 66 kV but not exceeding 132 kV	6.7	6.7
Exceeding 132 kV but not exceeding 275 kV	7.0	7.0
Exceeding 275 kV but not exceeding 400 kV	7.3	7.3

2.14.2 The minimum conductor clearance information for the Project is provided in **Section 6.2** which demonstrates compliance with these requirements.

2.15 Summary of Policy and Legislation

2.15.1 The EMF policies applying to high-voltage electricity equipment comprise compliance with the exposure guidelines, as set out in the Code of Practice on Compliance; the policy on optimum phasing, as set out in the Code of Practice on Optimum Phasing; and the policy on indirect effects expressed in the Code of Practice on Microshocks; but no other policies.

2.15.2 NPS EN-5 explicitly applies these policies to applications for consent for new electricity connections such as the Project. If a proposed overhead line or, where relevant, underground cable, substation etc. complies with these, there are no grounds in relation to EMF not to grant consent.

2.15.3 No guidance on EMF in aquatic environments is provided in NPS EN-5 except a broad statement covering farming, flora and fauna. NPS EN-3 covering renewable offshore assets provides provisions to assess the impact of EMF in the marine environment that will be applied in this assessment.

3. Electromagnetic Compatibility

3.1 Electromagnetic Compatibility

3.1.1 Electromagnetic compatibility (EMC) is controlled by The Control of Electromagnetic Compatibility Regulations, 2016 which are based on the EU Directive 2014/30/EU (the EMC Directive) These Regulations are statutory under UK law.

3.1.2 The requirements of the EMC Regulations are that the electromagnetic disturbance that an apparatus generates should not exceed a level allowing radio and telecommunication equipment and other apparatus to operate as intended; and that the apparatus itself has an adequate level of intrinsic immunity to electromagnetic disturbance to enable it to operate as intended.

3.1.3 Permanent, fixed infrastructure of the type owned and operated by NGET is covered by specific provisions in the EMC Directive relating to 'fixed installations'.

3.1.4 Article 6 of the 2014 Directive requires conformity with Annex 1, Part 2 of that Directive, which in turn requires that '*A fixed installation shall be installed applying good engineering practices*…' in order to avoid EMC problems.

3.1.5 The main potential source of interference from transmission systems such as the Project arises from radio frequency (RF) emissions caused by corona discharge from overhead lines and substations (underground cables do not in general produce any significant radio-frequency emissions). Corona discharge results from the high voltages on the surface of conductors, particularly in wet conditions where water droplets can concentrate the electric field; it is recognisable by the characteristic crackling sound. RF emissions and corona levels are limited by designing to NGET's technical specifications which include BS 5049-3 (BSI, 1994), along with other equipment-specific standards such as BS EN 60437 (BSI, 1998) for the insulators on the pylons. Thus, NGET's Transmission System applies good engineering practices and meets the essential requirements detailed in Annex 1 of the EMC Directive.

3.1.6 This was initially documented and certified under the provisions of the EMC Directive then in force, the 1989 Directive 89/336/EEC, by creating a Technical Construction File (TCF) for the NGET transmission system. The TCF is based on a combination of extensive on-site testing (overhead lines and substations) and examination of NGET's technical specifications, policies and standards to ensure that RF noise and corona are adequately addressed. The on-site surveys showed that there were no significant emission problems to address; and equipment technical specifications and policies ensured equipment was designed in accordance with British Standards to limit RF noise and corona. Using the rationale of the TCF, it was determined that the NGET system meets the essential requirements of the EMC Directive. A Certificate of Conformity was issued by Hursley EMC Services (the Competent Body) and is provided at Appendix 2.

3.1.7 The subsequent EMC Directive, 2004/108/EC, and the current EMC Directive 2014/30/EU, no longer use the terminology of a TCF and Certification. However, the essential requirements of the Directives have not changed, and the content of the TCF remains a valid method of documenting compliance with the EMC Directive.

3.1.8 The Project would contain electrical equipment that is the same as or similar to that tested by on-site measurements documented in the TCF and would also be designed to the same technical specifications.

3.1.9 Occasionally, radio interference is reported from equipment on the NGET system. The most likely cause of such interference is equipment that has been damaged or degraded while in operation. This sort of occurrence is normally addressed during routine maintenance. Interference reports are extremely rare, but where interference is reported it will be investigated and remedial action will be where it is appropriate to do so.

3.1.10 Given that the provisions of the current EMC Directive are met through using good engineering practice and applying the relevant technical standards, and that the EMC performance of this system has been certificated as compliant by a Competent Body following appropriate on-site testing, the Project would present no issues with TV or radio interference under normal operating conditions.

4. Assessment Methodology

4.1 Methodology

4.1.1 The assessment considers the EMF produced from the electricity assets associated with the Project. Each asset is assessed including the cumulative impacts on existing assets.

4.2 Study Area

4.2.1 The EMF produced by the electrical assets of the Project would have a given magnitude at a given distance from the asset. Therefore, the study area of the assessment includes all areas around the assets where the EMF could potentially be significant, such that the assessment is asset-specific rather than location-specific.

4.3 Predicted Field Levels

4.3.1 The magnetic field produced by a current in an individual conductor falls with distance from the conductor. Where there is more than one current forming part of one or more electrical circuits, there is also partial cancellation between the magnetic fields produced by the individual currents, and that cancellation generally becomes more complete as the distance increases. Overall, the magnetic field is highest at the point of closest approach to the conductors and falls rapidly with distance. Similarly, there is partial cancellation between the electric fields produced by the voltages on individual conductors, and the electric field is usually highest at the point of closest approach to the conductors and falls rapidly with distance.

4.3.2 For sources of field with a simple, defined geometry, such as overhead lines or underground cables, calculations are the best way of assessing fields and are acceptably accurate. The calculations of fields for the Project presented in **Section 6** follow the provisions specified in the Code of Practice on Compliance and were performed using specialised computer software that has been validated against direct measurement of EMF from overhead lines and cables (Swanson, 1995).

4.3.3 By contrast, due to the complex physical arrangement of electrical equipment, the EMF produced by an electrical substation or sealing-end compound are not readily calculable. However, the highest field levels at and outside the perimeter of a substation are usually those produced by the overhead lines entering the substation. The fields produced by equipment within the substation are generally smaller and decrease with distance more quickly than fields generated by overhead lines.

4.3.4 Since field strengths are constantly varying, they are usually described by reference to an averaging calculation known as the ‘root mean square’ or RMS. Future mention of power-frequency field strengths in this chapter refer to the RMS amplitude of the power-frequency modulation of the total field, which is the conventional scientific way of expressing these quantities.

4.3.5 To assess compliance with exposure limits, the Code of Practice on Compliance specifies that the maximum fields the overhead line is capable of producing should be calculated using the following conditions:

- electric fields: for nominal voltage and design minimum clearance;
- magnetic fields: for the highest rating that can be applied continuously in an intact system (i.e., including ratings which apply only in cold weather, but not including short-term ratings or ratings which apply only for the duration of a fault elsewhere in the electricity system) and design minimum clearance; and
- electric and magnetic fields: for 1 m above ground level, of the unperturbed field, taking account of the correct wire type and bundle size, taking account of the basic pylon geometry for the design of overhead line in question, but ignoring variations in conductor spacing at angle pylons etc., of the 50 Hz component ignoring harmonics, ignoring zero-sequence currents and voltages and currents induced in the ground or earth wire, and using the infinite-straight-line approximation.

4.3.6 The same provisions apply, where relevant, to assessing the fields from underground cables.

4.3.7 Therefore, the calculations for the Project were performed using worst-case conditions including minimum conductor clearances for overhead lines. The circuits are unlikely to operate at this maximum rating routinely, resulting in lower typical magnetic fields on a day-to-day basis.

4.3.8 Electric fields (but not magnetic fields) are readily perturbed by conducting objects, including, for example, buildings, fences and trees. The fields calculated here are unperturbed fields, as specified by the Code of Practice on Compliance. These give a valid indication of the size of any electric-field related phenomena over the area concerned, but the local value, close to a source of perturbation, would vary. In practice, perturbations within or to the sides of buildings and other fixed objects usually act so as to reduce, not increase, the electric field. Fields inside any buildings are generally much reduced. However, the Code of Practice specifies that it is acceptable to demonstrate compliance by reference to the unperturbed fields.

4.3.9 As an alternative to calculations, the Code of Practice on Compliance specifies that there are certain classes of equipment which inherently produce fields below the guideline levels and can be assumed to comply without producing case-by-case specific assessments of the field. Substations are one such type of equipment:

‘*The Energy Networks Association will maintain a publicly-available list on its website of types of equipment where the design is such that it is not capable of exceeding the ICNIRP exposure guidelines, with evidence as to why this is the case. Such types of equipment are likely to include:*

- *overhead power lines at voltages up to and including 132 kV*
- *underground cables at voltages up to and including 132 kV*
- *substations at and beyond the publicly accessible perimeter*

Compliance with exposure guidelines for such equipment will be assumed unless evidence is brought to the contrary in specific cases.’ (Page 4)

4.3.10 The Energy Networks Association’s publicly available list can be found on the NGET EMF website (http://www.emfs.info/compliance/public/). This confirms that substations (that do not contain a static var compensator) and CSE compounds, such as those proposed or that would be extended by the Project, are within the class of equipment which are regarded as inherently compliant without the need for case-by-case specific assessments.

4.4 Combining Fields from Different Sources

4.4.1 When more than one source of EMF is present, such as two different overhead lines or an overhead line and an underground cable, the field from each source is calculated separately, and it is then necessary to combine the two individual fields to obtain the resulting field.

4.4.2 Because of the physical properties of EMF, specifically that they are what is known as ‘vectors’ not ‘scalars’, (i.e., direction as well as magnitude is relevant), the magnitudes of the EMFs from two different sources do not simply add together. The addition of EMF from different sources is complex, but has the general effect that, when the field from one source is larger than the other, the larger field dominates, with the smaller field making only a small difference to the resulting field.

4.5 Significance Evaluation

4.5.1 The Project is assessed as having a significant effect if non-compliance with the EMF exposure limits was demonstrated, using the principles set out in the Code of Practice on Compliance. Conversely, as specified in NPS EN-5, if the Project complies with the exposure limits and with the policies on phasing and microshocks, EMF effects would be assessed as not significant, and no mitigation would be necessary. Compliance with these policies is documented in Chapter 6.

4.5.2 For the aquatic environments, total field values are produced and compared to the requirements of NPS EN-3 and used to assess potential impacts to freshwater life with reference to findings from relevant research. The impact of EMF on the freshwater environment is addressed in **Section 7** of this report.

5. Baseline Environment

5.1.1 The Project would be located within a mixture of primarily rural and semi-rural areas, which accommodate existing electrical assets, including the existing 4ZC overhead line that currently operates with one circuit at 400 kV and the other mainly at 132 kV. The existing transmission circuits cross the Afon Glaslyn via underground cables, consisting of two circuits, one operating at 400 kV the other 132 kV. These existing transmission assets are a source of background EMF.

5.1.2 All equipment that generates, distributes or uses electricity produces EMF. The UK power frequency is 50 Hz, which is the principal frequency of the EMF produced.

5.1.3 Electric and magnetic fields both occur naturally. The earth's magnetic field, which is caused mainly by currents circulating in the outer layer of the earth's core, is roughly 50 μT in the UK. This field may be distorted locally by ferrous minerals or by steelwork such as in buildings. At the earth's surface, there is also a natural electric field, created by electric charges high up in the ionosphere, of about 100 V/m in fine weather.

5.1.4 As detailed earlier in this report, the earth's natural fields are static, and the power system produces alternating fields. In homes in the UK that are not close to high-voltage overhead lines or underground cables, the average "background" power-frequency magnetic field (the field existing over the whole volume of the house) ranges typically from 0.01–0.2 μT with an average of approximately 0.05 μT, normally arising from currents in the low-voltage distribution circuits that supply electricity to homes. The highest magnetic fields to which most people are exposed arise close to domestic appliances that incorporate motors and transformers. For example, close to the surface, fields can be 2,000 μT for electric razors and hair dryers, 800 μT for vacuum cleaners, and 50 μT for washing machines. The electric field in most homes is in the range 1–20 V/m, rising to a few hundred V/m close to appliances.

5.1.5 The Project is to upgrade existing Transmission assets which currently produce electric and magnetic fields. There are also overhead lines operated by the Distribution Network Operator (DNO) at 132 kV and lower voltages in the area which produce EMF. The fields produced by these specific lines depend on the loads carried and will be different for different lines and at different times but would all be within the exposure limits.

5.1.6 Magnetic and electric fields for the existing 4ZC route under maximum continuous loads, average and minimum conductor clearances for the route are shown in **Figure 5.1** and **Figure 5.2**. The Distribution Network Operator overhead lines in the area are represented by a steel pylon 132 kV design and wood-pole distribution lines are represented by a 33 kV design.

5.1.7 In addition to the overhead line, there are two existing circuits which cross under the Afon Glaslyn operating at 400 kV and 132 kV. These are a source of magnetic fields and the maximum and typical magnetic fields are presented in **Figure 5.3**.

5.1.8 These circuits operate now and will continue to operate using AC technology and will not add or subtract to these natural DC fields.

Figure 5.1 – Magnetic Fields from Existing Overhead Lines

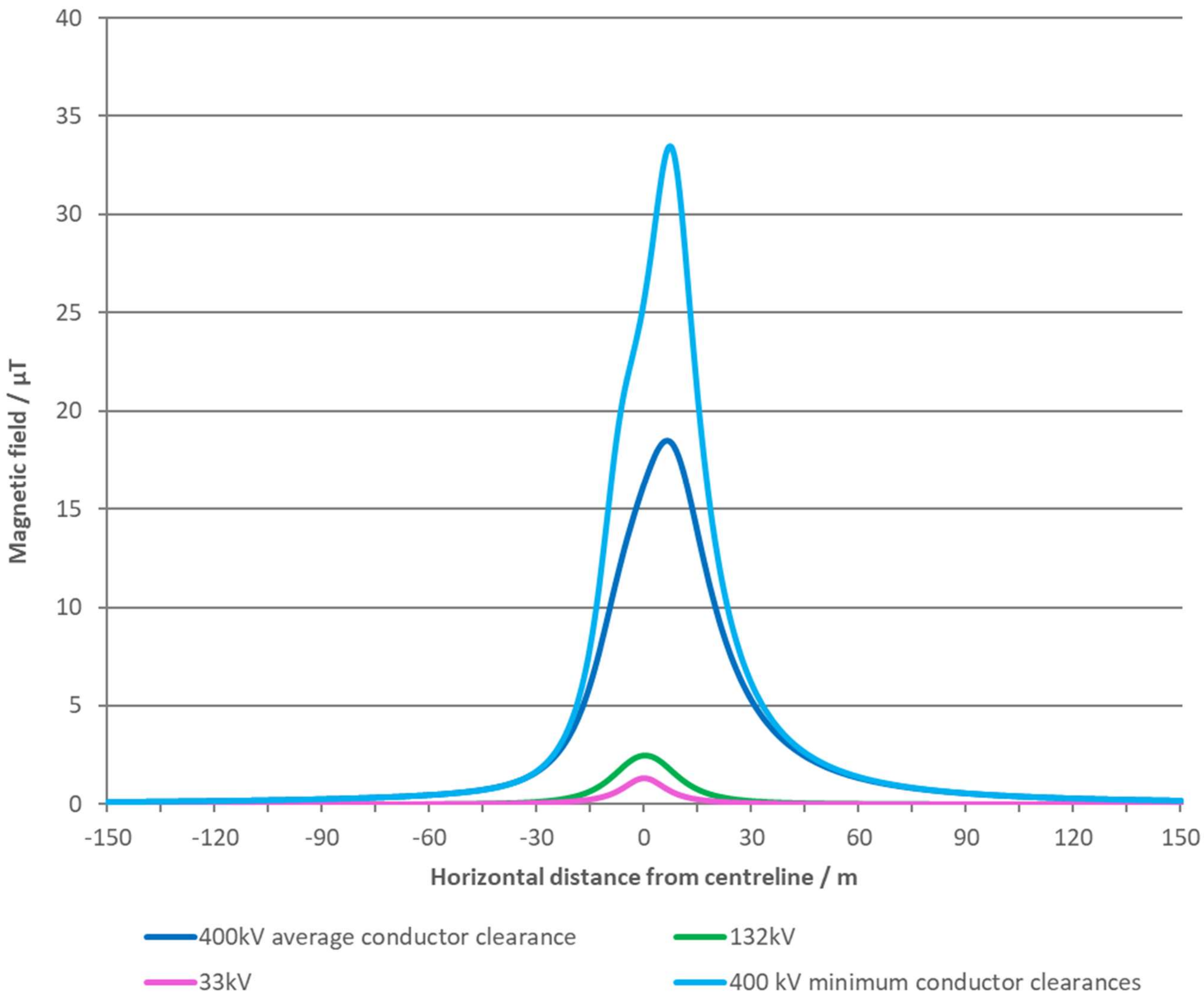


Figure 5.2 – Electric Fields from Existing Overhead Lines

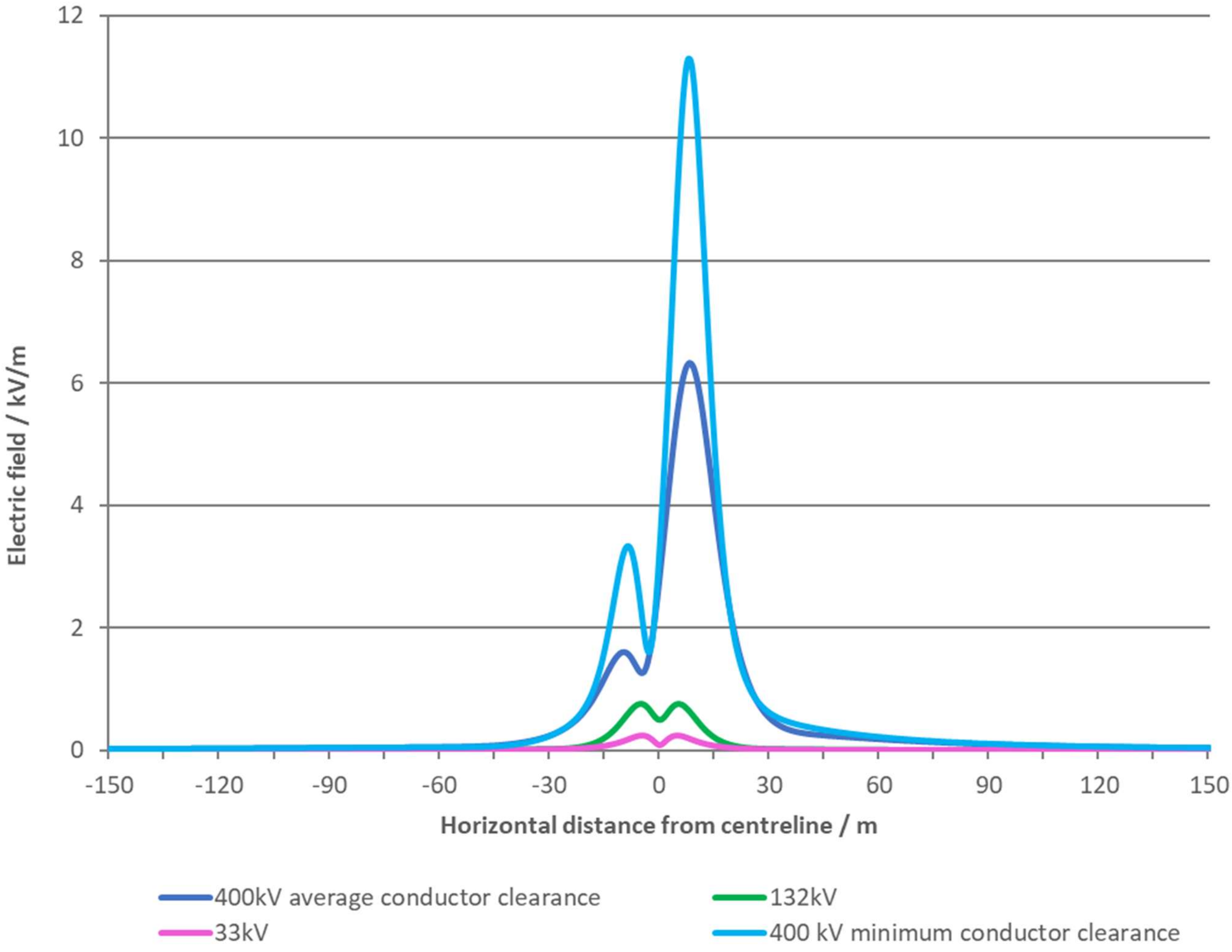
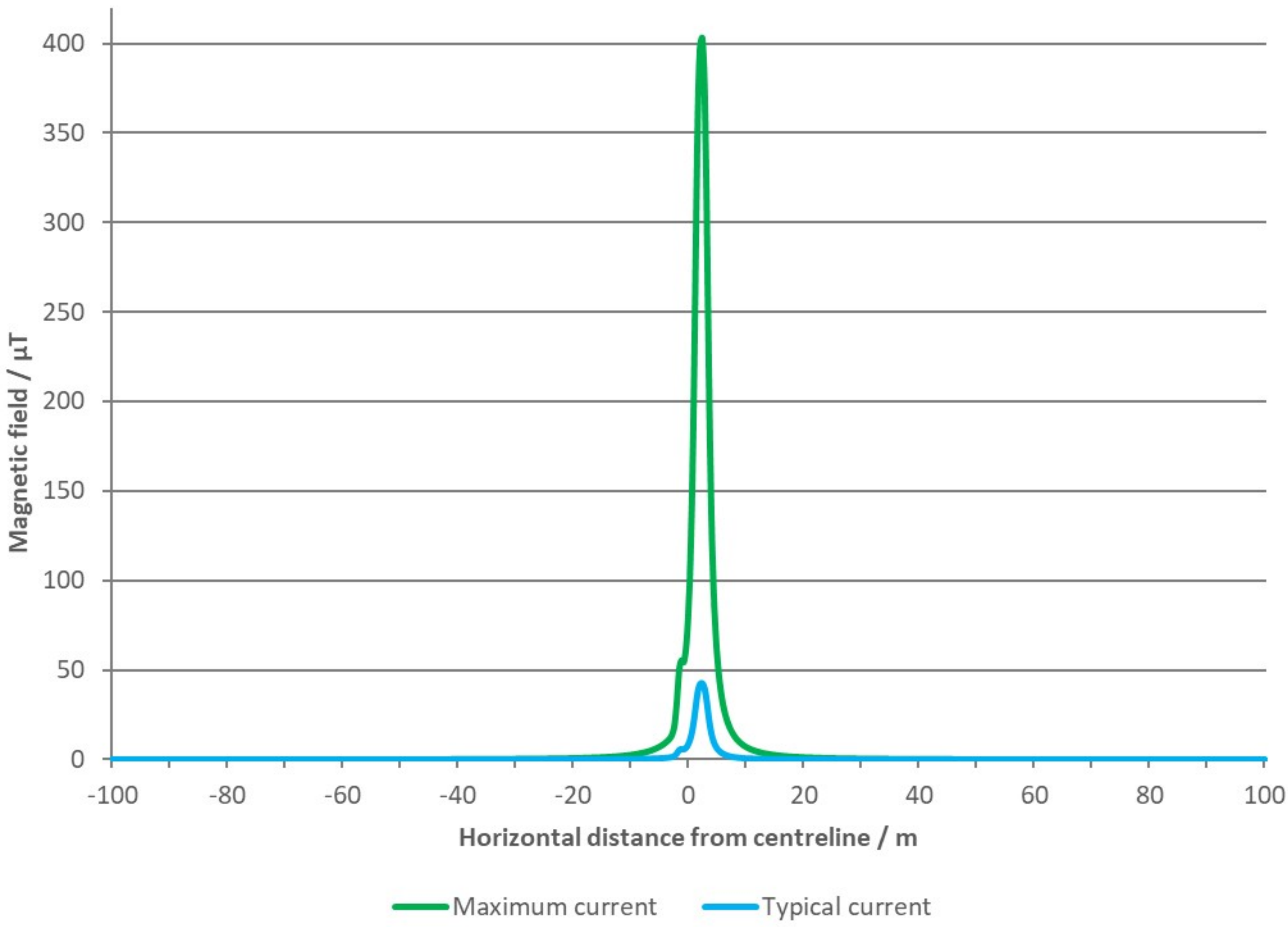


Figure 5.3 – Maximum and Typical Magnetic Fields from Existing Underground Cables which Cross Afon Glaslyn



6. Demonstrating Compliance with EMF Requirements of NPS EN-5

6.1 Construction Effects

6.1.1 During construction and prior to energisation, transmission equipment would not produce any EMF as no voltage is applied or current flowing in the equipment. Therefore, construction effects are not considered further.

6.2 Operational Effects – Uprating of Existing 4ZC Overhead Line

EMF Assessment of the Uprated 400 kV Overhead Line Route.

6.2.1 The existing 4ZC overhead line route between Pentir and Trawsfynydd has one circuit operating at 400 kV and one circuit operating at 132 kV. The Proposed Project would uprate the existing 132 kV circuit to 400 kV, making the 4ZC route a double circuit 400 kV line. In addition to the voltage uprating of the 132 kV circuit, between spans 5 (Trawsfynydd) to 70 (south of Bryncir village) conductors will be changed from Quad Zebra to Twin Araucaria. The remaining spans will all be Quad Zebra conductors. The conductors on the existing overhead line between spans 70 to 157 (Pentir) will remain unchanged along with the ground clearances. The average clearance for the entire 400 kV 4ZC route is 11.7 m.

6.2.2 Calculations were performed at the pre-fault continuous rating which is 2332 Mega Volt Ampere (MVA) per circuit and nominal voltage (400 kV) at 1 m above ground. Calculations were performed using Quad Zebra conductors on both circuits and twin Araucaria on both circuits to represent the entire overhead line route from Pentir to Trawsfynydd. The results of these calculations are illustrated in **Figure 6.1 and 6.2** (for magnetic fields) and **Figure 6.3 and 6.4** (for electric fields) for both the lowest and average clearance of the conductors along the route operating at 400 kV. The highest calculated electric and magnetic fields produced by the overhead line using the worst-case conditions are 10.1 kV/m and 78.9 μT and for average clearance was 5.1 kV/m and 44.4 μT.

Figure 6.1 – Maximum Electric Fields from Uprated 400 kV Overhead Line with Twin Araucaria Conductors

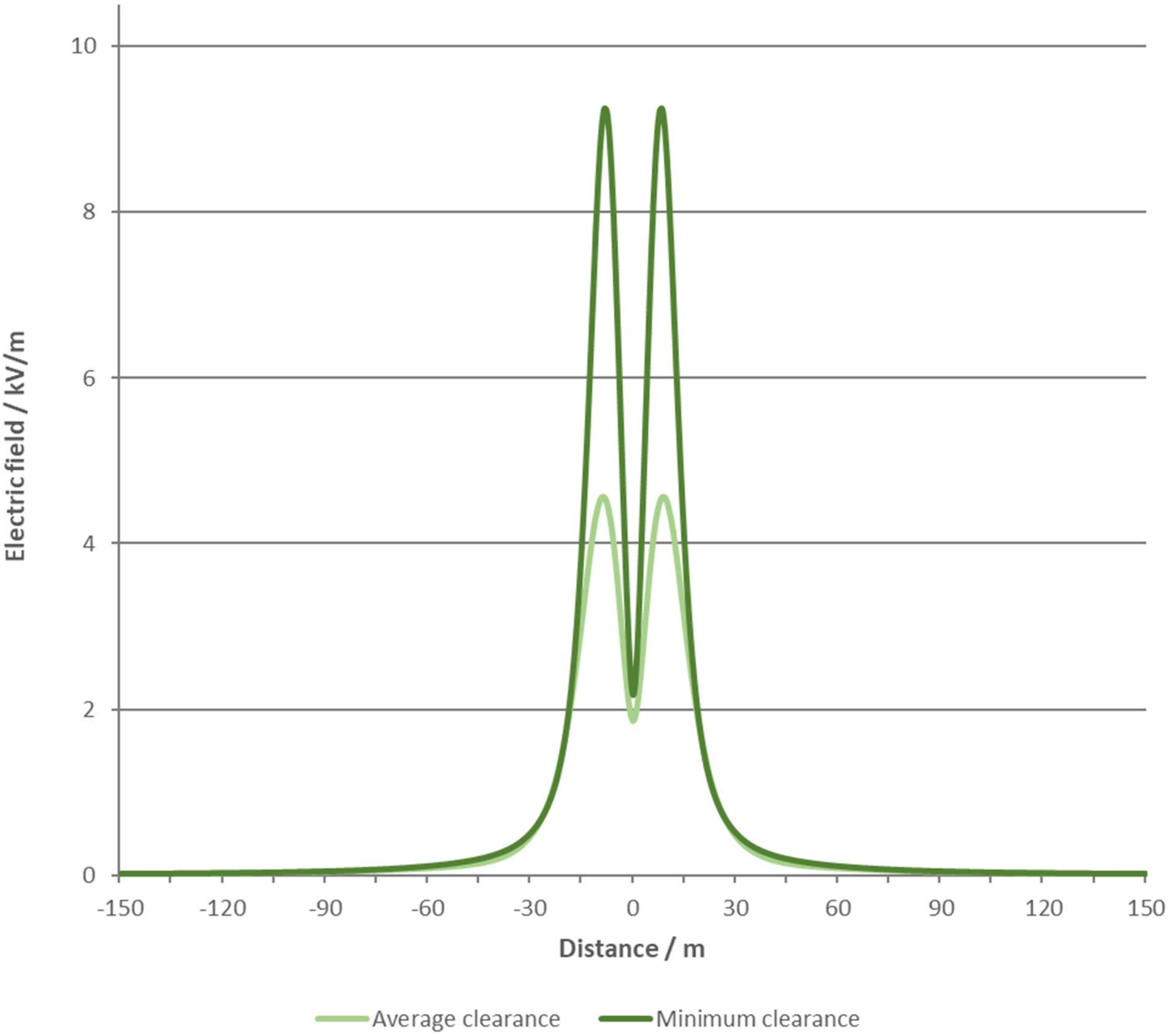


Figure 6.2 – Maximum Electric Fields from Uprated 400 kV Overhead Line with Quad Zebra Conductors

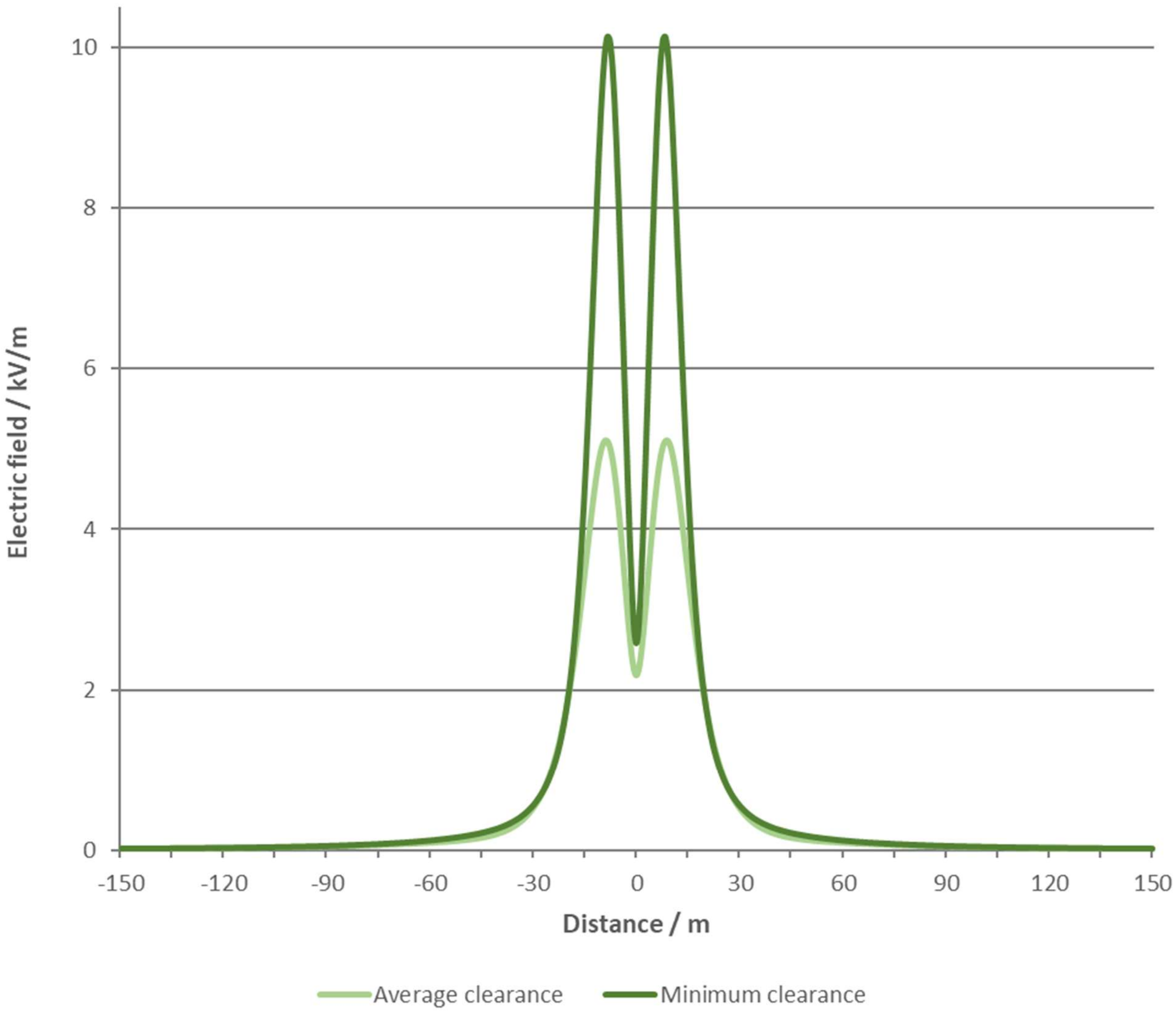


Figure 6.3 – Maximum Magnetic Fields from Uprated 400 kV Overhead Line with Twin Araucaria Conductors

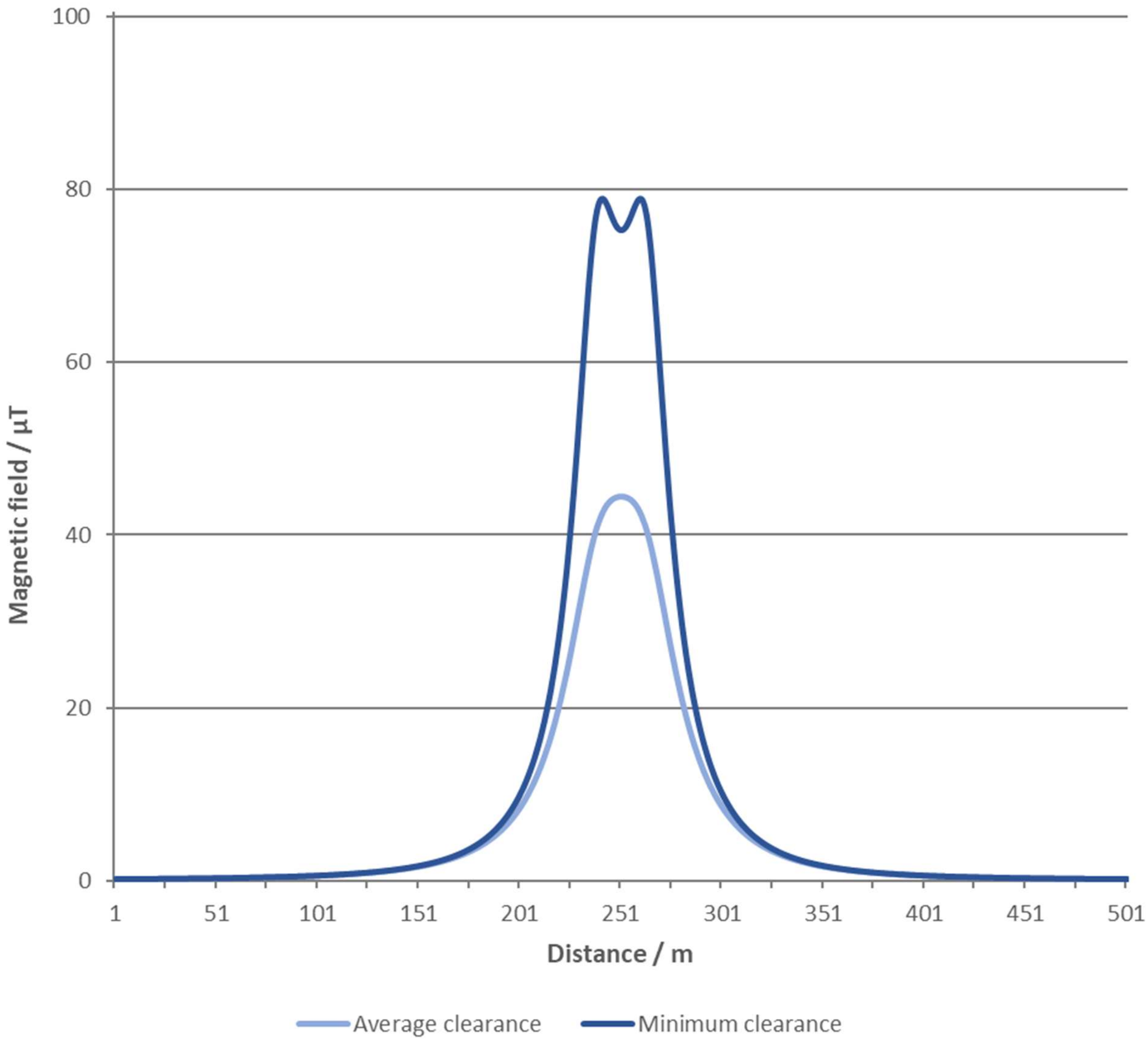
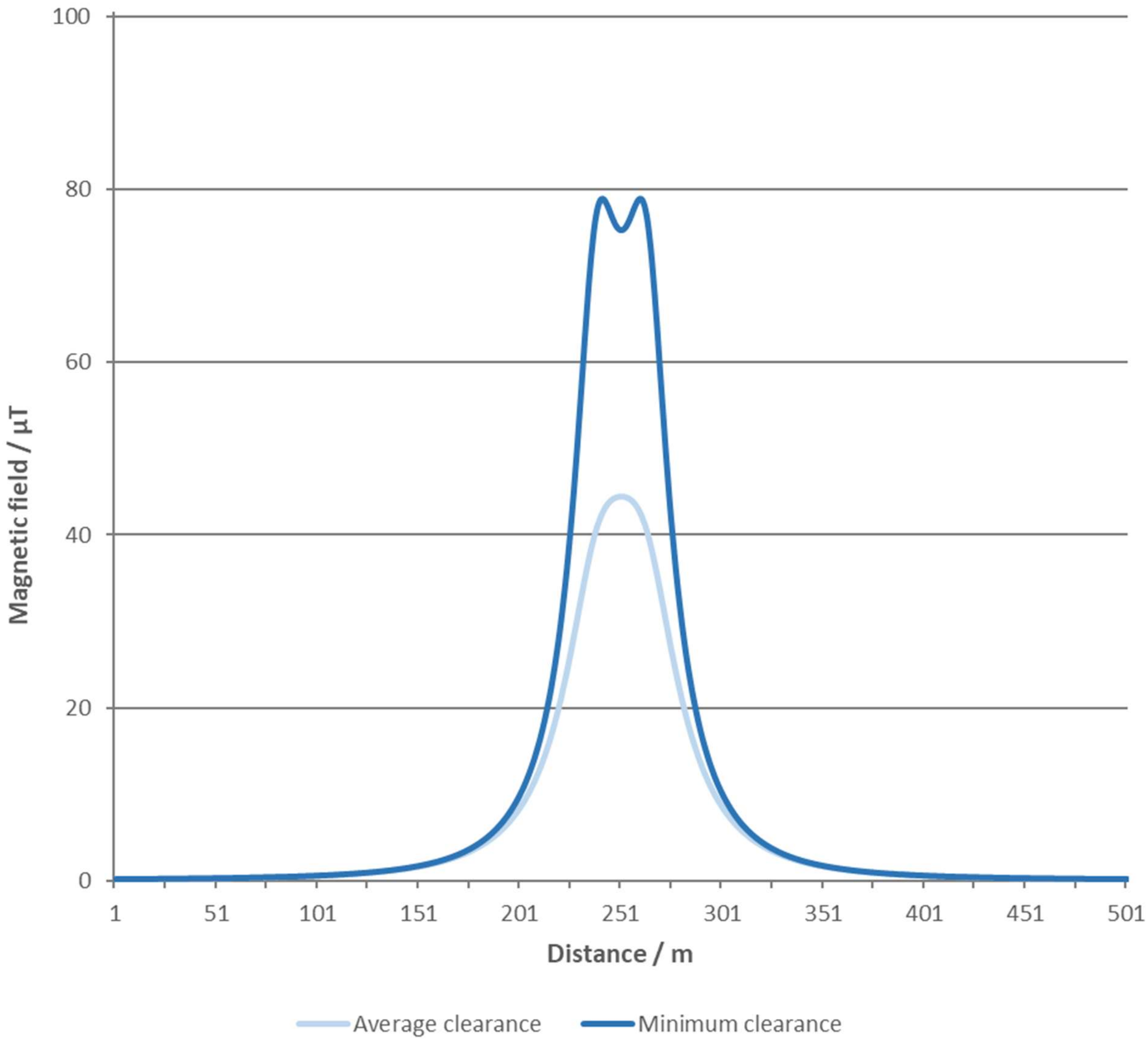


Figure 6.4 – Maximum Magnetic Fields from Uprated 400 kV Overhead Line with Quad Zebra Conductors



Compliance with Policy on Phasing

6.2.3 The existing 400 kV overhead line was designed with transposed phasing meaning that it is optimally phased as set out in the Code of Practice on Optimum Phasing. The two circuits are arranged to produce the greatest degree of cancellation between the magnetic fields produced by the two circuits and hence the lowest resultant magnetic field to the sides of the line. No changes to the phasing are proposed and the overhead line is compliant with the requirements in the Code of Practice.

Overhead Lines – Assessment

6.2.4 The maximum calculated magnetic field will increase when the line is uprated as the current carried by the line will be greater. The maximum magnetic field from the uprated overhead line, calculated according to the Code of Practice on Compliance will be 78.9 µT. The maximum calculated electric field for uprating the overhead line is 10.1 kV/m, which is lower than the existing overhead line arrangements due to electric field cancellation, resulting from having both circuits at the same voltage. The respective exposure limits for the general public are 360 µT and 9 kV/m.

6.2.5 The maximum electric fields values for the uprated 400 kV line for each individual span exceeding 9 kV/m are noted in the appendix with details of land use. There are 7 out of 134 spans which exceed 9 kV/m. As the maximum magnetic field is below the exposure limit of 360 μT for all spans and is compliant with the exposure limits in all situations.

6.2.6 The assessment presented above shows that the maximum value of the magnetic field produced by uprating the overhead line would be compliant with the public exposure limits, even directly under the overhead lines. All of the 7 spans which exceed 9 kV/m are compliant with the Government policy due to the land use under each span, as set out in the Code of Practice detailed below.

6.2.7 As in the Code of Practice on demonstrating compliance, Government policy is that the 1998 ICNIRP guidelines apply in the terms of the 1999 EU Recommendation. This specifies that Member States should:

"II. (b) implement measures according to this framework……when the time of exposure is significant….. "

"III (c) may take into account criteria, where appropriate, such as duration of the exposure….."'

6.2.8 When taking into account the use of the land under each span, it is not expected that members of the public would be exposed to electric fields above 9 kV/m for an appreciable proportion of time. For new overhead lines, technical specifications ensure the clearance is sufficient to not exceed 9 kV/m. Existing lines were designed to a lower clearance, which in some cases mean they can exceed 9 kV/m; in these cases land use under the overhead line span is considered. Only a small area under the overhead lines conductors will have the highest fields, demonstrated in Appendix 3.

6.2.9 There is no minimum lateral distance from the overhead line required in order to achieve compliance, but the EMFs reduce quickly with distance from the overhead lines. Although not required for assessing compliance, the graphs presented above can be used to estimate the maximum fields at any given distance from the line.

6.2.10 The calculated EMF are presented for compliance purposes using worst-case conditions. Typically, the overhead line would produce lower EMF than these levels for two reasons: the circuits are unlikely to operate at maximum rating routinely, and a typical current on a day-to-day basis would be around 50% or less of this; and for overhead lines typically the conductors would be higher than the minimum design clearance used for assessing compliance, reducing the EMF at ground level, with the minimum clearance found only in a limited area towards the middle of certain spans.

6.3 Operational Effects – Underground Cables

Electric Fields

6.3.1 Underground cables produce no external electric field because of the metallic sheath which surrounds the cable.

Magnetic Fields

6.3.2 The existing 400 kV and 132 kV cable circuits under the Afon Glaslyn will be decommissioned and replaced with two new 400 kV underground cable circuits.

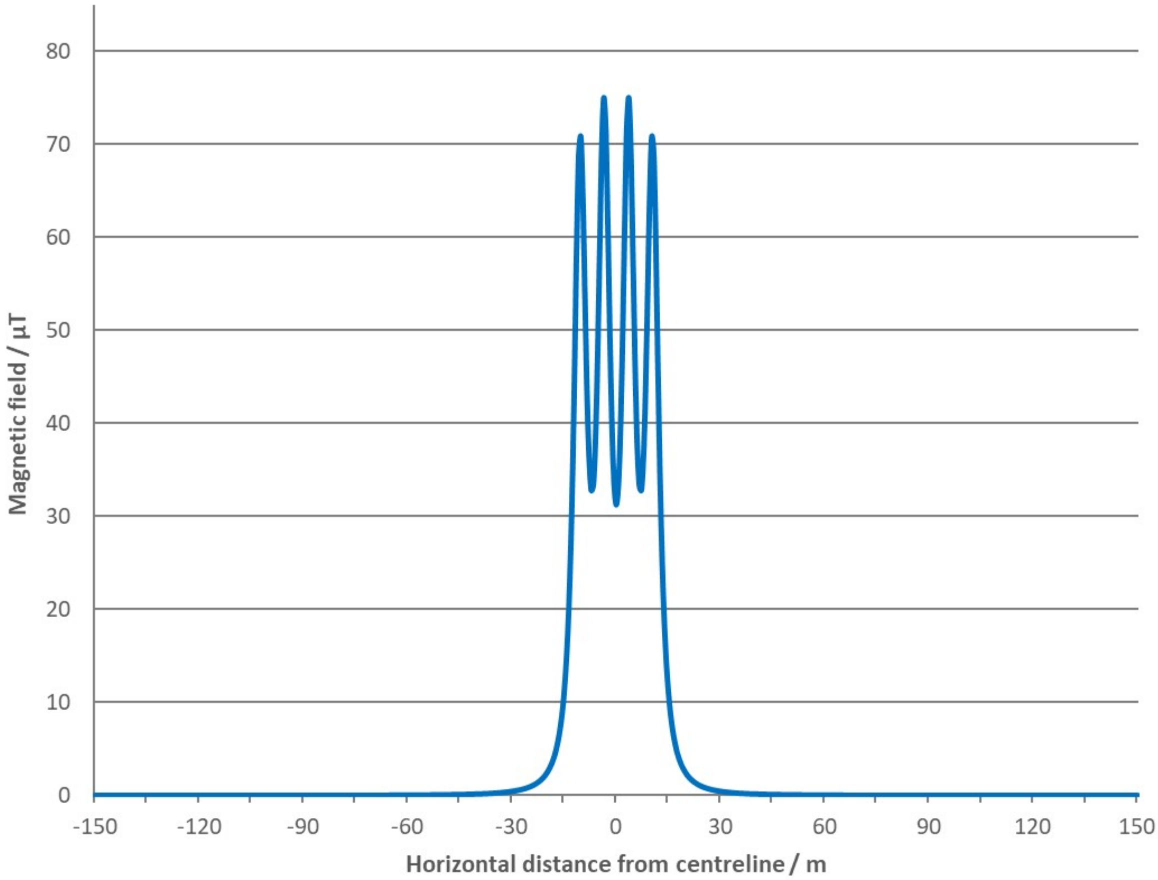
6.3.3 The underground cable systems would consist of 12 transmission cables, two cables per phase installed using Horizontal Directional Drilling (HDD) techniques under the Afon Glaslyn and in some other locations. The installation design and burial depth of the cables can impact the magnetic fields produced. Compliance of each main installation technique with the EMF exposure limits is demonstrated below.

Standard Installation - Magnetic Fields

6.3.4 The standard installation technique involves installing 12 cables in four trenches, two trenches per circuit and each trench containing three cables. Each circuit will have two cables per phase and cables will be installed at a minimum depth of 1.1 m. Calculations were performed using the maximum pre-fault continuous rating for each circuit which is 2473 MVA and at minimal burial depth.

6.3.5 The maximum calculated magnetic field is 74.9 μT for standard trench installation using these worst-case conditions. **Figure 6.5** shows the calculated magnetic field from the cables and demonstrates how quickly the magnetic field reduces with distance. Calculations were performed in accordance with the conditions set out in the codes of practice on compliance**Error! Bookmark not defined.**.

Figure 6.5 – Calculated Maximum Magnetic Field for the 400 kV Underground Cables Standard Trench Installation.



Afon Glaslyn Crossing - Magnetic Fields

6.3.6 To cross the Afon Glaslyn, trenchless crossing techniques will be used, specifically HDD. This method usually installs the cables deeper, typical to avoid sensitive feature, such are railways, roads and rivers. The cables are installed deeper, but to achieve the same electrical ratings, the cables are also installed further apart. When cables are further apart it can impact the magnetic fields they produce, so the Afon Glaslyn crossing has been assessed separately.

6.3.7 The trenchless crossing proposed for the Afon Glaslyn consists of 12 cables installed 10 m apart (centre to centre). The river depth and width vary along the route, ranging between approximately 12.2 m and 14.4 m with a minimum burial depth of 12.2 m below the Riverbed. calculations were performed using the maximum pre-fault continuous rating for each circuit which is 2473 MVA.

6.3.8 The maximum calculated magnetic field across the riverbed varies between 33.9 μT at the deepest point to 26.8 μT at the shallowest points using these worst-case conditions. **Figure 6.7** demonstrates how the maximum varies across the riverbed where the cables cross perpendicular to the river flow. **Figure 6.6** shows the calculated magnetic field from the cables and demonstrates how quickly the magnetic field reduces with distance to the sides of the cables, assuming the minimum distance of 12.2 m between the cable and riverbed. Calculations were performed in accordance with the conditions set out in the codes of practice.

6.3.9 Calculations of the magnetic fields have been performed on the riverbed, and at 0.5 m, 1 m, 2 m and 5 m above the riverbed. **Table 6.1** gives the maximum magnetic fields from the proposed cables at 100% current rating at varying distances from the Riverbed.

6.3.10 The new cable installation will result in 11.7 times reduction in the magnetic fields at the riverbed, reducing the maximum possible magnetic fields at the riverbed from 403.3 μT to 33.9 μT. This is a result of the increase burial depth, but also the addition of two cables per phase, rather than the existing cables only having one cable per phase. The additional cable per phase essentially halves the current flowing in each cable, acting to reduce the magnetic fields further.

Table 6.1 – Maximum Magnetic Field Calculations for Proposed River Crossing

	Magnetic Fields (μT)					
	Distance from Cable Circuit (m)					
	Riverbed	0.5	1	2	5	10
Afon Glaslyn HDD Cables	33.9	32.1	30.5	27.3	23.3	12.8

Figure 6.6 – Calculated Maximum Magnetic Field for the 400 kV Underground Cables HDD Installation at Minimum Depth Below Afon Glaslyn Riverbed.

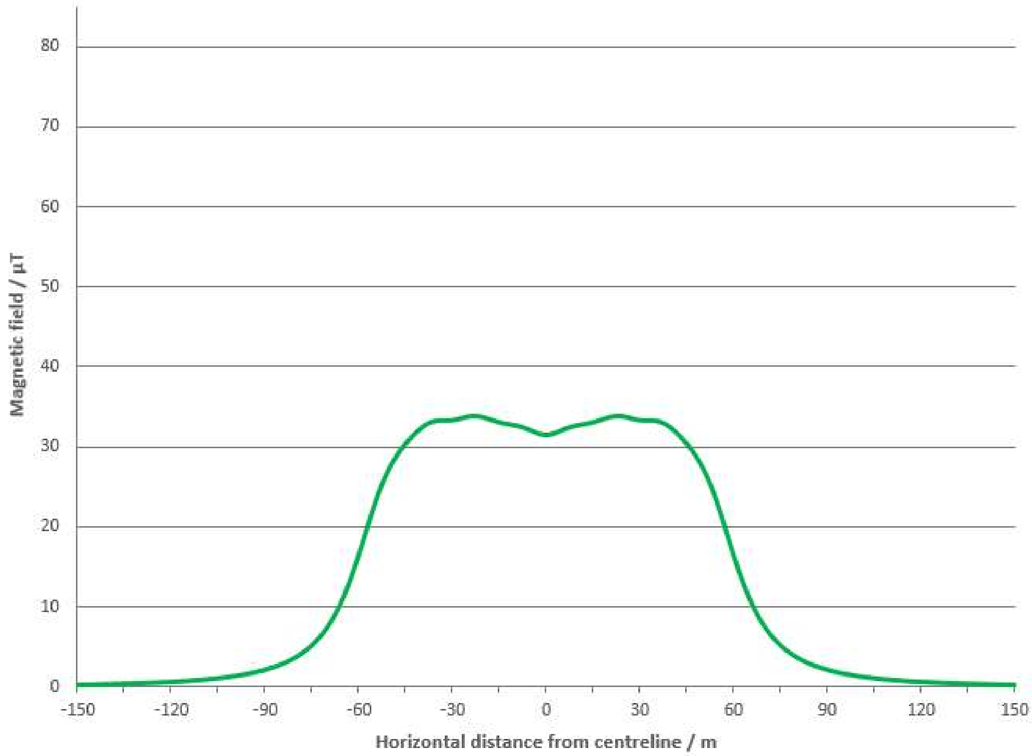
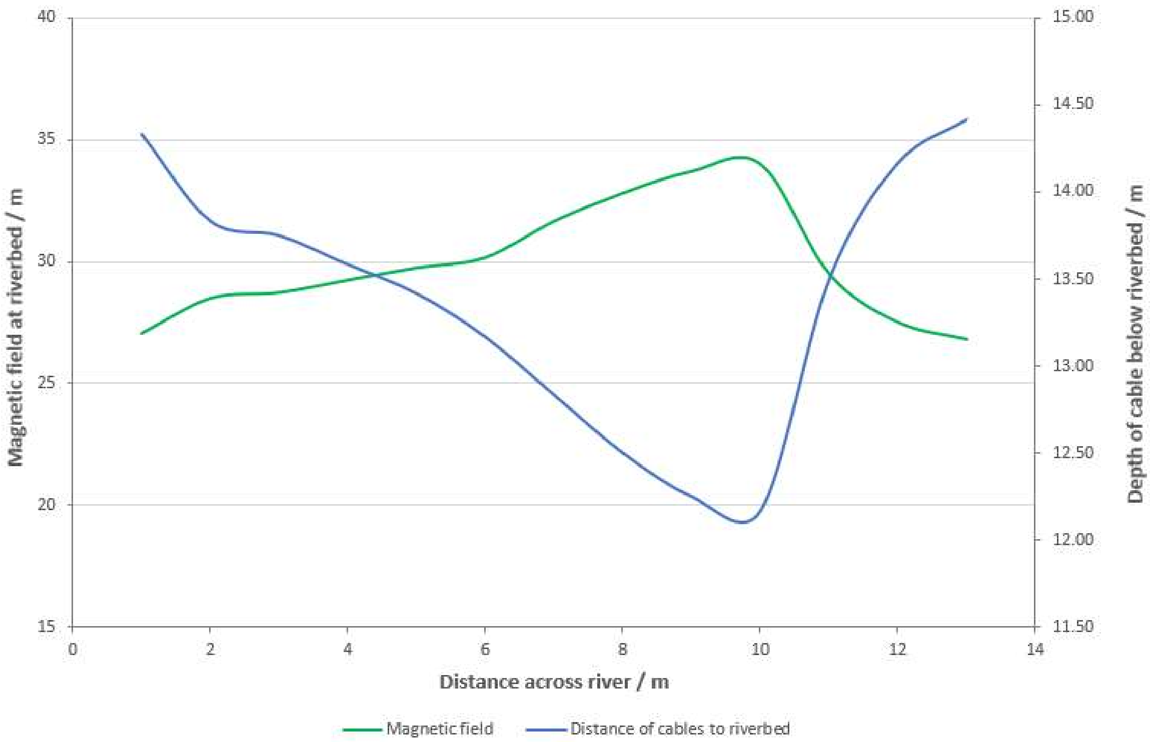


Figure 6.7 – Calculated Maximum Magnetic Field for the 400 kV Underground Cables HDD Installation at Minimum Depth Below Afon Glaslyn Riverbed.



Small water course crossings: Trenched installation - Magnetic Fields

6.3.11 Although the main Afon crossing and many of its tributaries have HDD installed cables, some water courses along the route are crossed with a trenched installation. This method uses open trenches to cross the water way and cables are typically 1.1 m deep.

6.3.12 The trenched crossing proposed for the small water course crossings consists of 12 cables in four separate trenches. Each trench will contain three cables, 0.5 m apart. Each trench will be approximately 3.8 m apart (centre to centre). Calculations were performed using the maximum pre-fault continuous rating for each circuit which is 2473 MVA.

6.3.13 The maximum calculated magnetic field across small water crossings is 228.3 μT using these worst-case conditions. **Figure 6.8** shows the calculated magnetic field from the cables and demonstrates how quickly the magnetic field reduces with distance to the sides of the cables. Calculations were performed in accordance with the conditions set out in the codes of practice.

6.3.14 Calculations of the magnetic fields have been performed on the water course bed, and at 0.2 m, 0.5 m, and 1 m above the bed. **Table 6.2** gives the maximum magnetic fields from the proposed cables at 100% current rating at varying distances from the water course bed.

Figure 6.8 – Calculated Maximum Magnetic Field for the 400 kV Underground Cables trenched Installation at Minimum Depth Below Small Water Course Crossings

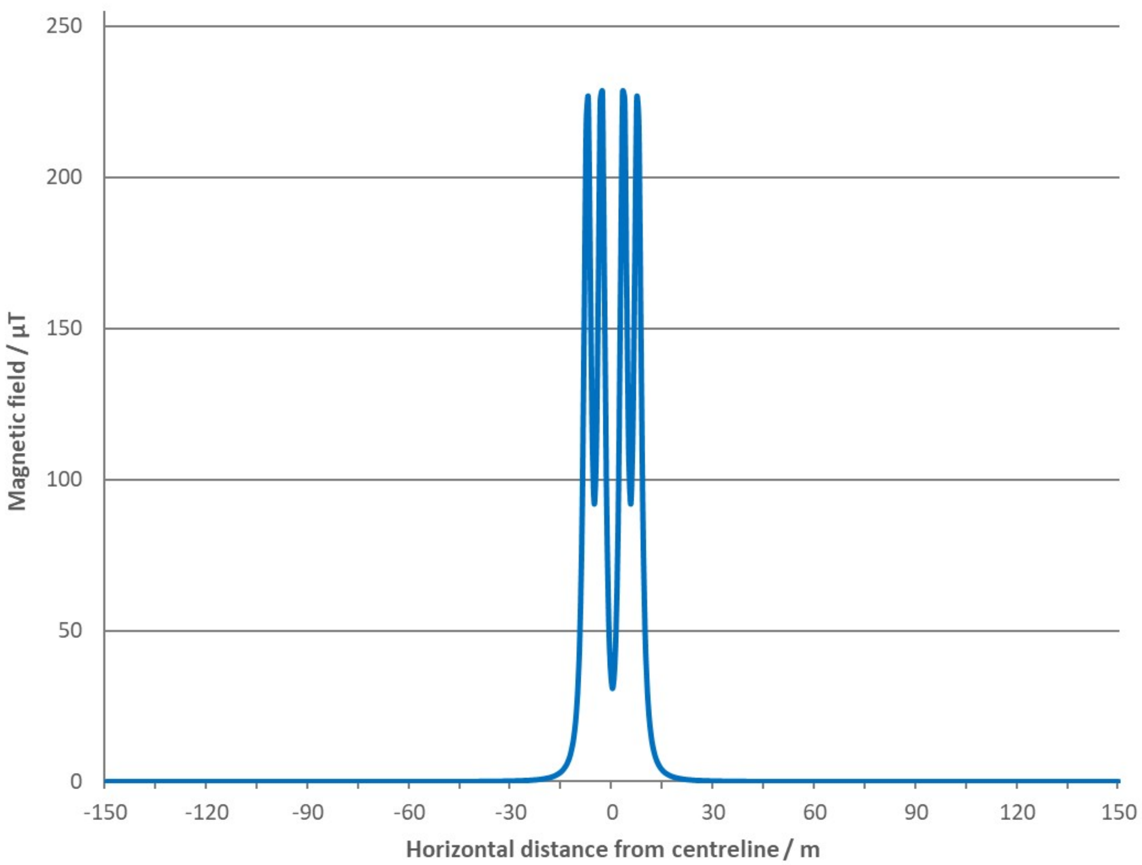


Table 6.2 – Maximum Magnetic Field Calculations for Proposed Small Water Course Crossings

	Magnetic Fields (μT)			
	Distance from Cable Circuit (m)			
	Bed	0.2	0.5	1
Small water course trenched crossings	228.3	174.6	125.5	79.5

6.4 Compliance of Underground Cables with Human Exposure Limits

6.4.1 The maximum field the underground cables can produce is 74.9 μT at 1 m above ground, below the relevant exposure limit detailed in **Table 2.2**, and therefore the maximum fields are compliant with the EMF requirements in NPS EN-5.

6.5 132 kV Overhead Line and Underground Cables at Bryncir

6.5.1 The Project will replace of part of the SPEN DB route with a new section of 132 kV overhead line and new 132 kV underground cables.

6.5.2 132 kV overhead lines and underground cables are specified in the Code of Practice on compliance as a type of equipment that are inherently compliant with Government exposure limits due to their design. This equipment is deemed compliant with the guidelines as per Code of Practice on Compliance, page 4 quoted at paragraph 4.3.9 and does not require a detailed demonstration of compliance.

6.6 Operational Phase Effects: Bryncir Substation and CSE Compounds

6.6.1 As explained in paragraph 4.3.9, substations without air-cored reactive equipment and CSEC are treated, according to the Code of Practice on Compliance, as inherently compliant with the exposure limits. This equipment is deemed compliant with the guidelines and does not require a detailed demonstration of compliance.

6.6.2 Bryncir substation is an Air-Insulated Switchgear (AIS) design with no air-cored reactive equipment installed and therefore is inherently compliant.

6.6.3 The highest fields around substations and CSEC are usually from any overhead lines or underground cables entering them and not from equipment within the substation or CSE compound itself. This compliance includes any lengths of underground cable making connections within the overall boundary of the substation or CSEC.

7. Assessment of EMF Effects in Afon Glaslyn Species

7.1.1 An assessment of the potential impact of magnetic fields associated with the operation of the underground cables is given below for fish and invertebrate receptors located within a 2 km radius of the proposed cable crossing location. Magnetic fields from cables are highly localised, but the 2 km radius ensures that all species which could be exposed to magnetic fields from the cables are considered in the assessment. A number of species have been identified as being potential receptors in the Afon Glaslyn detailed in **Environmental Statement Volume 4: Glaslyn Cables**.

7.1.2 To facilitate the assessment, species have been identified that are the most likely receptors of impacts to EMFs. These were identified by a scientific literature review identifying those species showing some evidence of electroreception, magnetoreception or a biological response to EMF detailed in **Table 7.1**. Further evidence for sensitivity of different species specific to Afon Glaslyn are provided in **Section 7.2**.

7.1.3 Given the lack of specific impact criteria, the assessment has been based on a review of literature on the current understanding of the potential effects of EMF on the listed species and the potential for these species to encounter EMF from the proposed cables. Elasmobranchs are sensitive to electric fields, but these species are not present in the study area, so have not been assessed further.

Table 7.1 Summary of Electric and Magnetic Field Sensitivity in Fish and Invertebrates

Species Identified in Afon Glaslyn	Electro-Sensitive	Magneto-Sensitive	Notes
Invertebrates Freshwater pearl mussel	No evidence	Certain marine species are sensitive to DC, no evidence freshwater species AC sensitivity unknown	Little evidence of electric sensitivity in literature
Primitive fish Lamprey species	Can sense both AC and DC	No evidence of magnetoreception	Electric sensitivity well documented in marine environment, no evidence in freshwater
Salmonids Brown/Sea trout Atlantic salmon	Unknown	Evidence of sensitivity to DC magnetic fields, limited evidence of AC	Little evidence of electric sensitivity Magnetic sensitivity is well documented in salmonids. AC sensitivity needs investigating (only demonstrated in sea trout thus far).
Bony fish European eel	Unknown	Evidence of sensitivity to DC magnetic fields AC sensitivity largely unknown	Little evidence of electric sensitivity Magnetic sensitivity is well documented in salmonids and eels.

	AC sensitivity needs investigating (only demonstrated in sea trout thus far).

7.2 Sensitivity of Receptors

7.2.1 Several fish and invertebrate species are known either to be sensitive to natural magnetic, electric, and electromagnetic fields or have the potential to detect them (Gill and Taylor, 2001; Gill et al, 2005; Hutchison et al, 2020). These species can be categorised into two groups based either magneto-receptive, direct detection of magnetic fields, or electro-receptive, the ability to detect induced electric fields, noting that some species may use both (Anderson et al, 2017).

7.2.2 An assessment of the potential impact of magnetic fields associated with the operation of the underground cables is given below for fish and invertebrate receptors located within a 2 km radius of the proposed cable crossing location. A number of species have been identified as being potential receptors in the project area detailed in **Environmental Statement Volume 4: Glaslyn Cables**.

7.2.3 To facilitate the assessment, species have been identified that are the most likely receptors of impacts to EMFs. These were identified by a scientific literature review identifying those species showing some evidence of electroreception, magnetoreception or a biological response to EMF detailed in **Table 7.1**. Given the lack of specific impact criteria, the assessment has been based on a review of literature on the current understanding of the potential effects of EMF on the listed species. Much of the literature available has been performed in the marine environment, where water conductivities will be higher than those in freshwater or estuarine waters. Magnetic fields are not impacted by water conductivity, the magnetic field produced by a cable will be the same in a marine or freshwater environment if all other design and current flow details are the same. Therefore, results on magnetic field exposure can translate between the two environments. Electric fields will differ, and be significantly higher in marine environment, due to the higher water conductivity (Rzempoluch et al, 2025). Elasmobranchs are sensitive to electric fields, but these species are not present in the study area, so have not been assessed further.

Lamprey Species

7.2.4 *Lampetra planeri* (brook lamprey) and *Lampetra fluviatilis* (river lamprey) have been identified as being potential receptors throughout the project area. Very little information is available in the literature regarding EMF sensitivity of these species. There is however research available on sea lamprey and EMF. It is unclear if brook and river lamprey respond in the same way to *Petromyzon marinus* (sea lamprey), but available literature for sea samprey has been included due to lack of data on the specific receptor species.

7.2.5 Sea lampreys, possess electrosensory cells known as ‘end buds’ that protrude directly from the epidermis (Jørgensen, 2005). These electroreceptors are sensitive to weak, low-frequency E-fields the same as elasmobranchs (Bodznick and Northcutt, 1981; Bodznick and Preston, 1983). Tricas and Carlston (2012) reported that the maximum sensitivity to currents was to frequencies less than 1 Hz, below AC 50 Hz frequency.

7.2.6 Whilst responses to E-fields have been reported in these species, information on how they use electro-sensitivity is limited. It is likely however, that they use it in a similar way as elasmobranchs to detect prey, predators or conspecifics and potentially for orientation or navigation (Normadeau et al, 2011).

7.2.7 A study commissioned by the MMO (2014) evaluated the results of post environmental data associated with post-consent monitoring of licence conditions of offshore wind farms. The report concluded the following:

"From the results of post-consent monitoring conducted to date, there is no evidence to suggest that EMFs pose a significant threat to elasmobranchs at the site or population level, and little uncertainty remains. Targeted research using high tech equipment and experimental precision has been unable to ascertain information beyond that of fish being able to detect EMFs and at what levels they become attracted or abhorrent to them. EMFs emitted from standard industry cables for offshore wind farms are unlikely to be repellent to elasmobranchs beyond a few metres from the cable if buried to sufficient depth. It is likely that the subtler effects of EMF, including attraction of elasmobranchs, inquisitiveness and feeding response to low level EMFs, may occur. The Burbo Bank offshore wind farm post-consent monitoring undertook EMF specific surveys including stomach analysis of common elasmobranch species. Fish caught at the cable site (and hence subject to EMFs) were well fed. No deleterious effects were recorded to fish populations, at least when this effect occurs in association with the probable increased feeding opportunities reported as a result of increased habitat heterogeneity".

7.2.8 There is no evidence that sea lampreys possess an ability to detect B fields (Gill & Bartlett 2010). As such, there is no evidence that ability to detect EMF plays any role during migration from feeding areas to coasts and estuaries. The cues used by sea lampreys during their homeward sea migrations are not known, but olfactory cues play an important role in stream finding behaviour (Vrieze et., al 2011).

7.2.9 A limited number of studies investigating physiological effects have been published. Normandeau et al, (2011) reviewed studies investigating physiological effects of electric fields on lamprey. Hormonal responses of males and females differed in response to DC electric fields and reduced activity was observed from wild adult lamprey. No responses have been observed to AC fields of the types produced by the proposed Project.

7.2.10 Migration behaviour of sea lamprey was affected (i.e. adults did not move) when stimulated with electrical fields of intensities of between 2.5 and 100 mV/m. Normal behaviour was observed at electric field intensities higher and lower than this range (Chung-Davidson et al, 2008). These levels were considerably higher than would be expected from the proposed cables.

7.2.11 Given that there is limited evidence of physiological effects at electric fields higher than those produced by the cables, there is no evidence of a barrier to movement or sensitivity to magnetic fields. Lamprey are deemed to be of **low sensitivity**.

Atlantic Salmon and Brown/Sea Trout

7.2.12 Juvenile salmon and trout spend around one to four years in freshwater, leaving the river to enter the sea as smolts. Downstream migration of smolts occur during spring with timings driven by abiotic factors such as water discharge and temperature (McCormick et al, 1998; Thorstad et al, 2011). As adults, they return to rivers to spawn, where many die. Those that survive return to the sea as kelts.

7.2.13 Several studies have investigated the potential for EMF from cables to act as a barrier to movement, impact orientation or migration of fish. Atlantic salmon possess magnetite particles in their lateral line sense organs allowing them to sense the Earth's geomagnetic fields (Moore et al, 1990). It is hypothesised that these particles may allow the species to use the earth geomagnetic field to aid orientation and migration over long distances.

7.2.14 Lohmann et al., (2008) suggest that if salmonids do use magnetic cues for orientation or navigation it is likely that these cues are used at a large spatial scale, helping to identify a particular coastal region, whereas the homing phase of migration is largely dependent on olfactory cues (Lohmann et al, 2008; Putman et al, 2014).

7.2.15 *Salmo salar* (Atlantic salmon) migration in and out of the Baltic Sea over a number of operational subsea HVDC cables has been observed to continue apparently unaffected by the EMFs produced by the cables (Walker, 2001).

7.2.16 Research carried out in San Francisco Bay in respect of the impact of a HVDC cable on the migration of Oncorhynchus tshawytscha (chinook salmon), found the HVDC cable had a mixed but limited effect on the movements and migration success of smolts (Wyman et al, 2018). Similarly, a study by Bureau of Ocean Energy Management (BOEM) (2016) reported that energised cables do not appear to present a strong barrier to the natural seasonal movement patterns of migratory fish and while they may be attracted to the cable after activation, they do not appear to be impeded from successfully migrating through the Bay (BOEM, 2016).

7.2.17 Few laboratory studies have demonstrated avoidance or disorientation in teleost fish to EMF exposure. A study where transmitters were attached to the heads of salmon and trout, generating twice the earth's magnetic field, found no measurable impact on movement or behaviour (Swedpower 2003).

7.2.18 A laboratory study conducted by Marine Scotland Science (MSS) exposing Atlantic salmon smolt and adult to 50 Hz magnetic field (95 μT,) found no evidence of unusual behaviour (Armstrong et al., 2015).

7.2.19 Laboratory studies using static and alternating (50 Hz) magnetic fields ranging from 1000 to 10 000 μT, caused increased spermatozoa motility time and movement velocity, increased fertilisation and increased volume of eggs in Brown/Sea Trout (reviewed in Formicki et al, 2018). Similar magnetic fields were shown to lengthen egg incubation leading to larger fry and reduced mortality again in Brown/Sea Trout; reviewed in Formicki et al., 2018). However, all of these studies were carried out using magnetic fields orders of magnitude larger than those of the proposed cables.

7.2.20 Recently, Krzystolik et al, (2024) investigated effects of overhead power lines and transformers on developing sea trout embryos at a Polish Generating station. Fertilised eggs from fish were collected from the Rega River in three incubation tanks. One tank was placed directly under a 220/110 kW transformer, one directly under a 220 kV high voltage line overhead and the third in a control position away from EMF exposure. The results showed that embryo alignment was altered by the magnetic field exposure, however this varies and was more directional in the lowest exposure tank, under the overhead line. The authors concluded '*Increased embryo mortality was observed only at 110 kV site, but probably due to factors unrelated to EMF. In conclusion, EMF generated by High Voltage Transmission Line did not significantly change pike embryo orientation or chances of survival. However, longer exposure or higher EMF levels could provoke notable reactions, requiring ongoing evaluation as power networks continue to spread more widely.*' No accounting for heating effects under the transformer was mentioned in the study.

7.2.21 Given that there is no evidence of a barrier to movement and limited evidence of behavioural effects, with those observed subtle and transitory; the impacts on migratory fish are deemed to be of **medium sensitivity** recognising there is a recommendation for further research.

European Eel

7.2.22 *Anguilla rostrata* (European eel) have a complex lifecycle, which starts as eggs hatch in the Sargasso Sea; the larvae (leptocephali) then migrate towards Europe floating on Sea currents. The journey takes around 1 to 2 years totalling over 5000 km long. Once reaching the continental shelf of Europe they develop into glass eels where then then enter rivers. Eels complete the last stages of their lifecycle developing into elvers, yellow eels and then silver eels in rivers. It is at this stage then then migrate back to the Sargasso Sea to spawn. There is no evidence that eels home accurately to a particular home river, their population has been described as being structured at a relatively large special scale (Ragauskas et al, 2017).

7.2.23 There is a body of evidence that eels can sense magnetic fields and respond behaviourally to those cues, and evidence would suggest European eels are the most sensitive of the target species at detecting magnetic fields. Experimental studies performed in laboratory conditions using Helmholtz coils to produce magnetic fields have shown that eels can use DC fields between 50.3 to 51 μT with an inclination of 73 degrees to orientate themselves. In test tanks eels were shown to orientate towards the direction of the magnetic field was in the absence of other orientational cues (Durif et al., 2013). Naissbett-Jones et al, (2017) also reported eels' ability to sense and orientation to changes in DC magnetic field direction in tank experiments. AC magnetic fields do not impact compass direction or alter the direction of the earth's geomagnetic field (See **Section 2.13**).

7.2.24 Acoustically tagged European Eels were studied to investigate their migratory speed over a 130 kV AC cable in the Baltic Sea (Westerberg and Lagenfelt, 2008). Magnetic field measurements were not taken during the experiment, but the cable was transmitting 140 to 300 A meaning an AC magnetic field would be present. The study found a short-term change to migration timing (tens of minutes), however overall migration route direction remained unaffected. The predicted delay in migration of less than 1 hour was considered unlikely to affect fitness in the context of migration of several thousand km. It was not conclusively demonstrated whether the delay was due to EMF or some other feature of the area around the cable, although the study did correct for current speed. Although performed in the marine environment, water conductivity levels have no impact on the magnetic field produced by cables, therefore the effects would translate to the freshwater environment.

7.2.25 Ohman et al, (2007) summarised studies on European Eel showing some deviation of European Eels from migratory routes in response to low (5 μT) DC magnetic fields, however, the effects were short-term and short scale and not thought to impact on overall migration.

7.2.26 Several studies have investigated the impacts of live in-service electricity cables on population densities and abundance. Dunlop et al, (2016) investigated fish densities (including gib and American eel) associated with a 245 kV AC cable in the Laurentian Great Lakes, finding no effect of the proximity to the cable on fish communities. Manned submersible vehicle surveys were used to study faunal colonisation around 35 kV AC cables producing magnetic fields ranging between 0 and 205 μT off the Californian coast (Love et al, 2016). Fish densities and invertebrate abundance were higher on and around the cables than surrounding seabed, but there were no differences in overall fish and invertebrate communities when the cable was energised and switched off, nor in densities of the most common fish species, with depth a more important factor. Although not directly investigating European eels, this report is one of few investigating live cables in the freshwater environment.

7.2.27 Monitoring studies carried out at the Lillgrund wind farm in Sweden on the abundance and distribution patterns of benthic fish communities found no large-scale effects on fish diversity and abundance post-construction, including European eels (Bergström et al, 2013). Furthermore, a seven year post operational study of the Horns Rev 1 wind farm in Danish waters conducted mark and recapture experiments, which showed that eels did cross the offshore export cable (Leonhard et al, 2011).

7.2.28 Silver American eels were studies by Hutchison et al, (2021) assessing the impacts to movement across the Cross Sound HVDC Cable. Eels were acoustically tagged, released upstream and tracked using fine scale 2D and novel 3D telemetry to enable both the horizontal and vertical movement of the eels to be accurately mapped. A total of 13 eel movements were recorded from 12 eels. During the observation period, the cable was producing a DC magnetic field between -0.0179 and 0.0869 μT and an AC magnetic field between 0.0008 and 0.1477 μT AC. Eels swam significantly faster and with more directional movement in response to DC magnetic field increases (and probably AC fields too, since they were correlated), suggesting attraction or investigation behaviour. They were, however, found on both sides of the cable suggesting no barrier to migratory movement occurred.

7.2.29 This is consistent with tank studies by Marine Scotland Science (MSS) demonstrating that eels would pass through energised Helmholtz coils producing 9.6 μT, 50 Hz AC magnetic fields (Orpwood et al, 2015).

7.2.30 A review of potential effects of EMF on migratory fish for Scottish Natural Heritage (Gill & Bartlett, 2010) identified that there was insufficient evidence to be able to confirm whether any impacts will arise from the field strengths generated by offshore wind farm cabling. The magnetic fields from this installation are likely to be of a similar magnitude to those of offshore wind farm cabling, also operating.

7.2.31 Studies investigating the physiological effects of the European eel to EMF have demonstrated mixed results. European eels were shown to demonstrate bradycardia to both A.C. electric field ranging between 0.97 to 3.6 mV/cm at 0.5 Hz and 19 to 50 mV/cm at 50 Hz; (Berge, 1979) and their lateral lines show an electrophysiological response to changes in EMF (Vriens & Bretschneider, 1979; Moore & Riley, 2009). In contrast, no change was recorded in the level or rhythmicity of locomotor activity of juvenile American eels exposed to 60 to 75 Hz electric and magnetic fields of 0.07 to 0.7 V/m and 50 μT, respectively (Richardson et al, 1976).

7.2.32 Given that there is no evidence of a barrier to movement and limited evidence of behavioural effects, where those observed subtle and transitory; the impacts on migratory fish are deemed to be of **medium sensitivity** recognising there is a recommendation for further research.

Invertebrates

7.2.33 Research on marine invertebrate electroreceptive capability is particularly sparse, with no truly conclusive evidence (Bullock, 1999; Albert et al, 2020; England and Robert, 2021).

7.2.34 Commercially important marine and freshwater molluscs (such as scallops and mussels) have not been the subject of any tests for electroreceptive capability (whether DC or AC) as far as the literature suggests.

7.2.35 The MAGNETIse project, investigated if operational HVDC cables would present a barrier to movement for the commercially important American lobster and little skate (Hutchison et al, 2020). The study used mesocosm enclosures placed over the operational 300 MW, 300 kV Cross Sound HVDC Cable in Long Island Sound. Both DC and AC magnetic fields in the ranges of 51.6 - 65.3 μT and 0.15 μT were present respectively. Both species were able to cross the energised cable, but the trials showed an increase in exploratory/foraging behaviour within the EMF zone in little skates. This species is thought to be responsive to electric fields but it is not present in the Afon Glaslyn study area.

7.2.36 For invertebrate species found in the Afon Glaslyn that maybe sensitive to EMF, specifically the Freshwater pearl mussel, little research has been performed. Invertebrate research has focused on potential migratory impacts, which are not an issue for this sessile species. Given this, invertebrates are deemed to be of **low sensitivity.**

7.3 Significance of the Effect

7.3.1 EMF are already present in Afon Glaslyn and river crossings due to the existing 400 kV and 132 kV cable circuits that were installed and operational since 1969. The proposed Project would reduce the worst-case levels of magnetic field present in the Afon Glaslyn from 403.3 μT to 33.9 μT due to the depth of cable burial and cable design. Where cables cross smaller water courses, there is a possibility European Eels and other potentially sensitive species may be present. In these locations the magnetic fields will be a maximum of 228.3 μT. Effects will be localised, affecting a relatively small proportion of the fish and invertebrate habitats where EMF has been present for five decades i.e. within metres of the cables. The magnitude of the impact is therefore classed as low.

7.3.2 For migratory fish species, studies investigating operational cables and post installation studies of EMF exposure on fish have found either no impact on migratory fish movement, or transitory delays to migration of less than 1 hour in eels which have been described as likely insignificant in the literature (Westerberg and Lagenfelt, 2008). Eel migration in rivers and estuaries is significantly influenced by tidal cycles, allowing species energy conservation during upstream migration. Silver eels also use tidal currents for their downstream migration. During their migration up and down stream using tidal and flood tides, the eels move up the water column taking advantage of the current flow (Verhelst et al, 2023). This increases the distance between the cable and eel during migration, but the tidal current may also mitigate some of the exploratory behaviour thought to be responsible for the delays in migration reported in the literature.

7.3.3 No evidence of a barrier to movement is present in the literature, despite being investigated and no impact on fish abundance has been reported. The majority of research in this area has been performed in the marine environment, however water conductivity has no impact on magnetic fields from cables so it is expected the response in both environments would be the same or similar. Some evidence of physiological effects exists but is contradictory or at significantly higher exposures than those produced by the proposed Project. Given the low to medium sensitivity of the species and the magnitude for impact is low, the effects on fish are predicted to be **minor adverse**, which is **not significant**.

7.3.4 For invertebrate species, the Freshwater pearl mussel found in the Afon Glaslyn, little research has been performed. Invertebrate research has focused on potential migratory impacts, which are unlikely to be an issue for this sessile species. Given the low sensitivity of the species and the magnitude for impact is low, the effects on invertebrates in Afon Glaslyn are predicted to be **minor adverse**, which is **not significant.**

8. Conclusion

8.1.1 UK Government, acting on the advice of authoritative scientific bodies, has put in place appropriate measures to protect the public from EMF. These measures comprise compliance with the relevant exposure limits, and one additional precautionary measure, optimum phasing, applying to high voltage power lines. This policy is incorporated in NPS EN-5.

8.1.2 The uprating works proposed for the Project are deemed to be fully compliant with the current public exposure guidelines for EMFs documented in NPS EN-5. This includes those small areas where the electric field is above 9 kV/m, where members of the public are not exposed for a significant duration. Therefore, there will be no significant EMF effects resulting from the Project. The overhead lines would comply with the policy on optimum phasing. If these requirements are met NPS EN-5 states that 'EMF effects are minimal' and therefore, there would be no significant EMF effects resulting from the Projects. This report demonstrates compliance with these requirements.

8.1.3 There are no corresponding limits for non-human exposure in freshwater environments. The magnetic field exposures from river crossings assessed in **Section 6.3** and **Section 7** assess the magnetic fields in Afon Glaslyn and impacts to freshwater species. The magnetic fields present due to the Project would reduce the existing magnetic fields by a factor of five. The assessment of EMF impacts on species present within 2km of the cable crossing in the Afon Glaslyn demonstrated a potential effect of **minor adverse**, which is **not significant.**

9. Abbreviations and Glossary

Table 9.1 – List of Abbreviations

Abbreviations	Full Term
AC	Alternating Current
AIMDs	Active Implantable Medical Devices
AGNIR	Advisory Group on Non-Ionising Radiation
BS	British Standard
CCC	Climate Change Committee
CEMFWR	Control of Electromagnetic Fields at Work Regulations
CSEC	Cable Sealing End Compound
DECC	Department of Energy and Climate Change
EC	European Commission
EEG	Electroencephalogram
EIA	Environmental Impact Assessment
ELF	Extremely Low Frequency
EMC	Electromagnetic Compatibility
EMF	Electric and Magnetic Fields
EN-1	Overarching National Policy Statement for Energy
EN-5	National Policy Statement for Electricity Networks Infrastructure
ES	Environmental Statement
EU	European Union
HPA	Health Protection Agency (Centre for Radiation)
Hz	Hertz
IARC	International Agency for Research on Cancer
ICDs	Implanted Cardiac Defibrillators
ICNIRP	International Commission on Non-Ionizing Radiation Protection
IPC	Infrastructure Planning Commission (replaced by the Planning Inspectorate)
kV	Kilovolt
kV/m	kilovolts per metre
m	metre/million
MHRA	Medicines and Healthcare products Regulatory Agency

MF	Magnetic Field
MVA	Mega Volt Ampere. This is a Standard Unit of Power and is used to describe physical capabilities of electrical equipment
NPS	National Policy Statement
NRPB	National Radiological Protection Board
PHE	Public Health England
PINS	Planning Inspectorate
RF	Radio Frequency
RMS	Root Mean Square
SAGE	Stakeholder Advisory Group on ELF EMFs
SCENIHR	Scientific Committee on Emerging and Newly Identified Health Risks
SGT	Super Grid Transformer
SQSS	Security and Quality of Supply Standard
TCF	Technical Construction File
TV	Television
UK	United Kingdom
UKHSE	United Kingdom Heath Security Agency
WHO	World Health Organisation

Table 9.2 – Glossary

Term	Definition
Baseline	The situation prevailing before the Project is commenced (the current baseline), and also to the situation that would prevail in the future without the Project (the projected future baseline).
Cable Sealing End Compound (CSEC)	Electrical infrastructure used as the transition point between overhead lines and underground cables. A compound on the ground acts as the principal transition point.
Circuit	A set of wires along which current flows and returns. It is necessary to have a complete circuit for current to flow. In AC transmission circuits, each consists of three phases.
Corona Discharge	Is an electrical discharge caused by the ionization of a fluid, such as air surrounding a conductor carrying a high voltage. It represents a local region where the air has undergone electrical breakdown and become conductive, allowing charge to continuously leak off the conductor into the air.
Conductor	A material that allows electricity to flow through it. These are the wires or cables that for overhead lines and underground cables.
Cumulative effects	There are two types of effect, in-combination effects and cumulative effects. The former occurs as a result of two or more impacts acting together (i.e. combined), to result in a new or changed effect on a single receptor. The latter arise as a result of the Project in combination with other large-scale developments or projects.
Current	The flow of electricity. A voltage will always try to drive a current. The size current that is driven depends on the resistance of the circuit
Development Consent Order (DCO)	Where the Secretary of State (SoS) proposes to grant consent for a NSIP, this will be through a DCO which is normally made as a statutory instrument – a form of secondary legislation. The DCO not only provides planning consent for the Project but may also incorporate other consents and include authorisation for the compulsory acquisition of land.
Direct effects	Direct effects are those that result directly from the Project.
Extremely Low Frequency	Defined as the range of frequencies from 30 to 300 Hz and therefore including the power frequencies of 50 or 60 Hz.
Electricity transmission system	The electricity transmission system is made up largely of 400kV, 275kV and 132kV assets connecting separately owned generators and interconnectors with the demand for electricity fed directly from the transmission system, and distribution systems. The 'transmission' classification applies to assets at 132kV or above in Scotland or offshore. In England and Wales, it relates to assets at 275kV and above. The electricity transmission system is designed to make sure there is sufficient transmission capacity to ensure that the system can be operated in an economic and efficient way by the ESO, ensuring power can be moved from where it is generated to demand centres across Britain. This planning and development of the electricity transmission system is governed by the Security and Quality of Supply Standard (SQSS) which ensure that the network is developed and operated securely and is resilient to any foreseeable network faults and disruption.
Electric and magnetic fields (EMF)	Electric fields are created by differences in voltage: the higher the voltage, the stronger the resultant field. Magnetic fields are created when electric current flows: the greater the current, the stronger the magnetic

	field. An electric field will exist even when there is no current flowing. If current does flow, the strength of the magnetic field will vary with power consumption but the electric field strength will be constant.
Environmental Impact Assessment (EIA)	An EIA is a tool for systematically examining and assessing the impacts and effects of a development on the environment. The objective of the EIA is to identify any likely significant effects which may arise from the Project and identify measures to prevent, reduce or offset any adverse effects.
Environmental Statement (ES)	The outcome of the EIA process is reported within a document called an ES.
Impacts	For the purposes of the EIA and this Scoping Report, the term ‘impacts’ is used to describe the changes that arise as a result of the Project (e.g. changes in drainage pattern).
Kilovolts (kV)	A unit of electromotive force, equal to 1,000 volts.
Microshock	Small discharges sometimes experienced when touching a metal object in an electric field, similar to touching a filing cabinet or doorknob after walking across a nylon carpet
Microtesla	1/1,000,000 of a tesla. A unit of magnetic field more commonly used than the tesla because it is more convenient. Symbol μT
Nominal Voltage	A value assigned to a circuit or system to designate its voltage class conveniently e.g., 400kV, 275kV, rather than its operating voltage
Numerical Dosimetry	Calculation and assessment of the induced current by the human body. Computerized models of the human body, including the varying tissue cconductivities are used to calculate the induced current inside the body when exposures to external EMF.
Optimum Phasing	A design feature of double-circuit overhead lines that reduces the electric and magnetic fields at perpendicular distances from the ooverhead line.
Overhead line	Conductor (wire) carrying electric current, strung from pylon to pylon.
Phasing	The way in which the two circuits of a power line are wired relative to each other, which affects the magnetic field produced
Pylon	Overhead line structure used to carry overhead electrical conductors, insulators and fittings.
Reconductoring	The replacement of old conductors (wires), insulators, earthwires, etc on an existing overhead line.
Root Mean Square	A measure used for AC quantities which allows them to be expressed as a single number. For practical purposes in the electricity industry, it is just a constant fraction of the amplitude: rms = 0.71 x amplitude, amplitude = 1.41 x rms. (The factor 1.41 is the square root of 2.) Rms is used because an alternating current usually has the same effect as a direct current when its rms values is the same as the direct current.
Security and Quality of Supply Standard (SQSS)	The SQSS sets out a coordinated set of criteria and methodologies that the Transmission Licences shall use in the planning and operation of the national electricity transmission system.
Substation	Electrical equipment in an electric power system through which electrical energy is passed for transmission, transformation, distribution or switching.
Underground Cable	An insulated conductor carrying electric current designed for underground installation.

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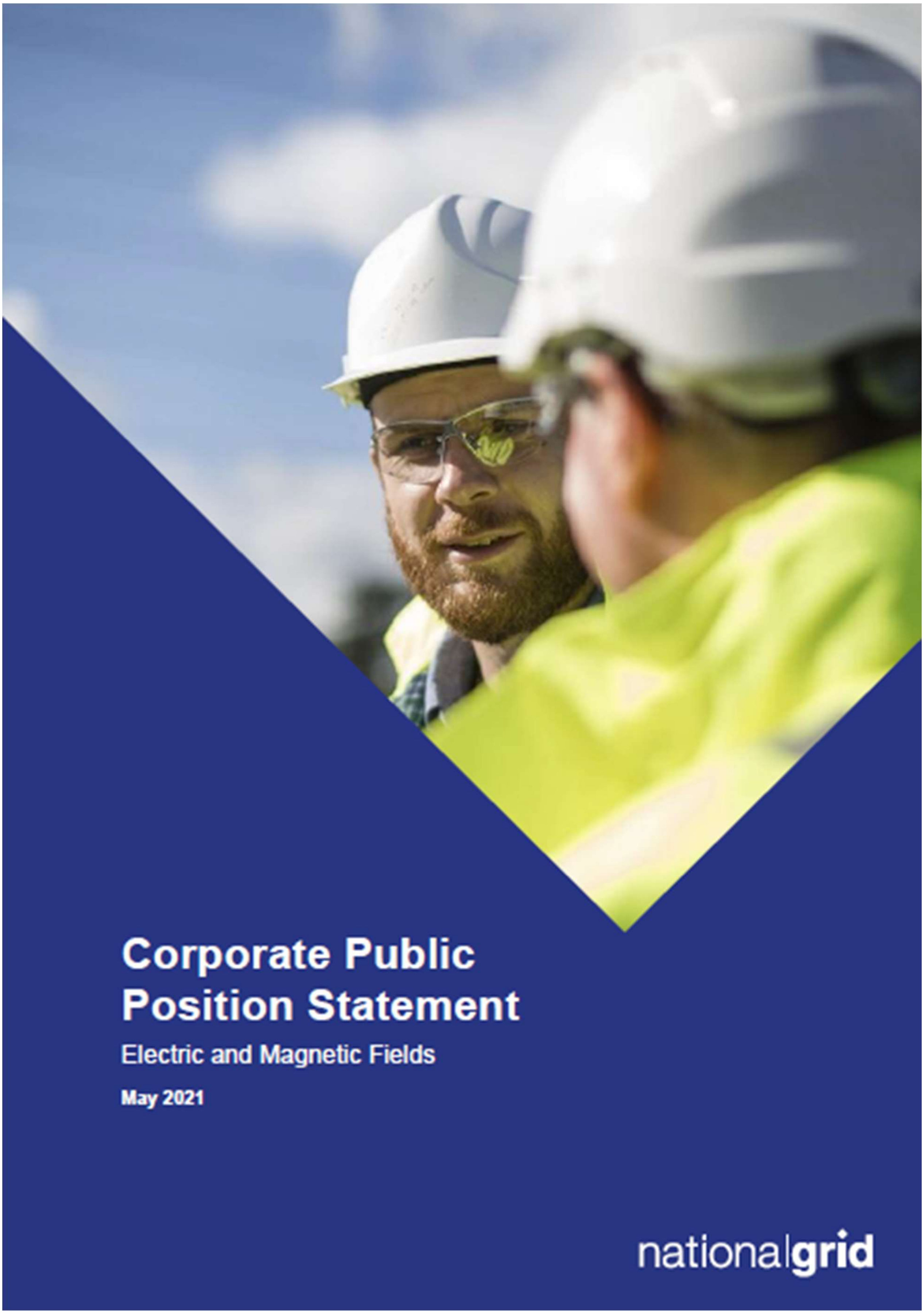
APPENDIX 1: NGET's Public Position Statement on Electric and Magnetic Fields



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Electric and Magnetic Fields

Objective

Electric and Magnetic Fields (EMFs) can be generated from a wide variety of sources, including distribution and transmission power lines and wireless infrastructure. National Grid recognises that there is scientific debate about whether certain adverse health effects may be linked to EMFs. As a consequence, there is public concern around the subject.

We take the responsible management of EMFs very seriously. This public position statement sets the framework within which National Grid will manage EMFs. We will:

- Continually assess the scientific evidence in this area;
- Determine any implications for the way in which we conduct our business; and
- Explain to society what the science is telling us.

The President of Electricity Transmission is responsible for ensuring that this public position statement reflects and is compliant with current legislation and is kept up to date with new or changing legislation.

Scope

This public position statement applies to National Grid and its Subsidiary Companies. For Associate Companies, National Grid will seek to promote the adoption of statements and practices consistent with those set out in this document.

This statement covers:

- EMFs that arise from transmission and distribution power lines and associated equipment; and
- Radio-frequency EMFs that arise from wireless infrastructure, including from third-party assets.

Framework

Electric and Magnetic Fields can arise from many sources including household appliances, electrical distribution and transmission facilities and equipment, mobile telephones, and radio-transmission devices. Research is ongoing to improve our understanding of the effects of EMFs. The balance of evidence remains **against** both power-frequency and radio-frequency EMFs causing ill health. However, National Grid recognises that the World Health Organization has classified power-frequency EMFs as "possibly" carcinogenic. This scientific position is reflected in the views of the regulatory bodies in the countries in which we operate.

We also recognise that scientific developments on EMFs do not depend on international boundaries. This public position statement establishes the common threads applicable across all our operations.

This public position statement has seven central principles:

1. We recognise that the societies in which we operate hold a variety of views on EMFs. In view of the scientific position and the fact that EMFs are of concern to some, we take the matter very seriously.
2. In all our operations, as a minimum, we comply with legal requirements, including relevant EMF regulations. We also aim to follow industry guidelines or best practice in the countries and different jurisdictions in which we operate. Where other companies (such as telecommunications operators) use our assets, we require them to do the same.
3. We support the view of regulators and governments that the EMF issue warrants consideration for a precautionary approach. We look to them to decide on any measures that may be necessary, as they can evaluate the science and weigh-up costs and benefits on behalf of society as a whole.
4. To mitigate the amenity impact of new overhead transmission lines, we always endeavour to route them:
   - along formal Rights of Way in countries where they exist; or
   - away from existing buildings where they do not.

   In order to ensure safety clearances and to help us maintain our network, we do not encourage housing development immediately beneath our lines. We will work with planning bodies to promote the sustainable use of land under our lines. These steps will usually result in EMF exposures being lower than would otherwise be the case.
5. We recognise that scientific understanding of any effects of EMFs is improving. We review all relevant scientific developments in this area from across the world and assess any implications for the way in which we operate.
6. We support high-quality research into EMFs and make the results available for scientific review.
7. We communicate in an open manner with those who have an interest in EMF matters, and make available information that will help society's understanding of EMFs. We will participate openly and constructively in debate on precautionary approaches appropriate to the EMF issue.

In support of this public position statement, each Subsidiary Company will ensure that:

- A plan is put in place to ensure all relevant elements of this public position statement are implemented.
- All regulatory and legal requirements are met for both new and existing lines and infrastructure.
- All legal non-compliances or suspected non-compliances are investigated, and if appropriate. prompt corrective actions taken. Associate Companies will be encouraged to put similar arrangements in place.

Related Corporate Policies and Other Documents

- Framework for Responsible Business.
- Environment policy.
- Safety and Occupational Health policy.
- Terms of Reference of the Safety, Environment and Health Committee.

Key Contacts

This public position statement is written and maintained by the President of Electricity Transmission, to whom questions regarding its content and application should be addressed.

The lead expert for this public position statement and the first point of contact is Dr Hayley Tripp, EMF Specialist, Electricity Transmission.

Monitoring and Compliance

The President of Electricity Transmission is responsible for ensuring that this public position statement is effectively communicated throughout its lifecycle.

The President of Electricity Transmission will ensure that compliance with this public position statement is reviewed periodically. Any changes needed to ensure its effectiveness will be drawn to the attention of the Board's Safety, Environment and Health Committee and to the Board itself.

Each Subsidiary Company will ensure that it has the necessary arrangements in place to monitor and report compliance against this public position statement periodically. Each Associate Company will be encouraged to put in place similar arrangements to enable compliance to be reported periodically.

In line with good corporate governance practices, we will review this public position statement periodically.

The Corporate Environmental Audit Programme will be used from time-to-time to determine the level of compliance with all, or aspects of, this public position statement.

Definitions

Associate Company: A company whose equity share capital is 20% or more, but not more than 50%, beneficially owned by a National Grid company or companies.

Subsidiary Company: A company that is a subsidiary of National Grid provided that a National Grid company holds or controls a majority of the voting rights in it or the right to appoint or remove a majority of its directors.

Review Cycle

This Public Position Statement came into effect in 2003.

It was last reviewed in April 2021.

The next review will take place no later than April 2023.

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APPENDIX 2: Certificate of Conformity of NGET Transmission System with EMC Requirements

**Technical Certificate 05R110 issued by
Hursley EMC Services Ltd**

*Appointed by the Secretary of State for Trade and Industry
as a UK EMC Competent Body*

HURSLEY EMC SERVICES

TECHNICAL CERTIFICATE

PRODUCT TITLE: NGT Electricity Transmission Network

MANUFACTURED BY: National Grid Transco (NGT) plc
Manufacturers Address: NGT House, Warwick Technology Park, Gallows Hill, Warwick CV34 6DA UK

Applicants Name: **Mr Jon Carlton**, of NGT plc.

Product Description: The NGT Electricity Transmission Network (consisting of some 14,000 Km of high voltage supply lines) is the high voltage electricity transmission system in England and Wales.

Technical Statement: The Technical Construction File (TCF), "NGT Electricity Transmission Network" (dated 2005), describes the general construction, conformity procedures and EMC test rationale for the Electricity Network. This Technical Construction File, in so far as is technically viable, is based on testing to international standards, specifically EN50121-2:2000 and CISPR 18 for emissions. These standards were used as the most suitable guide for the emissions testing in lieu of any other practical or harmonized product related standards. Given the size of the equipment, testing was performed in-situ at several representative sites and is therefore an approximation to the standards. The results of the tests applied and described in the test reports along with the EMC detail supplied in the TCF indicate that the product complies with the standards.
Taking into consideration the technical rationale provided in the TCF and the results of the site measurement reports, Hursley EMC Services is satisfied the TCF does demonstrate compliance with the essential protection requirement of EC Directive 89/336. NGT operates a certified ISO 9001 quality management system covering both the operation and installation procedures for the Electricity Network. Due to its size and nature along with quality procedures used for installations the NGT Electricity Transmission Network would seem inherently immune to normal EMC phenomena.
This route to compliance with respect to the provisions of EC Directive 89/336 is in accordance with section 42(c) of the UK Statutory Instrument 1992 No 2372 (The Electromagnetic Compatibility Regulations). This application and certificate applies only to the NGT Electricity Transmission Network for the UK as described in the Technical Construction File.

COMPETENT BODY CONFORMITY STATEMENT

Hursley EMC Services Ltd. certifies that the National Grid Transco plc TCF demonstrates that the NGT Electricity Transmission Network conforms to the protection requirements of European Council Directive 89/336 and its amendments. This directive is on the approximation laws of the Member States relating to electromagnetic compatibility.

Signed: R. P. St John James
Rob St John James
EMC Technical Manager

Approved: Ian Kenney
Ian Kenney
EMC Quality Manager

Hursley EMC Services Ltd
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Issue Date: 17th March 2005

APPENDIX 3: Overhead Line Spans Exceeding 9 kV/m and Associated Land Uses

A.1 Introduction

This appendix details calculated electric field levels for 7 spans that are anticipated to exceed 9 kV/m of the uprating project on the 4ZC route. These calculations are to assess compliance with exposure policies detail the electric fields and the land uses under the overhead line spans. The spans are described by referencing the overhead line tower numbers at each side (so span 4ZC 008 to 009 is between those overhead line towers). **Table A.1** below shows the approximate mid-span locations for each span.

Table A.1 Approximate Mid-Span Locations

Span	Approximate Mid-span Location
4ZC 008 to 009	1 km west of Trawsfynydd substation
4ZC 015 to 016	1.3 km west of Maentwog Dam, on the western side of Llyn Trawsfynydd
4ZC 091 to 092	1 km south of Llanllyfni and 1 km northwest of Nebo
4ZC 099 to 100	0.5 km east of Penygroes; Pant Du Vineyard
4ZC 105 to 106	0.4 km west of Carmel
4ZC 132 to 133	1 km south of Llanrug
4ZC 152 to 153	0.8 km south of Pentir substation

A.2 Calculations

Calculated electric field levels using 3-dimensional calculation software (EFC-400, Narda) have been produced for spans identified as exceeding 9 kV/m. All calculations were performed in accordance with the conditions set out in the Codes of Practice as detailed in **Sections 2.2 and 2.3**. These additional calculations have been performed to check for any land directly below the overhead line which may be used by people for significant durations including residences to ensure compliance.

A.2.1 Calculated Electric Fields and Land Uses for Spans Exceeding 9 kV/m

4ZC 008 to 009: This span has a minimum conductor clearance of 7.65 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 015 to 016: This span has a minimum conductor clearance of 7.70 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 091 to 092: This span has a minimum conductor clearance of 8.38 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 099 to 100: This span has a minimum conductor clearance of 8.37 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 105 to 106: This span has a minimum conductor clearance of 8.37 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 132 to 133: This span has a minimum conductor clearance of 7.73 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

4ZC 152 to 153: This span has a minimum conductor clearance of 7.58 m which results in small areas of land directly below the conductors exceeding 9 kV/m detailed in red in the graphic below. Land use does not fall under the categories of those defined in the Code of Practice and is compliant with the EMF requirements in NPS EN-5.

A.3 Summary

For each span considered in this appendix, the uprating proposal by the Project will produce electric fields that are fully compliant with the public exposure guidelines for EMFs.

7.1.B. Report to Inform Habitats Regulations Assessment

nationalgrid

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1. Introduction

1.1.1 National Grid Electricity Transmission plc. (NGET) (‘the Applicant’) has undertaken a Report to Inform Habitats Regulations Assessment (HRA) of the potential effects of the proposed Pentir to Trawsfynydd Reinforcement Project (the ‘Project’) on areas that have been internationally designated for nature conservation purposes i.e., ‘Habitats sites’. Habitats sites are protected under the Conservation of Habitats and Species Regulations 2017 (as amended; relevant to England and Wales) (Ref 1.1), also known as the Habitats Regulations.

1.1.2 Regulation 63 of the Habitats Regulations requires a ‘Competent Authority’ to undertake an ‘Appropriate Assessment’ (AA) of any plan or project (alone or in-combination with other plans and projects) that is likely to have a significant effect on the qualifying features of a Habitats site, unless the project is directly connected with the management of the site. In light of the conclusions of the assessment, the Competent Authority may proceed with or consent to the plan or project only after having ascertained that it will not adversely affect the integrity of the Habitats site.

1.1.3 If adverse effects on integrity are identified that cannot be sufficiently mitigated, alternatives should be considered to avoid those effects. However, where no alternative solution exists, and an adverse effect remains, a further assessment should be made of whether the proposed project is required for imperative reasons of overriding public interest (IROPI) for the project in accordance with Regulation 64. If it passes that test, then compensation for any harm that would be caused to the National Site Network must be delivered.

1.1.4 This report is designed to serve three key functions:

- to inform the Competent Authorities’ HRA, with regard to analysis of impacts of the Project on Habitats sites.
- advise on appropriate mechanisms for delivering mitigation where such effects are identified.
- to act as a confirmatory checklist that can be used to ensure that the relevant information needed for a HRA has been provided as part of the application process.

1.1.5 This report has been prepared based on scientific knowledge and an examination of all the potential impacts of the Project on Habitats sites. For clarity, where reference is made below to ‘this HRA’ it refers to this *Report to Inform HRA to be undertaken by Competent Authorities*.

1.2 Project Overview

1.2.1 The Project comprises five components, as briefly described below. Full details are provided in **Volumes 2 – 6 of the Environmental Statement (ES).**

- Pentir Works (**Volume 2**) – Replacement of existing underground cables, installation of new cross site underground cables in the existing Pentir substation; and ancillary works.

- Bryncir Works (**Volume 3**) – A new 400/132 kilovolt (kV) substation south of Bryncir village ('Bryncir substation'); replacement of Tower 4ZC067 and new downleads into Bryncir substation; construction of a new SPEN 132 kV line (partly overhead and partly underground) between the new Bryncir substation and the existing SPEN DB route; and removal of a redundant section of SPEN DB route.
- Glaslyn Cables Works (**Volume 4**) – An extension to the existing Wern Cables Sealing End Compound (CSEC), replacement of the Glaslyn Cables with new 400 kV sections ('inland' A circuit and 'coastal' B circuit) between Wern CSEC and Minffordd CSEC. A new CSEC and a Tunnel Head House previously consented by the Eryri Visual Impact Provision (EVIP) Project (increase of floor height) at Minffordd; removal of the existing Garth CSEC; removal of some redundant sections of the existing 400 kV and 132 kV cables; and making safe sections of redundant Glaslyn Cables left in-situ.
- Trawsfynydd Works (**Volume 5**) – Replacement of downleads from Tower 4ZC005, underground cabling works, installation of a shunt reactor and amendments to the Trawsfynydd substation compound fence line.
- Wider Works (**Volume 6**) – Reconductoring and replacement of fittings on the 'coastal' circuit B between Towers 4ZC005 (near the Trawsfynydd substation) and Tower 4ZC027 (at the EVIP project) and replacement of the earthwire with Optical Ground Wire (OPGW). Reconductoring and replacement of fittings between Tower 4ZC044 (Wern CESC) and Tower 4ZC070 (near the new Bryncir substation) with 400 kV conductors and replacement of the earthwire with OPGW. Installation of fibre optic cables along the existing earthwire on the 4ZC between Towers 4ZC070 and Tower 4ZC140 (near the Pentir substation).

2. Legislative Framework

2.1.1 As part of the assessment of a development, it is necessary to consider whether the development is likely to have a 'significant' effect on Habitats sites' (see 1.1.1 above).

2.1.2 The UK left the European Union (EU) on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 (termed the 'Withdrawal Act'). However, the most recent amendments to the 'Habitats Regulations' (i.e., Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 (Ref 2.1) confirm that the need for HRA continues to apply. The 2019 Regulations make changes to the Habitats regime and terminology e.g., by introducing the term 'national site network', and 'Habitats sites'. This document uses the term 'Habitats sites' to refer to all former Natura 2000 sites in line with current standard practice (comprising Special Areas of Conservation (SAC) and Special Protection Areas (SPA)) potentially affected by the Proposed Development. Planning Policy Wales Technical Advice Note 5: Nature Conservation and Planning (Ref 2.2) requires proposed SACs and SPAs to be treated as Habitats sites along with Ramsar (wetlands of international importance) sites.

2.1.3 All plans and projects should identify any possible effects early in the plan/project making process and then either alter the plan/project to avoid them or introduce mitigation measures to the point where no adverse effects remain. The Competent Authority must consult with the Statutory Nature Conservation Body (in this case, Natural Resources Wales) and have regard to their comments. They may also consult the general public if considered appropriate.

2.2 Relevant Case Law

2.2.1 Although the UK is no longer part of the EU, a series of rulings of the Court of Justice of the European Union (CJEU) are still relevant. The HRA is in accordance with the principles established through these precedence cases. The relevant rulings and their implications for this HRA are summarised in **Table 2.1** and this HRA is cognisant of these rulings.

Table 2.1 – Case law relevant to the HRA of the Project

Case	Ruling	Relevance to HRA
People Over Wind and Sweetman v Coillte Teoranta (C-323/17) (Ref 2.3)	The ruling of the CJEU in this case requires that any conclusion of 'no likely significant effect' on a Habitats site at the screening stage must be made prior to any consideration of measures to avoid or reduce harm to the Habitats site. The determination of likely significant effects at the screening stage should not, in the opinion of the CJEU, constitute an attempt at detailed	This ruling clarified that 'mitigation' (i.e., measures that are specifically introduced to avoid or reduce a harmful effect on a Habitats site that would otherwise arise) should not be taken into account when forming a view on likely significant effects at the screening stage. Mitigation should instead only be considered at the AA stage.

Case	Ruling	Relevance to HRA
	technical analyses. This should be conducted as part of the AA.	
Waddenzee (C-127/02) (Ref 2.4)	The ruling in this case clarified that AA must be conducted using best scientific knowledge, and that the Competent Authority must be satisfied that there is no reasonable doubt as to the absence of adverse effects on the integrity of a Habitats site. The Waddenzee ruling also provided clarity on the definition of 'significant effect', specifically that any effect from a plan or project on the conservation objectives of any Habitats site will be a significant effect.	Adopting the precautionary principle, a 'likely' significant effect in this HRA is interpreted as one which is 'possible' and cannot be objectively ruled out. The test of significance of effects has been conducted with reference to the conservation objectives of relevant Habitats sites.
Holohan and Others v An Bord Pleanála (C-461/17) (Ref 2.5)	The conclusions of the Court in this case were that consideration must be given during AA to: Effects on qualifying habitats and/or species of a SAC or SPA, even when occurring outside of the boundary of a Habitats site, if these are relevant to the site meeting its conservation objectives; and Effects on non-qualifying habitats and/or species on which the qualifying habitats and/or species depend and which could result in adverse effects on the integrity of the Habitats site.	This relates to the concept of 'functionally-linked habitat' (i.e., areas outside of the boundary of a Habitats site which supports its qualifying feature(s)). In addition, consideration must be given to non-qualifying features upon which qualifying habitats and/or species rely. This HRA has taken the use of functionally linked habitats into account in relation to marsh fritillary.
T.C Briels and Others v Minister van Infrastructuur en Milieu (C-521/12) (Ref 2.6)	The ruling of the CJEU in this case determined that compensatory measures cannot be used to support a conclusion of no adverse effect on site integrity.	Compensation can only be considered at the IROPI stage of HRA and not during AA. Compensation must be delivered when AA concludes that there will be adverse effects on site integrity.
Langton, R (on the Application of) v Secretary of State for Environment, Food and Rural Affairs & Anor. (CO/2062/2020) (Ref 2.7)	High Court ruled that conditions on badger cull licences preventing badger culling near a Special Protection Area or at certain times of year should not be classed as mitigation measures as described in the People over Wind ruling.	Restrictions on the timing of works which are part of the proponent's proposal can be taken into account in HRA Stage 1.

3. Assessment Methodology

3.1 Introduction

3.1.1 This HRA has been undertaken with reference to the general European Commission (EC) guidance on HRA (Ref 3.1), and general guidance on HRA published jointly by the UK Government, Natural England and Natural Resources Wales in February 2021 (Ref 3.2).

3.1.2 Whilst the HRA decisions must be taken by the Competent Authority, the information needed to undertake the necessary assessments must be provided by the Applicant. The information needed for the Competent Authority to establish whether there are any Likely Significant Effects (LSEs) from the Project and to assist in carrying out its Appropriate Assessment (if required), are provided in this HRA report.

3.2 Description of HRA Tasks

Evidence Gathering

3.2.1 Baseline data for the Habitats sites covered in this assessment is derived from the Joint Nature Conservation Committee (JNCC) website (Ref 3.3), Natural Resources Wales (NRW), Designated Site search (Ref 3.4) and the Multi-Agency Geographic Information for the Countryside website (Ref 3.5).

3.2.2 This HRA has been informed by the following Pentir to Trawsfynydd Reinforcement Project Environmental Statement (ES) reports:

- **Volumes 2-5: Chapters 2, 5, 9, 10 and 11.**
- **Volumes 6 and 7.**
- **Relevant Ecology Survey appendices.**

3.1 HRA Task 1: Test of Likely Significant Effects – 'Screening'

3.1.1 The objective of the test of likely significant effects (ToLSE) is to 'screen out' those aspects of a Project and/or the Habitats sites that can, without any detailed appraisal, be deemed unlikely to result in significant adverse effects upon Habitats sites, usually because there is no mechanism for an adverse interaction (i.e., an impact pathway) with Habitats sites. The remaining aspects are then taken forward to an Appropriate Assessment (AA). The HRA must consider the potential for effects 'in combination' with other plans and projects.

3.1.2 This HRA has been prepared in accordance with principles set out in relevant case law and guidance relating to the 2017 Regulations, the Habitats Directive (Ref 1.1) and Birds Directive (Ref 3.6), see **Table 2.1**). This includes the ruling by the CJEU in the case of 'People Over Wind', Peter Sweetman v Coillte Teoranta (C-323/17) (Ref 2.3). This case held that: *"it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site"* (Paragraph 40). This establishes that mitigation measures cannot be taken into account at the screening stage, but they can be taken into account in an AA. The effect of this is that the screening stage must be undertaken on a precautionary basis with no regard to mitigation measures.

3.1.3 This ruling has since been qualified by the UK courts. On 15 August 2018, in the case of Langton (Ref 2.7), the High Court ruled that conditions on badger cull licences preventing badger culling near a Special Protection Area or at certain times of year should not be classed as mitigation measures as described in the People over Wind ruling. The judge ruled that these licence conditions were properly characterised as “integral features of the project” and could therefore be relied on for the purposes of Habitats screening. His reasoning was that it would be *"contrary to common sense for Natural England to assume that culling would take place at times and places where the applicants did not propose to do so”.* Restrictions on the timing of works which are part of the proponent's proposal can be taken into account in HRA Task 1.

3.1.4 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 3.7) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 3.8) make it an offence to pollute watercourses, irrespective of whether they are designated as Habitats sites or not. Therefore, pollution control measures can also be considered at the ToLSE stage.

In-Combination Assessment

3.1.5 It is a requirement of the Habitats Regulations that the impacts and effects of any proposed development being assessed are not only considered in isolation but also in combination with other plans and projects that may also have effects on the Habitats site(s) in question.

3.1.6 When undertaking this part of the assessment it is essential to consider the principal intention behind the legislation, i.e., to ensure that those projects or plans (which in themselves may have minor impacts) are not simply dismissed on that basis but are evaluated for any cumulative contribution they may make to an overall significant effect. In practice, in-combination assessment is of greatest relevance when a proposed development would otherwise be screened out because its individual contribution is inconsequential. The overall approach is to exclude the risk of there being unassessed LSEs in accordance with the precautionary principle. This was first established in the seminal Waddenzee case (Ref 2.4).

3.1.7 The in-combination assessment is discussed in **Chapter 9** of this report

3.2 HRA Task 2: Appropriate Assessment

3.2.1 Where it is determined that a conclusion of ‘no LSE’ cannot be drawn, the HRA proceeds to HRA Task 2 - Appropriate Assessment (AA). Case law has clarified that ‘Appropriate Assessment’ is not a technical term. There are no specific technical analyses, or level of detail, that are classified by law as belonging to Appropriate Assessment rather than the screening for LSEs. The Appropriate Assessment constitutes whatever level of further assessment is required to determine whether an adverse effect on the integrity of a Habitats site would arise as a result of the Project.

3.2.2 As HRA Task 2 – Appropriate Assessment follows the screening process, there is an understanding that the analysis will be more detailed than that undertaken at the previous stage. One of the key considerations during HRA Task 2 - Appropriate Assessment is whether there is available mitigation that would address the potential effect, allowing for a conclusion of no adverse effect on integrity. In practice, HRA Task 2 – Appropriate Assessment takes any element of the Project that could not be excluded as having LSEs following HRA Task 1 and assesses the potential for an effect in more detail, to conclude whether that element would cause an adverse effect on site integrity for a Habitats site. Adverse effects on a Habitats site's integrity include disruption of the coherent structure and function of the Habitats site(s) and the ability of the site to achieve its Conservation Objectives.

3.2.3 In 2018, the Holohan ruling (Ref 2.5) was handed down by the European Court of Justice. Paragraph 40 of the ruling states that: *''Article 6(3) of the Habitats Directive must be interpreted as meaning that an 'appropriate assessment' must, on the one hand, catalogue the entirety of habitat types and species for which a site is protected, and, on the other, identify and examine both the implications of the proposed project for the species present on that site, and for which that site has not been listed, <u>and the implications for habitat types and species to be found outside the boundaries of that site, provided that those implications are liable to affect the conservation objectives of the site</u>"* [emphasis added]. This ruling has been considered in relation to the Proposed Development, particularly with regard to mobile qualifying species.

4. Establishing the Zone of Influence

4.1 Approach

4.1.1 There is no pre-defined guidance on the physical scope of an HRA in all circumstances. When seeking to identify relevant Habitats sites, consideration was given primarily to potential impact pathways and the source-pathway-receptor approach, rather than adopting a purely ‘zones’-based approach. The source-pathway-receptor model is a standard tool in environmental assessment. For an impact to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no possibility for an effect to occur.

4.1.2 Further, even where an impact is predicted to occur, it will not necessarily result in significant effects if, for example, it falls below an effect threshold. It is important to distinguish between an ‘impact’ and an ‘effect’. An impact is defined as an action resulting in changes to an ecological feature, while an effect is the outcome to an ecological feature arising from an impact (Ref 4.1). For example, an impact may be the disturbance of a roost of wintering waders as a result of construction activities; the effect would be how the population or conservation status of the species disturbed by the works changes as a consequence.

4.1.3 The likely zone of impact (also referred to as the likely ‘zone of influence’ - ZoI) of a project is the geographic extent over which ecological effects are likely to occur. The ZoI of a project will vary depending on the specifics of a particular proposal and must be determined on a case-by-case basis with reference to a variety of criteria, including:

- the nature, size, scale and location of the project;
- the connectivity between the plan or project and Habitats sites, for example through hydrological connections or because of the natural movement of qualifying species;
- the sensitivity of ecological features under consideration; and
- the potential for in-combination effects.

4.1.4 There is no geographical limit beyond which Habitats sites need not be considered by HRA of a project.

4.1.5 The process of determining which (if any) Habitats sites are in the ZoI of the Project was a progressive appraisal of the potential for each impact source which could arise from its construction operation(including maintenance) and decommissioning to affect the qualifying features of such sites.

4.2 Sources of Impact from the Project

4.2.1 A number of impacts could arise from the construction, operation and maintenance of the Project. A description of each, and their potential relevance to the qualifying features of Habitats sites, is shown in **Table 4.1.**

Table 4.1 – Sources of impact from the Project

Impact category	Brief description
Direct loss of habitat	The direct loss of habitat from within the boundary of a Habitats site. This may include the loss of a habitat type which is itself a qualifying feature of a site, or the loss of habitat that is used by qualifying species for commuting, foraging and/or sheltering, which would pose implications for the site conservation objectives.
Loss of functionally-linked habitat	The loss of habitat which is outside of the boundary of a Habitats site, but which is critical to its functioning. For example, the loss of habitat outside of an SPA which is used for foraging purposes by qualifying bird species which nest in the SPA.
Waterborne pollution	Including, for example, suspended sediment or run-off of water containing other pollutants such as hydrocarbons or chemicals. Effluent discharges would also be included in this category.
Airborne pollution	This encompasses both dust (i.e., particles of sufficiently large size to coat vegetation and interfere with photosynthesis) and atmospheric pollutants that can be toxic to vegetation or contribute to nitrogen deposition and thus eutrophication. The latter mainly constitutes oxides of nitrogen (NOx) associated with combustion such as vehicle exhausts, and ammonia (NH_3) associated particularly with industrial processes and agriculture, but also with vehicle exhausts.
Hydrological changes	Impacts which alter the hydrological conditions either within a Habitats site or in an area used by the qualifying features of a Habitats site. For example, reduced flows in a watercourse due to impoundment, or changes to groundwater flows or volumes due to abstraction. These changes can have multiple effects on habitats and species.
Disturbance of qualifying species	This could be physical disturbance, for example, due to the movement of vehicles in proximity to qualifying species, or due to noise and/or vibration. The latter may occur at greater distances. Disturbance could arise either during the construction or operational phase of a development.
Barriers and/or disturbance displacement	Barriers to the movement of qualifying species, which can either be physical (for example, a dam in a river) or physiological (for example, the attraction of migratory fish towards the outflow of a hydroelectric scheme). Disturbance displacement may also occur due to the presence of new infrastructure that interrupt open vistas preferred by some qualifying bird species.
Injury or mortality	The direct injury or mortality of a qualifying species, either during the construction or operation of a new development. For

Impact category	Brief description
	example, birds may suffer injury or mortality when colliding with overhead lines.
Spread of invasive non-native species	Invasive non-native species can have detrimental impacts on native species and habitats. Their spread can occur during construction and operation of a development, and via multiple pathways (for example via watercourses or on the treads of construction machinery).

4.3 Impact Pathways

4.3.1 Impact pathways are routes by which the implementation of a project or plan can lead to an effect upon a Habitats site. For an impact to have an effect on a qualifying feature of a Habitats site, a pathway between the impact source and that feature must exist. An example of this would be visual and noise disturbance arising from the construction work or operational phase associated with a project. If there are sensitive ecological receptors in a nearby Habitats site (e.g., non-breeding overwintering birds), this could alter their foraging and roosting behaviour and potentially affect the site's integrity. For some impact pathways (notably air pollution) there is guidance that sets out distance-based zones required for assessment. These are discussed below where relevant.

4.3.2 For each of the types of impact which could arise (as set out in **Table 4.1**) the maximum distance at which an effect could occur was assessed based on the pathway(s) by which such impact(s) could reach a Habitats site or its qualifying feature(s). These 'impact pathway buffers' were based on published guidance or best available research, wherever possible. For other impact pathways, a professional judgment must be made based on the best available evidence. The adopted impact pathway buffers are set out in **Table 4.2**.

Table 4.2 – Impact pathway buffer distances

Impact category	Brief description
Direct loss of habitat	Within Habitats site boundary.
Loss of functionally-linked habitat	Depends on the species in question. NatureScot's guidance on 'Assessing Connectivity with Special Protection Areas (SPAs)' (Ref 4.2) suggests that certain species of geese may forage up to 15-20 kilometres (km) from the boundary of SPAs for which they are qualifying features. This is likely to be the largest distance at which functionally-linked habitat may be from a Habitats site, although there more be specific data (e.g. tracking data) which indicates linkages across greater distances. More generally, functionally-linked habitat is likely to be within a maximum of 10 km (though often considerably less than this) from Habitats site boundary for most species.
Waterborne pollution	No buffer used – relies on there being a hydrological connection to a Habitats site according to the source-pathway-receptor model.

Impact category	Brief description
Airborne pollution	50 metres (m) for dust generation (Ref 4.3) and 200 m for emissions from road traffic (Ref 4.4).
Hydrological changes	No buffer used – relies on there being a hydrological connection to a Habitats site according to the source-pathway-receptor model
Disturbance of qualifying species	Based on the published guidance referenced below, the following distances were used when considering how far construction, operational and maintenance activities may disturb qualifying species: • non-breeding waterbirds – the Waterbird Disturbance Mitigation Toolkit (Ref 4.5) provides species-specific information on the sensitivity of several bird species which are qualifying features of SPAs. However, it suggests that, in general, disturbance of non-breeding waterbirds can occur up to distances of up to 500 m from construction works; • breeding birds – 1 km, this being the maximum distance at which (Ref 4.6) consider disturbance could occur on the most sensitive species for which SPAs are designated. • Otter (*Lutra lutra*) – 200 m in accordance with SNH (undated(b)) (Ref 4.7) which suggests this distance for otter breeding sites, reduced to 30 m for other resting sites not used for breeding purposes.
Barriers and/or disturbance displacement	Not possible to set buffer. Depends on movements of species, which may be very long-distance for those which migrate. Although otter could be impacted by works in watercourses or waterbodies, this species is readily able to navigate overland. There is consequently no mechanism by which the Project could prevent the regular movements, including migration, of qualifying species other than fish. The ZoI for this impact was taken to be any SAC designated for fish species for which a direct hydrological connection to the Project exists.
Injury or mortality	Injury or mortality only likely to occur in Habitats site boundary or when species are using functionally-linked habitat: refer to criteria for ‘Direct loss of habitat’ and ‘Loss of functionally-linked habitat’.
Spread of invasive non-native species	Generally within 100 m, except where hydrological connectivity could result in spread further afield.

4.4 Relevant Habitats Sites

4.4.1 To identify which Habitats sites should be scoped into the HRA, the impact pathway buffers set out in **Table 4.2** and professional judgment were used. **Table 4.2** shows that the impacts which could occur over the largest distance (excluding instances where there is a hydrological connection) are the loss of functionally-linked habitat used by foraging non-breeding goose species (up to 20 km).

4.4.2 Based on the impact pathway buffers set out in **Table 4.2**, and professional judgement, a search radius of 10 km has been used for SACs and 20 km for SPAs designated for species with large core foraging ranges for this HRA. This is extended to 30 km for SACs designated for bats, or where bats are listed as a qualifying feature. These buffers have been applied to each separate component of the Project.

4.4.3 Based on the search radii above, relevant Habitats sites were identified using Geographic Information System data from datasets downloaded from the Joint Nature Conservation Committee (JNCC) and the Multi-Agency Geographic Information for the Countryside (MAGIC) website.

4.4.4 It was decided that this HRA should focus on the Habitats sites shown in **Tables 4.3 – 4.7** as no realistic linking impact pathways exist to other Habitats sites.

Pentir Substation

Table 4.3 – Habitats sites for consideration and their location in relation to the Pentir substation component of the Project

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
Eryri/Snowdonia SAC	Annex I habitats that are a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Siliceous alpine and boreal grasslands • Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels • Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) • Calcareous rocky slopes with chasmophytic vegetation • Siliceous rocky slopes with chasmophytic vegetation Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:	2.89 km south-east

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
	• Northern Atlantic wet heaths with *Erica tetralix* • European dry heaths • Alpine and Boreal heaths • Alpine and subalpine calcareous grasslands • Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)* **Priority feature** • Blanket bogs (* if active bog)* **Priority feature** • Depressions on peat substrates of the *Rhynchosporion* • Petrifying springs with tufa formation (*Cratoneurion*)* **Priority feature** • Alkaline fens • Alpine pioneer formations of the *Caricion bicoloris-atrofuscae** **Priority feature** • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex II species that are a primary reason for selection of this site: • Slender green feather-moss • Floating water-plantain	
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	Annex I habitats that are a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time • Mudflats and sandflats not covered by seawater at low tide • Reefs Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Large shallow inlets and bays • Submerged or partially submerged sea caves	3.11 km west
Traeth Lafan/Lavan Sands, Conway Bay SPA	Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC:	6.06 km north-east

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
	• Oystercatcher (*Haematopus ostralegus*) • Red-breasted merganser (*Mergus serrator*) • Curlew (*Numenius Arquata*) • Great crested grebe (*Podiceps cristatus*) • Redshank (*Tringa totanus)*	
Afon Gwyrfai a Llyn Cwellyn SAC	Annex I habitats that are a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species that are a primary reason for selection of this site: • Atlantic salmon (*Salmo salar*) • Floating water-plantain (*Luronium natans*) Annex II species present as a qualifying feature, but not a primary reason for site selection: • Otter (*Lutr lutra*)	8.76 km south
Coedydd Aber SAC	Annex I habitats that are a primary reason for selection of this site: • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * **Priority feature**	10.07 km east
Glynllifon SAC	Annex II species that are a primary reason for selection of this site: • Lesser horseshoe bat (*Rhinolophus hipposideros*)	13.62 km south-west
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd	Annex I habitats that are a primary reason for selection of this site:	17.09 km south-east

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
Oakwoods and Bat Sites SAC	• Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * **Priority feature** Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Northern Atlantic wet heaths with *Erica tetralix* • European dry heaths • Tilio-*Acerion* forests of slopes, screes and ravines* **Priority feature** • Bog woodland* **Priority feature** Annex II species that are a primary reason for selection of this site: • Lesser horseshoe bat	
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Annex I habitats that are a primary reason for selection of this site: • Calaminarian grasslands of the *Violetalia calaminariae* Annex II species present as a qualifying feature, but not a primary reason for site selection: • Lesser horseshoe bat	21.06 km east

Wider Works

Table 4.4 – Habitats sites for consideration and their location in relation to the Wider Works component of the Project (Habitats sites outside the ZoI are denoted by 'N/A').

Habitats site	**Reason for designation**	**Distance (at closest point) and direction from Project**	
		Tower 4ZC141 to 4ZC044	**Tower 4ZC026 to Trawsfynydd Substation**
Afon Gwyrfai a Llyn Cwellyn SAC	Refer to **Table 4.3**	Project crosses over the SAC between 4ZC120 and 4ZC121.	N/A
Corsydd Eifionydd/Eifionydd Fens SAC	Annex I habitats that are a primary reason for selection of this site: • Transition mires and quaking bogs Annex II species that are a primary reason for selection of this site: • Marsh fritillary butterfly (*Euphydryas (Eurodryas, Hypodryas) aurinia*) • Slender green feather-moss (*Drepanocladus (Hamatocaulis) vernicosus*)	0.12 km south-west of 4ZC081.	N/A
Glynllifon SAC	Refer to **Table 4.3**	0.89 km north-west	N/A
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites	Refer to **Table 4.3**	1.57 km east.	Within
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Annex I habitats that are a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time • Estuaries • Coastal lagoons * **Priority feature** • Large shallow inlets and bays	2.4 km south	0.34 km north

Habitats site	Reason for designation	Distance (at closest point) and direction from Project	
		Tower 4ZC141 to 4ZC044	Tower 4ZC026 to Trawsfynydd Substation
	• Reefs Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Mudflats and sandflats not covered by seawater at low tide • *Salicornia* and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Submerged or partially submerged sea caves Annex II species present as a qualifying feature, but not a primary reason for site selection: • Bottlenose dolphin (*Tursiops truncates*) • Otter • Grey seal (*Halichoerus grypus*)		
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Annex II species that are a primary reason for selection of this site: • Red-throated diver (*Gavia stellata*)	2.54 km south of 4ZC058	9.10 km west
Eryri/Snowdonia SAC	Refer to **Table 4.3**	2.3 km east of 4ZC141	N/A
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	Refer to **Table 4.3**	4.15 km north-west	N/A
Morfa Harlech a Morfa Dyffryn SAC	Annex I habitats that are a primary reason for selection of this site: • Embryonic shifting dunes • "Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")"	4.67 km south-east	5.10 km south-west

Habitats site	Reason for designation	Distance (at closest point) and direction from Project	
		Tower 4ZC141 to 4ZC044	Tower 4ZC026 to Trawsfynydd Substation
	• "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * **Priority feature** • Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) • Humid dune slacks Annex II species that are a primary reason for selection of this site: • Petalwort (*Petalophyllum ralfsii*)		
Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	Annex I habitats that are a primary reason for selection of this site: • Embryonic shifting dunes • "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" • "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * **Priority feature** • Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) • Humid dune slacks Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* -type vegetation Annex II species that are a primary reason for selection of this site: • Petalwort • Shore dock (*Rumex rupestris*)	6.10 km west	N/A
Traeth Lafan/Lavan Sands, Conway Bay SPA	Refer to **Table 4.3**	9.90 km north-east	N/A

Habitats site	Reason for designation	Distance (at closest point) and direction from Project	
		Tower 4ZC141 to 4ZC044	Tower 4ZC026 to Trawsfynydd Substation
Migneint-Arenig-Dduallt SPA	Annex II species that are a primary reason for selection of this site: • Hen harrier (*Circus cyaneus*) • Merlin (*Falco columbarius*) • Peregrine falcon (*Falco peregrinus*)	16.23 km east	1.68 km east
Migneint-Arenig-Dduallt SAC	Annex I habitats that are a primary reason for selection of this site: • European dry heaths • Blanket bogs (if active bog)* **Priority feature** Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Natural dystrophic lakes and ponds • Northern Atlantic wet heaths with *Erica tetralix* • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles	N/A	1.68 km east
Rhinog SAC	Annex I habitats that are a primary reason for selection of this site: • European dry heaths • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*	N/A	3.33 km south

Habitats site	Reason for designation	Distance (at closest point) and direction from Project	
		Tower 4ZC141 to 4ZC044	Tower 4ZC026 to Trawsfynydd Substation
	• Northern Atlantic wet heaths with *Erica tetralix* • Alpine and Boreal heaths • Blanket bogs (* if active bog) * **Priority feature** • Depressions on peat substrates of the *Rhynchosporion* Annex II species present as a qualifying feature, but not a primary reason for site selection: • Floating water-plantain		
Afon Eden - Cors Goch Trawsfynydd SAC	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Active raised bogs * **Priority feature** Annex II species that are a primary reason for selection of this site: • Freshwater pearl mussel (*Margaritifera margaritifera*) • Floating water-plantain Annex II species present as a qualifying feature, but not a primary reason for site selection: • Atlantic salmon • Otter	N/A	3.64 km south
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Refer to **Table 4.3**	20.93 km east	19.36 km north
Llyn Idwal Ramsar	Ramsar criterion 1: • A small, shallow, oligotrophic corrie lake. The semi-circular rock basin (or cwm) containing the lake is one of the finest examples in Snowdonia.	N/A	9.98 km south-east

Habitats site	Reason for designation	Distance (at closest point) and direction from Project	
		Tower 4ZC141 to 4ZC044	Tower 4ZC026 to Trawsfynydd Substation
	Ramsar criterion 2: • Species-rich plant community, including almost all of the species typical of oligotrophic waters in Britain. Notable species include *Elatine hexandra* and *Subularia aquatica* (both nationally scarce) and *Pilularia globulifera* (vulnerable at a European level).		

Bryncir

Table 4.5 – Habitats sites for consideration and their location in relation to the Bryncir component of the Project

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
Corsydd Eifionydd/Eifionydd Fens SAC	Refer to **Table 4.4**	1.88 km north-east.
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Refer to **Table 4.4**	5.13 km south-east.
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Refer to **Table 4.4**	5.16 km south.
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Refer to **Table 4.3**	7.62 km south-east.
Glynllifon SAC	Refer to **Table 4.3**	9.23 km north-west.

Glaslyn Cables

Table 4.6 – Habitats sites for consideration and their location in relation to the Glaslyn Cables component of the Project

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Refer to **Table 4.3**	Within.
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Refer to **Table 4.4**	0.54 km south.
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Refer to **Table 4.4**	2.94 km south-west.
Morfa Harlech a Morfa Dyffryn SAC	Refer to **Table 4.4**	3.18 km south.
Corsydd Eifionydd/Eifionydd Fens SAC	Refer to **Table 4.4**	6.12 north-west.
Rhinog SAC	Refer to **Table 4.4**	6.66 km south-east.
Migneint-Arenig-Dduallt SPA	Refer to **Table 4.4**	11.03 km east.
Glynllifon SAC	Refer to **Table 4.3**	12.92 km north.
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Refer to **Table 4.3**	24.36 km north-east.

Trawsfynydd Substation

Table 4.7 – Habitats sites for consideration and their location in relation to the Trawsfynydd substation component of the Project

Habitats site	Reason for designation	Distance (at closest point) and direction from Project
Migneint-Arenig-Dduallt SAC	Refer to **Table 4.4**	1.08 km north-east.
Migneint-Arenig-Dduallt SPA	Refer to **Table 4.4**	1.08 km north-east.
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Refer to **Table 4.3**	1.44 km south-west.
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Refer to **Table 4.4**	3.35 km north-west.
Afon Eden – Cors Goch Trawsfynydd SAC	Refer to **Table 4.4**	3.36 km south.
Rhinog SAC	Refer to **Table 4.4**	4.60 km south-west.
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Refer to **Table 4.3**	19.87 km north.
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Refer to **Table 4.4**	15.48 km west.

4.5 Summary

4.5.1 From the scoping exercise it can be seen that pathways from multiple components exist to Habitats sites. These are summarised in **Table 4.8**.

Table 4.8 – Summary by potential common impact pathways

Habitats site	Project component with potential linking impact pathways				
	Trawsfynydd	Glaslyn	Bryncir	Wider Works	Pentir
Migneint-Arenig-Dduallt SAC	Y	-	-	Y	-
Migneint-Arenig-Dduallt SPA	Y	Y	-	Y	-
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Y	Y	Y	Y	Y
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Y	Y	Y	Y	-
Afon Eden – Cors Goch Trawsfynydd SAC	Y	-	-	Y	-
Rhinog SAC	Y	Y	-	Y	-
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Y	Y	-	Y	Y
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Y	Y	Y	Y	-
Morfa Harlech a Morfa Dyffryn SAC	-	Y	-	Y	-
Corsydd Eifionydd/Eifionydd Fens SAC	-	Y	Y	Y	-
Glynllifon SAC	-	Y	Y	Y	Y
Afon Gwyrfai a Llyn Cwellyn SAC	-	-	-	Y	Y
Eryri/Snowdonia SAC	-	-	-	Y	Y
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	-	-	-	Y	Y

Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	-	-	-	Y	-
Traeth Lafan/Lavan Sands, Conway Bay SPA	-	-	-	Y	Y
Llyn Idwal Ramsar	-	-	-	Y	-
Coedyyd Aber SAC	-	-	-	-	Y

4.5.2 For each of the Habitats sites identified as having potential linking pathways, the qualifying features were established and the conservation objectives for each feature were obtained. Information was also sought to understand the potential vulnerability of the features to any effects that might arise from the proposed Project and the NRW Core Management Plans for each Habitats site were also consulted.

4.5.3 **Figures 7.1.B.1 to 7.1.B.5, Appendix A** show these Habitats sites in relation to each component of the proposed Project sites.

4.5.4 The following Habitats sites have been scoped out from further assessment:

- Glannau Mon: Cors heli/Anglesey Coast: Saltmarsh SAC – situated 6.42 km (at its closest point) to the north-west of the Wider Works, this Habitats site is located on the island Anglesey and designated for its non-mobile features. It is reasonable to conclude that there are no linking pathways between this Habitats site and the Project, either alone or in-combination with other plans and projects.
- Anglesey Terns/Morwenoliaid Ynys Môn SPA - situated 11.89 km (at its closest point) to the north-west of the Wider Works and designated for its breeding tern (*Sterna* spp.) colonies. Terns like to nest on bare shingle or sand, creating scrapes in the stones to lay eggs that are camouflaged to look like pebbles. Habitats within and around the Project are not suitable for use by nesting terns. The foraging range of terns can vary, but most breeding birds feed within 20 km of their colony (Ref 4.8). However, terns are primarily offshore feeders and the Project is inland. It is reasonable to conclude that there are no linking pathways between this Habitats site and the Project, either alone or in-combination with other plans and projects.
- Liverpool Bay/Bae Lerpwl (Wales) SPA – situated 16.04 km north-east and designated for red-throated diver (non-breeding), little gull (*Hydrocoloeus minutus* (non-breeding)), little tern (*Sternula albifrons* (breeding)), common tern (*Sterna hirundo (*breeding)), migratory common scoter (*Melanitta nigra*) and its overall waterbird assemblage. As discussed above, the habitats associated with and around the Project are unsuitable for breeding and foraging terns. As with terns, little gulls are coastal birds, foraging offshore. The common scoter is a sea duck and although its foraging ranges could extend beyond site boundaries at coastal sites, they are unlikely to utilise inland water bodies. Wintering red-throated diver generally has a foraging range of <8 km (Ref 4.8), which is well below the distance of the SPA to the Project. Furthermore, they overwinter on the coast as opposed to inland. It is reasonable to conclude that there are no linking pathways between this Habitats site and the Project, either alone or in-combination with other plans and projects.

- Ynys Seiriol/Puffin Island SPA – situated 19.92 km north-east and designated for cormorant (*Phalacrocorax carbo*). Cormorants nest in colonies around the shore, on trees, islets or cliffs. They are coastal rather than oceanic birds, and some have colonised inland waters. Cormorants forage mainly in shallow coastal waters rather than offshore waters, foraging over rocky as well as sandy substrates. Foraging range varies between colonies and with season. A maximum foraging distance of 35 km has been recorded for this species. The mean of all the maximum foraging ranges recorded by different studies is 25 km (Ref 4.8). Although the Wider Works element of the Project is within this foraging range, there are no suitable foraging areas. It is reasonable to conclude that there are no linking pathways between this Habitats site and the Project, either alone or in-combination with other plans and projects.

5. Background to Potential Impact Pathways

5.1 Noise and Visual Disturbance

5.1.1 Development can result in noise or visual disturbance of qualifying species in Habitats sites, during the construction, operational and maintenance phases. For example, noise and visual disturbance arising from construction or maintenance may result in temporary behavioural changes in otter, such as disturbance in holts and displacement from specific stretches of the river. Disturbance from construction or maintenance may result in temporary behavioural changes in qualifying birds (e.g., interruption or cessation foraging, minor and major flight responses). During operation, noise emitted from industrial developments may permanently affect site usage of foraging and roosting birds. Disturbance from site usage by operational site staff, road traffic and operational lighting might also arise. Three of the most important factors determining the magnitude of disturbance from proposed developments on ecological receptors are individual species sensitivity, proximity of the disturbance source and timing/duration of the disturbance.

5.1.2 Both noise and visual stimuli may elicit disturbance responses, potentially affecting the fitness and survival of qualifying birds. Noise is a complex disturbance parameter requiring the consideration of multiple factors, including its non-linear scale, non-additive effect and source-receptor distance. Professional judgment suggests that a high level of noise disturbance constitutes a sudden noise event of over 60dB (decibels) or prolonged noise of over 72dB. Bird responses to high noise levels include major flight or the cessation of feeding, both of which might affect the survival of birds, particularly if other stressors are also present (e.g., cold weather, food scarcity).

5.1.3 Generally, research has shown that above noise levels of 84dB waterfowl show a flight response, while at levels below 55dB there is no effect on their behaviour (Ref 5.1). These two thresholds are useful as defining two extremes. The same authors have advised that regular noise levels should remain below 70dB at bird receptors, which will habituate to noise levels below this level (Ref 5.2). Generally, noise is attenuated by 6dB with every doubling of distance from the source. For example, impact piling, the noisiest construction activity (approximately 110dB at 0.67 m from source) will thus reduce to 67-68dB by 100 m away from the source.

5.1.4 The following parameters for the assessment of noise disturbance impacts have been acceptable on other projects[1]:

- 55dB is a reasonable ‘no effect’ level i.e. birds don’t react to sounds quieter than this;
- A 3dB change is the minimum change that is considered perceptible as a change (which would raise the acceptable noise threshold to 58dB);

[1] Discussions over noise disturbance to SPA/Ramsar took place over several projects, including the Sea Link and Viking CCS Pipeline developments.

- There is a difference between a change in noise being perceptible and being disturbing; it was agreed that 5dB above 55dB (60dB) was a suitably precautionary threshold for disturbance, unless baseline noise levels already exceed 60dB.

5.1.5 Visual stimuli have a higher disturbance potential than noise stimuli as, in most instances, visual stimuli will elicit a disturbance response at much greater distances than noise (Ref 5.3). For example, a flight response is triggered in most species when they are approached to within 150 m across a mudflat. Visual disturbance can be exacerbated by workers moving across open habitats undertaking sudden movements and using large machinery. Several species are particularly sensitive to visual disturbance including curlew (taking flight at 275m), redshank (at 250m), shelduck (*Tadorna tadorna*) (at 199m) and bar-tailed godwit (*Limosa lapponica*) (at 163m).

5.1.6 Overall, specific regard should be given to assemblage composition when identifying threshold levels for both visual and noise disturbance. It is likely that different avian species are differently affected depending on the types of habitat present, spatial requirements of ecological receptor species (e.g. flocking species such as pink-footed goose (*Anser brachyrhynchus (not found in the Project area)*) require large areas of supporting habitat), species-specific foraging behaviour and individual species sensitivity.

5.1.7 Fish can be impacted by underwater sound which can either be impulsive or continuous in nature and can cause a variety of impacts to fish, ranging from severe physical injury (e.g., rupture of the swim bladder), physical damage to the auditory system (e.g., temporary shifts in hearing thresholds) to behavioural changes, such as disruption of migratory behaviours.

5.1.8 Fish that rely on acoustic communication may be the most obvious to be affected by anthropogenic noise (Refs 5.4 and 5.5). However, all fish have the capability to hear low-frequency sounds (< 500 Hertz (Hz)) and, consequently, can be disturbed by noisy human activities (Ref 5.6 and 5.7).

5.1.9 General effects of noise on aquatic life have been reviewed extensively (Ref 5.8). These reviews highlight a critical need for data on population level effects, including reproduction, as successful reproduction is essential for population viability. For many fish species, the spawning period may be highly sensitive to impacts from noise if individuals gather in dense, localised spawning aggregations (Ref 5.9). A disturbance during spawning may hamper a much larger fraction of the population compared to other periods of the year. Additionally, during this critical period, fish may also be most vulnerable to external stressors (Ref 5.10), because fish are often in their poorest body condition during the spawning period (Refs 5.11 and 5.12).

5.1.10 Overall, the available baseline information suggests that the following Habitats sites within the Zone of Influence (ZoI) of the Project are sensitive to potential noise and visual disturbance. These sites are taken forward into the following chapters:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Glynllifon SAC
- Migneint-Arenig-Ddualt SPA

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Afon Eden – Cors Goch Trawsfynydd SAC

5.1.11 This pathway is scoped out for the Corsydd Eifionydd/Eifionydd Fens SAC as the Core Management Plan (Ref 5.13) does not specify disturbance as a threat to site integrity.

5.1.12 This pathway is scoped out for the Afon Eden – Cors Goch Trawsfynydd SAC as no in-channel works are proposed.

5.1.13 This pathway is also scoped out for the following Habitats sites as they are designated for non-mobile features:

- Migneint-Arenig-Dduallt SAC
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Y Fenai a Bae Conwy/Menai Strait SAC
- Conwy Bay SAC
- Eryri/Snowdonia SAC
- Rhinog SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Llyn Idwal Ramsar
- Coedydd Aber SAC

5.1.14 This pathway is also scoped out for the following Habitats site as it is well beyond the impact pathway buffer distances for disturbance of qualifying features described in **Table 4.2**:

- Traeth Lafan/Lavan Sands, Conway Bay SPA (9.81 km away)

5.1.15 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.2 Water Quality

5.2.1 The quality of the water that feeds a Habitats site is an important determinant of the condition of the habitats and species it supports. Poor water quality can have a range of environmental impacts:

- At high levels, toxic chemicals and metals can result in immediate death of aquatic life, and can have detrimental effects even at lower levels, including increased vulnerability to disease and changes in wildlife behaviour.
- Construction activities that involve ground excavations and the stripping of topsoil are associated with a high risk of sediment release in surface runoff. Excessive sedimentation can smother aquatic habitats and plants, increase turbidity and accelerate eutrophication.

- Eutrophication, the enrichment of water with nutrients, increases plant growth and consequently results in oxygen depletion. Algal blooms, which commonly result from eutrophication, increase turbidity and decrease light penetration. The decomposition of organic wastes that often accompanies eutrophication deoxygenates water further, augmenting the oxygen depleting effects of eutrophication. In freshwater ecosystems, plant growth is primarily determined by phosphorus (P) concentrations, which are determined by a wide range of sources, including treated sewage effluent from Wastewater Treatment Works and urban surfaces such as roads.
- Some pesticides, industrial chemicals, and components of sewage effluent are suspected to interfere with the functioning of the endocrine system, possibly having negative effects on the reproduction and development of aquatic life.

5.2.2 Under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 5.14), it is legally required to maintain and/or improve the ecological and chemical status of the water environment, which includes rivers, lakes, wetlands, groundwater, estuaries and coastal waters. There should be no deterioration or prevention of future improvement in the status of waterbodies. Water Framework Directive (WFD) assessments are directly linked to HRA in that consideration must also be given when undertaking a WFD assessment to the Conservation Objectives of designated sites, including SACs, SPAs and Ramsar's.

5.2.3 The magnitude of water quality impacts primarily depends on the appropriate treatment of process water and/or surface runoff. Furthermore, the severity of potential construction and operational water quality impacts is partially determined by the distance between development sites and ecological receptor sites.

5.2.4 The available baseline information suggests that the following Habitats sites within the ZoI of the Project are sensitive to potential water quality impacts. These sites are taken forward into the following chapters:

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Corsydd Eifionydd/Eifionydd Fens SAC
- Afon Gwyrfai a Llyn Cwellyn SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

5.2.5 This pathway is scoped out for the following Habitats sites as there is no hydrological connection between the qualifying features of these Habitats sites and the Project sites:

- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Afon Eden – Cors Goch Trawsfynydd SAC
- Rhinog SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Glynllifon SAC
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Migneint-Arenig-Dduallt SPA
- Migneint-Arenig-Dduallt SAC
- Eryri/Snowdonia SAC

- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Coedydd Aber SAC

5.2.6 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.3 Water Quantity, Level and Flow

5.3.1 The water level, its flow rates and the mixing conditions are important determinants of the conditions present within Habitats sites and the state of their qualifying features. Hydrological processes are critical in influencing habitat characteristics in coastal waters, including parameters such as current velocity, water depth, dissolved oxygen (DO) concentrations, salinity and water temperature. In turn, these parameters determine the short- and long-term viability of plant and animal species, as well as overall ecosystem composition. Changes to the water flow rate within an estuary can be associated with a multitude of knock-on impacts, including substratum loss, smothering and changes in wave exposure.

5.3.2 The unique nature of wetlands combines shallow water and conditions that are ideal for the growth of organisms at the basal level of food webs, which feed many species of birds, mammals, fish and amphibians. Overwintering, migrating and breeding wetland bird species are particularly reliant on these food sources, as they need to build up enough nutritional reserves to sustain their long migration routes or feed their hatched chicks.

5.3.3 The proliferation of impermeable surfaces increases the volume and speed of surface water runoff. Traditional drainage systems often cannot cope with the volume of runoff, particularly during intense rainfall events, resulting in downstream flooding of ecological receptor sites.

5.3.4 The available baseline information suggests that the following Habitats sites within the ZoI of the Project are sensitive to potential hydrological changes. These sites are taken forward into the following chapters:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Corsydd Eifionydd/ Eifionydd Fens SAC

5.3.5 This pathway is scoped out for the following Habitats sites as there is no hydrological connection between the qualifying features of these Habitats sites and the Project sites:

- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Afon Eden – Cors Goch Trawsfynydd SAC
- Rhinog SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Glynllifon SAC
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC

- Migneint-Arenig-Dduallt SPA
- Migneint-Arenig-Dduallt SAC
- Eryri/Snowdonia SAC
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA
- Llyn Idwal Ramsar
- Coedydd Aber SAC

5.3.6 The following Habitats sites have been scoped out as these Habitats sites are tidal and so not dependent on riverine input:

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

5.3.7 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.4 Loss of, or Damage to, Functionally Linked Habitat (FLH)

5.4.1 While most Habitats sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not necessarily the case. A diverse array of qualifying species including birds, bats, invertebrates and amphibians are not always confined to the boundary of designated sites. For example, marsh fritillary colonies vary in size with individuals rarely moving more than 1 km in their lifetime, however, movements of up to 5 km have been recorded between colonies (Ref 5.15) in search of suitable habitat comprising devil’s bit scabious, which is the larval food plant of the marsh fritillary butterfly.

5.4.2 Due to the highly mobile nature of waterfowl, it is inevitable that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of the Habitats site for which they are an interest feature. However, this area will still be essential for maintenance of the structure and function of the interest feature for which the site was designated and land use plans that may affect this land should still be subject to further assessment. This has been underlined by a European Court of Justice ruling C-461/17 (paragraphs 37 to 40), known as the Holohan ruling which confirms the need for an AA to consider the implications of a plan or project on habitats and species outside the Habitats site boundary provided that those implications are liable to affect the conservation objectives of the site.

5.4.3 Natural England has published guidance on SSSI Impact Risk Zones (IRZs) (Ref 5.16) associated with different types of development on various functional groups of birds (see **Table 5.1**). These IRZs provide a high-level screening tool for assessing the risk of planning applications affecting important habitats outside European site boundaries. The guidance identifies that functionally linked habitats may extend up to the maximum foraging distances from roost locations, although it also notes that the proportion of designated foraging birds will decrease with distance from the European site. Importantly, the IRZ guidance note does not define the required abundance threshold needed to meet the criterion of functional habitat linkage. However, Natural Resources Wales and Natural England generally advocate that usage of a land parcel by 1% of the qualifying SPA or Ramsar population is needed for that parcel to be defined as ‘functionally linked habitat’.

Table 5.1 – Impact risk zones for designated bird species (Ref 5.16)

Assemblage	Impact risk zone (foraging distance)
Wintering birds (except wintering waders and grazing wildfowl; and wigeon (*Anas penelope*) and geese).	Up to 500 m.
Dabbling ducks such as teal (*Anas crecca*), mallard (*Anas platyrhynchos*) and gadwall (*Anas strepera*).	Home ranges could extend beyond site boundaries at coastal sites, but less likely to do so at inland water bodies.
Wintering waders (except golden plover (*Pluvialis apricaria*) and lapwing (*Vanellus vanellus*)), brent goose (*Branta bernicla*) and wigeon	Maximum foraging distance is 500 m.
Wintering lapwing and golden plover	Maximum foraging distance is 15-20 km. Golden plover can forage up to 15 km from a roost site within a protected site. Lapwing can also forage similar distances. Both species use lowland farmland in winter, and it is difficult to distinguish between designated populations and those present within the wider environment. Developments affecting functionally linked land more than 10 km from the site are unlikely to impact significantly on designated populations.
Wintering white-fronted goose (*Anser albifrons*), greylag goose (*Anser answer*), Bewick's swan (*Cygnus columbianus bewickii*), whooper swan (*Cygnus cygnus*), pink-footed goose and wintering bean goose (*Anser fabalis*)	Maximum foraging distance is 10 km although studies have shown that pink-footed geese will fly 20 km from their roosting site to feed. A bespoke functional land IRZ has replaced the individual Birds 6/7 IRZs for sites supporting the following goose and swan species: pink-footed geese, barnacle goose (*Branta leucopsis*), Bewick's swan, white-fronted goose and whooper swan. The IRZ is based on GIS distribution records of feeding pink-footed geese from a study undertaken for Natural England by the Wildfowl & Wetlands Trust and the results of work undertaken by the British Trust for Ornithology to identify functionally connected habitat used by barnacle goose, Bewick's swan, white-fronted goose and whooper swan based on Wetland Bird Survey (WeBS) site and BirdTrack data.

5.4.4 Areas of functionally linked land typically provide habitat for foraging or other ecological functions essential for the maintenance of the designated bird population (e.g. high tide roosts for coastal populations). Functionally linked land may extend up to the maximum foraging distance for the designated bird species. However, the number of birds foraging will tend to decrease further away from the protected site and thus the importance of the land to the maintenance of the designated population will decrease.

5.4.5 The identification of an area as functionally linked habitat is not always a straightforward process. The importance of non-designated land parcels may not be apparent and thus might require the analysis of existing data sources e.g., Bird Atlases or data from record centres) to be firmly established. In some instances, data may not be available at all, requiring further survey work. Generally, it is reasonable to assume that a site of under 2 hectares (ha) in size is unlikely to support a large enough population of birds (taking sightlines and other factors into account) to constitute 1% of an SPA/Ramsar population.

5.4.6 **Table 5.2** lists the habitat preferences and diet of bird features of the Migneint-Arenig-Dduallt SPA, Northern Cardigan Bay/Gogledd Bae Ceredigion SPA and Traeth Lafan/Lavan Sands, Conway Bay SPA.

Table 5.2 – Habitat preferences and diet for designated bird species[2]

Qualifying feature	Habitat preferences	Diet
Hen harrier	Upland moorland in the summer and coastal marshes during the winter.	The main food source of hen harriers are small rodents, with the exact species depending on the location. In many cases voles are the prey species. In addition to rodents, it also regularly takes young rabbits and young birds, as well as reptiles and insects.
Merlin	Upland moorland in the summer and coastal marshes during the winter.	Specialize in preying on small birds. Larger birds and other animals such as insects (especially dragonflies and moths), small mammals, and reptiles complement their diet as well.
Peregrine falcon	Adaptable	Generally, peregrines eat a wide variety of birds.
Red-throated diver	Favour small lochs and lakes close to the sea	Fish
Oystercatcher	Rocky and estuarine shores	Primarily shellfish

5.4.7 NatureScot also produced guidance to help identify ‘connectivity’ between development proposals and Special Protection Areas (SPAs) (Ref 4.2). The guidance provides

[2] *Adapted from* https://www.bto.org/understanding-birds/welcome-birdfacts

information on dispersal and foraging distances for a range of bird species which are frequently encountered when considering plans and projects.

5.4.8 The connectivity distances of each species set out in **Table 5.3** are drawn from a literature review that examined ranging behaviour. In most cases the core range should be used when determining whether there is connectivity between the proposal and the qualifying interests. Maximum ranges are also provided to indicate that birds will, at times, travel further.

Table 5.3 – Summary of foraging distance during breeding season

Species	Foraging range from nest site during breeding season
Red-throated diver	Generally less than 8 km, but regular flights of 11-13.5 km recorded on Western Isles.
Black-throated diver (*Gavia arctica*)	Likely to be less than 10 km
Red kite (*Milvus milvus*)	Core range of 4 km, with maximum range of up to 6 km.
Hen harrier	Core range of 2 km, with maximum range of 10 km.
Goshawk (*Accipiter gentilis*)	Core range of 3 km, with maximum range generally less than 10 km, and maximum recorded distance of 18 km.
Golden eagle (*Aquila chrysaetos*)	Core range of 6 km, with maximum range of up to 9 km.
Osprey (*Pandion haliaetus*)	Core range of 10 km, with some regular foraging up to 20 km, and maximum recorded distance of 28 km.
Merlin	Within 5 km.
Peregrine falcon	Core range of 2 km, with maximum recorded distance in Britain of 18 km.
White-tailed eagle (*Haliaeetus albicilla*)	Core range of 5 km, with maximum range of 13 km.
Short-eared owl (*Asio flammeus*)	Core range of 2 km, with maximum range of 5 km.
Black grouse (*Lyrurus tetrix*)	Within 2 km, with male core ranges of up to 1.5 km and of female core ranges of approximately 0.5 km.
Golden plover	Core range of 3 km, with maximum range of 11 km.
Greenshank (*Tringa nebularia*)	Core range of 2 km, with maximum range of 3 km.
Dunlin (*Calidris alpina*)	Core range of 500 m, with maximum range of 3 km.
Curlew	Core range of 1 km, with maximum range usually within 2 km.

5.4.9 Moving from birds to bats, these are not only dependent on their roosts and foraging habitat in the SAC, but potentially also on habitat that lies outside the designated site boundary. Feeding areas and commuting routes (flightlines) outside the designation may be integral to sustaining the bat population. The Bat Conservation Trust (BCT) has defined ‘Core Sustenance Zones’ (CSZs) for different bat species (Ref 5.17). A core sustenance zone (CSZ), as applied to bats, refers to the area surrounding a communal bat roost within which habitat availability and quality will have a significant influence on the resilience and conservation status of the colony using the roost. With reference to planning and development the core sustenance zone could be used to indicate:

- *The area surrounding the roost within which development work can be assumed to impact the commuting and foraging habitat of bats using the roost, in the absence of information on local foraging behaviour. This will highlight the need for species-specific survey techniques where necessary.*
- *The area within which mitigation measures should ensure no net reduction in the quality and availability of foraging habitat for the colony, in addition to mitigation measures shown to be necessary following ecological survey work* (Ref 5.18).

5.4.10 BCT core sustenance zone sizes are given in **Table 5.4**. The Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC qualifying species are highlighted in green.

Table 5.4 – CSZ sizes calculated for UK Bat species and species groups

Species	CSZ radius (km)
Greater horseshoe bat (*Rhinolophus ferrumequinum*)	3
Lesser horseshoe bat	2
Barbastelle (*Barbastella barbastellus*)	6
Brown long-eared bat (*Plecotus auritus*)	3
Grey long-eared bat (*Plecotus austriacus*)	3
Long-eared bat (*Plecotus* sp.)	3
Daubenton’s bat (*Myotis daubentonii*)	2
Natterer’s bat (*Myotis nattereri*)	4
Alcathoe bat (*Myotis mystacinus/brandtii/ alcathoe*)	1
Bechstein’s bat (*Myotis bechsteinii*)	3
‘Mouse-eared bats’ (*Myotis* sp.)	4
Common pipistrelle (*Pipistrellus pipistrellus*)	2
Soprano pipistrelle (*Pipistrellus pygmaeus*)	3
Nathusius’s pipistrelle (*Pipistrellus nathusii*)	3
Pipistrelle bats (*Pipistrellus* sp.)	3
Common noctule (*Nyctalus noctula*)	4
Leisler’s bat (*Nyctalus leisleri*)	3
Noctule bats (*Nyctalus* sp.)	4
Serotine bat (*Eptesicus serotinus*)	4

Species	CSZ radius (km)
Bats (*Chiroptera* sp.)	3

5.4.11 Generally, lesser horseshoe bats forage between 2 and 3 km from their roost but they have been observed to range up to 4 km in their nightly foraging trips (Ref 5.18). The Bat Conservation Trust identifies a weighted average CSZ of 2 km for lesser horseshoe bats, as shown in **Table 5.4** It is recognised that linear features (required to navigate) and permanent pasture and unimproved grassland (favoured feeding areas) and woodlands within this distance outside the SAC boundary need to be maintained. It is also a species that will forage during winter at which time its core foraging range is reduced to 1.2 km from the hibernation site.

5.4.12 lSome genetic interchange between the SAC populations and roosts located far beyond the CSZs is likely to occur. Although some degree of linkage is likely to exist with populations across Wales, the HRA process is concerned with identifying the core zone around bat SACs that is integral for sustaining the SAC colonies and for the sites to achieve their Conservation Objectives. The importance of functionally linked roosts is likely to reduce with distance because fewer bats would be expected to cover such large distances.

5.4.13 The available baseline information suggests that the following Habitats sites within the ZoI of the proposed Project are sensitive to the potential loss of functionally linked habitat. These sites are taken forward into the following chapters:

- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Glynllifon SAC
- Afon Eden - Cors Goch Trawsfynydd SAC
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Migneint-Arenig-Dduallt SPA
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Corsydd Eifionydd/Eifionydd Fens SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA

5.4.14 This pathway is scoped out for the following Habitats sites as they are designated for non-mobile features:

- Migneint-Arenig-Dduallt SAC
- Y Fenai a Bae Conwy/Menai Strait SAC
- Conwy Bay SAC
- Eryri/Snowdonia SAC
- Rhinog SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Llyn Idwal Ramsar
- Coedydd Aber SAC

5.4.15 This pathway is also scoped out for Afon Gwyrfai a Llyn Cwellyn SAC as no in-channel works are proposed.

5.4.16 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.5 Temporary Loss of/Damage to Qualifying Habitat

5.5.1 Generally, the temporary (or permanent) loss of designated habitat must be avoided or mitigated, if habitat in question is a designated feature or critical for the Habitats site to meet its Conservation Objectives. However, temporary habitat loss within designated site boundaries is permissible where this solely encompasses habitat that is part of the 'site fabric' i.e., areas which are not designated SAC feature habitat or SPA supporting habitat (Ref 5.19).

5.5.2 Any permanent, irreversible, habitat loss from a Habitats site that involves the loss of qualifying features will be adverse, although to affect the integrity of the SAC (the coherence of its structure and function) the loss must be sufficient to materially impair the achievement of the Habitats site's Conservation Objectives.

5.5.3 Various developments can result in the loss of habitat in Habitats sites, either temporarily or permanently. Temporary habitat loss, such as that potentially resulting from usage of temporary access tracks and vegetation clearance for visibility splays, is typically reversible. Further, there is the potential for deploying mitigation measures to avoid adverse effects on site integrity. In contrast, the permanent loss of designated habitat will result in a reduction of coverage of a potentially very rare ecosystem, with potential knock-on impacts on dependent qualifying species.

5.5.4 Plans or projects that result in the loss of land from a Habitats site can be approved (Ref 5.20), even if the loss is sufficient to result in adverse effects on site integrity, if three tests are met:

- No feasible alternative solutions to the plan or project exist that are less damaging;
- There are imperative reasons of overriding public interest (IROPI) for the plan or project; and
- Compensatory measures are secured to ensure that the overall coherence of the National Site network is maintained.

5.5.5 The following Habitats sites within the ZoI of the proposed Project are sensitive to the direct temporary loss of habitat, primarily due to the vegetation clearance required for visibility splays and usage of access tracks. These sites are taken forward into the following chapters:

- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

5.5.6 This pathway is scoped out for all other Habitats sites as no works are proposed within the boundary of these Habitats sites. As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.6 Atmospheric Pollution

5.6.1 Construction and maintenance of the Project have the potential to affect air quality. This is primarily expected due to emissions associated with exhaust emissions from construction vehicles and equipment.

5.6.2 The main pollutants of concern for Habitats sites are nitrogen oxides (NOx), ammonia (NH_3) and sulphur dioxide (SO_2) – see **Table 5.5**. NH_3 can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges (Ref 5.21). NOx can also be toxic to vegetation at very high concentrations (far above the annual average Critical Level). High levels of NOx and NH_3 are likely to increase the total nitrogen (N) deposition, potentially leading to deleterious knock-on effects in recipient ecosystems. An increase in N deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on plant community composition and the overall quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (Refs 5.21 and 5.22).

Table 5.5 – Main sources and effects of air pollution on habitats and species (www.apis.ac.uk)

Pollutant	Source	Effects on habitats and species
SO_2	The main sources of SO_2 are electricity generation, and industrial and domestic fuel combustion. However, total SO_2 emissions in the UK have decreased substantially since the 1980s. Another origin of SO_2 is the shipping industry and high atmospheric concentrations of SO_2 have been documented in busy ports. In future years shipping is likely to become one of the most important contributors to SO_2 emissions in the UK.	Wet and dry deposition of SO_2 acidifies soils and freshwater and may alter the composition of plant and animal communities. The magnitude of effects depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species. However, SO_2 background levels have fallen considerably since the 1970s and are now not regarded a threat to plant communities. For example, decreases in SO_2 concentrations have been linked to returning lichen species and improved tree health in London.
Acid deposition	Leads to acidification of soils and freshwater via atmospheric deposition of SO_2, NOx, NH_3 and hydrochloric acid (HCl). Acid deposition from rain has declined by 85% in the last 20 years, with most of this contributed by lower sulphate levels. Although future trends in SO_2 emissions and subsequent deposition to terrestrial and	Gaseous precursors (e.g., SO_2) can cause direct damage to sensitive vegetation, such as lichen, upon deposition. Can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and

Pollutant	Source	Effects on habitats and species
	aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced SO_2 levels.	compromised reproduction in birds/plants. Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible.
Ammonia (NH_3)	Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes and from some chemical processes and vehicle exhausts. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock. Ammonia reacts with acid pollutants such as the products of SO_2 and NOx emissions to produce fine ammonium (NH_4+) – containing aerosol. Due to its significantly longer lifetime, NH_4+ may be transferred much longer distances (and can be a significant trans-boundary issue). While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.	The negative effect of NH_4+ may occur via direct toxicity when uptake exceeds detoxification capacity and via N accumulation. Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen. As emissions mostly occur at ground level in the rural environment and NH_3 is rapidly deposited, some of the most acute problems of NH_3 deposition are for small relict nature reserves located in intensive agricultural landscapes.
NOx	Nitrogen oxides are mostly produced in combustion processes. Half of NOx emissions in the UK derive from motor vehicles, one quarter from power stations and the rest from other industrial and domestic combustion processes.	Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g., roadside verges). A critical level of NOx for all vegetation types has been set to 30 $\mu g/m^3$ (micrograms per cubic metre). Deposition of nitrogen compounds (nitrates (NO_3), NO_2 and nitric acid (HNO_3)) contributes to the total N deposition and may lead to both soil and freshwater acidification. In addition, NOx contributes to the eutrophication of soils and water,

Pollutant	Source	Effects on habitats and species
		altering the species composition of plant communities at the expense of sensitive species.
N deposition	The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g., NOx) or reduced (e.g., NH_3) N emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices. The N pollutants together are a large contributor to acidification (see above).	All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally. Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species. N deposition can also increase the risk of damage from abiotic factors, e.g., drought and frost.
Ozone (O_3)	A secondary pollutant generated by photochemical reactions involving NOx, volatile organic compounds (VOCs) and sunlight. These precursors are mainly released by the combustion of fossil fuels (as discussed above). Increasing anthropogenic emissions of ozone precursors in the UK have led to an increased number of days when ozone levels rise above 40 ppb (parts per billion) ('episodes' or 'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.	Concentrations of O_3 above 40 ppb can be toxic to both humans and wildlife and can affect buildings. High O_3 concentrations are widely documented to cause damage to vegetation, including visible leaf damage, reduction in floral biomass, reduction in crop yield (e.g., cereal grains, tomato, potato), reduction in the number of flowers, decrease in forest production and altered species composition in semi-natural plant communities.

5.6.3 SO_2 emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as shipping (particularly on a local scale). There will be no material release of SO_2 in the construction, operational or maintenance phases of the Project. This atmospheric pollutant is not considered further in this HRA.

5.6.4 NOx emissions are dominated by the output of vehicle exhausts (more than half of all emissions) and some vehicles also emit NH_3. The main air quality impact of the Project is likely to occur in the construction and maintenance phases, when construction traffic will lead to the temporary emission of NOx, NH_3 and, likely, an overall increase in total N deposition. According to the World Health Organisation (WHO), the Critical Level for NOx for the protection of vegetation is 30 μgm^{-3} (micrograms per cubic metre) and the Critical Level for NH_3 when lower plants are present is 1 μgm^{-3} (Ref 5.22). In addition, ecological studies have determined Critical Loads for atmospheric nitrogen deposition (NOx combined with NH_3) (Ref 5.23).

5.6.5 The Department of Transport's Transport Analysis Guidance (Ref 4.4) states that beyond 200 m, the contribution of vehicle emissions from the roadside to local pollution levels is insignificant (refer to **Plate 5.1**). This is the distance that is used in this HRA to screen for potential atmospheric pollution impacts associated with the Project.

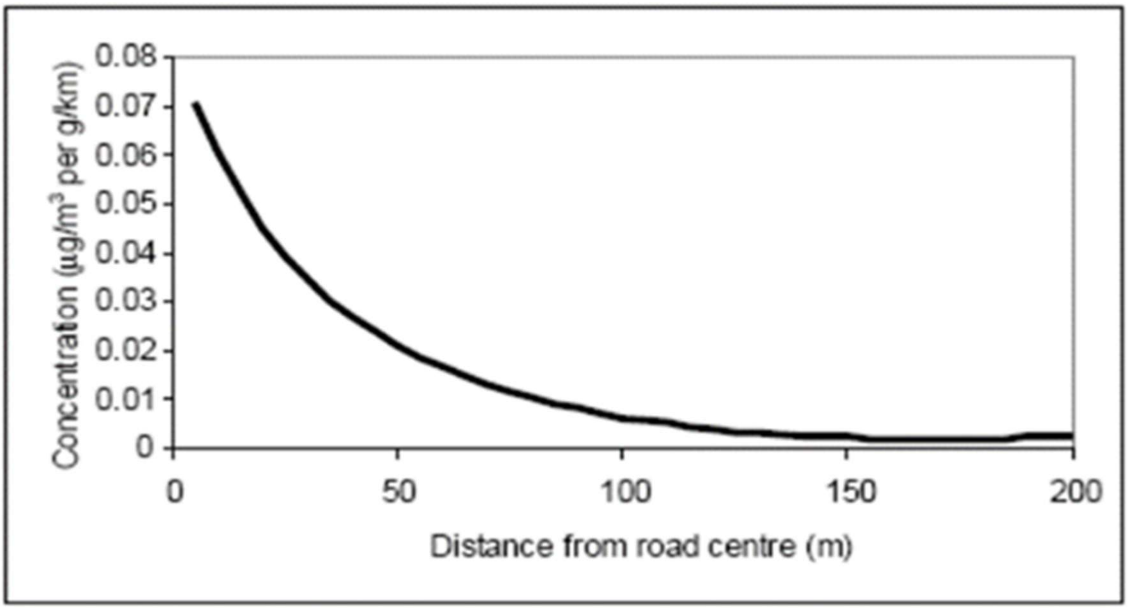

Plate 5.1 – Traffic Contribution to Concentrations of Pollutants at Different Distances from a Road

5.6.6 The available baseline information suggests that the following Habitats sites within the ZoI of the Project are sensitive to atmospheric pollution. These sites are taken forward into the following chapters:

- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Afon Eden – Cors Goch Trawsfynydd SAC
- Gwydir/Gwydyr Forest Mines SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Afon Gwyrfai a Llyn Cwellyn SAC
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Eryri/Snowdonia SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Migneint-Arenig-Dduallt SAC
- Llyn Idwal Ramsar
- Coedydd Aber SAC

5.6.7 This pathway is scoped out for the following sites as the qualifying features are not sensitive to atmospheric pollution:

- Migneint-Arenig-Dduallt SPA
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Glynllifon SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA

5.6.8 This pathway is scoped out for the following Habitats sites as they are > 200 m as they are all >200 m away from a main 'A' road:

- Rhinog SAC
- Corsydd Eifionydd/Eifionydd Fens SAC

5.6.9 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

Dust Deposition

5.6.10 Construction and maintenance activities can generate dust emissions from operating machinery that can cause localised smothering of vegetation or potential health issues in fauna. The effects of dust will depend on the prevailing wind direction, and the transport distance is related to particle size. Dust particle size and chemical composition is important as smaller particles can enter or block stomata and thus interfere with gas exchange, while sufficient coverage may prevent light penetration to the chloroplasts.

5.6.11 Fauna are exposed to air pollutants via three pathways: 1) inhalation of gases or small particles; 2) ingestion of particles suspended in food or water; or, 3) absorption of gases through the skin. It is likely that birds are more susceptible to gaseous pollutant injury than mammals due to their higher respiratory rates. For the purposes of screening, according to guidance from the Institute of Air Quality Management (IAQM) (Ref 4.3), with respect to possible effects due to dust, *"…an assessment will normally be required where there is…an 'ecological receptor' within: 50 m of the boundary of the site; or 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s)"*.

5.6.12 The available baseline information suggests that the following Habitats sites within the ZoI of the Project are sensitive to dust emissions. These sites are taken forward into the following chapters:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Corsydd Eifionydd/Eifionydd Fens SAC

5.6.13 This pathway is scoped out for all other Habitats sites as they are all >50 m from the proposed Project sites. As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.7 Injury or Mortality

5.7.1 The direct injury or mortality of qualifying species could occur where construction works take place within the boundary of a Habitats site, or where the species in question may be using functionally-linked habitat outside of a Habitats site boundary. When considering the latter possibility, the only relevant terrestrial animal species which are sufficiently mobile to be at risk are otter and marsh fritillary.

5.7.2 Construction works which take place directly within or adjacent to a watercourse or waterbody could also result in injury or mortality of qualifying fish species. The ZoI for the direct injury or mortality of freshwater qualifying animals encompasses any SAC designated for these species for which a direct hydrological connection to the Project exists.

5.7.3 Except where nesting, birds are not vulnerable to injury or mortality from construction works as they are readily able to move away from works activities. There is no realistic possibility of increased mortality of bird species due to collision with overhead lines during operation as the Project involves re-stringing existing lines and undergrounding cables, so there is no increase in collision risk.

5.7.4 The available baseline information suggests that the following Habitats sites within the ZoI of the proposed Project support qualifying species that could be susceptible to injury or mortality. These sites are taken forward into the following chapters:

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Corsydd Eifionydd/Eifionydd Fens SAC

5.7.5 This pathway is screened out for the following Habitats sites as no in-channel works are proposed:

- Afon Eden – Cors Goch Trawsfynydd SAC
- Afon Gwyrfai a Llyn Cwellyn SAC

5.8 Introduction of Invasive Non-Native Species (INNS)

5.8.1 An ‘invasive species’ is a species that is: 1) non-native (or alien) to the ecosystem under consideration, and 2) whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. They can be introduced to an area by (e.g.,) ship ballast water, accidental release, and most often, by people. Invasive species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. Any construction project can introduce INNS if inadequate biosecurity protocols are followed, particularly when working in the riverine environment.

5.8.2 The available baseline information suggests that the following Habitats sites within the ZoI of the proposed Project are sensitive to the introduction of INNS. These sites are taken forward into the following chapters:

- Afon Gwyrfai a Llyn Cwellyn SAC
- Corsydd Eifionydd/Eifionydd Fens SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

5.8.3 This pathway is screened out for the following Habitats sites as they are all >100 m from the proposed Project sites and/or there is a lack of hydrological connection:

- Migneint-Arenig-Dduallt SAC
- Migneint-Arenig-Dduallt SPA
- Afon Eden – Cors Goch Trawsfynydd SAC
- Rhinog SAC
- Morfa Harlech a Morfa Dyffryn SAC
- Glynllifon SAC
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Eryri/Snowdonia SAC
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA
- Llyn Idwal Ramsar
- Coedydd Aber SAC

5.8.4 As no pathway to these Habitats sites exists, this impact can be scoped out, both alone and in-combination with other plans and/or projects.

5.9 Summary

5.9.1 **Table 5.6** summarise the sites and impact pathways to be taken forward to the Test of Likely Significant Effects (ToLSEs). The reason for designation, conservation objectives, supplementary advice and environmental vulnerabilities of the Habitats sites are detailed in **Appendix B.**

Table 5.6 – Impact pathways and habitats sites to be taken forward

Habitats site	Impact pathway							
	Noise and visual disturbance	**Water quality**	**Water quantity, level and flow**	**Loss of/damage to FLL**	**Loss of/damage to qualifying habitat**	**Atmospheric pollution (inc. dust)**	**Injury or mortality**	**Introduction of INNS**
Migneint-Arenig-Dduallt SAC	-	-	-	-	-	Y	-	-
Migneint-Arenig-Dduallt SPA	Y	-	-	Y	-	-	-	-
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	Y	-	-	Y	Y	Y	-	Y
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	Y	Y	-	Y	-	Y	Y	Y
Afon Eden – Cors Goch Trawsfynydd SAC	-	-	-	Y	-	Y	-	-
Rhinog SAC	-	-	-	-	-	-	-	-
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Y	-	-	Y	-	Y	-	-
Northern Cardigan Bay/Gogledd Bae	Y	Y	-	Y	-	-	-	Y

Habitats site	Impact pathway							
	Noise and visual disturbance	Water quality	Water quantity, level and flow	Loss of/damage to FLL	Loss of/damage to qualifying habitat	Atmospheric pollution (inc. dust)	Injury or mortality	Introduction of INNS
Ceredigion SPA								
Morfa Harlech a Morfa Dyffryn SAC	-	-	-	-	-	Y	-	-
Corsydd Eifionydd/Eifionydd Fens SAC	-	Y	Y	Y	-	-	-	Y
Glynllifon SAC	Y	-	-	Y	-	-	-	-
Afon Gwyrfai a Llyn Cwellyn SAC	Y	Y	Y	-	-	Y	-	Y
Eryri/Snowdonia SAC	-	-	-	-	-	Y	-	-
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	-	Y	-	-	-	Y	-	Y
Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	-	-	-	-	-	Y	-	-
Traeth Lafan/Lavan Sands, Conway Bay SPA	-	-	-	Y	-	-	-	-
Llyn Idwal Ramsar	-	-	-	-	-	Y	-	-
Coedydd Aber SAC	-	-	-	-	-	Y	-	-

5.9.2 **Table 5.6** shows that no impact pathways have been identified linking Rhinog SAC to the Project. This Habitats site is scoped out, both alone and in-combination with other plans and/or projects.

6. Test of Likely Significant Effects - Screening

6.1 Introduction

6.1.1 This section evaluates whether the Project will result in Likely Significant Effects (LSEs) on the qualifying features of the Habitats sites identified in **Section 4.4**. This section only considers impact pathways for which any or all of these Habitat sites have been identified to lie within the ZoI of the Project.

6.1.2 In line with case law (People Over Wind and Sweetman v Coillte Teoranta (C-323/17)), consideration cannot be given at this stage to specific mitigation measures designed to avoid significant effects on a Habitats site. However, as discussed in **Section 3.1**, it is reasonable to consider the 'intrinsic elements' of a development, including those which can be regarded as 'good practice' or 'best practice' for development of that type. Standard good practice works methods which would be adopted by the Project, regardless of the presence of Habitats sites, would include the implementation of pollution prevention measures following Natural Resources Wales guidance for pollution prevention (Ref 6.1). Under the Wildlife and Countryside Act 1981 (the 'WCA'), it is an offence in Wales to cause any animal or plant to spread or grow in the wild outside of its native range. Appropriate biosecurity measures will be implemented during works carried out during the construction, maintenance and operational phases to prevent the spread of invasive non-native species. Such measures would be set out in a Construction Environmental Management Plan (CEMP) or equivalent document (such as a Works Environmental Management Plan for the Wider Works).

6.2 Noise and Visual Disturbance (within site boundaries and functionally linked habitats)

6.2.1 A range of construction and maintenance activities will be required for the proposed Project, which will involve the presence of site staff and usage of heavy machinery within the Project sites. These activities have the potential to result in noise and visual disturbance to sensitive ecological receptors, both within Habitats sites and functionally linked habitats outside Habitats site boundaries.

6.2.2 Operational impacts are anticipated to be negligible.. The only potential source of noise and disturbance will be those associated with vehicle movements by operation and maintenance staff, during routine maintenance/testing or in the event of a blackout. Operational phase disturbance impacts is screened out, both alone and in-combination with other plans and projects.

Migneint-Arenig-Dduallt SPA

6.2.3 The Core Management Plan (CMP) for Migneint-Arenig-Dduallt SPA (Ref 6.2) specifies disturbance as a threat to the integrity of this Habitats site.

6.2.4 Migneint-Arenig-Dduallt SPA is designated for hen harrier, merlin and peregrine falcon. As mentioned in **Table 5.2**, hen harrier and merlin like to nest on the ground of upland heather moorland during breeding season. In winter, they relocate to lowlands, especially close to coastal areas. Peregrine falcons are more adaptable and can be found in a wide range of habitat types.

6.2.5 Migneint-Arenig-Dduallt SPA is 1.08 km from the Project at its closest point to Trawsfynydd Substation and 1.68 km from the Wider Works. Although at the upper end of the foraging range for breeding hen harrier and merlin, it is still within that range, and well within the range for merlin (refer to **Table 5.3**). Given that the overwintering habitats are present both in and around the proposed Project sites, namely Trawsfynydd Substation and Wider Works, LSEs of the proposed Project regarding noise and visual disturbance adjacent to Migneint-Arenig-Dduallt SPA in the construction or maintenance periods cannot be excluded. This impact pathway is screened in for AA for this Habitats site.

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

6.2.6 Elements of the Glaslyn Cables and Wider Works are in the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC. The CMP for this SAC (Ref 6.3) specifies disturbance to roosts as a threat to the integrity of this Habitats site. Construction and maintenance activities could disturb foraging bats should, for example, lighting be required. LSEs of elements of the proposed Project (Glaslyn and sections of the Wider Works) regarding noise and visual disturbance to the qualifying features of the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC in the construction or maintenance periods cannot be excluded. This impact pathway is screened in for AA.

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

6.2.7 Trawsfynydd Substation lies 3.35 km to the north-west of, Glaslyn 0.54 km to the north, Bryncir 5.13 km north and Wider Works 0.34 km north Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC. The CMP for Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC (Ref 6.4) does not identify any specific activities as having a direct impact on otter but states *"Mitigation for otters in developments is not always sufficient and could be a factor in why otters are not doing quite as well in this site when compared to other European marine sites in Wales with otter as a feature."* On the basis of the impact buffer set out for otter in **Table 4.2**, there will be no direct LSEs on otters within the SAC itself; however, it is acknowledged that otters from the SAC will utilise the wider area. The SAC is also designated for bottlenose dolphin and grey seal. Part of the proposed Project includes docking a special order equipment barge on the Black Rock Sands beach at Morfa Bychan. Both species are vulnerable to underwater noise disturbance and grey seal are also vulnerable to airborne noise disturbance. This aspect of the proposed Project presents a potential impact on the SAC. LSEs of elements of the proposed Project regarding noise and visual disturbance in and adjacent to Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC in the construction or maintenance periods cannot be excluded. This impact pathway is screened in for AA.

Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC

6.2.8 The CMP for Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC (Ref 6.5) specify disturbance as a threat to the integrity of this Habitats site.

6.2.9 Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC is well beyond the 2 km CSZ for lesser horseshoe bats (**Table 5.4**), at over 19 km away from the proposed Project sites at its closest point. There is no potential for the proposed Project to result in LSEs as a result of disturbance on the Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC regarding noise and visual disturbance to roosts or foraging bats in the construction and operation phases, either alone or in combination with other plans and projects. This impact pathway is screened out.

Northern Cardigan Bay/Gogledd Bae Ceredigion SPA

6.2.10 The CMP for Northern Cardigan Bay/Gogledd Bae Ceredigion SPA (Ref 6.6) specifies disturbance as a threat to the integrity of this Habitats site. Northern Cardigan Bay/Gogledd Bae Ceredigion SPA is designated for its population of overwintering red-throated diver. Almost all birds at UK breeding sites commute from their freshwater nesting site to feed at sea in nearby shallow coastal areas (Ref 6.7). In the winter, the main source of disturbance to this species is through marine activity (Ref 6.7). The proposed Project is inland and there is no potential for the proposed Project to result in LSEs on the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA regarding noise and visual disturbance in the construction and operationphases. Furthermore, the Project lies 2.09 km away from this Habitats site at its closest point which is well beyond the impact buffer of 500 m for wintering waterbirds shown in **Table 4.2**. This impact pathway is screened out.

Glynllifon SAC

6.2.11 Glynllifon SAC lies 13.62 km south-west of Pentir substation, 12.92 km north of Glaslyn and 9.23 km north-east of Bryncir, well beyond the 2 km CSZ for lesser horseshoe bats (**Table 5.4**). However, this Habitats site lies just 899 m north-west of Wider Works (4ZC102) and is designated for lesser horseshoe bats, well within the 2 km CSZ.

6.2.12 The CMP for Glynllifon SAC (Ref 6.8) specifies disturbance of maternity and hibernation roosts as a threat to the integrity of this Habitats site. The three maternity roosts are buildings (Glynllifon Mansion, Melin y Cim and Pen y Bont). Glynllifon Mansion also serves as a hibernation roost along with the mines at Simdde – dylluan. The Project does not require access to any of these roosts and Glynllifon Mansion is over 3 km away from Wider Works. Whilst there will be no direct disturbance to maternity and hibernation roosts as a result of the Project, construction and maintenance activities could result in LSEs on foraging bats for example, through additional lighting; this impact pathway is screened in for AA.

Afon Gwyrfai a Llyn Cwellyn

6.2.13 The Project crosses the Afon Gwyrfai a Llyn Cwellyn SAC between 4ZC120 and 4ZC121 which is designated for Atlantic salmon and otter. The CMP for Afon Gwyrfai a Llyn Cwellyn SAC (Ref 6.9) specifies disturbance to otter, albeit recreational, as a threat to the integrity of this Habitats site. It does not recognise disturbance as a threat to Atlantic salmon. As no in-channel works are proposed, no LSEs on Atlantic salmon are anticipated.

6.2.14 The tower working area for 4ZC120 lies approximately 94 m from the Afon Gwyrfai, and the tower working area for 4ZC121 is approximately 206 m away. The intervening habitat types comprise improved grassland and riparian woodland, with the woodland providing a substantial natural barrier. The cable works will be restricted to the daytime, when otter, which are predominantly nocturnal, are unlikely to be travelling along the river at that time.

6.2.15 LSEs of this element of the proposed Project regarding noise and visual disturbance to otter in the construction or maintenance periods can be excluded. This impact pathway is screened out for this Habitats site.

6.3 Water Quality

6.3.1 All aquatic ecosystems are sensitive to water pollution from a wide range of substances, including toxic contaminants, non-toxic contaminants (e.g., nutrients) and sediments. Negative changes in water quality have the potential to directly impact on SAC habitats and species, as well as resulting in cascading effects on SPA/Ramsar wildfowl. Two of the most important factors influencing the likelihood of potential water quality impacts of developments are the presence of a hydrological connection with and flow-path distance to Habitats sites.

Corsydd Eifionydd/Eifionydd Fens SAC

6.3.2 Corsydd Eifionydd/Eifionydd Fens SAC is a topogenous (alluvial) fen, where vertical (groundwater) water table changes dominate due to limited drainage. The CMP for Corsydd Eifionydd/Eifionydd Fens SAC (Ref 6.10) specifies water pollution as a threat to site integrity, most notably arising from anything draining from the land above in the form of nutrient-rich runoff from agricultural practices and recommends a 10-20 m buffer around the SAC. As the fen is groundwater fed and the proposed works are all well over 20 m from the SAC, is considered that there is no potential for the proposed Project to result in LSEs on the Corsydd Eifionydd/Eifionydd Fens SAC regarding water quality impacts in the construction and operation phases. This impact pathway is screened out, both alone and in-combination with other plans and projects.

Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC

6.3.3 The Advice Provided by the Countryside Council for Wales (Ref 6.11) for the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC specifies *'Pollutant Response'* as a threat to site integrity. However, it focuses on oil spill response both at sea and shore cleaning i.e., marine activities as opposed to inputs from riverine systems. Given the small extent of the works across the Afon Gwyrfai, and that any potential incident would be small and localised, there is no potential for the proposed Project to result in LSEs on the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC regarding water quality impacts in construction and operation . This impact pathway is screened out, both alone and in-combination with other plans and projects.

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and Afon Gwyrfai a Llyn Cwellyn SAC

6.3.4 The Advice Provided by the Countryside Council for Wales (Ref 6.12) for Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC specifies *'Water pollution – diffuse sources'* as a threat to site integrity and there is a definitive hydrological connection between the proposed Project and this SAC via Afon Glaslyn as it flows through the Glaslyn Cables site.

6.3.5 The proposed Project traverses the Afon Gwyrfai a Llyn Cwellyn SAC between 4ZC120 and 4ZC121. The Afon Gwyrfai then feeds into the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC at Foryd Bay, some 6 km downstream (as the crow flies). The CMP for the Afon Gwyrfai a Llyn Cwellyn SAC (Ref 6.13) specifies water quality as a threat to site integrity and, there is a definitive hydrological connection between the proposed Project and this SAC.

6.3.6 Extensive excavations have the potential to intercept groundwater, or perched groundwater levels. Piling activities could also create pathways for contaminants near the surface to the underlying groundwater body. Where construction works are undertaken, there is potential for spillages or leakages of oil, fuel or other liquid chemicals to contaminate the ground and subsequently leach into underlying groundwater causing pollution and potentially making the water unfit for use. The risk is likely to be significant in locations where there is naturally high groundwater and/or where there are groundwater abstractions nearby.

6.3.7 The Environmental Permitting (England and Wales) Regulations 2016 (Ref 6.14) make it an offence to pollute watercourses, irrespective of whether they are Habitats sites or connect to Habitats sites.

6.3.8 The construction period on every project must have a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters. Robust CEMPs that include measures to manage the environmental effects of the proposed works and demonstrate compliance with environmental legislation will be implemented. The CEMPs will detail the measures required to mitigate construction related effects including those associated with pollution incidents and water quality.

6.3.9 New infrastructure can be constructed in a way to prevent pollution to the water environment to ensure no adverse effects from water pollution on any Habitats site. LSE is screened out for all Habitats sites through this impact pathway

6.4 Water Quantity, Level and Flow

6.4.1 The Project is associated with a range of requirements and activities with potential impacts on local hydrology:

- Meeting the potable water supply requirements for site staff and construction processes may result in the drawdown of local water levels;
- Some structures required in the construction period may have the potential to affect local groundwater and surface water flows by altering prevailing hydrological conditions; and
- Access tracks and crossings of watercourses introduce a temporary and/or permanent net increase in impermeable surfaces, with the potential to increase runoff rates.

Afon Gwyrfai a Llyn Cwellyn SAC

6.4.2 Being a riverine ecosystem, the Afon Gwyrfai a Llyn Cwellyn SAC and its ‘water courses’ feature are sensitive to changes in flow regime beyond natural limits. Natural flow regimes are important in sustaining its characteristic biotope mosaic through prevailing abiotic conditions, including riverbed hydraulics, water depth, wetted area, temperature and Dissolved Oxygen (DO) concentrations. The Conservation Objectives for the SAC state *“Flow regime, water quality and physical habitat should be maintained in, or restored as far as possible to, a near-natural state, in order to support the coherence of ecosystem structure and function across the whole area of the SAC.”* (Ref 6.15). Maintaining a natural flow regime is also critical to all aspects of the life cycle of designated fish (i.e., Atlantic salmon) and otter. Adequate river flows are particularly important for anadromous salmon, which spawn in freshwater habitats and complete their life cycle at sea. Significantly reduced or increased river flows may impede salmon from reaching their historic spawning grounds in upstream river stretches, potentially affecting reproductive success.

6.4.3 The Core Management Plan for the Afon Gwyrfai a Llyn Cwellyn SAC (Ref 6.15) states *“Factors that are important to the favourable conservation status of this feature include flow, substrate quality and water quality, which in turn influence species composition and abundance. These factors often interact, producing unfavourable conditions by promoting the growth of a range of algae and other species indicative of eutrophication. Under conditions of prolonged low flows and high nutrient status, epiphytic algae may suppress the growth of aquatic flowering plants. Favourable management for this feature is therefore largely dependent on ensuring that sufficient depth, velocity and duration of flow and sufficiently low phosphate levels are maintained within the natural range of the vegetation.”*

6.4.4 The Project is situated in the supply area of Welsh Water which has a statutory obligation to deliver potable water to new developments without negatively impacting the environment (including Habitats sites).

6.4.5 Overall, since no additional water supplies beyond existing consents and licensed volumes will be required to meet the potable water demand, there is no potential for the Project to result in LSEs on the Afon Gwyrfai a Llyn Cwellyn SAC regarding water supply in the construction, maintenance or operational phases.

Corsydd Eifionydd/Eifionydd Fens SAC

6.4.6 Corsydd Eifionydd/Eifionydd Fens SAC is a topogenous (alluvial) fen, where vertical (groundwater) water table changes dominate due to limited drainage. The CMP for Corsydd Eifionydd/Eifionydd Fens SAC (Ref 6.16) specifies the importance of maintaining current water levels in order to support the qualifying features.

6.4.7 There is potential for increased volumes and rates of surface runoff from temporary and/or permanent impermeable surfaces within the proposed Project, such as compacted access tracks and watercourse crossings. While the risk of material hydrological effects from each individual surface is likely to be small, the cumulative increase in runoff from all surfaces is considered here as a precautionary measure.

6.4.8 However, Statutory Natural Resources Wales guidance (Ref 6.17) makes it clear that developments must achieve no net increase in runoff beyond greenfield rates.

6.4.9 The construction period on every project must have a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters. A CEMP that includes measures to manage the environmental effects of the proposed works and demonstrate compliance with environmental legislation will be implemented. The CEMP will include measures such as the provision of storage facilities for solid materials, including waste soils, to prevent their escape via surface run off and ensuring that all reinstated surfaces have the same runoff properties and are at the same elevation as existing as far as practically feasible.

6.4.10 Similarly, during the operational phase National Grid have that same duty of care. This is usually undertaken in the form of an Environmental Management Plan (EMP).

6.4.11 New infrastructure can be constructed in a way to prevent pollution to the water environment from run-off to ensure no adverse effects from water pollution on any Habitats site. LSEs are screened out for all Habitats sites through this impact pathway.

6.5 Loss of, or Damage to, Functionally Linked Habitat

Corsydd Eifionydd/Eifionydd Fens SAC

6.5.1 One of the qualifying features of the Corsydd Eifionydd/Eifionydd Fens SAC is the marsh fritillary, whose main habitat type in Wales is Rhôs pasture - a distinctive, Welsh marshy grassland habitat. This habitat is usually dominated by tussocks of purple moor-grass (*Molinia caerulea*) and various rush species (*Juncus* spp.). Marsh fritillary is heavily dependent on an abundance of its larval foodplant, the devil's-bit scabious (*Succisa pratensis*), within such habitats.

6.5.2 Marsh fritillary colonies vary in size with individuals rarely moving more than 1 km in their lifetime, however, movements of up to 5 km have been recorded between colonies (Ref 6.18). However, according to Butterfly Conservation Wales (Ref 6.19) any suitable habitat within 2 km of an occupied site are priority for preserving metapopulations. Areas of Rhôs pasture within 2 km of the SAC boundary could feasibly serve as FLH.

6.5.3 Towers 4ZC069 – 4ZC090 all lie within 2 km of the SAC. Analysis of DataMap Wales (Ref 6.20) show the following towers and associated tower and scaffolding working areas (the access routes are yet to be confirmed) to be in Rhôs pasture:

- 4ZC071
- 4ZC072
- 4ZC073
- 4ZC074
- 4ZC075
- 4ZC078
- 4ZC079
- 4ZC080
- 4ZC082
- 4ZC088
- 4ZC089

6.5.4 The Phase 1 Habitat survey (**Volume 8: Appendices 6.5.A Habitats Report**) also identified the following towers and associated working areas to be in Rhôs pasture:

- 4ZC081
- 4ZC083

6.5.5 Damage to FLH during construction and maintenance activities can occur through trampling and the use of vehicles. Purple moor-grass is moderately sensitive to trampling (Ref 6.21) and some degree of trampling can be beneficial to marsh fritillary habitat. Trampling creates an uneven sward structure of tall vegetation, short vegetation and bare soil. Patches of bare soil (poaching) are essential for wildflowers to germinate and establish roots. However, too much poaching can be detrimental to the vegetation and soil. LSEs of the proposed Project on the Corsydd Eifionydd/Eifionydd Fens SAC from damage to FLH during construction and maintenance cannot be excluded and this impact pathway is screened in for AA.

Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC, Glynllifon SAC and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

6.5.6 Lesser horseshoe bats are a qualifying feature of Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC, Glynllifon SAC and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC. Based on the 2 km CSZ for lesser horseshoe bat, as shown in **Table 5.4**, the following components of the Proposed Development could result in the loss of or damage to FLH:

- Trawsfynydd Substation – elements are within 2 km of Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Glaslyn – elements are within 2 km of Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Wider Works – elements are within 2 km of Glynllifon SAC and Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

6.5.7 LSEs of the proposed Project on Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and Glynllifon SAC from damage to FLH during construction and maintenance cannot be excluded and this impact pathway is screened in for AA.

6.5.8 This pathway is screened out for Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC as all components of the proposed Project are well beyond the 2 km CSZ for lesser horseshoe bat.

Migneint-Arenig-Dduallt SPA

6.5.9 Migneint-Arenig-Dduallt SPA lies approximately 1.08 km to the north-east of the Trawsfynydd component of the proposed Project. This Habitats site is designated for its breeding populations of hen harrier, merlin and peregrine falcon. Whilst peregrine can be adaptable in their habitat preferences, both merlin and hen harrier favour upland moorland during the breeding season (**Table 5.2**). The cable route for the Trawsfynydd component passes primarily through agricultural land, however review of aerial photography does show the cable to be passing through small areas of lowland heath. As this equates to <2 ha, these areas do not constitute FLH. This pathway is screened out for Migneint-Arenig-Dduallt SPA.

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC, Afon Eden - Cors Goch Trawsfynydd SAC and Afon Gwyrfai a Llyn Cwellyn SAC

6.5.10 Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC is designated for otter. Afon Eden - Cors Goch Trawsfynydd SAC and Afon Gwyrfai a Llyn Cwellyn SAC are designated for otter and Atlantic salmon. Both these species are highly mobile and likely to be frequently using functionally linked habitats beyond the designated site boundary. Otter are known to have extensive home ranges, having been recorded between 12 and 80 km for males (Ref 6.22). Atlantic salmon are anadromous and expected to use the entire continuum of watercourses from Tremadoc Bay and Treath Bach (Glaslyn & Dwryrd), to the upper reaches of the Afon Glaslyn and Afon Dwryrd.

6.5.11 The habitat use of otter is largely limited to river water channels and adjoining banks, where holts and couches represent the most sensitive features. There will be no in-channel or bankside works within the Afon Eden, Afon Gwyrfai, Afon Glaslyn or Afon Dwryrd. There will be no disturbance to FLH during construction and maintenance and this pathway is screened out for the Afon Gwyrfai a Llyn Cwellyn SAC and Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC.

Northern Cardigan Bay/Gogledd Bae Ceredigion SPA

6.5.12 Northern Cardigan Bay/Gogledd Bae Ceredigion SPA is designated for wintering red-throated diver which generally has a foraging range of <8 km (**Table 5.2**). Elements of the Glaslyn, Bryncir and Wider Works components of the proposed Project are in this foraging range. However, red-throated divers winter along coastlines with shallow inshore waters. They are rarely found inland during the winter (Ref 6.23) and there will be no LSEs from disturbance of FLH during construction and maintenance. This impact pathway is screened out.

6.5.13 Technically the loss of FLH commences in the construction phase when site staff and construction plant are likely to lead to noise and visual disturbance. Some degree of FLH loss will also continue into the maintenance phase, when activities in the Proposed Development would continue to lead to the loss of usable habitat. However, any loss of FLH will not be permanent outside the operational phase and this impact pathway is not assessed for the construction and maintenance phases hence referring to 'disturbance' of FLH.

6.5.14 There will be no loss of FLH as a result of operation as Trawsfynydd is an existing sub-station. No additional land-take is required.

6.5.15 The Bryncir works comprises a new 400 kV substation, including a permanent access road which will result in permanent land-take. The dominant habit type that would be directly and permanently impacted is improved grassland (**Volume 8, Appendix 3.5.C: Ecology Report: Bryncir Habitats**). As mentioned in paragraph 6.5.12, red-throated divers winter along coastlines with shallow inshore waters. Improved grassland is not suitable habitat.

6.5.16 This impact pathway is screened out for the operational phase of the development, both alone and in-combination with other plans and projects.

Traeth Lafan/Lavan Sands, Conway Bay SPA

6.5.17 Traeth Lafan/Lavan Sands, Conway Bay SPA is designated for overwintering oystercatcher. Although known to breed on inland waterways and lakes, during the winter, oystercatchers are still very much a bird of tidal estuaries and rocky shores (Ref 6.24). There will be no LSEs from disturbance of FLH during construction and maintenance and this impact pathway is screened out.

6.6 Temporary Loss of or Damage to Qualifying Habitat

6.6.1 Most SACs are designated for habitats of international conservation importance, many of which have been subject to encroachment from development and gradual loss. The Conservation Objectives for most Habitats sites include a target to maintain or restore the extent of qualifying habitats to achieve favourable conservation status. Any construction activities associated with the temporary and/or permanent loss of designated habitat, by definition, would result in LSEs on a SAC. The following elements of the construction or maintenance stages of the proposed Project with the potential for damage to and temporary loss of qualifying habitat have been identified:

- Construction works in the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, which include:
  - vegetation clearance during construction being limited to strimming of the bramble type vegetation between the track and the link/junction box with no trees to be removed.
- Routine maintenance works within the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, which includes:
  - maintenance of (mounted) joint bay 26/27
  - cable marker maintenance
  - maintenance of thermos couplers pit
  - maintenance of (mounted) joint bay 27/28
- The proposed beach landing at Morfa Bychan which crosses Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC, which includes:
  - construction, and subsequent removal, of a temporary aluminium trackway to facilitate the unloading of a vessel to transport a shunt reactor to Trawsfynydd Substation.

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

6.6.2 The primary qualifying habitats of the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC are old sessile oak woods with *Ilex* and *Blechnum* and alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*. Other habitats present as a qualifying feature includes water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation; Northern Atlantic wet heaths with *Erica tetralix*; European dry heaths; *Tilio-Acerion* forests of slopes, screes and ravines and bog woodland (Ref 6.25).

6.6.3 The construction and maintenance works listed above lie in an area of "alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*". This has been confirmed by the Phase 1 Habitat Survey carried out on behalf of the Applicant between May to August 2023 (refer to **Volume 8: Appendix 4.5.A Habitats Report**). As LSEs of the proposed Project on the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC as a result of loss of or damage to qualifying habitat cannot be excluded, this impact pathway is screened in for AA.

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

6.6.4 The primary qualifying habitats of the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC are sandbanks which are slightly covered by sea water all the time, estuaries, coastal lagoons (a priority feature), large shallow inlets and bays and reefs. Other habitats present include mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals colonizing mud and sand, Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) and submerged or partially submerged sea caves.

6.6.5 The construction, and subsequent removal, of a temporary aluminium trackway has the potential to damage qualifying habitats. As LSEs of the proposed Project on the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC as a result of loss of or damage to qualifying habitat cannot be excluded, this impact pathway is screened in for AA.

6.6.6 No damage or loss of qualifying habitat is envisaged during the operational phase. Operational phase impacts are screened out, both alone and in-combination with other plans and projects.

6.7 Atmospheric Pollution (including dust deposition)

6.7.1 Traffic exhaust emissions contribute oxides of nitrogen and (from petrol exhausts) ammonia. These are pollutants but also contribute to nitrogen deposition (and thus acid deposition). Nitrogen deposition is a form of fertilisation that can change vegetation structure and species composition. Guidance from the Institute of Air Quality Management (Ref 6.26) and Natural England (Ref 6.27) identify that traffic exhaust emissions can affect ecological sites within 200 m of the source.

6.7.2 Using recognised screening criteria, as stated in the Land-Use Planning & Development Control: Planning for Air Quality guidance (Ref 6.28) **Table 6.2** of this said guidance includes a list of *"indicative criteria to proceed to an air quality assessment"*, two of which are *"a change of light duty vehicle (LDV) of more than 500 Annual Average Daily Traffic (AADT)"* and *"a change of heavy-duty vehicle (HDV) of more than 100 AADT"*[3].

6.7.3 The Traffic and Transport analysis (**Chapter 9 of Volumes 2-6)** has forecast the following vehicle movements:

- Trawsfynydd Substation - 66 two-way daily LDV movements and 16 two-way HDV movements.
- Glaslyn Cables - 48 two-way daily LDV movements and 100 two-way HDV movements.
- Bryncir - 76 two-way daily LDV movements and 80 two-way HDV movements.

[3] Note this refers to one way movements

- Pentir Substation - 84 two-way daily LDV movements and 10 two-way HDV movements.
- Wider Works – 16 two-way daily LDV movements and 4 two-way HDV movements.

6.7.4 This relates to total traffic generation on the network for each part of the Project. Flows on roads within 200 m of Habitats sites will be even lower than these figures. Moreover, vehicle movements in any location will be short-term and temporary. This is relevant because the air quality assessment metrics for habitat are based on annual average concentrations and deposition rates and, particularly for nitrogen deposition, assume continuous long-term exposure (i.e. many years). As these AADTs are well below the guidance levels there will be no LSEs as a result of air quality impacts due to traffic emissions during construction and maintenance on any of the relevant Habitat sites. This impact pathway is screened out.

6.7.5 According to the IAQM guidance exhaust emissions from on-site plant are unlikely to make a significant impact on local air quality and will not need to be quantitatively assessed. This is the case for the construction of the proposed works, due to the transient and intermittent nature of emissions from site plant and Non-Road Mobile Machinery (NRMM), operating as and when and where required.

6.7.6 In addition to traffic exhaust emissions, guidance from the Institute of Air Quality Management (Ref 6.29) identifies that significant dust soiling can arise on ecological receptors located within 50 m of construction sites. A construction dust emissions assessment has been undertaken for the Project (**Chapter 10 of Volumes 2 - 6**)

6.7.7 The following Habitats sites lie within 50 m of potential construction activities:

- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC – within the Glaslyn Cables component.
- Corsydd Eifionydd/Eifionydd Fens SAC – Wider Works haul road runs adjacent to the SAC.
- Afon Gwyrfai a Llyn Cwellyn SAC - Project crosses over the SAC between 4ZC120 and 4ZC121.

6.7.8 LSEs of the proposed Project on the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC, Corsydd Eifionydd/Eifionydd Fens SAC and Afon Gwyrfai a Llyn Cwellyn SAC as a result of construction dust emissions cannot be excluded and this impact pathway is screened in for AA.

6.7.9 AADTs during operation will be significantly even less than during the construction and maintenance phases. There will be no LSEs as a result of air quality impacts due to traffic emissions during the operational phase.

6.8 Injury or mortality

6.8.1 Otters and marsh fritillary are afforded protection under the Wildlife and Countryside Act 1981 (as amended) and the Conservation of Habitats and Species Regulations 2017 (as amended). Under this legislation it is an offence to:

- deliberately or recklessly capture, injure or kill an otter or marsh fritillary;
- disturb an otter or marsh fritillary in a way that will impair its ability to reproduce or migrate; or,

- damage, destroy or obstruct access to their breeding or resting places (note: this is an offence whether an individual is present or not, and is an offence whether deliberate or not).

6.8.2 Both otter and marsh fritillary are also listed as a species of principal importance under Section 7 of the Environment (Wales) Act 2016.

6.8.3 The desk study returned records of otter within the survey areas and several of the SACs near the works are designated for otter. As otter are highly mobile species, tributaries and rivers connected to the SACs also have the potential to support otter.

6.8.4 The risk of injury or mortality is most likely to be a risk if holts or couches are close to the works area and where earthworks were proposed close by.

6.8.5 The following SACs are close to the Project and designated for otter:

- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Afon Eden – Cors Goch Trawsfynydd SAC
- Afon Gwyrfai a Llyn Cwellyn SAC

6.8.6 The desk study returned records of marsh fritillary within the survey areas and Corsydd Eifionydd/Eifionydd Fens SAC is designated for marsh fritillary.

6.8.7 As discussed in paragraph 6.5.1, marsh fritillary favour areas of Rhôs pasture as it supports devil's-bit scabious, their larval foodplant. Trampling and the use of vehicles in suitable habitat within 2 km of the SAC could result in the injury or mortality of both adults and larvae.

6.8.8 LSE of the proposed Project on the above SACs from injury and mortality to otter cannot be excluded and this impact pathway is screened in for AA.

6.9 Introduction of Invasive Non-Native Species

6.9.1 There are several legislative instruments relating to INNS. The purpose of this legislation is to prevent and reduce the negative economic and environmental impacts of these species. Key legislation identifies species for which mitigation is required, specifically:

- Species listed in Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) (WCA) (Ref 6.30); and
- Species of special concern and Schedule 2 species as per the Invasive Alien Species (Enforcement and Permitting) Order 2019 (as amended) (IASO) (Ref 6.31).

6.9.2 Taken together, the relevant legislation makes it an offence to plant or otherwise cause to grow (including allowing to spread) listed species in the wild. If transported off-site, there is a duty of care with regards to the disposal of any part of the plant that may facilitate establishment in the wild and cause environmental harm (as per the Environmental Protection Act 1990) (Ref 6.32).

6.9.3 While it is not illegal to have any of the identified INNS on a property, even when growing on managed land, the spread of Schedule 9 WCA species should be kept under control such that the species is not having an appreciable adverse impact on habitats and their native biodiversity.

6.9.4 Appropriate biosecurity measures will be implemented during works carried out during the construction and maintenance phases of any scheme to prevent the spread of INNS, irrespective of whether there are Habitats sites in the vicinity. LSEs of the proposed Project during construction, maintenance and operation on Habitats sites regarding the introduction of INNS are screened out.

6.10 In-Combination Effects

6.10.1 It has been possible to screen out certain impact pathways for certain Habitats sites both alone and in combination with other plans and projects because no pathway exists i.e., the Habitats sites are beyond the specified ZoI. It follows that if a pathway does not exist alone, it can’t exist in-combination.

6.10.2 One impact where a pathway to Habitats sites exists is changes in air quality. Whilst feasible to screen out this impact pathway alone it is one where in-combination effects could arise. However, in this instance it is reasonable to screen out air quality effects arising from exhaust emissions as the traffic flows forecast are so low they would not be visible in air quality modelling, therefore there can be no LSEs either alone or in-combination.

7. Conclusion of the Test of Likely Significant Effects

7.1.1 A ToLSEs, i.e., Stage 1 - Screening, has been undertaken for the Project. Based on the 'source-pathway-receptor model' the following Habitats sites were identified as being of relevance to this HRA:

- Migneint-Arenig-Dduallt SAC
- Migneint-Arenig-Dduallt SPA.
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC.
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC.
- Afon Eden – Cors Goch Trawsfynydd SAC.
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA.
- Morfa Harlech a Morfa Dyffryn SAC.
- Corsydd Eifionydd/Eifionydd Fens SAC.
- Glynllifon SAC.
- Afon Gwyrfai a Llyn Cwellyn SAC.
- Eryri/Snowdonia SAC.
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC.
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC.
- Traeth Lafan/Lavan Sands, Conway Bay SPA.
- Llyn Idwal Ramsar.
- Coedydd Aber SAC.

7.1.2 Based on the recognised impact pathway buffer distances shown in **Table 5-2** and professional judgement, the following impact pathways have been considered:

- Noise and visual disturbance.
- Water quality.
- Water quantity, level and flow.
- Loss of, or damage to, functionally linked habitat.
- Temporary loss of, or damage to qualifying habitat.
- Atmospheric pollution (including dust deposition).
- Injury or mortality.

- Introduction of invasive non-native species.

7.1.3 Having undertaken the Stage 1 Screening exercise, LSEs on the following Habitats sites could not be ruled out and are taken through to Stage 2 of the HRA process – Appropriate Assessment:

- Migneint-Arenig-Dduallt SPA – noise and visual disturbance.
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC – noise and visual disturbance; loss of, or damage to, FLH; temporary loss of, or damage to, qualifying habitat; atmospheric pollution (construction dust emissions).
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC – noise and visual disturbance; injury or mortality.
- Glynllifon SAC – noise and visual disturbance; loss of, or damage to, FLH.
- Afon Gwyrfai a Llyn Cwellyn SAC – atmospheric pollution (construction dust emissions).
- Corsydd Eifionydd/Eifionydd Fens SAC – loss of, or damage to, FLH, atmospheric pollution (construction dust emissions), injury and mortality.
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA – noise and visual disturbance.

8. Appropriate Assessment

8.1 Noise and Visual Disturbance

Migneint-Arenig-Dduallt SPA

8.1.1 **Chapter 6** of this HRA identifies that LSEs of the Trawsfynydd Substation and Wider Works (Tower 4ZC026 to Trawsfynydd Substation) elements of the Project on qualifying SPA birds utilising functionally linked habitats adjoining the Project regarding construction, maintenance and operational noise and visual disturbance could not be excluded.

8.1.2 Works at Trawsfynydd comprise works within the existing substation compound, including:

- Replacement of existing cross site underground cables within Trawsfynydd Substation;
- Amendments to the downleads from existing Tower 4ZC005 into a new gantry within the substation compound;
- A new shunt reactor, 400 kV cables and other new equipment; and
- Amendments to the substation compound fence line to accommodate the amended downleads.

8.1.3 The SPA is designated for breeding merlin and hen harrier, which nest in the upland moorlands and peregrine falcons, which prefer open areas with cliffs or crags for nesting, although they are highly adaptable (Ref 8.1).

8.1.4 NatureScot conducted a literature review of disturbance distances of selected bird species and made suggestions for buffer zones (Ref 8.2). **Table 8.1** shows the likely sensitivity to disturbance and suggested buffer zones during the breeding (BR) and nonbreeding (NBR) seasons considered for each SPA qualifying bird species.

Table 8.1 – Likely sensitivity to disturbance and suggested buffer zones during the breeding (BR) and nonbreeding (NBR) seasons considered for each of the SPA qualifying bird species.

Species	Likely sensitivity to disturbance	Buffer zone (m) suggestions during the breeding (BR) and nonbreeding (NBR) seasons
Hen harrier	Medium	BR and NBR = 300 – 750 m
Peregrine falcon	Medium	BR = 500 – 750 m NBR = $\leq$ 200 m
Merlin	Medium	BR = 300 – 500 m NBR = $\leq$ 200 m

8.1.5 At 1.08 km from Trawsfynydd Substation and 1.27 km from Wider Works, the works are well beyond the BR buffer zones shown within Table 8.1. It can be concluded that there will be no direct visual or noise disturbance to nesting hen harrier and merlin. It is possible that some structures, such as pylons and/or the former Trawsfynydd Nuclear Power Station, could be used by nesting peregrine. However, this is unlikely, particularly for those closer to the works due to increased human activity and disturbance in comparison to those further away. Direct disturbance of birds on the nest will not arise. However, at 1.08 km and 1.27 km away, both Trawsfynydd Substation and Wider Works are within the core foraging ranges for all three species from nest sites during breeding season.

8.1.6 As shown in **Table 5.2** both hen harrier and merlin occupy upland moorland in the summer moving to the lowlands, particularly coastal marshes during the winter, with peregrine being more adaptable.

8.1.7 Review of aerial imagery shows the surrounding habitat to be broadleaved woodland, with Llyn Trawsfynydd to the south. Such habitats are unsuitable for foraging hen harrier and merlin. There are areas of farmland to the north which could potentially be used for foraging; however, the broadleaved woodland screens both the Trawsfynydd Substation and Wider Works areas. Moreover, given the expanse of available upland foraging habitat it is likely that use of farmland is very limited, if it is used at all, during the breeding season. It is reasonable to conclude that there will be no adverse effects on the qualifying SPA species and therefore on site integrity as a result of visual disturbance.

8.1.8 With regard to noise disturbance, the noise and vibration assessment (**Volume 5, Chapter 11: Noise and Vibration** of this ES) concluded that no receptors that are sensitive to noise or vibration have been identified within 300 m of the Trawsfynydd Substation and Wider Works and moving receptors (such as foraging birds that will be in a given area briefly and forage over large areas) are less susceptible to significant effects from noise disturbance than static receptors such as birds on the nest or roosting on the ground. It also concluded that, during operation, noise emissions from a shunt reactor (a sound power level of approximately 85 dB) are sufficiently quieter than existing transformers (a sound power level of approximately 95 dB) that any changes in operational noise would not be perceptible.

8.1.9 Moreover, as previously mentioned, the broadleaved woodland between the works and the farmland to the north will serve as an acoustic barrier as well as a visual one. The noise and vibration assessment concluded that the embedded mitigation measures are expected to prevent any effects during construction, operation and maintenance. It is reasonable to conclude that there will be no adverse effects on the qualifying SPA species and therefore on site integrity as a result of noise disturbance.

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

8.1.10 Elements of the Glaslyn Cables works and Wider Works lie within the boundary of this Habitats site and/or within the 2 km CSZ for lesser horseshoe bats. Trawsfynydd Substation is also within the 2 km CSZ.

8.1.11 Bat roost suitability (BRS) surveys were carried out on suitable trees within the Glaslyn Cables area, plus a minimum 50 m buffer (which encompassed the Wider Works areas within the 2 km CSZ) – the Survey Area, between May and September 2023. A combined Daytime Bat Walkover (DBW) and Ground Level Tree Assessments (GLTA’s) were also carried out within the Survey Area. The DBW/GLTAs were undertaken in January 2024 and February 2024. Only those trees potentially impacted or likely to be removed during the proposed works were assessed.

8.1.12 Following initial assessments, a suite of surveys was undertaken including:

- Dusk emergence surveys of suitable structures – Church Porch and a barn.
- Dusk emergence surveys of trees assessed as having moderate or high suitability for roosting bats, likely to require removal (four in total).
- Endoscope surveys were carried out on three trees with high suitability likely to require removal.
- Bat activity transect surveys.
- Automated echolocation detector surveys which allow for bat sonogram analysis.

8.1.13 Based on the survey findings, Church Porch is a confirmed roost used by brown long-eared bat. Based on the survey work to date it is concluded that the Barn is a non-breeding day roost (a non-breeding roost where either individual or small groups of bats rest or shelter in the day) used by two whiskered bats. Neither of these two species are qualifying features of the SAC.

8.1.14 Based on the surveys undertaken in 2024; the trees do not support roosting bats. Direct disturbance of roosting bats associated with the SAC is not likely and an adverse effect on integrity will not arise.

8.1.15 The SAC area in the east of the Glaslyn works site was assessed as having moderate suitability habitat for foraging and commuting bats. The Porthmadog area in the centre of the Site and Wern Manor area in the west of the Site were both assessed as having low suitability habitat for foraging and commuting bats. In the SAC, 943 bat passes were recorded, seven of which were lesser horseshoe bats. In the Porthmadog area, 1,341 bat passes were recorded, 50 of which were lesser horseshoe bats. Around Wern Manor, 783 bat passes were recorded, eight of which were lesser horseshoe bats. During additional transects undertaken in May 2024 191 bat passes were recorded of which five were lesser horseshoe bats. The static bat detectors recorded lesser horseshoe bats both within the SAC and around Wern Manor. Full details of the bat surveys can be found in **Volume 8 Appendix 4.5.F. Bat Survey Report.**

8.1.16 The surveys have confirmed lesser horseshoe foraging and commuting activity within the Glaslyn Cables working area. There is the potential to cause disturbance to foraging and commuting bats through, for example, the use of lighting during construction (Ref 8.3). The slower-flying, broad winged species such as lesser horseshoe bats have been shown to avoid commuting and foraging routes illuminated with a variety of different street luminaires (Refs 8.4, 8.5, and 8.6). Lesser horseshoe bats have been shown to move their flight paths which link their roosts and foraging grounds to avoid artificial light installed on their usual commuting routes. Significant effects have been recorded from as low as 3.6 lux (Ref 8.7). The average light level on hedgerows most regularly used by this species has been recorded at 0.45 lux (Ref 8.8).

8.1.17 To avoid adverse effects on the integrity of the SAC, works are only to be carried out during daylight to minimise any requirement for artificial lighting. Where this is not practicable and such lighting is necessary, the brightness would be limited to what is safely required to carry out the works and be directed towards those areas necessary only, avoiding the potential for light pollution in the surrounding areas. The measures to be implemented for minimising visual disturbance include the following:

- Minimum brightness/power rating to perform the required function;
- Light fittings that reduce light spillage above the horizontal axis;
- Direction of light to avoid light spillage on nearby watercourses and woodland edges; and
- Passive Infra-Red (PIR) controlled lights (motion sensors) will be deployed except where task-specific lighting is required.

8.1.18 The following mitigation measures will also be implemented:

- Where the removal/reduction of trees with low bat roost suitability is unavoidable (trees that are identified as PRF – I), these trees will be soft section felled in accordance with an approved Method Statement, under an ecological watching brief.
- Pre-construction surveys will be undertaken to support the baseline survey findings where tree removal/reduction cannot be avoided. Where impacts to roosting bats cannot be avoided a licence from NRW will be obtained and suitable mitigation put in place.
- A minimum of 15 m stand-off buffers will be applied to retained suitable trees to limit the potential for disturbance to roosting bats which may be present.

8.1.19 No works will directly affect the derelict barn near to Wern.

8.1.20 Pentir Substation and Bryncir are beyond the 2 km CSZ, being 16.93 km and 7.79 km away respectively. It is reasonable to conclude that there will be no LSE's on the qualifying SAC species and therefore on site integrity as a result of noise and visual disturbance.

Glynllifon SAC

8.1.21 Glynllifon SAC is a site designated for both maternity and hibernation roots of lesser horseshoe bats and comprises approximately 6% of the UK population. It lies 0.83 km to the north-west of Wider Works which is within the 2 km CSZ for lesser horseshoe bats. The towers in the 2 km CSZ are towers 4ZC097 to 4ZC107. The work required at these tower locations is the installation of approximately 23.5 km of fibre optic cable along the existing earth wire of the overhead line. This will take place between towers 4ZC070 and 4ZC140 and will involve visiting each tower with a vehicle and pulling fibre optic between towers so that it wraps around the existing earth wire. No bat surveys were conducted between 4ZC097 and 4ZC107.

8.1.22 However, as the works are within 2 km of the CSZ there is the potential to cause disturbance to foraging and commuting lesser horseshoe bats through, for example, the use of lighting during construction. To avoid adverse effects on the integrity of the SAC, works are only to be carried out during daylight to minimise any requirement for artificial lighting. Where this is not practicable and such lighting is necessary, the brightness would be limited to what is safely required to carry out the works and be directed towards those areas necessary only, avoiding the potential for light pollution within the surrounding areas. The measures to be implemented for minimising visual disturbance include the following:

- Minimum brightness/power rating to perform the required function;
- Light fittings that reduce light spillage above the horizontal axis;

- Direction of light to avoid light spillage on nearby watercourses and woodland edges; and
- PIR controlled lights (motion sensors) will be deployed except where task-specific lighting is required.

8.1.23 Some extended or 24-hour working may be required on the Project; however, this is likely to be limited areas of HDD which is not part of the works at this location.

8.1.24 It is reasonable to conclude that there will be no adverse effects on the qualifying SAC species and therefore on site integrity as a result of disturbance.

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

8.1.25 The Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC lies approximately 540 m south from the Glaslyn Cable works and, although not a primary reason for the selection of the site, otter is a qualifying feature of the SAC. Otter is a wide-ranging species, with home ranges extending up to around 40 km for males, and 16-21 km for females (Ref 8.9). Based on the home ranges given in Harris and Yalden, otter associated with the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC could potentially occur within the vicinity of the Glaslyn Cables works. There is also the potential for otters to be present within the wider area.

8.1.26 The habitat use of otter is largely limited to river water channels and adjoining banks, where holts and couches represent the most sensitive features. Due to the sensitivity of the habitats to open-cut trenching construction methods, it has been confirmed that cable installation at this location will be through trenchless methods (i.e., HDD). Directional bore machines are associated with loud grinding noise that can reach sound levels of up to 85 dB at source. While otters are known to be relatively tolerant to noisy environments, there is the potential for noise and visual disturbance which must be assessed further.

8.1.27 Field surveys carried out during 2023 and 2024 revealed the presence of otter and a summary of the findings is shown in **Table 8.2** (details are in **Volume 8: Appendix 4.5.H Riparian Mammals Survey Report**).

Table 8.2 – Otter survey results

Watercourse (number and name where known)	Otter field sign	Date	OS Grid Reference	Distance from Scheme Boundary
7b Nant yr Afon-oer	Potential resting site	23 May 2023	SH 54994 39978	Within
4.26	Spraint	24 August 2023	SH 57049 39393	Within
4.33 Afon Glaslyn	Potential holt and spraint (unsuitable for use as a natal holt)	5 September 2023	SH 58903 38983	0.7 m north

Watercourse (number and name where known)	Otter field sign	Date	OS Grid Reference	Distance from Scheme Boundary
4.7b Nant yr Afon-oer	Spraint	23 May 2023	SH 55334 39848	10 m north east
4.7b Nant yr Afon-oer	Spraint	23 May 2023	SH 55360 39838	10 m north east
4.33 Afon Glaslyn	Slide	5 September 2023	SH 58930 39005	30 m north
4.33 Afon Glaslyn	Footprints	19 March 2025	SH 5934038942	40 m north
4.33 Afon Glaslyn	Spraint	5 September 2023	SH 58476 38421	310 m south

8.1.28 The cable works will be restricted to daytime, meaning that otter, which are predominantly nocturnal, are unlikely to be travelling along the rivers but will be within their holts. The chances of them being present within the works area is low. Notwithstanding this, to minimise otter disturbance in construction stand-off buffers between all works areas and the top of the banks of watercourses will be implemented.

8.1.29 Stand-off buffers of a minimum of 10 m from watercourses known to support otter will be applied to limit noise and visual disturbance, with the exception of where watercourses are crossed by cabling works and open cut techniques are required, where bridge construction is required, or where existing cable requiring removal is in the buffer. A minimum stand-off buffer of 50 m from Afon Glaslyn bankside (where a potential otter holt has been recorded) will be implemented to reduce the likelihood of disturbance to any resident otter.

8.1.30 HDD which has been identified as being associated with the highest disturbance potential for otter will be used for parts of the Glaslyn works. The HDD launch and receiving pits will be a minimum of 30 m from the top of the banks of watercourses. Noise contours, including both LAeq and LAmax, were modelled outward from the HDD launch pits to establish the distances at which construction noise would have dropped to lower than disturbing levels.

8.1.31 A metric that is commonly used for the assessment of noise impacts in animals is that of 'decibels above the hearing threshold' (dBht). This is species-specific, requiring knowledge of the hearing threshold of the species in question, and has been most widely investigated for marine fish species, although more data are becoming available on freshwater fish and terrestrial species.

8.1.32 There is no available research into the hearing thresholds of the European otter. However, research undertaken into the North American otter enabled a probable hearing threshold for the European otter to be determined by Bureau Veritas (Ref 8.11). Otters have very acute high frequency hearing sensitivity (16 kilohertz [kHz]) but much poorer hearing sensitivity than humans at frequencies below 4 kHz. This is likely to be why they utilise 'noisy' environments, such as roads, industrial buildings, quarries and other sites impacted by anthropogenic activities (Ref. 8.10). Overall, otters appear to be flexible in their habitat usage and do not avoid areas impacted by human activities.

8.1.33 Bureau Veritas identified that a sound pressure level below 50 dBht would probably result in a low likelihood of disturbance for otters as it does for humans and many marine species (Ref. 8.11). The report established that most construction activities involving ground penetration or noise would not result in disturbance (i.e., noise levels above 50 dBht impacting on European otter) if undertaken over 30 m from a watercourse; hence the offset distance for the HDD pits.

8.1.34 Any noise assessment should relate overall noise levels generated to the duration and frequency of occurrence and the pre-construction noise baseline. Exceedance of the dBht threshold does not necessarily mean an adverse ecological impact will occur. If the otter population in a particular catchment is stable, it can reasonably be concluded that a level of noise that does not (or only marginally) exceeds the existing pre-construction background noise level is unlikely to negatively impact otters, even if it exceeds the 50 dBht threshold.

8.1.35 Irish guidelines (Ref. 8.12) for site works in the vicinity of active otter holts stipulate that no works should be undertaken within 150 m of such breeding sites however the potential holt has been assessed as unsuitable for use as a natal holt (Table 8.2).

8.1.36 On the assumption that noise levels resulting from the proposed HDD works could be sufficient to cause disturbance to otter, precautionary portable acoustic fencing will be utilised around the HDD locations. It is anticipated that this measure will achieve a noise reduction of at least 5 dB. See **Chapter 11: Noise and Vibration** for further details. This fencing will be temporary and will be moved to another location as soon as the construction noise for the noise generating activity of concern is complete.

8.1.37 Otter are nocturnal animals and only very limited works will be undertaken outside daylight hours (e.g., occasional evening works in winter and HDD); visual disturbance is unlikely to be an issue for this species. Where lighting is required, it will conform to best practice guidelines (Ref. 8.13 and Ref 8.14) with respect to minimising light spill into adjacent habitats. By avoiding light spill into adjacent habitats this will ensure they remain dark corridors for nocturnal mammal movements and prevent disturbance to otter and other species using the watercourses.

8.1.38 The measures to be implemented for minimising visual disturbance include the following:

- Minimum brightness/power rating to perform the required function;
- Light fittings that reduce light spillage above the horizontal axis;
- Direction of light to avoid light spillage on nearby watercourses; and
- PIR controlled lights (motion sensors) will be deployed except where task-specific lighting is required.

8.1.39 Pre-construction surveys will be undertaken to support the baseline survey findings where intrusive crossing methods of watercourses are proposed in the Site. Where direct impacts to otter cannot be avoided a licence from NRW will be obtained and suitable mitigation put in place.

8.1.40 During operation and maintenance the presence of personnel and vehicles will be substantially reduced. Most works will also take place during daylight hours, when otter are less active. It is unlikely that disturbance would be caused, and even if this were to occur, it would be minor and temporary.

8.1.41 There is consequently no adverse effect on otter belonging to the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC and therefore on site integrity as a result of disturbance during the construction or operational/maintenance phases.

8.1.42 Part of the Trawsfynydd works includes transferring special order equipment via beaching a barge on the Black Rock Sands Beach in Morfa Bychan and then transfer by road to the Trawsfynydd substation. Bottlenose dolphin and grey seal are Annex II species present as qualifying features but not a primary reason for site selection at this site and there is the potential that disturbance could occur to these species.

8.1.43 The use of a vessel in the SAC will generate underwater sound, which has the potential to impact marine mammals. Man-made sound sources have the potential to affect marine mammals where the frequency of the sound generated is within a species auditory range. Vessel engine sounds cover a range of frequencies, depending on the size and type of engine, but are all within marine mammals' range of hearing. Exposure to such sounds can result in auditory effects (permanent or temporary threshold shift), masking of other ecologically important sounds, and behavioural effects. For vessel sounds, which are non-impulsive and generally of low intensity, the most likely response is behavioural, which can include increased alertness, alteration of movement or diving behaviour, interruption of social interactions, and temporary or permanent habitat abandonment. There are no thresholds for behavioural effects (Ref 8.15, Ref 8.16), but responses are highly variable and context specific. For example, a meta-analysis of marine mammal (including both cetaceans and seals) responses to small vessel presence reported varying behavioural reactions, from no response to avoidance of vessels at close range (Ref 8.17).

8.1.44 Although the vessel will operate at a frequency within the hearing ranges of marine mammals, the most likely response to underwater sound produced by vessels is low level behaviour such as avoidance by swimming away, although many species, dolphins in particular, are known to bow ride small fast-moving vessels (Ref 8.18). The works in the SAC involve a single vessel which will land on and re-float from the beach within 24 hours. When considering the temporary and short-term nature of the works within the SAC and slow vessel speed coupled with the likely low-level response there will be no adverse effects on bottlenose dolphin and grey seal, both alone and in combination with other plans and projects.

8.1.45 Seals regularly spend time at the sea surface or 'hauled out' on land where they rest, breed, and moult, making them more susceptible to airborne sound and visual stimuli. Where sites are designated for the protection of seals, the associated haul out sites can support hundreds to thousands of individuals (Ref 8.19). Disturbed seals can exhibit a range of behaviours from increased alertness to 'flushing', in which disturbed seals flee their haul-out site and return to the water (Ref 8.20; Ref 8.21). Such behaviour could cause individuals to stop resting, feeding, travelling and/or socialising, with repeated disturbance potentially resulting in permanent displacement and abandonment of pups, which could lead to declines in fitness and/or productivity. Grey seals are known to haul out along the northern coasts of Cardigan Bay (Ref 8.22).

8.1.46 Studies of seal disturbance have indicated that flushing can occur in response to vessel presence up to 1,000 m (Ref. 8.23), but the distance can vary depending on vessel type, species, and locality (Ref 8.21). The percentage of seals observed flushing and the distance at which this occurred was greater at sites with lower vessel activity, suggesting that habituation to the local environment, and background levels of potentially disturbing activity, is an important factor in seal disturbance (Ref 8.24). Spatial analysis has indicated a high co-occurrence of seals at sea, within 50 km of their haul-out sites and shipping vessels, with no evidence of related population declines (Ref 8.25).

8.1.47 When considering the short-term and temporary nature of vessel use in this instance, it is likely that a negligible increase in vessel traffic will be produced and any disturbance is likely to be short-lived and localised. The nearest known haul out site for seals is located >20 km from the beach at Morfa Bychan. Given this distance it is reasonable to conclude that there will be no adverse effects on the SAC.

Afon Gwyrfai a Llyn Cwellyn SAC

8.1.48 Otter are a qualifying feature of the Afon Gwyrfai a Llyn Cwellyn SAC although not a primary reason for the selection of the site. The SAC is crossed by the Wider Works between tower 4ZC120 and 4ZC121. Otter is a wide-ranging species, with home ranges extending up to around 40 km for males, and 16-21 km for females (Ref 8.26). As the Wider Works cross the SAC otter associated with the Afon Gwyrfai a Llyn Cwellyn SAC could potentially occur in the vicinity of Wider Works. The habitat use of otter is largely limited to river water channels and adjoining banks, where holts and couches represent the most sensitive features.

8.1.49 The works required at these tower locations is the installation of approximately 23.5 km of fibre optic cable along the existing earth wire of the overhead line. This will take place between towers 4ZC070 and 4ZC140 and will involve visiting each tower with a vehicle and pulling fibre optic between towers so that it wraps around the existing earth wire.

8.1.50 Otter are less active during daylight hours. During construction, works will be restricted to daylight hours wherever practicable to remove the need for artificial lighting, with focussed task specific lighting provided where this is not possible, e.g., HDD drilling operations, which are not part of the works in the vicinity of the SAC. Where lighting is required, it will conform to best practice guidelines (Ref. 8.27 and Ref. 8.28) with respect to minimising light spill into adjacent habitats and prevent disturbance to otter and other species using the watercourses.

8.1.51 The measures to be implemented for minimising visual disturbance include the following:

- Minimum brightness/power rating to perform the required function;
- Light fittings that reduce light spillage above the horizontal axis;
- Direction of light to avoid light spillage on nearby watercourses; and
- PIR controlled lights (motion sensors) will be deployed except where task-specific lighting is required.

8.1.52 Pre-construction surveys will be undertaken where intrusive crossing methods of the watercourse is proposed within the SAC. Where direct impacts to otter cannot be avoided a licence from NRW will be obtained and suitable mitigation put in place.

8.1.53 Where indirect impacts such as disturbance are unavoidable, further mitigation will be put in place, such as acoustic fencing as described in **Section 5.14**.

8.1.54 There are no maintenance works proposed during operation of the Wider Works.

8.1.55 It is reasonable to conclude that there will be no adverse effects on the qualifying SAC species and therefore on site integrity as a result of visual disturbance during construction or operation of the Wider Works.

Northern Cardigan Bay/Gogledd Bae Ceredigion SPA

8.1.56 The CMP for Northern Cardigan Bay/Gogledd Bae Ceredigion SPA (Ref 6.6) specifies disturbance as a threat to the integrity of this Habitats site. Northern Cardigan Bay/Gogledd Bae Ceredigion SPA is designated for its population of overwintering red-throated diver. Almost all birds at UK breeding sites commute from their freshwater nesting site to feed at sea in nearby shallow coastal areas (Ref 6.7). In the winter, the main source of disturbance to this species is through marine activity (Ref 6.7).

8.1.57 Although the SPA is well outside the Project's proposed works boundaries, part of the Project will include transporting special order equipment from a barge that will beach at Back Rock Sands beach Morfa Bychan and be moved via road from there to the Trawsfynydd substation. The barge will arrive at the beach through the SPA and be docked at the low tide mark adjacent to the boundary of the SPA for a full tide cycle. There is the potential for disturbance to red throated diver, the qualifying species of the SPA.

8.1.58 The SPA is designated for overwintering red throated diver; should seasonal restrictions be utilised, e.g. undertaking the beach docking during the spring/summer months the red throated diver will not be present within the SPA and will not be disturbed. Additionally, due to the short time e.g. approximately 24 hours or less of the barge being present within or adjacent to the SPA this is a very short-term impact even if it was undertaken in the winter.

8.1.59 The beach docking will require its own HRA to obtain the marine licence required to undertake the docking and the HRA will have to conclude no adverse impact on the integrity of the SPA. This beach docking has been licensed before and it is entirely possible for the beach docking to conclude no adverse impacts should seasonal restrictions be in place.

8.1.60 Since mitigation measures such as seasonal avoidance are available, that the impact is expected to be negligible even without such measures, and given that a bespoke HRA will be required to conclude either no likely significant effect or no adverse effect on the integrity of the SPA to obtain the marine licence, this HRA can conclude no adverse effect on the integrity of the SPA with regards to disturbance of red throated divers.

8.2 Loss of, or Damage to, Functionally Linked Habitat

Corsydd Eifionydd/Eifionydd Fens SAC

8.2.1 The Corsydd Eifionydd/Eifionydd Fens SAC lies approximately 340 m west of the Wider Works at its closest point. The marsh fritillary is an Annex II species that are a primary reason for selection of this SAC. The marsh fritillary butterfly is typically found on wet grassland (Rhôs pasture). Marsh fritillary exist as metapopulations, comprising groups of local populations connected by occasional dispersal (Ref 8.29). The butterfly requires a network of suitable habitat, not just within the SAC. According to Butterfly Conservation Wales (Ref 8.29) any suitable habitat within 2 km of an occupied site are priority for preserving metapopulations. This has been utilised as the ZoI with regards to the SAC and land functionally linked.

8.2.2 Not all sites are utilised every year; however, they are still valuable for 'boom' years where they can offer source populations where other core populations may fail. There is 15.03 ha of marshy grassland and 1.14 ha of fen in the Wider Works study area (with potential for approximately up to 3 ha of further priority habitat purple moor grass and rush pastures in areas not accessed). This includes 2.5 ha of marshy grassland and 0.1 ha of fen present in work areas (the tower and scaffolding working areas) (with potential for approximately up to 0.5ha of further priority habitat purple moor grass and rush pastures in areas not accessed). Not all areas had devil's bit-scabious recorded during the Phase 1 Habitats Survey. Devil's bit-scabious is the larval food plant of the marsh fritillary butterfly and the anchor to the populations. Where works outside of the SAC will temporarily or permanently remove or disturb areas of dense and/or abundant devil's bit scabious this can potentially impact the wider network of populations of the butterfly and the integrity of the SAC itself.

8.2.3 Analysis of the Phase 1 survey data (**Volume 8: Appendices 6.5.A Habitats Report**) shows that devil's-bit scabious has been recorded in the following locations:

- Towers 4ZC069 – 4ZC070: An area of fen with abundant devil's-bit scabious.
- Towers 4ZC071 – 4ZC072: Marshy grassland with frequent devil's-bit scabious.
- Towers 4ZC074 – 4ZC075: An area of fen within the southwest corner of the Tower works area with occasional devil's-bit scabious.
- Towers 4ZC079 – 4ZC080: There is an area of fen with frequent devil's-bit scabious.

8.2.4 There were access restrictions between Towers 4ZC075 – 4ZC079 and the presence or absence of devil's-bit scabious is currently unknown. Cofnod, the Local Environmental Records Centre for North Wales, did not provide any records of devil's-bit scabious in this area although that does not confirm absence.

8.2.5 The areas of habitat with devil's-bit scabious present in the Wider Works work areas is 0.1 ha (0.95 ha in Wider Works study area). Devil's-bit scabious was not recorded in other marshy grassland areas in the Wider Works boundaries. This is a very small area of devil's-bit scabious comparative to areas of suitable fen/marshy grassland within the SAC and the wider area. All works areas in the Wider Works are temporary.

8.2.6 As a precaution, in order to avoid any adverse effects on marsh fritillary butterfly, patches of dense or abundant devil's-bit scabious will be avoided (i.e. routed around or avoided by temporary plant) in order to preserve the larval food plant of the marsh fritillary. Areas required for preservation would be identified on the ground by an Ecological Clerk of Works prior to works commencing in a given location. Where it is not possible to avoid dense areas of devil's bit-scabious a pre-construction survey to check for the presence of marsh fritillary larval webs will be carried out at a suitable time of year (mid to late August or September prior to any works taking place in suitable habitat for this species). If marsh fritillary are subsequently confirmed to be present, then further measures such as, but not exclusive to, establishing no-work buffer zones will be taken to avoid damaging food or larval plants. Where devil's-bit scabious is located within works areas, translocation of the larval webs and plants that contain marsh fritillary eggs may be required, although in general the simpler approach would be to micro-site the works around any identified populations. Once works are complete the works areas would be reinstated to the condition it was in prior to the works.

8.2.7 With such measures in place it is reasonable to conclude that there will be no adverse effects on the qualifying SAC species and therefore on site integrity as a result of loss of functionally linked habitats during construction or operation of the Wider Works. These measures will be embedded via the CEMP.

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

8.2.8 Elements of the Glaslyn Cables Works and Wider Works lie within the boundary of this Habitats site and/or within the 2 km CSZ for lesser horseshoe bats. Trawsfynydd Substation is also within the 2 km CSZ.

8.2.9 The Trawsfynydd works site is approximately 1.44 km south west of the SAC and covers approximately 3.05 ha although the permanent development will be entirely within the existing substation footprint. The land in the Trawsfynydd works site comprises the existing Trawsfynydd Substation, the access road, office and welfare facilities, material storage areas, laydown areas and car parking.

8.2.10 Works would include the removal of existing electrical apparatus, the demolition of old concrete slabs and foundations and decommissioning and dismantling of old existing redundant 400 kV oil filled cables. Part of the existing access road in the fenced substation will be widened to accommodate the delivery of the shunt reactor.

8.2.11 The ES chapter for Trawsfynydd substation (**Volume 5: Trawsfynydd Works Chapter 5 Ecology and Nature Conservation**) highlights embedded mitigation measures which include that the proposed works have been designed to avoid key nature conservation and ecological features where possible and have put in place works buffers which include no works within 15 m of woodland and individual trees and 10 m from watercourses other than the use of the existing access track which will not be modified. There is a small area of self-seeded semi-natural broadleaved woodland in the substation boundaries that will need to be removed, totalling approximately 180 square meters (m^2). This would have been removed as part of site maintenance even if the Project did not go ahead. As this stand of trees is in the boundaries of the substation it is likely to be somewhat artificially lit, the substation is likely to be sub-optimal for foraging and commuting. It is unlikely that this stand of trees would be of significance as a foraging resource for preserving the bat population of the SAC.

8.2.12 The Glaslyn works site covers an area of approximately 106.4 ha The land in the Glaslyn works site will be used for access roads, turning areas, construction compounds and laydown areas required for the construction and operation of the works. Works would include the extension to the existing Wern cable sealing end compound; the replacement of the 400 kilovolt cables and associated infrastructure, with some sections of existing underground cables being left in situ due to social and ecological sensitivities; removal of the existing Garth cable sealing end compound and installation of the proposed Minffordd cable sealing end compound. The proposed works also includes the Minffordd Tunnel Head House (THH), previously consented and constructed under the EVIP project, , in line with the Minffordd cable sealing end compound. The ES states that where existing cables need to be decommissioned within areas of ancient woodland these will be retained in situ (rather than being removed) specifically to avoid loss or damage to this habitat. There is a small area of restored ancient woodland that will require minor tree trimming to facilitate existing visibility splays at the junction with A497. Minor trimming of trees is unlikely to affect foraging and commuting routes of lesser horseshoe bats. There are no works outside of the SAC to ancient or veteran trees. A small area of planted mixed woodland approximately 0.22 ha will be removed permanently to facilitate the extension of the Wern CSEC. The construction of the proposed works will include impacts on hedgerows and other boundary features, which will adversely impact connectivity across the Glaslyn works site for commuting and foraging bats. Any temporary loss will be reinstated however, where the woodland cannot be replanted in situ such as at the Wern CSEC extension these will be replaced elsewhere. As the loss of woodland is only small and temporary and will be replaced it is unlikely to cause an adverse effect to the SAC through loss of significant functionally linked land.

8.2.13 There were no existing records of bat roosts in the Wider Works site. Two trees (6.T.E65 and 6.T.E64) with Potential Roost Features (PRFs) were identified in the area where the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC and Wider Works site overlap (**Volume 8: Appendices 6.5.C Bat Survey Report**). Lesser horseshoe bats are not known to roost in trees (Ref 8.30).

8.2.14 Tree removal will only be required where necessary and at the proposed locations at towers 4ZC023, 4ZC045, 4ZC046, 4ZC059 and 4ZC061. Trees will be trimmed at 4ZC006, 4ZC016, 4ZC026 and 4ZC060. None of these trees have been identified as having PRFs. If any of the trees with identified PRFs require removal or pruning, additional surveys of these trees will be carried out as part of the pre-construction surveys. Re assessment of the affected trees will also be required as part of any pre-construction surveys.

8.2.15 No tree or vegetation removal is proposed in the area that overlaps with the Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC. Vegetation management will take place, which would include trimming of a small number of trees for an access road and strimming of vegetation around tower bases to allow access. There will be no working at night, or use of lighting at night.

8.2.16 Additional NBW and automated bat detector surveys will be carried out as part of the pre-construction surveys in May and June of the year prior to construction, to provide additional survey data for spring in the area of the Wider Works site that overlaps in the SAC.

8.2.17 With such measures in place it is reasonable to conclude that there will be no adverse effects on the qualifying SAC species and therefore on site integrity as a result of loss of functionally linked habitats during construction or operation of the Wider Works. These measures will be embedded via the CEMP.

Glynllifon SAC

8.2.18 Glynllifon SAC lies 0.83 km from the proposed works at Bryncir. This is within the CSZ for lesser horseshoe bats.

8.2.19 The Bryncir works site covers an area approximately 17.7 ha. However, the permanent Bryncir Substation compound would occupy over approximately 1.6 ha. The remainder of the land in the Bryncir works site will comprise the SPEN DB route, access road, construction compound (comprising office and welfare facilities) and laydown areas. One tree is currently proposed for removal and it is possible that trees along the access route may require pruning to facilitate access to the proposed works.

8.2.20 No confirmed bat roosts were recorded in the Bryncir works site during surveys carried out between November 2023 and March 2025. The tree proposed for removal has potential roosting features suitable for individual or a small number of bats (**Volume 8: Appendix 3.5.F Bat Survey Report**).

8.2.21 Should additional trees become affected they would be subject to assessments for suitable features, and further pre-construction surveys conducted as required.

8.2.22 Bat activity surveys identified lesser horseshoe bats using the works site. Activity was concentrated along ditches, hedgerows, and treelines, particularly during summer and early autumn. These features were mainly used for both foraging and commuting. To minimise potential impacts on bats during both construction and operational phases of the development, bat-sensitive lighting will be incorporated into the project design. This will follow current best practice guidance (Ref 8.31 and Ref 8.32), avoiding unnecessary illumination of key features such as tree lines, hedgerows, and watercourses used by bats for navigation and feeding. Where lighting is necessary, it would be low-level, directional, and use warm-spectrum LEDs to reduce disturbance.

8.2.23 With such measures in place it is reasonable to conclude that there will be no adverse effects on the qualifying SAC species and therefore on site integrity as a result of loss of functionally linked habitats during construction or operation of Bryncir

8.3 Temporary Loss of, or Damage to Qualifying Habitat

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

8.3.1 Construction and maintenance works will be carried out in the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC in an area that is within an area of "alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior",* a qualifying habitat.

8.3.2 Small areas of scrub will be removed to facilitate works to existing link boxes in the SAC. The current access track will be used and unamended. The habitat loss immediately around each link box, which comprises scrub, will be minimised and temporary. Although the scrub habitat is part of the site fabric of the SAC, it is not a qualifying habitat. Works will not directly impact qualifying habitats such as old sessile oak woodland. Restricting access to the existing unmodified track will prevent damage to trees from machinery through soil compaction or root disturbance.

8.3.3 No qualifying habitat will be affected by the works and there will be no adverse effects on the integrity of the SAC as a result of the temporary loss of, or damage to qualifying habitat from the works described above..

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

8.3.4 As part of the proposed Project special order equipment must be delivered to the Trawsfynydd substation. It is necessary to land a boat at a beach close to the substation to avoid significant disturbance to the road network. The equipment will be delivered via the Black Rock Sands beach at Morfa Bychan.

8.3.5 A specialist heavy lift barge will be selected that is designed to beach land and discharge abnormal loads cargo with the minimum of temporary facilitation works. Prior to the beach landing the beach will be inspected. Temporary buoys will be installed to mark the landing and any rocks or protrusions that could damage the barge will be removed. The barge will land on the beach at high tide, as the tide recedes load spreading aluminium trackway will be laid via a self-laying vehicle mounted Hiab from the road at the top of the beach down to the vessel.

8.3.6 The trackway is laid in 3 x 2.5 m sections and will be laid 6 m wide and a distance of approximately 300 m dependant on the level of the tide during the day of the operation, which will equate to approximately 200 below the mean high-water mark. Steel ramps will be positioned onto the trackway from the barge via the vessels own cranes or by using a mobile crane and then the barges inbuilt ram will be lowered onto the steel ramps and trackway. The trailer carrying the load will then be driven down the beach over the trackway and onto the barge and attached to the load. Once the cargo transits the beach the trackway will be removed via the vehicle mounted Hiab. At the next high tide the barge will then re-float and depart. The entire operation is expected to last no more than 24 hours.

8.3.7 In terms of damage to SAC habitats, the aluminium trackways are load spreading in order to ensure minimal disturbance and no damage to the foreshore. There is unlikely to be a need for grading or levelling of the beach. The operation is of short duration, up to 24 hours and all equipment will be removed. The majority of the operation will be below high-water mark and as the beach is washed with the tide twice a day the habitats in this area are moved around on a consistent basis. Should the operation take longer than the tide allows the aluminium trackway will be weighted with concrete blocks to stop them shifting and will be recovered at the next low tide. A similar delivery was undertaken via the Black Rock Sands beach through an approved Marine Licence in 2023 with no adverse effects on the integrity of the SAC with mitigation in place.

8.3.8 The proposed Project will need to undertake a project-specific HRA and to gain the Marine Licence the project specific HRA must conclude no adverse effects on the integrity of the SAC. The previous operation was able to conclude no adverse effects on the integrity of the SAC and it is highly likely that the current project can conclude the same. On this basis, it is reasonable to conclude no adverse effects on the integrity of the SAC. The marine licensing process provides an added level of control to support this conclusion.

8.4 Atmospheric Pollution (construction dust emissions)

Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC

8.4.1 Parts of the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC are in the Glaslyn Cables element of the works and therefore impacts from construction dust emissions could not be screened out.

8.4.2 The construction dust emissions assessment undertaken for Glaslyn Cables (**Volume 4: Glaslyn Cables Chapter 10 Air Quality and Emissions**) concluded that the potential magnitude of impacts will be negligible and not significant given compliance with mitigation measures described in the assessment and to be secured in the CEMP. These include:

- Develop and implement a Dust Management Plan (DMP) as part of the CEMP, which may include measures to control other emissions, approved by the Local Authority.
- Impose and signpost a maximum-speed-limit of 15-miles per hour (mph) on surfaced and 10-mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the local authority, where appropriate).
- Record any exceptional incidents that cause dust and/or air emissions, either on- or off-site, and the action taken to resolve the situation in the log-book.

- Plan site layout so that machinery and dust causing activities are located away from receptors, as far as is possible.
- Erect solid screens or barriers around dusty activities or the Glaslyn works site that are at least as high as any stockpiles on site.
- Fully enclose site or specific operations where there is a high potential for dust production and the site is active for an extensive period.
- Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems.

8.4.3 With the implementation of a DMP and adherence to mitigation measures described in the CEMP in place it can be concluded that there will be no adverse effects on site integrity as a result of construction dust emissions.

Corsydd Eifionydd/Eifionydd Fens SAC

8.4.4 The Eifionydd Fens SAC is designated for transition mires and quaking bogs. The transition mire and quaking bog according to the CMP is currently unfavourable declining status. However, this is due to current management leading to under-grazing, scrub encroachment and uncontrolled burning, decreasing the quality of the habitats. A Wider Works haul road runs adjacent to the SAC (SH46864713) and dust emissions from construction could potentially coat floral species in the habitat preventing them from photosynthesising and damage the floristic diversity, adding to the current impact of the management practices. An Air Quality assessment was undertaken **(Volume 6: Wider Works, Chapter 5: Likely Significant Effects)** and it was determined that implementing mitigation measures identified in the ES and set out in a Works Environmental Management Plan would reduce the magnitude of the impacts to -negligible and not significant. These measures include:

- Develop and implement a Dust Management Plan (DMP), which may include measures to control other emissions.
- Impose and signpost a maximum-speed-limit of 15-mph on surfaced and 10-mph on unsurfaced haul roads and work areas (if long haul routes are required these speeds may be increased with suitable additional control measures provided, subject to the approval of the nominated undertaker and with the agreement of the highway authority, where appropriate).
- Produce a Construction Logistics Plan to manage the sustainable delivery of goods and materials
- Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate.
- Use water-assisted dust sweeper(s) on the access and local roads, to remove, as necessary, any material tracked out of the site. This may require the sweeper being continuously in use.
- Avoid dry sweeping of large areas.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Inspect on-site haul routes for integrity and instigate necessary repairs to the surface as soon as reasonably practicable.

- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site where reasonably practicable).
- Install hard surfaced haul routes, which are regularly damped down with fixed or mobile sprinkler systems, or mobile water bowsers and regularly cleaned.

8.4.5 With the implementation of a DMP and adherence to mitigation measures described in the CEMP in place it can be concluded that there will be no adverse effects on site integrity as a result of construction dust emissions.

Afon Gwyrfai a Llyn Cwellyn SAC

8.4.6 The Wider Works element of the works crosses the Afon Gwyrfai a Llyn Cwellyn SAC between 4ZC120 and 4ZC121 and mpacts from construction dust emissions could not be screened out.

8.4.7 An Air Quality assessment was undertaken **(Volume 6: Wider Works Chapter 5: Likely Significant Effects)** and it was determined that implementing mitigation measures identified in the ES would reduce the magnitude of the impacts to being negligible and not significant provided the mitigation measures described in the assessment and those in the WEMP are adhered to.

8.4.8 These measures are described above under Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC and Corsydd Eifionydd/Eifionydd Fens SAC. With the implementation of a DMP and adherence to mitigation measures described in the CEMP in place it can be concluded that there will be no adverse effects on site integrity as a result of construction dust emissions.

8.5 Injury or Mortality

Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC

8.5.1 Field surveys carried out during 2023 and 2024 revealed that otters are utilising water bodies and riparian habitats in the Glaslyn works site (**Volume 8: Appendix 4.5.H Riparian Mammals Survey Report**). However, no otter resting sites have been recorded in the proposed works area, and injury or mortality of this qualifying species is not anticipated while in resting sites.

8.5.2 Otter will be able to move across the Glaslyn works sites along the water courses however, mitigation will be implemented to prevent otter from being trapped in any excavations left open overnight. This will include implementing measures to avoid animals being injured or killed in construction working areas, through excluding them from such areas and preventing them from becoming trapped in excavations. If excavations are required to be left open overnight, ramps will be provided to allow animals a means of escape.

8.5.3 Pre-construction surveys will be carried out as required to support the baseline survey findings and inform any additional mitigation or licensing to prevent any potential injury or mortality to otter.

8.5.4 With the incorporation of such embedded mitigation measures it can be concluded that there will be no adverse effects on site integrity. These measures will be embedded via the CEMP.

Corsydd Eifionydd/Eifionydd Fens SAC

8.5.5 As discussed above, the areas of habitat with devil's-bit scabious present that are within the Wider Works work areas is a total of 0.1 ha. This is a very small area of devil's-bit scabious comparative to areas of suitable fen/marshy grassland within the SAC and the wider area. Additionally, all works areas within the Wider Works are temporary. Nevertheless, there is the potential for works within these areas to result in the injury/mortality of marsh fritillary larvae.

8.5.6 As a precaution, to avoid any adverse effects on marsh fritillary butterfly, patches of dense or abundant devil's-bit scabious would be avoided (i.e. routed around or avoided by temporary plant) to preserve the larval food plant of the marsh fritillary. Areas required for preservation would be identified on the ground by an Ecological Clerk of Works prior to works commencing in a given location. Where it is not possible to avoid dense areas of devil's bit-scabious a pre-construction survey to check for the presence of marsh fritillary larval webs will be carried out at a suitable time of year (mid to late August or September) prior to any works taking place in suitable habitat for this species. If marsh fritillary are subsequently confirmed to be present, then further measures such as, but not exclusive to, establishing no-work buffer zones will be taken to avoid damaging food or larval plants. Where devil's- bit scabious is in works areas, translocation of the larval webs and plants that contain marsh fritillary eggs may be required, although in general the simpler approach would be to micro-site the works around any identified populations. Once works are complete the works areas would then be required to be reinstated to the condition it was in prior to the works.

8.5.7 With the incorporation of such embedded mitigation measures it can be concluded that there will be no adverse effects on site integrity. These measures will be embedded via the CEMP.

9. In-Combination Assessment

9.1 Introduction

9.1.1 As discussed in **Section 4.5**, it is a requirement of the Habitats Regulations that the impacts and effects of any proposed development being assessed are not only considered in isolation but also in combination with other plans and projects that may also have effects on the Habitats site(s) in question.

9.1.2 Whilst there is no legal definition of what constitutes a ‘plan’ or ‘project’ for the purposes of the Habitats Regulations, PINS advises that the following (but not limited to) should be considered for the HRA in-combination assessment:

- Projects that are under construction;
- Permitted application(s) not yet implemented;
- Submitted application(s) not yet determined;
- All refusals subject to appeal procedures not yet determined;
- Projects on the PINS’ National Infrastructure Programme of Projects (Ref 9.1); and
- Projects identified in the relevant development plan (and emerging development plans – with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited and the degree of uncertainty which may be present.

9.2 The Assessment

9.2.1 A 2 km Study Area has been applied to consider applicable developments, based on the criteria above, for consideration of in-combination effects. To identify relevant projects for inclusion within this section, a review of Gwynedd Council planning portal (Ref 9.2) and Eryri National Park planning portal (Ref 9.3) was undertaken to identify planning applications validated within the last two years. A 2 km Study Area was deemed appropriate given the nature of the works and its predominantly rural setting.

9.2.2 Developments included in the in-combination assessment are detailed in **Table 9.1**. The assessment is also based on the following:

a) mitigation has been identified that will address the Project’s contribution to any in combination effect;

b) it has generally only been concluded that there will be no adverse effect on integrity without the need for mitigation where it has been affirmed the potential for any impact/effect is low; and

c) for functionally-linked land losses, either identified precautionary mitigation is included or it has been confirmed that the quality, scale and temporary nature of the habitat loss mean no effect on integrity would arise even in combination with other projects and plans.

Table 9.1 – Developments for Inclusion in the In-Combination Assessment

Application	Description	Location	Status	In-Combination Effect
C24/0532/25/LL	Proposed Energy Storage facility, related access, landscaping, infrastructure, ancillary equipment, with a grid connection import and export capacity of 57MWac.	230 m north-west of the site, Pentir Substation	Approved with conditions	No – The Preliminary Ecological Appraisal (PEA) (Ref 9.4) concluded that it would be highly unlikely for the development to have adverse impacts on Habitats sites and that there was no requirement for HRA. NRW had no comments regarding Habitats sites.
C23/0852/23/TC	The proposed siting of 323 holiday caravans/lodges across Brynteg Holiday Park, to include western former golf course area (area hatched green).	210 m east of the site, near Tower 4ZC134	In progress	No – The Supporting Statement (Ref 9.5) states *"The western former golf course area is located within the approved planning unit at Brynteg* *Holiday Park and is presently used for recreation and amenity purposes in connection with the park. The use being proposed does not therefore comprise any extension to the physical* *boundaries of the established holiday park."* There was no requirement for a PEA or HRA therefore no ecological impacts were expected.
C24/0360/22/LL	Erection of 4 no. linked light industrial, storage and distribution units with integral office space as follows: a. 4no. 5M units 1no. 8M unit b. 2no. 2 storey/office c.	640 m west of the site, near Tower 4ZC097	In progress	No – The PEA (Ref 9.6) concluded *"There are no statutory protected/designated sites within the 1 km radius data search area. It is therefore not considered feasible that the proposals could have any negative impact on any designated/protected*

Application	Description	Location	Status	In-Combination Effect
	4no. 5M units d. 4no. 5M units All to be use class B1 and B8.			*site."* There was no requirement for HRA.
C23/0522/36/LL	Application for a vertical extension of existing sand and gravel pit, partial backfilling and site restoration to agriculture.	Immediately west of the site, near Tower 4ZC073	In progress	No – NRW commented that *"The designated sites should have been covered in the original planning application and there should be no/minimal changes to the impact of designated sites from the deepening of the existing quarry area."* (Ref. 9.7). There was no requirement for HRA.
C23/0549/08/LL	Erect 8 new flexible business/industrial units (Use class B1, B2, B8) with associated parking and landscaping.	560 m south-east of the Site, Minffordd	Approved with conditions	No – No impact on Habitats sites and no HRA required.

9.2.3 In addition to the identified planning applications, NGET has requested that the EVIP project is considered. This comprises installing a tunnel accommodating cables beneath the Dwyryd Estuary between Minffordd to Llandecwyn and removing the existing overhead line to reduce visual impacts. This is subject to its own HRA which concluded that with mitigation measures in place there would be no adverse effects on Habitats sites (Ref 9.8).:

9.2.4 There will be no in-combination effects with other projects.

10. Conclusions

10.1 Introduction

10.1.1 This HRA assessed the potential effects of the Project in relation to noise and visual disturbance, water quality, water quantity, loss of or damage to FLH, temporary loss of or damage to qualifying habitats, atmospheric pollution, injury or mortality of qualifying species and the introduction of invasive non-native species on the following Habitats sites:

- Migneint-Arenig-Dduallt SAC
- Migneint-Arenig-Dduallt SPA
- Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
- Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Afon Eden – Cors Goch Trawsfynydd SAC
- Rhinog SAC
- Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC
- Northern Cardigan Bay/Gogledd Bae Ceredigion SPA
- Morfa Harlech a Morfa Dyffryn SAC
- Corsydd Eifionydd/Eifionydd Fens SAC
- Glynllifon SAC
- Afon Gwyrfai a Llyn Cwellyn SAC
- Eryri/Snowdonia SAC
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC
- Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC
- Traeth Lafan/Lavan Sands, Conway Bay SPA
- Llyn Idwal Ramsar
- Coedyyd Aber SAC

10.1.2 The following Habitats sites were scoped out from the assessment as there was no apparent linking pathway:

- Rhinog SAC
- Glannau Mon: Cors heli/Anglesey Coast: Saltmarsh SAC
- Anglesey Terns/Morwenoliaid Ynys Môn SPA
- Liverpool Bay/Bae Lerpwl (Wales) SPA

- Ynys Seiriol/Puffin Island SPA

10.1.3 It was determined that LSEs could not be excluded for all impact pathways for all Habitats sites and a more detailed AA has been undertaken with respect to the following:

- Noise and visual disturbance
  - Migneint-Arenig-Dduallt SPA
  - Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
  - Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
  - Glynllifon SAC
- Loss of or damage to FLH
  - Corsydd Eifionydd/Eifionydd Fens SAC
  - Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
  - Glynllifon SAC
- Temporary loss of or damage to qualifying habitats
  - Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
  - Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
- Atmospheric pollution
  - Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC
  - Afon Gwyrfai a Llyn Cwellyn SAC
- Injury or mortality
  - Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC
  - Corsydd Eifionydd/Eifionydd Fens SAC

10.1.4 In addition to embedded mitigation measures, where necessary, additional measures will be implemented in order to avoid, reduce or mitigate adverse effects on site integrity. Outline descriptions of these additional measures are provided in **Chapter 8** of this report. and will be secured via a CEMP which will be approved by NRW and the Planning Authorities.

10.1.5 These measures include:

- Avoiding light pollution
- Implementing stand-off buffers between works and trees and watercourses
- The use of portable acoustic fencing around HDD locations
- Securing a Marine Licence subject to its own HRA
- Pre-construction surveys which may be required to secure relevant NRW licences

- Implementation of a DMP
- Exclusion fencing and/or provision of ramps within open excavations
- Appointment of an Ecological Clerk of Works
- Species specific mitigation requirements as noted for example (but not limited to) for bat, otter and marsh fritillary butterfly

10.2 Conclusion

10.2.1 With the implementation of embedded and additional mitigation measures secured through CEMPs and equivalent documents, alongside a specific HRA to support the Marine Licence application for the beach landing of the Trawsfynydd shunt reactor it can be concluded that the Project will not have adverse effects on the site integrity of the Habitats sites considered within this report.

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Ref 9.5 Gwynedd Council (2023). Planning Application Reference C23/0852/23/TC. [online] Available at: https://amg.gwynedd.llyw.cymru/planning/index.html?fa=getApplication&reference=C23/0852/23/TC&language=en

Ref 9.6 Cambrian Ecology Ltd (2022). Preliminary Ecological Assessment Plot 8, Penygroes Industrial Estate Proposed Industrial Units. https://amg.gwynedd.llyw.cymru/planning/index.html?fa=getApplication&reference=C24/0360/22/LL&language=en

Ref 9.7 Gwynedd Council (2023). Planning Application Reference C23/0522/36/LL. [online] Available at: https://amg.gwynedd.llyw.cymru/planning/index.html?fa=getApplication&reference=C23/0522/36/LL&language=en

Ref 9.8 National Grid (2019). Habitats Regulations Assessment Report. Visual Impact Provision (VIP) Project – Snowdonia Project. Meirionnydd Oakwoods and Bat Sites Special Area of Conservation.

Appendix A – Figures

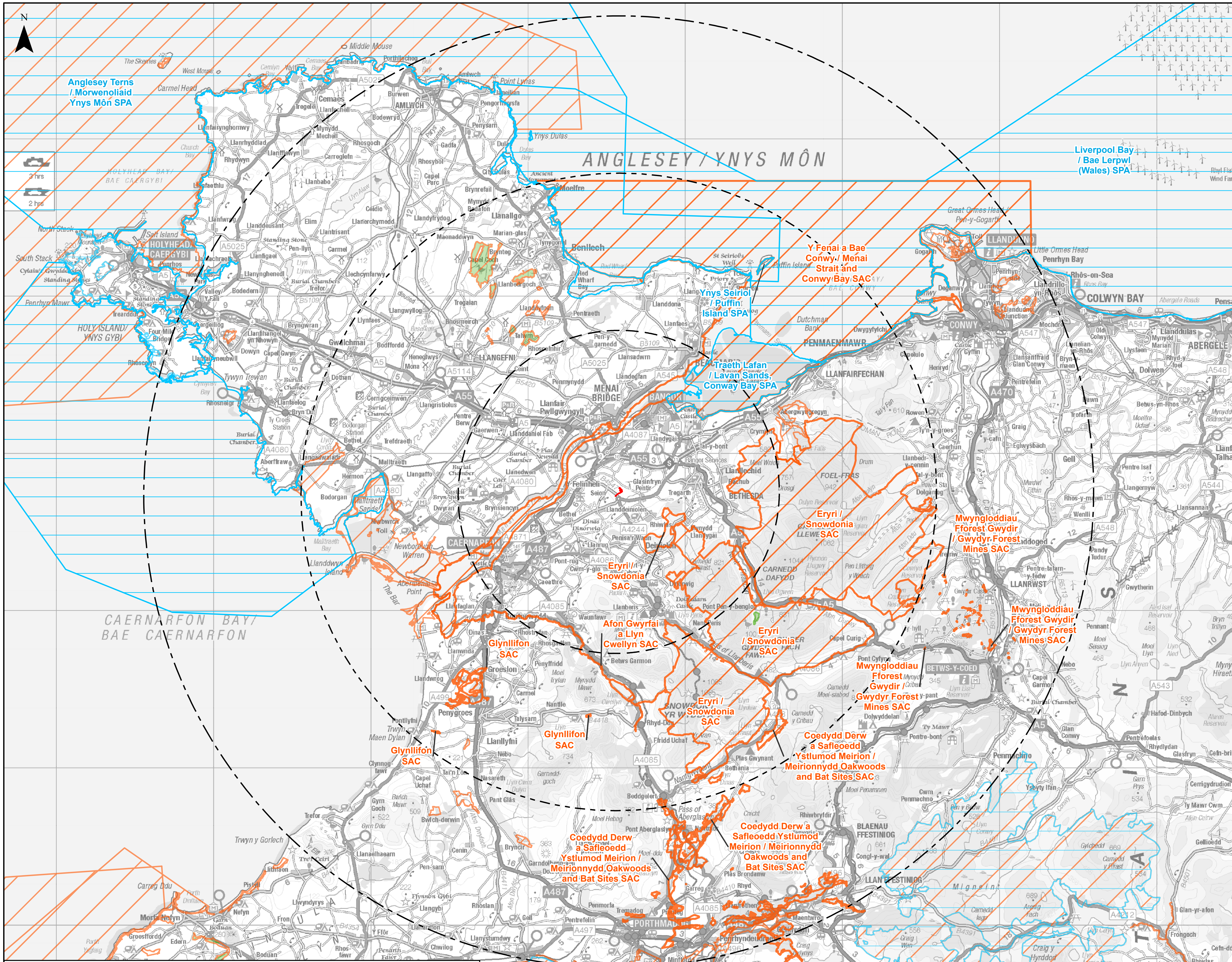
Figure 7.1.B.1 – Pentir Relevant Habitats Sites

Figure 7.1.B.2 – Bryncir Relevant Habitats Sites

Figure 7.1.B.3 – Glaslyn Relevant Habitats Sites

Figure 7.1.B.4 – Trawsfynydd Relevant Habitats Sites

Figure 7.1.B.5 – Wider Works Relevant Habitats Sites



PENTIR SUBSTATION WORKS ROUTE LEGEND

Legend

- Pentir Works Site Boundary
- 10km Buffer of Pentir Works Site Boundary
- 20km Buffer of Pentir Works Site Boundary
- 30km Buffer of Pentir Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Pentir works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

Rev	Date	Description	GIS	Chk	App
A	15/08/2025	Environmental Statement	MH	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES PENTIR SUBSTATION WORKS

Document Title: FIGURE 7.1.B.1 RELEVANT HABITATS SITES IN RELATION TO PENTIR WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:230,000	A3	1 OF 1	A

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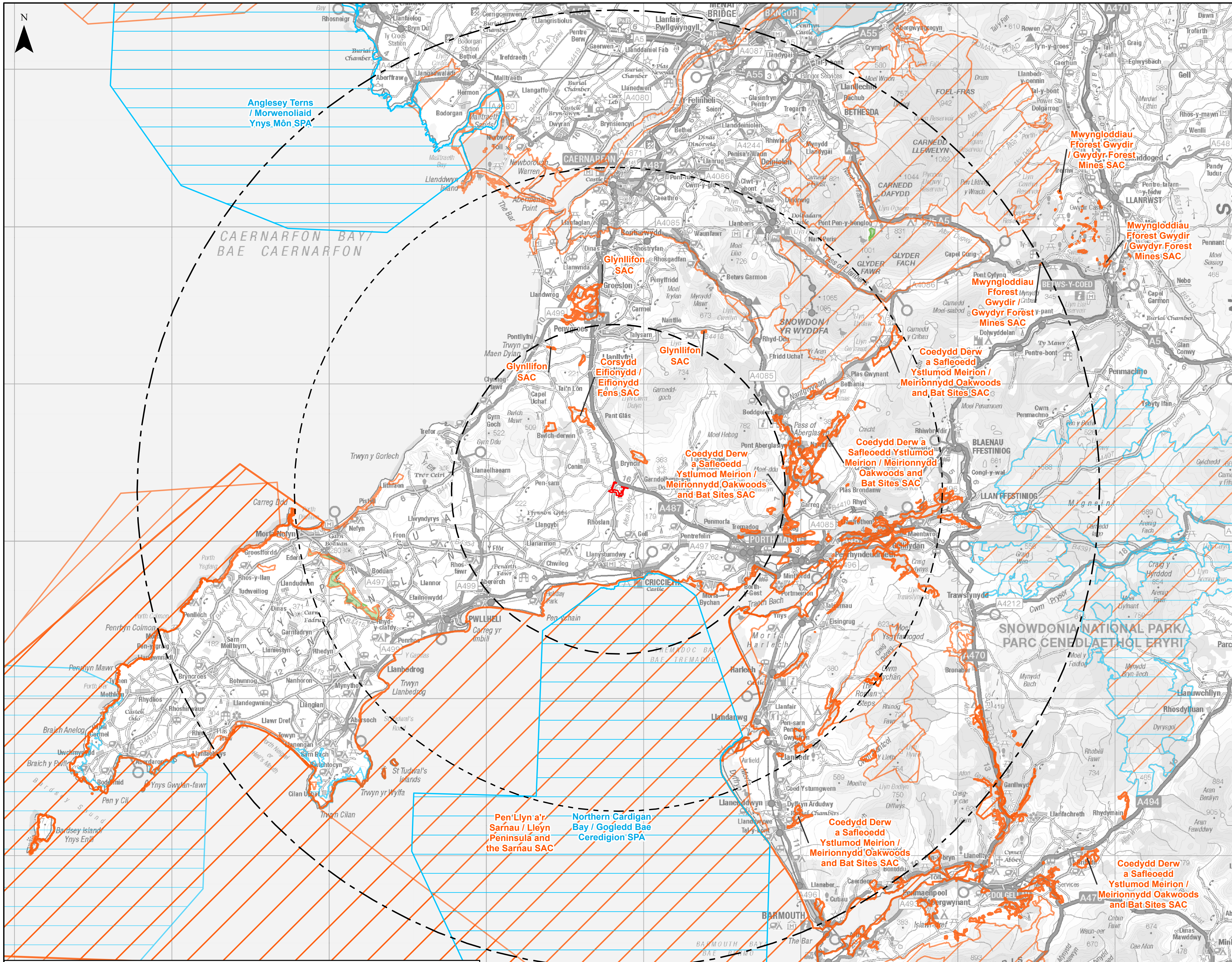

BRYNCIR WORKS ROUTE LEGEND

Legend

- Bryncir Works Site Boundary
- 10km Buffer of Bryncir Works Site Boundary
- 20km Buffer of Bryncir Works Site Boundary
- 30km Buffer of Bryncir Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Bryncir works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

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A	15/08/2025	Environmental Statement	MH	RR	NL

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

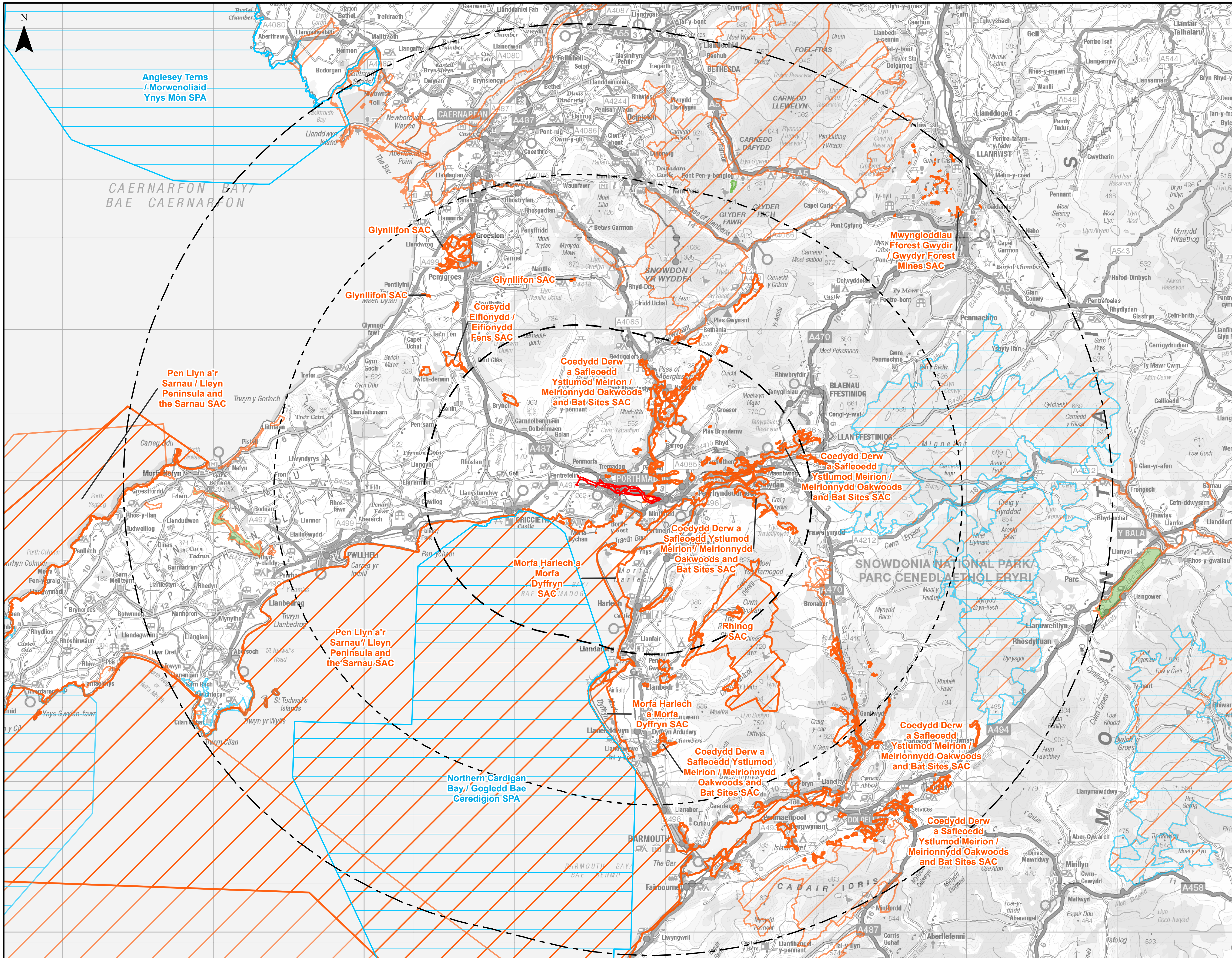
Volume: VOLUME 8: APPENDICES BRYNCIR WORKS

Document Title: FIGURE 7.1.B.2 RELEVANT HABITATS SITES IN RELATION TO BRYNCIR WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:230,000	A3	1 OF 1	A

Document Path: \\na.aecomnet.com\lfs\EMEA\Manchester-UKMCR5\DCS\Projects\EGE\60686216_NWWC_GIS2\900_CAD_GIS\920_GIS\02_Maps\PTR - Environmental Statement\PTR_ES_Chp5App_Fig_HRA_ECO_RelevantHabitatsSites.aprx



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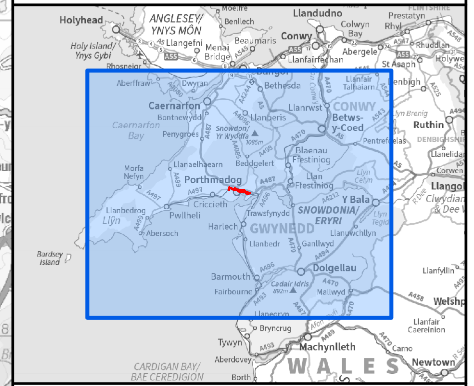
GLASLYN CABLES WORKS ROUTE LEGEND



Legend

- Glaslyn Works Site Boundary
- 10km Buffer of Glaslyn Works Site Boundary
- 20km Buffer of Glaslyn Works Site Boundary
- 30km Buffer of Glaslyn Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Glaslyn works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

Rev	Date	Description	GIS	Chk	App
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Volume: VOLUME 8: APPENDICES GLASLYN CABLES WORKS

Document Title: FIGURE 7.1.B.3 RELEVANT HABITATS SITES IN RELATION TO GLASLYN WORKS SITE

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MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

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FIGURE	1:240,000	A3	1 OF 1	A

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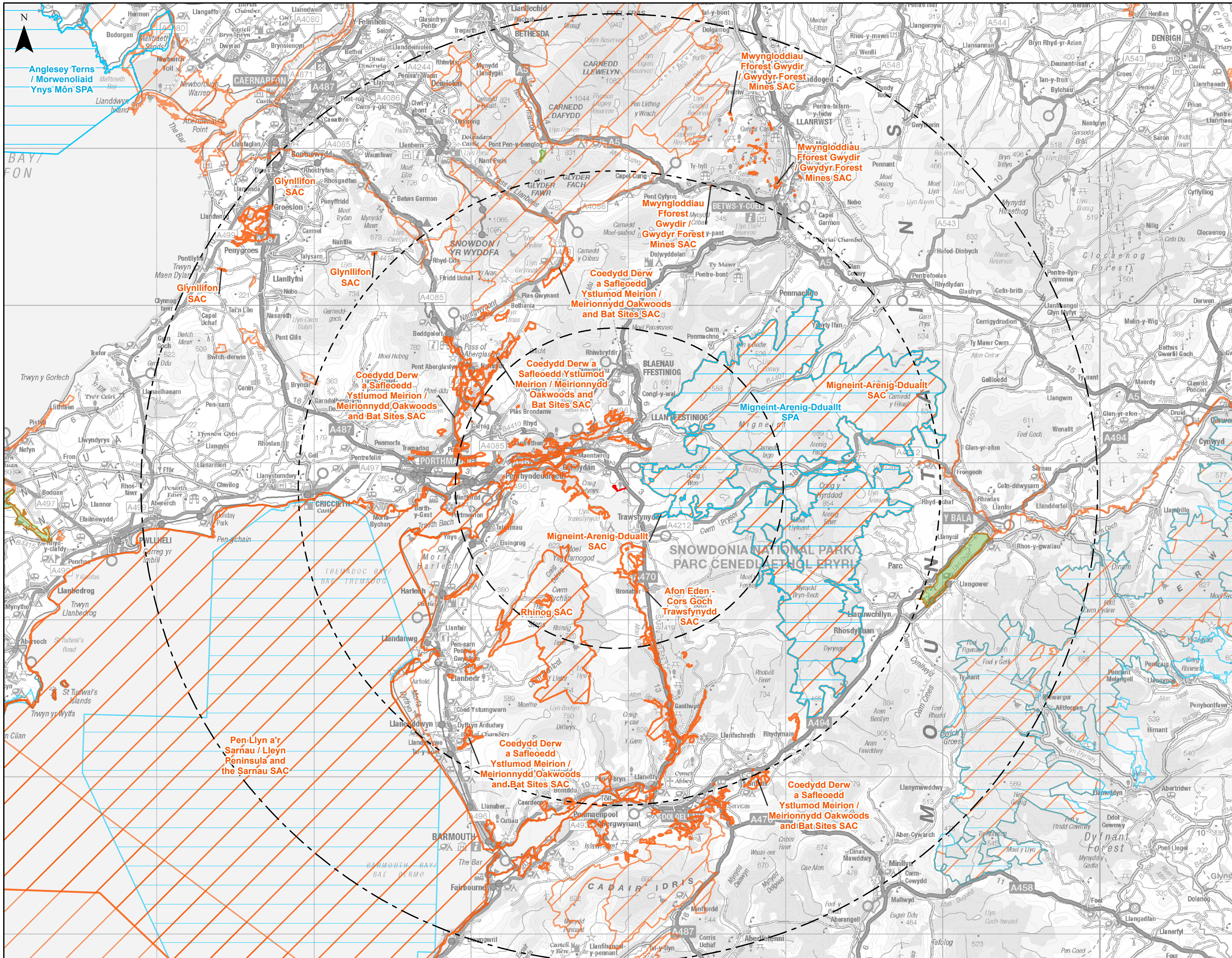

TRAWSFYNYDD SUBSTATION WORKS ROUTE LEGEND

Legend

- Trawsfynydd Works Site Boundary
- 10km Buffer of Trawsfynydd Works Site Boundary
- 20km Buffer of Trawsfynydd Works Site Boundary
- 30km Buffer of Trawsfynydd Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Trawsfynydd works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer

Rev	Date	Description	GIS	Chk	App
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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

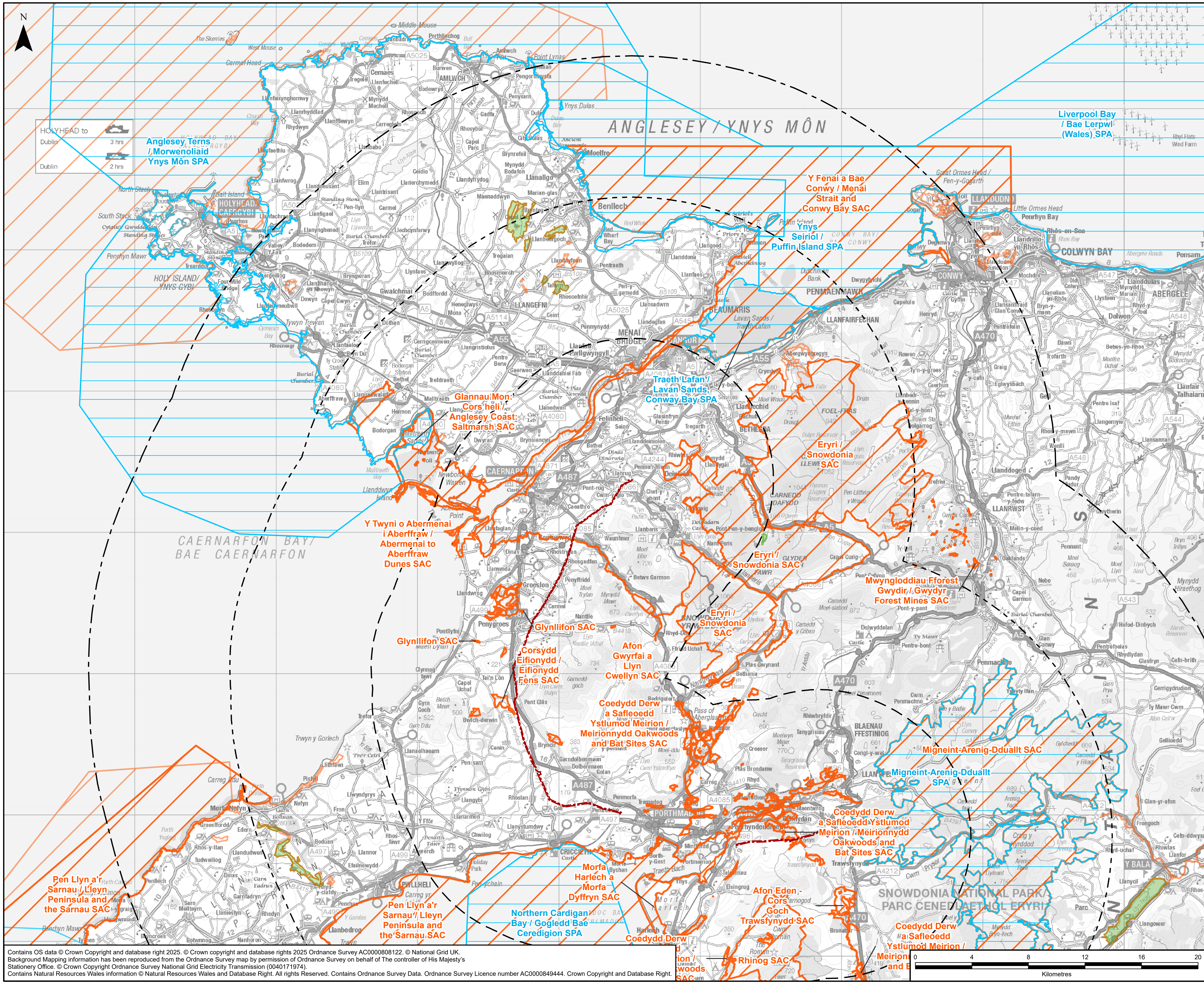
Volume: VOLUME 8: APPENDICES TRAWSFYNYDD SUBSTATION WORKS

Document Title: FIGURE 7.1.B.4 RELEVANT HABITATS SITES IN RELATION TO TRAWSFYNYDD WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
FIGURE	1:230,000	A3	1 OF 1	A

Document Path: \\na.aecomnet.com\lfs\EMEA\Manchester-UKMCR5\DCS\Projects\EGE\60686216_NWWC_GIS2\900_CAD_GIS\920_GIS\02_Maps\PTR - Environmental Statement\PTR_ES_Chp5App_Fig_HRA_ECO_RelevantHabitatsSites.aprx



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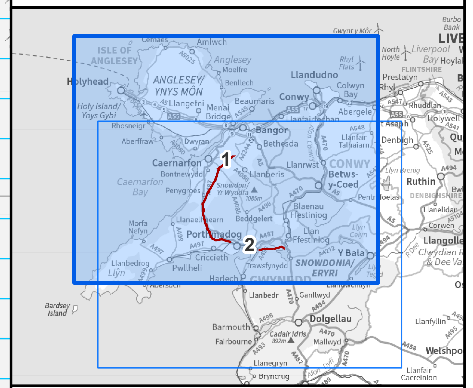
WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- 10km Buffer of Indicative Wider Works Site Boundary
- 20km Buffer of Indicative Wider Works Site Boundary
- 30km Buffer of Indicative Wider Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Wider works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

Rev	Date	Description	GIS	Chk	App
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Scheme:	PENTIR TO TRAWSFYNYDD REINFORCEMENT
Volume:	VOLUME 8: APPENDICES WIDER WORKS
Document Title:	7.1.B.5 RELEVANT HABITATS SITES IN RELATION TO WIDER WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

Document Type:	Scale:	Format:	Sheets:	Rev:
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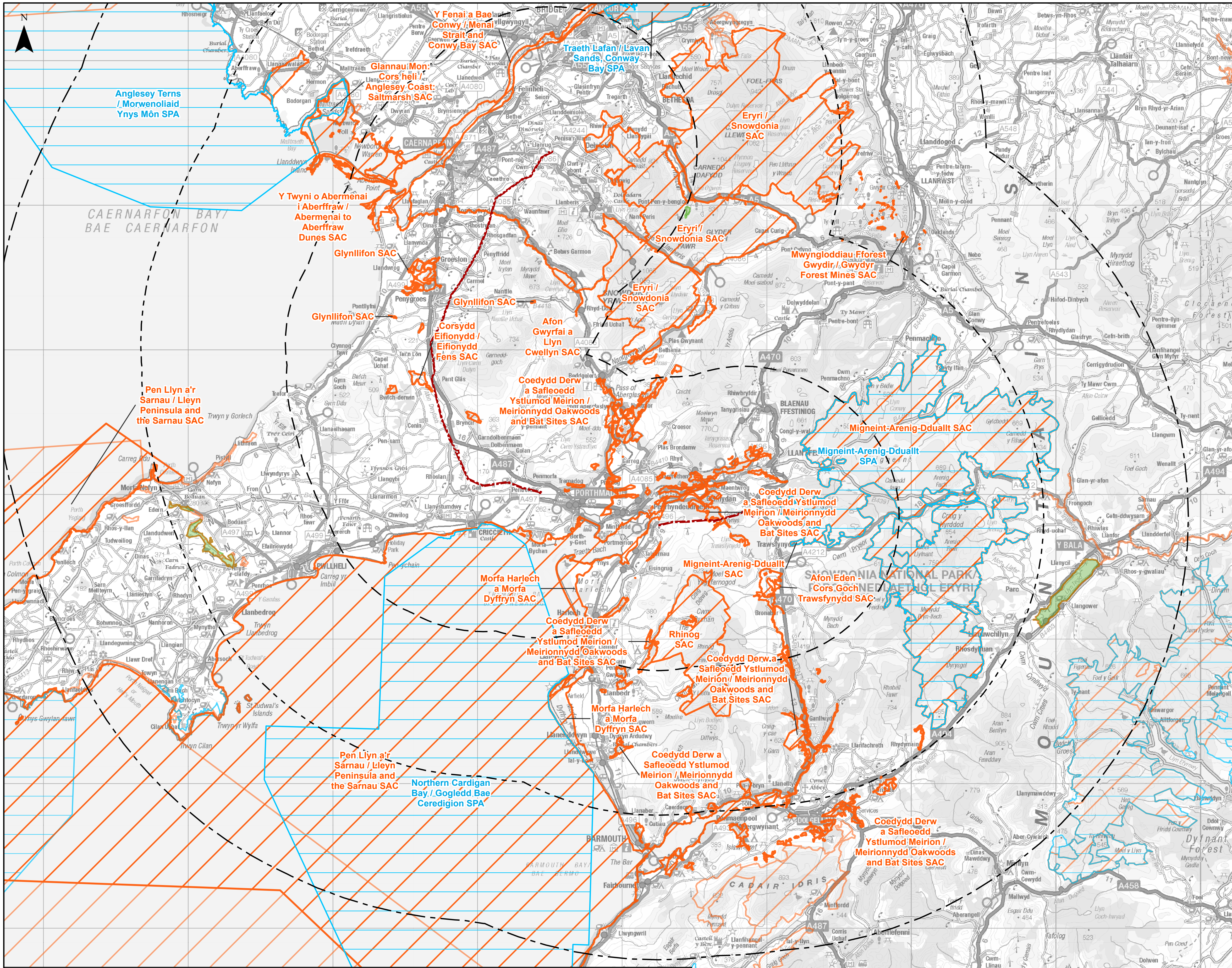
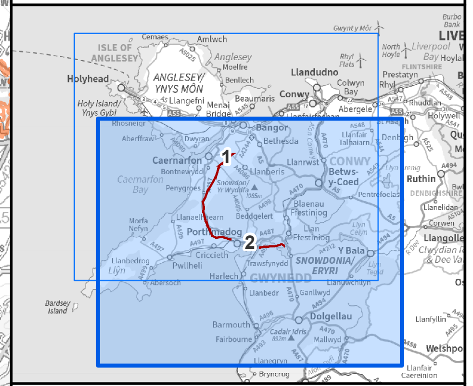


WIDER WORKS ROUTE LEGEND



Legend

- Indicative Wider Works Site Boundary
- 10km Buffer of Indicative Wider Works Site Boundary
- 20km Buffer of Indicative Wider Works Site Boundary
- 30km Buffer of Indicative Wider Works Site Boundary

Statutory Designated Sites for Nature Conservation[1]

- Special Protection Area (SPA)
- Special Area of Conservation (SAC)
- Ramsar

NOTES

1: Only Statutory Designated Sites within 10km of the Wider works site boundary, relevant sites designated for bird species with a large core foraging range within 20km and relevant sites for bats within 30km have been labelled. Those which are outside 10km and are not relevant are still displayed on the figure, but have a transparency applied to the layer.

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Rev	Date	Description	GIS	Chk	App

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Scheme: PENTIR TO TRAWSFYNYDD REINFORCEMENT

Volume: VOLUME 8: APPENDICES WIDER WORKS

Document Title: 7.1.B.5 RELEVANT HABITATS SITES IN RELATION TO WIDER WORKS SITE

Creator:	Date:	Checker:	Date:	Approver:	Date:
MH	15/08/2025	RR	15/08/2025	NL	15/08/2025

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Appendix B – Habitats Sites Taken Forward to HRA Screening

Table B-1 - Habitats Site Descriptions and Qualifying Features

Table B-2 - Conservation Objectives and Current Threats and Pressures

Table B-1 - Habitats sites descriptions and qualifying features

Name	Habitats site description	Summary of qualifying features
Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC	Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC is located in the Gwydyr Forest between the Conwy and Llugwy valleys north-west of Betws y Coed and west of Llanrwst. It comprises scattered areas of mine workings and polluted waste, which have been left behind as a legacy of the lead, zinc and iron mining industry which peaked in the late 1800s in this area. The waste is a hostile environment to most plants, but various metallophytes species have adapted to grow on the metal rich rocks and spoil. The metal rich rocks and spoil fall into the European habitat 'Calaminarian grasslands of the *Violetalia calaminariae*", which in Europe is characterised by *Viola calaminaria.* The aforementioned species is not found in the UK, but several of the other associated metallophytes races are found at Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC, i.e. *Asplenium septentrionale, Ditrichum plumbicola, Thlaspi caerulescens,* and *Silene vulgaris.* The extensive mine systems beneath the surface provide hibernation roosts to several species of bats, including the lesser horseshoe bat *Rhinolophus hipposideros*. The constant temperature of the deep mines is ideal for hibernating bats and the adjoining habitats are good feeding areas. The mines are too dangerous to explore and map, but the Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC includes the adit entrances to the mines in order to protect the lesser horseshoe bat.	Annex I habitats that are a primary reason for selection of this site: • Calaminarian grasslands of the *Violetalia calaminariae* Annex II species present as a qualifying feature, but not a primary reason for site selection: • Lesser horseshoe bat *Rhinolophus hipposidero*

Name	Habitats site description	Summary of qualifying features
Glynllifon SAC	Glynllifon SAC contains maternity roosts at management units 16 (Glynllifon Mansion), 32 (Melin y Cim) and 36 (Pen y Bont), and two hibernation roosts/areas at management units 16 (Glynllifon Mansion) (which is used both as a hibernation and a maternity roost) and 37 (Simdde – dylluan Copper Mine) old mine workings in the Nantlle Valley. In addition, areas of habitat surrounding these roosts have been included; a tree lined stream linking management units 32 and 36 (Melin-yCim and Pen y Bont), a large amount of woodland surrounding unit 16 (Glynllifon Mansion) and a small area of hillside unit 37 surrounding the Simdde – dylluan mine levels. Although some habitat is included within the SAC boundary, the bats use a much wider area for feeding and commuting and there are also known linked roosts outside of the SAC boundary. All these aspects need to be considered when determining the conservation status of the population of lesser horseshoe bats.	Annex II species that are a primary reason for selection of this site: • Lesser horseshoe bat Rhinolophus hipposidero
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	The Meirionnydd Oakwoods and Bat Sites SAC is made up of a series of woodlands, stretching from Dolgellau in the south to Eryri in the north. The majority of the SAC is classified as the woodland type known as “Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles”, which covers approximately 84% of the SAC and is the dominant woodland type at most of the sites. A key feature of European importance is the rich Atlantic bryophyte communities that are often well developed within this Annex I habitat. These include numerous rare species, such as *Campylopus setifolius, Sematophyllum demissum, Adelanthus decipiens, Leptoscy-phus*	Annex I habitats that are a primary reason for selection of this site: • Old sessile oak woods with Ilex and Blechnum in the British Isles • Alluvial forests with Alnus *glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) * **Priority feature** Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

Name	Habitats site description	Summary of qualifying features
	cuneifolius and *Plagiochila atlantica.* Another key feature of the Meirionnydd Oakwoods and Bat Sites SAC is the lichen flora which is exceptionally rich and includes numerous rare species such as, *Mi-carea xanthonica, Parmelinopsis horrescens, Phyllopsora rosei, Micarea stipitata* and *Tyothallia biformigera.* Frequently the oak woodland occurs as part of a mosaic of woodland types including other Annex I habitats, "Bog woodland", "Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*" and "*Tilio-Acerion* forests of slopes, screes and ravines" which occur in small areas and are only significant at a few of the component SSSI/units. The transitions between these different woodland types are important in terms of maintaining the structure and function of the habitat type and vary across the U.K. The heath is characterised by abundant *Calluna vulgaris, Ulex gallii* and *Erica cinerea* growing on thin, poor acidic soils. There are many small areas of dry heath interspersed amongst the woodland, which have not been measured, but the three largest areas of dry heath, together comprise 1% of the area of the SAC. The feature "Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation" occurs in the Afon Glaslyn which is within the Glaslyn SSSI and the SAC. Lesser horseshoe bats have over 20 known roosts within the SAC and forage widely within the SAC's woodlands, associated habitats and the surrounding countryside. The SAC includes maternity roost sites in various types of buildings and structures, and winter hibernation sites, especially in mines. There are other types of roost such as night, transitional, leks and swarming sites, about which very little is known.	• Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation • Northern Atlantic wet heaths with *Erica tetralix* • European dry heaths • *Tilio-Acerion* forests of slopes, screes and ravines *** Priority feature** • *Bog* woodland *** Priority feature** Annex II species that are a primary reason for selection of this site: • Lesser horseshoe bat *Rhinolophus hipposideros*

Name	Habitats site description	Summary of qualifying features
Migneint-Arenig-Dduallt SPA	Migneint-Arenig-Dduallt is a large upland site that stretches between Ysbyty Ifan and Penmachno in the north down to Rhydymain in the south, and from Trawsfynydd in the west to just east of Llyn Celyn. It ranges in altitude from 300 m to 712 m. The northern section encompasses a high peatland plateau centred on Migneint and extending to Tomen y Mur in the west and Cwm Hesgyn in the east, with higher points such as Arenig Fach around the rim. The southern section, south of the Afon Lliw, also comprises a high plateau surrounded by higher ground and dominated by Dduallt mountain. The central section, lies south of Cwm Prysor and Llyn Celyn and includes Moel Llyfnant and Moel y Slates as well as the Arenig Fawr mountain ridge which is the highest part of the whole site.	Annex II species that are a primary reason for selection of this site: • Hen harrier *Circus cyaneus* • Merlin *Falco columbarius* • Peregrine falcon *Falco peregrinus*
Migneint-Arenig-Dduallt SAC		Annex I habitats that are a primary reason for selection of this site: • European dry heaths • Blanket bogs (*if active) ***Priority feature** Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Natural dystrophic lakes and ponds • Northern Atlantic wet heaths with *Erica tetralix* • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	The Pen Llŷn a'r Sarnau SAC encompasses areas of sea, coast and estuary that support a wide range of different marine habitats and wildlife. The nature of the seabed and coast and the range of environmental conditions present vary throughout the SAC. Differences in rock and sediment type, aspect, sediment movement, exposure to tidal currents and wave action, water clarity and salinity together with	Annex I habitats that are a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time • Estuaries • Coastal lagoons * **Priority feature**

Name	Habitats site description	Summary of qualifying features
	biological and food chain interactions have created a wide range of habitats and associated communities of marine plant and animal species, some of which are unique in Wales. Pen Llŷn a'r Sarnau SAC is a multiple interest site that has been selected for the presence of 9 marine habitat types and associated wildlife (Habitats Directive Annex I habitat types) and 3 mammal species (Habitats Directive Annex II species). The features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations.	• Large shallow inlets and bays • Reefs Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Mudflats and sandflats not covered by seawater at low tide • *Salicornia* and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Submerged or partially submerged sea caves Annex II species present as a qualifying feature, but not a primary reason for site selection: • Bottlenose dolphin *Tursiops truncates* • Otter *Lutra lutra* • Grey seal *Halichoerus grypus*
Afon Eden – Cors Goch Trawsfynydd SAC	The Afon Eden/River Eden is a relatively unmodified river, mainly upland in character, of approximately 10 km length. The watershed begins just south of Llyn Trawsfynydd, within an area of gently sloping and poorly drained land. The upper section of the catchment is slow-flowing with a number of deep pools along its length. In the lower two-thirds of the catchment the river flows more steeply into a narrow rocky gorge, with an adjacent area of forestry	Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Active raised bogs * **Priority feature** Annex II species that are a primary reason for selection of this site: • Freshwater pearl mussel *Margaritifera margaritifera*

Name	Habitats site description	Summary of qualifying features
	plantation, known as Coed y Brenin. The Afon Eden joins with the Afon Mawddach, just above the village of Ganllwyd, but the SAC boundary continues downstream to the tidal limit of the Mawddach at Llanelltyd. The Afon Eden is fed by a number of base-poor upland streams, which flow from the eastern flanks of the Rhinog mountains. The Ardudwy leat takes the most acidic waters from the eastern tributaries to Llyn Trawsfynydd, with some of the leat water feeding back into the Afon Eden. This water is used to maximise the water available for HEP generation by the Maentwrog Power Station. The area receives high average rainfall, which has contributed to the development of raised bogs, blanket bog, and transition mires and quaking bogs. Two areas of raised bog occur at the top end of the catchment, close to the watershed, where they were once part of a much larger extent of bog, much of which is now flooded by Llyn Trawsfynydd. Transition mires and quaking bogs occur in waterlogged situations where they receive nutrients from the surrounding catchment as well as from rainfall. They are located within the wetlands surrounding the areas of raised bog.	• Floating water-plantain *Luronium natans* Annex II species present as a qualifying feature, but not a primary reason for site selection: • Atlantic salmon *Salmo salar* • Otter *Lutra lutra*
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	Northern Cardigan Bay/Gogledd Bae Ceredigion SPA, as the name suggests occupies the northern half of Cardigan Bay on the west coast of Wales. Several rivers flow into the northern part of Cardigan Bay including the Dwyfach, Glaslyn/Dwyryd, Wnion, Dysynni, Leri, Mawddach and Dyfi. The coastline is dominated by rocky cliffs and shores with occasional	Annex II species that are a primary reason for selection of this site: • Red-throated diver *Gavia stellata*

Name	Habitats site description	Summary of qualifying features
	sandy beaches and estuaries. Where estuaries flow into northern Cardigan Bay, the sea quickly becomes more than 20 metres deep, but elsewhere remains shallow (less than 10 m deep) for up to 20 km offshore. These shallow areas are sub-tidal shingle reefs, known as the sarnau. All three of the sarnau lie roughly north-east to south-west and are presumed to be formed from glacial deposits left at the end of the last ice age. Sarn Badrig is the largest and most northerly sarn, running parallel with the Llŷn Peninsula from Harlech up to 24 km offshore. Sarn y Bwlch is the smallest sarn, starting from near Tywyn. Sarn Cynfelyn, the most southerly sarn, starts from north of Aberystwyth. These shallow reefs are important ecological habitats within the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA and are important features of the Pen Llŷn a'r Sarnau Special Area of Conservation (SAC), designated under the EC Habitats and Species Directive. The two tidal streams that enter the Irish Sea, from the north near the Isle of Man and the south through the St George's Channel, meet in the vicinity of Cardigan Bay resulting in weak tidal currents in the area. The tidal range in the bay is up to 4 m at a spring tide.	
Morfa Harlech a Morfa Dyffryn SAC	The Morfa Harlech a Morfa Dyffryn SAC covers two sand dune systems, Morfa Harlech to the north and Morfa Dyffryn to the south. Morfa Harlech is a rapidly accreting dune system - gaining sand from the coast to the south including the dune system at Morfa Dyffryn, which is eroding.	Annex I habitats that are a primary reason for selection of this site: • Embryonic shifting dunes • "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")"

Name	Habitats site description	Summary of qualifying features
	The various sand dune communities will through natural processes expand at the expense of others. This may affect the extent of the component SAC features, however, the dynamic processes of the sand dunes and their associated vegetation communities is a valued aspect of the coastal dune systems. The biggest potential conflict is stabilization of dunes and the potential loss of pioneering vegetation communities to fixed dune communities.	• "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * **Priority feature** • Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) • Humid dune slacks Annex II species that are a primary reason for selection of this site: • Petalwort *Petalophyllum ralfsii*
Afon Gwyrfai a Llyn Cwellyn SAC	This site comprises the Afon Gwyrfai and Llyn Cwellyn. The Gwyrfai flows out of Llyn y Gader near Rhyd Ddu and passes through Llyn Cwellyn on its way to the sea at Y Foryd, Caernarfon Bay. It also includes a tributary of the Gwyrfai, the Afon Treweunydd, and the small lake it flows from on the slopes of Snowdon. Sporadically throughout its course, the SAC is abutted by semi-natural wetland riparian habitat much of which is within the SSSI. Llyn Cwellyn has long been recognised for its conservation importance and is an excellent example of a deep (maximum depth of 37m, average depth of 23m) oligotrophic lake formed during the last Ice Age. Its nutrient–poor waters support a range of typical macrophytes, and one of the best populations of floating water plantain in the UK. The whole of the Gwyrfai river system is of outstanding ecological quality. The river is particularly noted for its salmon population, for which it is considered to be one of the best supporting rivers in the United Kingdom. It	Annex I habitats that are a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Water courses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation Annex II species that are a primary reason for selection of this site: • Atlantic salmon *Salmo salar* • Floating water-plantain *Luronium natans* Annex II species present as a qualifying feature, but not a primary reason for site selection: • Otter *Lutra lutra*

Name	Habitats site description	Summary of qualifying features
	is also notable for its otter population which occur here in good numbers because of the relative naturalness of its riparian habitats and the abundance of undisturbed dense cover. In addition to the lake, the river supports a discrete community of floating water plantain, and water-crowfoot *Ranunculus* spp, with other associated vegetation including bryophyte assemblages occurring in various sectors of the river.	
Corsydd Eifionydd/Eifionydd Fens SAC	Corsydd Eifionydd SAC is made up of four separate Sites of Special Scientific Interest; Cors Graianog SSSI, Cors Gyfelog SSSI/NNR, Cors Llanllyfni SSSI and Cors y Wlad SSSI. The sites are situated within the upland-fringe transition between Snowdonia and the Llín Peninsula and together they cover an area of over 144 ha. Between them, they should support three features of international importance namely transition mire and quaking bog, marsh-fritillary and slender green feather moss. The sites should also support a range of other wetland habitats including marshy grassland, fen, bog, wet woodland and swamp habitats.	Annex I habitats that are a primary reason for selection of this site: • Transition mires and quaking bogs Annex II species that are a primary reason for selection of this site: • Marsh fritillary butterfly *Euphydryas (Eurodryas, Hypodryas) aurinia* • Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*
Eryri/Snowdonia SAC	Eryri comprises three upland massifs separated by roads, the Carneddau, Glyderau and Yr Wyddfa. All three host a number of biological and geological SSSI features and SAC features. The three massifs are divided into land parcels or compartments, most of which are in private ownership, but some are common land and some are owned by organisations such as the National Trust and power companies.	Annex I habitats that are a primary reason for selection of this site: • Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* • Siliceous alpine and boreal grasslands

Name	Habitats site description	Summary of qualifying features
		• Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels • Siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani*) • Calcareous rocky slopes with chasmophytic vegetation • Siliceous rocky slopes with chasmophytic vegetation Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Northern Atlantic wet heaths with *Erica tetralix* • European dry heaths • Alpine and Boreal heaths • Alpine and subalpine calcareous grasslands • Species-rich *Nardus* grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe) *** Priority feature** • Blanket bogs (* if active bog) *** Priority feature** • Depressions on peat substrates of the *Rhynchosporion* • Petrifying springs with tufa formation (*Cratoneurion*) *** Priority feature** • Alkaline fens

Name	Habitats site description	Summary of qualifying features
		• Alpine pioneer formations of the *Caricion bicoloris-atrofuscae* * **Priority feature** • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex II species that are a primary reason for selection of this site: • Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus* • Floating water-plantain *Luronium natans*
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	Menai Strait and Conwy Bay SAC is in north-west Wales. The unique physiographic conditions make this an unusual site, which has long been recognised as important for marine wildlife. The variation in physical and environmental conditions throughout the site, including rock and sediment type, aspect, water clarity and exposure to tidal currents and wave action result in a wide range of habitats and associated marine communities. Many of these community types are unusual in Wales. Of particular interest is the environmental and physical conditions and associated marine communities from the tide-swept, wave-sheltered narrows of the Menai Strait to the more open, less tide-swept waters of Conwy Bay and the moderately wave-exposed Great and Little Ormes. The features are distributed throughout the SAC with no single feature occupying the entire SAC and with features overlapping in some locations.	Annex I habitats that are a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time • Mudflats and sandflats not covered by seawater at low tide • Reefs Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Large shallow inlets and bays • Submerged or partially submerged sea caves

Name	Habitats site description	Summary of qualifying features
Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	The Abermenai to Aberffraw Dunes SAC lies at the southern end of the Menai Strait in Ynys Môn and Gwynedd, Wales. It comprises 3 main areas. Tywyn Aberffraw is a large and relatively intact calcareous hind-shore dune system enclosing a shallow lake (Llyn Coron). Newborough Warren is a large sand-dune system, partly afforested, located between the estuaries of the Afon Cefni and the Afon Braint including the shingle spit of Abermenai. Morfa Dinlle, on the south side of the Strait, is a large shingle spit and dune system.	Annex I habitats that are a primary reason for selection of this site: • Embryonic shifting dunes • "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")" • "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")" * **Priority feature** • Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae*) • Humid dune slacks Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition* - type vegetation Annex II species that are a primary reason for selection of this site: • Petalwort *Petalophyllum ralfsii* • Shore dock *Rumex rupestris*
Traeth Lafan/Lavan Sands, Conway Bay SPA	Traeth Lafan/Lavan Sands is located in Conwy Bay lying between Bangor and Llanfairfechan in north-west Wales. This large area of intertidal sand- and mud-flats lies at the eastern edge of the Menai Strait. The area has a range of exposures and a diversity of conditions, enhanced by freshwater streams that flow across the flats. The site is of importance for wintering waterbirds,	Annex II species that are a primary reason for selection of this site: <u>Wintering;</u> • Oystercatcher *Haematopus ostralegus* • Red-breasted merganser *Mergus serrator*

Name	Habitats site description	Summary of qualifying features
	especially Oystercatcher (*Haematopus ostralegus*) and Curlew (*Numenius arquata*). In conditions of severe winter weather, Traeth Lafan acts as a refuge area for Oystercatchers displaced from the Dee Estuary. The site is also an important moulting roost for Great Crested Grebe (*Podiceps cristatus*) in late summer/early autumn.	• Curlew *Numenius Arquata* • Redshank *Tringa tetanus* Summer/early autumn: • Great crested grebe *Podiceps cristatus*
Llyn Idwal Ramsar	A small nutrient-poor mountain valley lake with an unusually species-rich plant community, including almost all of the species typical of nutrient-poor waters in Britain. Numerous species are nationally scarce or vulnerable at a European level.	The site is designated as a Ramsar under the following criteria: Ramsar Criterion 1: A small, shallow, oligotrophic corrie lake. The semi-circular rock basin (or cwm) containing the lake is one of the finest examples in Snowdonia. Ramsar Criterion 2: Species-rich plant community, including almost all of the species typical of oligotrophic waters in Britain. Notable species include *Elatine hexandra* and Subularia aquatica (both nationally scarce) and *Pilularia globulifera* (vulnerable at a European level).
Coedydd Aber SAC	Coedydd Aber extends 4 km along the steep-sides valleys of the Afon Rhaeadr Fawr and Afon Anafon, which are situated immediately south of Abergwyngregyn village. The SAC comprises 346.2 hectares and is concurrent with the area of SSSI (with the exception of unit 7 which is SSSI only). Coedydd Aber NNR comprises some 169 hectare of the SAC area. The site lies	Annex I habitats that are a primary reason for selection of this site: • Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

Name	Habitats site description	Summary of qualifying features
	between 50 metres (at Bont Newydd) and 540 metres (at Marian Rhaeadr Fawr) above sea level. Coedydd Aber is of special interest for its botanical, ornithological and entomological interest. The site supports a mosaic of native broadleaved woodland types of international importance including alluvial forests with alder and ash, and old sessile oak woods, which form a natural elevation dependent habitat transition from coast to open mountain. The transition zones include stands of mixed oak, ash, alder and birch woodland, some of which can be classed as ancient, open hawthorn scrub, sub-montane heath, cliffs and acidic grassland. The tree dwelling or epiphytic lichen communities that the woodland communities support are also of national importance. The transition from woodland to mountain vegetation is also reflected in the diverse array of bird species assemblages from woodland, through torrent river, woodland edge, ffridd and heath to open species assemblages. The woodland, montane heath and grassland breeding bird assemblages qualify the site. The Afon Rhaeadr Fawr is one of the most precipitous rivers in Britain outside Scotland and is of national importance as a representative of this river type.	• Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) *** Priority feature**

Table B-2 - Conservation Objectives and threats/pressures to the integrity of relevant Habitats sites

<table>
<tr><th>Habitats site</th><th>Conservation objectives</th><th>Pressures and threats to site integrity</th></tr>
<tr><td>Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC</td><td>To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

Conservation Objective for Feature 1: Calaminarian grasslands of the Violetalia calaminariae

• The area of calaminarian grassland must be stable (based on the extent at the time of SAC notification), or increasing in the long term, and will occur in all management units.
• The remainder of the management units not highlighted for calaminarian grassland will be maintained in a favourable condition for lesser horseshoe bat.
• The calaminarian grassland can be described as either “calaminarian grassland with Ditrichum plumbicola” or “calaminarian grassland (metal spoil) without Ditrichum plumbicola”.
– Calaminarian grassland with D. plumbicola will be defined as a characteristically sparse and species poor vegetation type. The substrate varies from fine scree, through fine clay to fine silt like spoil. The substrate is rich in heavy metals (notably lead and zinc) resulting in a paucity of taxa within the habitat. Mosses and liverwort (e.g.</td><td>The following threats/pressures to the integrity of the Mwyngloddiau Fforest Gwydir/Gwydyr Forest Mines SAC have been identified in Natural Resources Wales Core Management Plan[4]

Main pressures and threats for Calaminarian grasslands of the Violetalia calaminariae

• Disturbance (human impact and recreation)
• Broadleaf, coniferous, exotic and scrub species encroachment.

Main pressures and threats for lesser horseshoe bat

• Site security - It is essential to minimise disturbance within roosts and potential harm to bats
• Roost entrances - The bats must be able to enter and leave the roost freely
• Disturbance (external and internal)
• Availability of bat fly-ways and feeding areas on surrounding land</td></tr>
</table>

[4] https://naturalresources.wales/media/672932/Mwyngloddiau%20Fforest%20Gwydyr%20Plan%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Polytrichum piliferum, Jungermanniana gracillima, Weissia controversa, Dicranella heteromalla, Pholia nutans and *Cephaloziella* spp.) are often the only taxa found in association with *D. plumbicola.* – Calaminarian grassland (metal spoil) without *D. plumbicola* is characterised by lichen encrusted (often *Stereocaulon* species), heavy metal rich, mine spoil. Between the blocks of spoil where humus accumulates, lower and higher plants with some degree of heavy metal toxicity tolerance grow. Mosses and liverworts often dominate the vegetation, however, in areas with greater depths of humus, pteridophytes and angiosperms can dominate. The metallophytes *Asplenium septentrionale* (Forked Spleenwort), *Silene uniflora* (Sea Campion) and *Thlaspi caerulescens* (Alpine Penny-cress) are often found in association with other higher plants on the mine spoil. • Broadleaf, coniferous, exotic and scrub species should be absent from the calaminarian grassland stands, because the above plants will shade out the slower growing moss and lichen species, and in time will smother the lower plants with litter material. • A 10 m buffer, clear of coniferous vegetation, will be maintained around the stands of calaminarian grassland with *D. plumbicola*. • Disturbance through human impact and recreation will be absent from the calaminarian grassland.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Lesser horseshoe bat *Rhinolophus hipposideros*** • The site will support a sustainable population of lesser horseshoe bats in the Gwydyr Forest area. • The population will viable in the long term, acknowledging the population fluctuations of the species. • The natural range of lesser horseshoe bats is neither being reduced nor is likely to be reduced for the foreseeable future. • Mines on the site will be in optimal condition to support the populations. • Sufficient foraging habitat is available, in which factors such as disturbance, interruption to flight lines, and mortality from predation or vehicle collision, changes in habitat management that would reduce the available food source are not at levels which could cause any decline in population size or range. • There is a sufficiently large area of suitable habitat surrounding the roosts to support the bat population, including continuous networks of sheltered broadleaved and coniferous woodland, and tree lines, connecting the various roosts with areas of insect rich grassland and open water. • Management of the surrounding habitats is of the appropriate type and sufficiently secure to ensure there is likely to be no reduction in population size or	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	range, nor any decline in the extent or quality of breeding, foraging or hibernating habitat. • All factors affecting the achievement of the foregoing conditions are under control.	
Glynllifon SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Lesser horseshoe bat *Rhinolophus hipposideros*** • The natural range of lesser horseshoe bats will not be reduced, nor be likely to be reduced for the foreseeable future. • There is, and will continue to be, sufficient habitat to maintain the lesser horseshoe bat population on a long-term basis. • The three maternity roosts will continue to be occupied annually by lesser horseshoe bats and their babies – Glynllifon Mansion (Unit 16). – Melin y Cim (Unit 32). – Pen y Bont (Unit 36). • There will be a sufficiently large area of suitable habitat surrounding these roosts to support the bat population, including continuous networks of	The following threats/pressures to the integrity of Glynllifon SAC have been identified in Natural Resources Wales Core Management Plan:[5] • Site security (maternity and hibernation roosts) • External condition of the building (maternity roost) • Roost entrance – buildings and underground sites (maternity and hibernation roosts) • External disturbance (maternity and hibernation roosts) • Internal condition (maternity and hibernation roosts) • Temperature of roost area (maternity roost) • Internal disturbance (maternity and hibernation roosts) • Quality (habitat within the SAC boundary)

[5] https://naturalresources.wales/media/672257/Glynllifon%20SAC%20Management%20Plan%2021.4.08%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	sheltered, broadleaved and coniferous woodland, tree lines and hedgerows connecting the various types of roosts with areas of insect-rich grassland and open water. • All factors affecting the achievement of these conditions are under control.	
Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1** **Woodlands including the following: Old sessile oakwoods with *Ilex* and *Blechnum*; Bog woodland; *Tilio-Acerion* forests of slopes, screes and ravines; Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior*:** • The total extent of the woodland area, including woodland canopy and scrub, woodland glades and associated dry heath, bracken and grassland shall be maintained, some 1826 ha in total. The location of the different woodland SAC features, as listed in the title above. The distribution of these woodland communities is largely a reflection of the topography, soils, geology and aspect and is unlikely to change. • The tree canopy percentage cover within the woodland area for the whole SAC shall be no less than 80%, 87% being the current canopy cover	The following threats/pressures to the integrity of the Coedydd Derw a Safleoedd Ystlumod Meirion/Meirionnydd Oakwoods and Bat Sites SAC have been identified in Natural Resources Wales Core Management Plan:[6] **Woodlands including the following: Old sessile oakwoods with *Ilex* and *Blechnum*; Bog woodland; *Tilio-Acerion* forests of slopes, screes and ravines; Alluvial forests with *Alnus glutinosa and Fraxinus excelsior:*** • Grazing - without an appropriate light grazing regime, the woodland tends to become overgrown with a reduction in lower plant diversity. • Non-native species - non-native species should be absent, unless individual trees are known to be important for maintaining humidity or for defined wildlife interest and there are mechanisms in place to ensure no seeding or encroachment. • Humidity - high humidity is essential for mosses and liverworts to survive and

[6] https://naturalresources.wales/media/672832/mow-sac-plan.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	(excepting natural catastrophic events). Some units will have a lower canopy cover which is acceptable provided this is compatible with safeguard of the habitat, features and special interest. • The canopy and shrub layer comprises locally native species. There shall be sufficient natural regeneration of locally native trees and shrubs to maintain the woodland canopy and shrub layer, by filling gaps and allowing the recruitment of young trees and encouraging a varied age structure. The typical ground layer species of each woodland SAC feature will be common. It is important for most of the woodland SAC that the vegetation does not becomes rank and overgrown with a height above 40cm and/or dominated by species such as bramble, ivy and young holly. Limits may be set on a unit or compartment basis. The abundance and distribution of common and typical (Atlantic, sub-Atlantic, western, oceanic) mosses and liverworts, lichens (and slime moulds), will be maintained or increased. The abundance and distribution of uncommon mosses and liverworts, lichens and slime moulds, will be maintained or increased. There will be a scattering of 5 mature trees per hectare within the existing tree canopy or parkland, that is trees of c60 cm diameter plus for oak and ash and/or with signs of decay, holes etc. In the longer-term, by 2060 there should be 1 veteran trees per hectare that is trees of c100 cm diameter plus for oak and ash and 75 cms birch. The volume of dead wood will exceed 30 cubic metres per hectare throughout and consist of a mixture of fallen trees (minimum 1 per hectare), broken branches, dead branches on live trees, and standing dead trees (minimum 1 per hectare). Volumes of deadwood are	reproduce. High humidity must be maintained. • Goats - grazing by goats can be detrimental to regenerating trees in areas e.g. Rhinog where the numbers are increasing. • Woodland management - Tree felling and scrub clearance, can be beneficial if carried out appropriately. It could however cause damage if for example important trees are felled or if mosses, other plants and/or wildlife are damaged or disturbed as a result. • Woodland fragmentation - sites where the remaining woodland is only a small fragment of its former size should be enlarged wherever possible. • Adventure gorge walking & white-water canoeing rafting - Activities such as gorge walking and kayaking should be monitored so that this may provide feedback to management. **Lesser horseshoe bats *Rhinolophus hipposideros:*** • Availability and condition of building or structure including mine • Disturbance to roosts • Availability of bat navigation flight lines • Roads and development

Habitats site	Conservation objectives	Pressures and threats to site integrity
	currently at relatively low levels because the woodlands, in general, have an even-age structure and lack mature trees and any quantity of deadwood because of past silvicultural management. Some lower plants are dead wood specialists but these woodlands tend to lack the rare dead wood invertebrate assemblages found in other parts of the UK. • All factors affecting the achievement of these conditions are under control. Invasive non-native species such as Rhododendron, Japanese knotweed and Himalayan balsam will not be present. **Conservation Objective for Feature 2: Lesser horseshoe bats *Rhinolophus hipposideros:*** • The population of lesser horseshoe bats should be maintained at its current size and encouraged where possible to increase. As there has been an upward trend in lesser horseshoe bats numbers in Wales it is reasonable to expect the Gwynedd population to increase. • The range of the population within the SAC/Gwynedd is stable or increasing. • There are sufficient breeding roosts (buildings, structures and trees) and hibernation roosts (mines and buildings) of appropriate quality. The other types of roost such as night, transitional, leks and swarming sites, should also be maintained as our knowledge of these often-significant roosts improves. Foraging or feeding habitat in the SAC and surrounding countryside, including grasslands and some gardens, is of appropriate quality, extent and connectivity	• Weather **European dry heaths:** • Inappropriate grazing • Burning • Mowing • Afforestation • Bracken **Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation:** • Flow regime – no increase in water abstraction upstream that will alter flow regime • Water quality • Water quantity • Channel morphology – river engineering • Channel substrate • Shading **Northern Atlantic wet heaths with *Erica tetralix:*** • None listed

Habitats site	Conservation objectives	Pressures and threats to site integrity
	across the range. Foraging or feeding habitat: No loss of foraging habitat or decline in its quality affecting invertebrate availability, such as over intensive woodland or grassland management and drainage of marshes or bogs. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 3: European dry heaths:** • The total extent of the dry heath area, approximately 21 ha, shall be maintained. • The structure of the heath should be maintained and restored, to show natural regeneration by layering and seeding, and to ensure that the component vegetation communities are naturally diverse. The heath will be generally free from trees and at most have only a few individuals at a density of no more than 2 per hectare. Exceptions to this rule are transition zones from woodland to heath land where trees may be denser grading to open heath. Limits for woodland transition zones should be set on a unit or sub-unit basis. • The typical and uncommon species of the vegetation communities comprising the dry heath will be frequent and abundant. • Invasive non-native species such as conifers, Rhododendron, Japanese knotweed and Himalayan balsam will not be present. All factors affecting the achievement of these conditions are under control.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Feature 4: Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation: • The extent of suitable river habitat within which the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation can occur should be stable or increasing. Part of the river Glaslyn (5.2 ha) is included in the SAC. The current distribution (not known) of the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation should be stable or increasing. • The river with floating vegetation may be dominated by water crowfoot species usually *Ranunculus fluitans*, (but this species is not recorded in Meirionnydd), *Callitriche stagnalis* and bryophytes. Species indicative of unfavourable condition for this feature e.g., filamentous algae associated with eutrophication and invasive non-native species, should be absent or below an acceptable threshold level, indicative of high ecological status, within the SAC. • All factors affecting the achievement of these factors are under control. **Conservation Objective for Feature 5: Northern Atlantic wet heaths with *Erica tetralix:*** • To be confirmed.	
Migneint-Arenig-Dduallt SPA/SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met	The following threats/pressures to the integrity of the Migneint-Arenig-Dduallt SPA and SAC have

Habitats site	Conservation objectives	Pressures and threats to site integrity
	restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for SAC Feature 1: Blanket Bog** • The total extent of the blanket bog area, including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated, some 8100 ha in total. Vegetation mapped as NVC M20, currently approx. 1700ha, is always considered to be unfavourable. The area of the blanket bog feature is expanding into areas of heavily modified bog currently occupied by wet heath or acid grassland. • The location and distribution of the blanket bog is increasing at the expense of less desirable vegetation communities. **Conservation Objective for SAC Feature 2: the European dry heaths and Northern Atlantic wet heath with *Erica tetralix*** • The total extent of the dry heath area, including those areas that are 'degraded' (approx 2600ha) shall at least be maintained as present when designated. The degraded areas and currently unfavourable dry heath should be managed under a restoration programme. The area of dry heath should increase at the expense of less desirable vegetation communities such as acid grassland. The total extent of the wet heath area, including those areas that are 'degraded' (approx 400 ha) shall at least be maintained as present when designated. The area of wet heath	been identified in Natural Resources Wales Core Management Plan:[7] **Main pressures and threats for blanket bog** • Grazing • Burning • Drainage ditches/moor grips • Recreation and access • Off-road vehicle use • Afforestation/conifer encroachment • Mineral exploration • Peat erosion • Atmospheric deposition and liming • Climate change **Main pressures and threats for European dry heaths and Northern Atlantic wet heath with *Erica tetralix*** • Grazing • Burning • Mowing • Afforestation/conifer encroachment • Drainage ditches/moor grips

[7] https://naturalresources.wales/media/672797/MigneintADd%20WES32%20plan%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	should increase in overall at the expense of less desirable vegetation communities. Some areas of wet heath which are degraded blanket bog may be restored to that priority habitat provided that there is a net gain of wet heath within the SAC. • The distribution of the dry and wet heath will at least be as shown on Maps 1-4 and will preferably be increasing as it is restored in additional areas. • The typical species of the vegetation communities comprising the dry heath and wet heath will be frequent and abundant. • The abundance and distribution of uncommon plants will be maintained or increased. • The structure of the heath should be maintained and restored, to show natural regeneration by layering and seeding, and to ensure that the component vegetation communities are naturally diverse (refer also to 3 and 4 above). In practise some stands will benefit from being taller with very mature heather (eg NVC H21) and others including wet heath from having a medium to short structure, less than 30cms height. Signs of overgrazing, including 'suppressed', 'topiary' or 'drumstick' growth habits will not be apparent. • Invasive non-native species such as conifers, rhododendron, Japanese knotweed, Himalayan balsam and bridewort (*Spiraea*) will not be present. • The surface of the heath will be generally free from trees and at most have only a few individuals at a density of no more than 2 per hectare. Exceptions to this rule are transition zones from woodland to heath	• Bracken • Development • Recreation and access • Off-road vehicle use • Non-native species • Agricultural improvement • Physical environment • Climate change **Main pressures and threats for oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflora* and/or of the *Isoëto-Nanojuncetea* and for natural dystrophic lakes and ponds** • Catchment management • Recreation and access, including fishing and watersports • Off-road vehicle use • Alien species • Climate change **Main pressures and threats for old sessile oakwoods with Ilex and *Blechnum* woodland** • Grazing • Non-native species

Habitats site	Conservation objectives	Pressures and threats to site integrity
	land where trees may be denser grading to open heath. Limits for woodland transition zones should be set on a unit or sub-unit basis. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for SAC Feature 3: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflora* and/or of the *Isoëto-Nanojuncetea* and for natural dystrophic lakes and ponds** • The total extent of the clear-water and peaty lakes shall be maintained as indicated on maps 1 – 4, some x ha of open water/swamp and immediate lake basin, as visible on air photographs. The lake condition is intrinsically linked to the condition of the catchment therefore the catchments should be maintained in at least their current condition (including vegetation cover, drainage and appropriate management ie not over grazing and burning). • The location of the clear-water and peaty lakes will be as shown on Maps 1-4 and as referred to by name in the table below. • The typical species, as listed following, of the vegetation communities comprising the **clear water lakes** SAC feature will be common. The vegetation community is characterised by amphibious short perennial vegetation, with shoreweed *Littorella uniflora* being considered as the defining component. This species often occurs in association with water lobelia *Lobelia dortmanna*, bog pondweed *Potamogeton polygonifolius*, quillwort *Isoetes*	• Humidity • Hydr-electric power • Woodland management • Adventure gorge walking & white water canoeing rafting • Civil engineering operations **Main pressures and threats for hen harrier** • Burning and mowing or topping vegetation • Grazing • Persecution • Predation • Disease • Weather • Development • Disturbance **Main pressures and threats for hen harrier** • Burning and mowing or topping vegetation • Grazing • Persecution • Predation • Weather

Habitats site	Conservation objectives	Pressures and threats to site integrity
	lacustris, bulbous rush *Juncus bulbosus*, alternate water milfoil *Myriophyllum alterniflorum* and floating water bur-reed *Sparganium angustifolium*. On Migneint Arenig-Dduallt all the above species are present, together with yellow water-lily *Nuphar lutea,* white water-lily *Nymphaea alba*, smooth stonewort *Nitella flexilis*, lesser bladderwort *Utricularia minor* and the nationally scarce slender stonewort *Nitella gracilis.* In the case of **peaty lakes**, these water bodies are very acidic and poor in plant nutrients. Their water has a high humic acid content and is usually stained dark brown through exposure to peat. Most examples are small (less than 5 ha in extent), shallow, and contain a limited range of flora and fauna, with the principal aquatic plants being *Sphagnum*, floating bur-reed and water lilies. The pools are naturally species-poor and a littoral zone is often absent. Fringing vegetation is that characteristic of the habitat in which the pools occur. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for SAC Feature 4: Old sessile oakwoods with *Ilex* and *Blechnum* woodland** • The total extent of the woodland area, including woodland canopy and scrub, woodland glades and associated dry heath, bracken and grassland shall be maintained as indicated on the map in the annex, of 67 ha plus additional areas of c.13ha (not mapped) giving a total of approx.80 ha. Broadleaved woodland and scrub currently covers about 0.4% of the site (and bracken over 2% (c. 450 ha).	• Development • Disturbance • Forestry management **Main pressures and threats for peregrine** • Burning vegetation • Grazing • Persecution • Predation • Weather • Development • Disturbance • Disease

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The location of the woodland SAC feature will be as shown on Maps in annex 1. Woodlands include. Coed Dol- Fudr(SH 831318), Coed Gordderw (SH838336), Coed Maen y Menyn (SH 848354) and Coed Boch-y-Rhaeadr (SH 843398). • The tree canopy percentage cover within the woodland area (see maps 1 - 4) shall be no less than 85% (excepting natural catastrophic events). • The canopy and shrub layer comprises locally native species typical of this upland woodland which is less oak and more birch dominated than more lowland examples of this SAC feature. • There shall be sufficient natural regeneration of locally native trees and shrubs to maintain the woodland canopy and shrub layer, by filling gaps and allowing the recruitment of young trees, and encouraging a varied age structure. • The typical ground layer species of the woodland SAC feature will be common. It is important for most of the woodland SAC that the vegetation does not becomes rank and overgrown with a height above 40 cm and/or dominated by species such as bramble, ivy and young holly. Limits may be set on a unit or compartment basis. Typical lower plants including oceanic species should continue to be abundant and/or maintained. • The abundance and distribution of uncommon mosses, liverworts, lichens and ferns, will be maintained or increased. • There will be a defined number of mature trees per hectare within the existing tree canopy on a unit	

basis. This will need to be defined by diameter for the upland situation where comparable trees at lower altitude are of c60 cm diameter plus for oak and ash and/or with signs of decay, holes etc.

- Dead wood will be present and consist of a mixture of fallen trees (minimum 1 per hectare), broken branches, dead branches on live trees, and standing dead trees (minimum 1 per hectare). Volumes of deadwood are currently at relatively low levels because the woodlands, in general, have an even-age structure and lack mature trees. Some lower plants are dead wood specialists but these woodlands tend to lack the rare dead wood invertebrate assemblage found in other parts of the UK.
- Invasive non-native species such as rhododendron, Japanese knotweed and Himalayan balsam will not be present.
- All factors affecting the achievement of these conditions are under control.

Conservation Objective for SPA Feature 5: Hen harrier *Circus cyaneus*

- The size of the population is at least 8 breeding pairs (SPA form 2003 10-12 pairs) and preferably increasing. (2007 –11 pairs)
- Hen Harrier nesting distribution within the site is maintained or expanded, so that breeding occurs in all appropriate habitats.
- Hen Harrier breeding success is at least one young fledged per nest.

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• There is sufficient nesting and roosting tall heather habitat to support the population in the long-term. • There is sufficient hunting habitat, often in mosaic and including areas of grassland, bogs, flushes, short heath and bracken with low trees/scrub present. There is an adequate supply of prey species in the form of small birds and small mammals to maintain successful breeding. Prey supply cannot be easily monitored or assessed but may be an important attribute, for research and study, if productivity is low. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for SPA Feature 6: Merlin *Falco columbarius*** • The size of the population is at least 9 breeding pairs (SPA form 2003 9-12 pairs, 0.7-0.9% GB) and preferably increasing. • Merlin nesting distribution within the site is maintained or expanded, so that breeding occurs in all appropriate habitats. • Merlin breeding success is at least one young fledged per nest when sample monitoring is carried out. • There is sufficient nesting and roosting tall heather, individual trees often with crows' nests and forestry edge habitat to support the population in the long-term. • There is sufficient hunting habitat, often in mosaic and including areas of grassland, bogs, flushes, short heath and bracken with low trees/scrub present. There is an adequate supply of prey species in the	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	form of small birds (commonly meadow pipit and skylark) and large insects to maintain successful breeding. Prey supply cannot be easily monitored or assessed but may be an important attribute, for research and study, if productivity is low. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for SPA Feature 7: Peregrine *Falco peregrinus*** • The size of the population is at least 9 breeding pairs (SPA form 2003 9-12 pairs, 0.7-0.9% GB) and preferably increasing. • Peregrine nesting distribution within the site is maintained or expanded, so that breeding occurs in all appropriate nest sites. • Peregrine breeding success is at least one young fledged per nest when sample population monitoring is carried out. • There are sufficient cliff and crag with ledges suitable for nesting usually known traditional nest sites to support the population in the long-term. • There is a sufficient hunting habitat and prey. Prey supply cannot be easily monitored or assessed but may be an important attribute, for research and study, if peregrine productivity is low. • All factors affecting the achievement of these conditions are under control.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Habitat Features** **1. Range** - The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing. For the **reef** feature these include: • Rocky intertidal reefs • Rocky subtidal reefs • Extensive boulder and cobble reefs – the sarnau • Biogenic reefs (horse mussel *Modiolus modiolus* reef/green crenella *Musculus discors* reef and Honeycomb worm *Sabellaria alveolata* reef • Carbonate reef formed by methane gas leaking from the seabed For the **intertidal mudflat and sandflat** feature these include: • *Mya arenaria* and polychaetes in muddy gravel • Eel grass *Zostera* marina beds.	The following threats/pressures to the integrity of the Pen Llyn a'r Sarnau/Lleyn Peninsula and the Sarnau SAC have been identified in Natural Resources Wales Core Management Plan:[8] • Docks, marinas and shipping • Civil engineering • Waste disposal • Exploitation of living resources • Cultivation of living resources • Exploitation of non-living resources • Pollution response • Recreation • Military activities • Miscellaneous operations and uses

[8] https://naturalresources.wales/media/673816/Pen%20Llyn%20ar%20Sarnau%20%20R33%20Feb%202009.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• Muddy gullies in the Mawddach estuary For the ***Salicornia*** feature this includes: • Communities characterised by the species Sar*cocornia perennis* **2. Structure and function** - The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Important elements include: • geology, • sedimentology, • geomorphology, • hydrography and meteorology, • water and sediment chemistry, • biological interactions This includes a need for nutrient levels in the water column and sediments to be: • at or below existing statutory guideline concentrations • within ranges that are not potentially detrimental to the long-term maintenance of the features species populations, their abundance and range. Contaminant levels in the water column and sediments derived from human activity to be: • at or below existing statutory guideline concentrations	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• below levels that would potentially result in increase in contaminant concentrations within sediments or biota • below levels potentially detrimental to the long-term maintenance of the feature species populations, their abundance or range taking into account bioaccumulation and biomagnification. For **Atlantic saltmeadows** this includes the morphology of the saltmarsh creeks and pans. **3. Typical species -** The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. Important elements include: • species richness • population structure and dynamics, • physiological heath, • reproductive capacity • recruitment, • mobility • range As part of this objective it should be noted that: • populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	maximum sustainable yield and secure in the long term • the management and control of activities or operations likely to adversely affect the habitat feature is appropriate for maintaining it in favourable condition and is secure in the long term. **Species features.** **4. Populations** - The population is maintaining itself on a long-term basis as a viable component of its natural habitat. Important elements include: • population size • structure, production • condition of the species within the site. As part of this objective it should be noted that for **bottlenose dolphin** and **grey seal**; • Contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression For **grey seal** populations should not be reduced as a consequence of human activity. **5. Range** - The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future. As part of this objective it should be noted that for bottlenose dolphin and grey seal:	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• Their range within the SAC and adjacent inter-connected areas is not constrained or hindered • There are appropriate and sufficient food resources within the SAC and beyond • The sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing. **6. Supporting habitats and species** - The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include: • distribution • extent • structure • function and quality of habitat • prey availability and quality. As part of this objective it should be noted that; • The abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term. • The management and control of activities or operations likely to adversely affect the species	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	feature is appropriate for maintaining it in favourable condition and is secure in the long term. • Contamination of potential prey species should be below concentrations potentially harmful to their physiological health. • Disturbance by human activity is below levels that suppress reproductive success, physiological health or long-term behaviour. For **otter** there are sufficient sources within the SAC and beyond of high-quality freshwater for drinking and bathing.	
Afon Eden – Cors Goch Trawsfynydd SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Features 1 and 2: Freshwater pearl mussel and Atlantic salmon:** There are generic conservation objectives for the physical habitat and water quality relevant to freshwater pearl mussel and Atlantic salmon which are defined below and should be met. • Quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving.	The following threats/pressures to the integrity of the Afon Eden – Cors Goch Trawsfynydd SAC have been identified in Natural Resources Wales Core Management Plan:[9] Raised bog: • Burning • Drainage • Invasive • Scrub • Forestry • Grazing. Acid grassland:

[9] https://afonyddcymru.org/wp-content/uploads/2022/11/afon-eden-wes32-plan-english.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• There should be sufficient habitat, of sufficient quality, to support the population in the long term. There are also generic conservation objectives for population attributes relevant to Freshwater pearl mussel and Atlantic salmon which are defined below and should be met. • The distribution of the population should be being maintained or where appropriate increasing. • There should be sufficient habitat, of sufficient quality, to support the population in the long term. • The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term. • Factors affecting the population or its habitat should be under appropriate control. **Conservation Objective for Feature 3: Floating water plantain *Luronium natans*:** The vision for this feature is for it to be in favourable conservation status, where all of the following conditions are satisfied: • The *L. natans* populations will be viable throughout their current extent in the Afon Eden and will be able to maintain themselves on a long-term basis. There will be no contraction of the current *L. natans* distribution in the Afon Eden and each *L. natans* population must be able to disperse and complete sexual and/or vegetative reproduction successfully.	• Cultivation • Stock feeding • Mowing. • Fertiliser • Grazing • Drainage. • Pesticides • Dumping of • Materials • Invasive scrub. Woodland & lower plants. • Grazing • Non-native tree & shrub species • Woodland fragmentation • Recreation. • Felling. Wet heath: • Drainage • Burning • Grazing

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The river will have sufficient habitat to support existing *L. natans* populations within their current distribution and future expansion. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 4: Otter *Lutra lutra:*** The vision for this feature is for it be in favourable conservation status, where all of the following conditions are satisfied: • The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behaviour. • The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory and/or provide routes between breeding territories. A number of potential and breeding sites have been identified (Lyles, 2006) in the upper reaches of the Afon Eden. The size of breeding territories may vary depending on prey abundance. • The population size should not be limited by the availability of suitable undisturbed breeding sites. Where these are insufficient, they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site is subject to a level of disturbance that could have an	• Stock feeding • Mowing • Dumping materials. Swamp and standing water: • Stock feeding & watering points • Drainage • Water quality & quantity • Management of aquatic and bank vegetation • Invasive aquatic species. Active raised bog: • Drainage • Grazing • Burning • Peat • Cutting • Ardudwy leat • Old municipal dump. Floating water plantain: • Water quantity

Habitats site	Conservation objectives	Pressures and threats to site integrity
	adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance are managed. Survey information shows that otters are widely distributed in the Mawddach catchment. The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing, etc. at road bridges and other artificial barriers. All factors affecting the achievement of these conditions are under control. Conservation Objective for Feature 5 Active raised bog NVC communities M2, M17, M18, M25:eThe vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied for both raised bogs management units: The location and distribution of the raised bogs and associated rands and fen laggs will increase at the expense of less desirable vegetation communities • The extent of the raised bogs and associated rands, fen lags and blanket bog (including those areas that are considered unfavourable or currently degraded) will be at least 157 ha. This area estimate is based on the extent of the management units within which the peat 'domes' are situated. • The raised bogs will exhibit a near-natural zonation from the purely ombrogenous (rain fed) bog crowns, through sloping rand and wet lagg zones to adjacent blanket bog.	• Dredging. • Water based recreation. Freshwater pearl mussels: • Water quantity & quality • Water based recreation • Population of host salmonids • Illegal pearl mussel poaching • Forestry. Atlantic salmon: • Water quality & quantity • Water based recreation during low flows. • Overfishing in low flows • Fish stocking • Poaching • Artificial barriers to migration. Otter: • Water quality • Breeding habitat • Food supply

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The abundance and distribution of uncommon plants is maintained or increased. • The typical species of the vegetation communities comprising the active raised bog SAC feature are frequent. • The hydrological integrity of each bog will be restored and maintained and the development of scrub and encroachment of *Molinia caerulea* will be managed. The structure of the bogs are maintained and restored to include bog pools, depressions, hummocks and hollows as a natural feature of the bog surface. Artificial drainage ditches or moor grips are not present as functioning drains. • Invasive non-native species such as conifers, rhododendron, Japanese knotweed, Himalayan balsam and bridewort (*Spirea*) are not present within the SAC boundary. • Each active raised bog management unit is free from all trees. • All factors affecting the achievement of these conditions are under control.	• Recreation • Mink predation.
Northern Cardigan Bay/Gogledd Bae Ceredigion SPA	The single qualifying feature of the proposed SPA is the nationally important non-breeding population of red-throated diver (*Gavia stellata*)	The following threats/pressures to the integrity of the Northern Cardigan Bay/Gogledd Bae Ceredigion SPA have been identified in Natural Resources Wales Core Management Plan:[10]

[10] https://naturalresources.wales/guidance-and-advice/environmental-topics/consultations/our-own-consultations-closed/closed-2016/new-marine-sac/northern-cardigan-bay/?lang=en

Habitats site	Conservation objectives	Pressures and threats to site integrity
	To achieve favourable conservation status all the following, subject to natural processes need to be fulfilled and maintained in the long-term. If these objectives are not met, restoration measures will be needed to achieve favourable conservation status. • The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term - the wintering population of Red-throated diver should be stable or increasing, for a peak mean of 1,186 individuals (2000/01-2003/04). There should be sufficient habitat, of sufficient quality, to support the population in the long term - The foraging habitat of this species should not decrease significantly, and its quality should remain unaffected by anthropogenic factors.	• Geophysical regime • Fundamental environmental parameters • Environmental quality • Physical disturbance • Other factors (removal of target species; introduction of non-native species)
Morfa Harlech a Morfa Dyffryn SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Embryonic shifting dunes**	The following threats/pressures to the integrity of the Morfa Harlech a Morfa Dyffryn SAC have been identified in Natural Resources Wales Core Management Plan:[11] Embryonic shifting dunes: • Physical structure- functionality and sediment supply from both on site and off site. There should be no further anthropogenic increase in factors leading to constraints to the natural mobility of the system. There should be net

11 https://naturalresources.wales/media/672822/Morfa%20Harlech%20a%20Morfa%20Dyffryn%20SAC%20Management%20Plan%2018%20April%202008%20_English_.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The total extent of the embryonic shifting dunes including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated. • The strand line and embryonic dune vegetation should be made up of typical species. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Shifting dunes along the shoreline with *Ammophila arenaria*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The total extent of the shifting dunes including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated, c.18.9 ha at Morfa Harlech which should be present both along the seaward dune ridge and inland within units 1, 3, 4 and 5 and at least 82 ha of shifting dunes at Morfa Dyffryn which should be distributed throughout units 28, 27, 26, 24, and 23. The shifting dunes should be vegetated by species such as those listed. • All factors affecting the achievement of these conditions are under control.	accretion recorded over a five-year period at the permanent beach markers. • Unselective beach cleaning. • Vehicle or visitor damage. • Grazing. Shifting dunes along the shoreline with *Ammophila arenaria*: • Decrease in extent due to anthropogenic factors. • Invasive species. • Physical structure – functionality and sediment supply. • Unselective beach cleaning. • Grazing and disturbance by livestock. • Grazing and digging by rabbits. • Vehicle or visitor damage. • Forestry plantation. Humid dune slacks and dunes with *Salix repens:* • Decrease in extent due to anthropogenic factors. • Constraints on the movement of sand. • Grazing and disturbance by livestock.

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Features 3 and 4: Humid Dune Slacks: Feature 3; Dunes with *Salix repens*: Feature 4 The vision for these features is for them to be in a favourable conservation status, where all of the following conditions are satisfied: • The total extent of the humid dune slacks and dunes with Salix repens including those areas that are considered unfavourable or currently degraded is maintained at the area present when designated, some 65.1 ha at Morfa Harlech and 43.6 ha at Morfa Dyffryn. • All successional phases of dune slack vegetation should be present at Morfa Dyffryn. • The humid dune slacks should be vegetated with typical and desirable species. • The dune slack vegetation should be free from scrub and should have a relatively short sward. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 5: Petalwort *Petalophyllum ralfsii*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:	• Changes in hydrological regime. • Vehicle or visitor damage. • Scrub encroachment. *Petalophyllum ralfsii:* • Vehicle or visitor damage. • Changes in hydrological regime. • Succession.

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The population of *Petalophyllum* will remain stable or increase. • *Petalophyllum* should be present at Morfa Harlech should be distributed across the northern part of Morfa Dyffryn sand dune system (Units 26 and 28). • The successionally young dune slacks that support the *Petalophyllum* should be in good condition as defined in the conservation objective for features 3 and 4 above. • All factors affecting the achievement of these conditions are under control.	
Afon Gwyrfai a Llyn Cwellyn SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoteo-Nanojuncetea:*** • Water quality of the lake is within parameters suitable to support the characteristic flora and fauna. • The lake shows the characteristic vegetation zonation from the shore to deeper water. • The lake has a macrophyte flora which includes many of the characteristic species including *Littorella*	The following threats/pressures to the integrity of the Afon Gwyrfai a Llyn Cwellyn SAC have been identified in Natural Resources Wales Core Management Plan:[12] • Water quality • Water flow • Light levels • Changes to substrate • Illegal fish poaching • Invasive alien species • Availability of coarse woody debris (CWD) • Dredging

[12] https://afonyddcymru.org/wp-content/uploads/2022/11/afon-gwyrfai-a-llyn-cwellyn-management-plan-_english_.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	uniflora, Lobelia dortmanna, Isoetes lacustris, Luronium natans and *Subularia aquatica*, together with a diverse range of associates including *Myriophyllum alterniflorum, Callitriche hamulata, Nitella flexilis* and *Potamogeton berchtoldii.* • *Nitella gracilis* and *Luronium natans* to be present as characteristic plants. • There will continue to be a healthy population of Arctic charr (*Salvelinus alpinus*) in Llyn Cwellyn. **Conservation Objective for Feature 2: Watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation:** • The conservation objective for the watercourse as defined above must be met. • The extent of this feature within its potential range in this SAC should be stable or increasing. • The extent of the sub-communities that are represented within this feature should be stable or increasing. • The conservation status of the feature's typical species should be favourable. • All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).	• Competition from other aquatic plant species • Food availability and riparian habitat • Diffuse and point source pollution • Agricultural operations • Forestry operations • River engineering • Recreation • Deposition – atmospheric pollution • Climate change

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Feature 3: Atlantic salmon Salmo salar: • The conservation objective for the watercourse as defined above must be met • The population of the feature in the SAC is stable or increasing over the long term • The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term. Suitable habitat is defined in terms of near-natural hydrological and geomorphological processes and forms e.g. suitable flows to allow upstream migration, depth of water and substrate type at spawning sites, and ecosystem structure and functions. Suitable habitat need not be present throughout the SAC but where present must be secured for the foreseeable future. Natural factors such as waterfalls may limit the natural range of individual species. Existing artificial influences on natural range that cause an adverse effect on site integrity, such as physical barriers to migration, will be assessed. • The Gwyrfai will continue to be a sufficiently large habitat to maintain the feature's population in the SAC on a long-term basis. **Conservation Objective for Feature 4: Floating water-plantain *Luronium natans:***	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The conservation objective for the watercourse as defined above must be met. • Llyn Cwellyn will continue to support a peripheral floating water-plantain assemblage, as well as a deeper water assemblage, with a characteristic zonation of vegetation from the shore at two areas of the lake. • Floating water-plantain will continue to flourish in the Afon Gwyrfai and will continue to occur in every selected section. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 5: European otter *Lutra lutra:*** • The population of otters in the SAC is stable or increasing over the long term and reflects the natural carrying capacity of the habitat within the SAC, as determined by natural levels of prey abundance and associated territorial behaviour. • The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches that are potentially suitable to form part of a breeding territory and/or provide routes between breeding territories. The size of breeding territories may vary depending on prey abundance. • The population size should not be limited by the availability of suitable undisturbed breeding sites.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Where these are insufficient they should be created through habitat enhancement and where necessary the provision of artificial holts. No otter breeding site is subject to a level of disturbance that could have an adverse effect on breeding success. Where necessary, potentially harmful levels of disturbance are managed. • The safe movement and dispersal of individuals around the SAC is facilitated by the provision, where necessary, of suitable riparian habitat, and underpasses, ledges, fencing etc at road bridges and other artificial barriers. • All factors affecting the achievement of these conditions are under control.	
Corsydd Eifionydd/Eifionydd Fens SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Transition mires and quaking bogs** • Transition mire and quaking bog will be the dominant habitat at Cors Gyfelog and Cors Graianog • A mosaic of fen, bog, marshy grassland and swamp habitats should cover at least 80% of both sites. The habitat should be of good quality, supporting a	The following threats/pressures to the integrity of the Corsydd Eifionydd/Eifionydd Fens SAC have been identified in Natural Resources Wales Core Management Plan:[13] **Main pressures and threats for transition mires and quaking bogs:** • Management neglect and scrub encroachment • Rhododendron • Drainage and water supply

[13] https://naturalresources.wales/media/671584/Corsydd%20Eifionydd%20plan%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	number of scarce, rare and endangered plant species. It should also provide habitat for a wide range of birds, insects and reptiles. • During the driest part of the year most of the site should have water at or above the surface and when the site is walked upon, the bog shakes. This quaking bog should support wetland habitats with typical species such as cross-leaved heath, bog asphodel, sundews, bogmosses (*Sphagnum* spp.) and cotton grass. • The site should support healthy populations of rarer plants such as intermediate bladderwort, bog sedge, royal fern, oblong-leaved sundew together with rare insect populations. Habitat suitable for the marsh fritillary butterfly should be present. The blue flowered devil's bit scabious should be common on the site because it is the food plant of marsh fritillary caterpillars. • Wet woodland should cover no more than 30% of Cors Gyfelog and 10% of Cors Graianog and there should be no rhododendron present. This diverse woodland community has developed over a number of years and supports a rich lichen and moss community. The woodland should continue to contain a number of different tree species and be able to support the lichen and moss communities. • Light grazing by cattle and ponies will occur across all accessible parts of the site during the late spring to early summer months.	• Grazing • Burning • Nutrient enrichment **Main pressures and threats for slender green feather moss:** • Scrub/gorse encroachment • Water quality • Drainage • Grazing **Main pressures and threats for marsh fritillary butterfly:** • Scrub/gorse encroachment • Shelterbeds • Water quality • Drainage • Grazing

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Slender green feather moss *Dreplanocladus (Hamatocaulis) vernicosus*:** • The low growing fen vegetation of Cors Gyfelog and Cors Llanllyfni should continue to support a healthy population of the slender green feather-moss. Management shall ensure that the population remains stable and afford it the opportunity to expand • On Cors Gyfelog, H. vernicosus is confined to neutral or slightly basic flushes and runnels with an open vegetation structure of brown mosses, sedges, mixed forbs and *Sphagnum* spp. • The open vegetation needs to be maintained by seasonally light grazing and a high water table with ground conditions being wet throughout the year, the water table being at or near to the surface. • Under-grazing is a significant threat to the *H. vernicosus* sub-populations at both sites since it could lead to increased cover by rushes, forbs, sedges and scrub invasion. When the vegetation became denser, the *H. vernicosus* formed small sub-populations of a few scattered scrawny stems. The site is summer-grazed by ponies, which maintains the short open sward conditions favoured by the moss. • Nutrient enrichment of the water source is also a potential risk at both sites. Measures should be	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	implemented to prevent and/or reduce to a minimum sources of nutrient enrichment. • Certain herbs, grasses and sedges grow in close proximity to the moss populations. These plants share the habitat requirements of the moss; they include Lesser Spearwort, Sharp-flowered Rush, Purple Moor-Grass, Star Sedge, Carnation Sedge, Devil's- bit Scabious, Lesser Skullcap, Large Bird's-foot Trefoil, Bogbean,, Common marsh-bedstraw, Common Cotton Sedge, Bottle Sedge, Common Sedge, Common Yellow Sedge, Velvet Bent and Flea Sedge. • All factors affecting the achievement of the foregoing conditions are under control. **Conservation Objective for Feature 2: Marsh fritillary butterfly *Euphydryas aurinia:*** • To ensure this, at least 80% of Cors y Wlad SSSI should be covered by habitat suitable for the marsh fritillary i.e. rushy vegetation (rhôs pasture). The habitat should be of good quality (tussocky grassland at a height of 10 – 20cm) with an abundance of devil's bit-scabious, the food plant of the marsh fritillary caterpillars. • The SAC supports a nationally important population of the marsh fritillary butterfly. Although, numbers of adult butterflies and larvae fluctuate annually in response to a parasitic wasp and weather conditions, the population is robust, resilient and viable in the	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	long term. This population contributes towards the larger population of the butterfly in the general area. • During peak years, a visitor taking a walk through the site on a sunny day in June will see numerous adult butterflies. In these years the caterpillars, feeding communally in silken webs on their foodplant devil's-bit scabious, will be abundant throughout those units supporting the butterfly. • The SAC population contributes to and is the core of the Eifionydd marsh fritillary metapopulation. The metapopulation consists of the SAC population, plus populations breeding on land outside the SAC. • The population breeds throughout 4 units, where it is a key species driving the management of each unit. • Rosettes of devils bit scabious will be both very numerous and widespread throughout parts of those units supporting marsh fritillary (particularly Cors y Wlad SSSI), growing amongst a turf of grasses, sedges and flowering herbs with scattered tussocks of purple moor grass and rushes providing shelter for the caterpillars in wet weather. • Dense mixed hedges of hawthorn, hazel, mountain ash and other locally native species grow around the external and internal boundaries and offer vital shelter to the breeding adult butterflies during poor weather in what is otherwise a very exposed landscape with little shelter. • All factors affecting the achievement of the foregoing conditions are under control.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
Eryri/Snowdonia SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Siliceous alpine and boreal grasslands** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The high summits of the Carneddau (Carnedd Dafydd, Pen yr Ole Wen, Carnedd Llewelyn, Garnedd Uchaf, Yr Aryg, Foel Grach, Llwytmor, Drosgl, Foel Fras, Pen Llythrig y Wrach and Pen yr Helgi Ddu) the Glyderau (Y Garn, Glyder Fach, Glyder Fawr, Elidir Fach, Carnedd y • Ffiliast and Mynydd Perfedd), should each support summit heath vegetation which does not show signs of heavy modification by grazing and/or heavy trampling. • There should be no further loss of summit heath on Yr Wyddfa. The extent of the habitat at Crib y Ddysgl and Garnedd Uchaf should be retained as an absolute minimum and there should be no loss of quality.	The following threats/pressures to the integrity of the Eryri/Snowdonia SAC have been identified in Natural Resources Wales Core Management Plan:[14] **Siliceous alpine and boreal grasslands:** • Livestock grazing • Trampling by people and livestock • Nitrogen deposition **Alpine and Boreal Heaths:** • Livestock grazing • Trampling by people and livestock • Nitrogen deposition • Burning **Hydrophilous tall herb communities of plains and of the montane to alpine levels:** • Livestock grazing • Recreational activity

[14] https://naturalresources.wales/media/671995/Eryri%20SAC%20plan%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The vegetation should be dominated by species typical of species of summit heath such as *Racomitrium lanuginosum* (woolly hair moss), *Carex bigelowii* (stiff sedge), shrubs dwarfed by the high altitude conditions such as *Vaccinium myrtillus* (bilberry) and *Salix herbacea*, lichens and montane bryophytes. • Grasses should not comprise a significant proportion of the vegetation. • The habitat should grade into montane heath at its lower level. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Alpine and Boreal Heaths** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • Alpine and Boreal heath habitat should cover considerable areas of the Eryri SAC at high altitudes i.e. from about 600 m upwards, though it may extend below this in particularly exposed areas. • It should grade into summit heath on the high summits and ridges, and into dry heath at its lower end. • This vegetation should be dominated by dwarf shrubs, typically stunted by the high altitude conditions, such as cowberry (*Vaccinium vitis idea*),	**Calcareous rocky slopes with chasmophytic vegetation:** • Livestock grazing • Recreational activity **Alpine and subalpine calcareous grasslands:** • Livestock grazing • Recreational activity **Siliceous rocky slopes with chasmophytic vegetation:** • Livestock grazing • Recreational activity **Siliceous scree of the montane to snow levels:** • Livestock grazing • Recreational activity **Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*** • Abstraction • Recreational activity **North Atlantic wet heaths with *Erica tetralix:***

Habitats site	Conservation objectives	Pressures and threats to site integrity
	bilberry (*Vaccinium myrtillus*) and mountain crowberry (*Empetrum hermaphroditum*), prostrate ling (*Calluna vulgaris*) and in some stands dwarf juniper (*Juniperus communis* ssp. *nana*.). Other montane species such as wooley hair moss (*Racomitrium lanuginosum*) and other montane bryophytes and lichens should be present. • Although some grasses, particularly sheep's fescue, will be present, they should not be at high cover. • In the long term we expect existing habitat to be retained and to improve in quality in its current locations, and also to expand into other suitable localities where the habitat now exists in a degraded state. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 3: Hydrophilous tall herb communities of plains and of the montane to alpine levels** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The area of tall herb ledge must be stable, or increasing in the long term. There will be no loss of tall herb ledge vegetation and the feature will occur in all management units in which it currently occurs. • Tall herb ledge vegetation will develop on ledges and on damp calcareous grassland below cliffs where the	• Livestock grazing • Recreational activity • Burning **European dry heath:** • Livestock grazing • Burning and cutting **Blanket bog:** • Livestock grazing • Burning and/or cutting • Gorse invasion • Drainage • Damage from vehicles • Atmospheric deposition **Depressions on peat substrates of the Rhynchosporion:** • Livestock grazing • Drainage or burning **Species-rich *Nardus* grassland on siliceous substrates in mountain areas:** • Livestock grazing **Old sessile oakwoods with Ilex and *Blechnum:***

Habitats site	Conservation objectives	Pressures and threats to site integrity
	potential exists but expansion is currently prevented by grazing. • Tall herb vegetation will consist of a number of flowering plant species such as Lady's mantle *Alchemilla* spp., Meadowsweet *Filipendula vulgaris*, Globeflower *Trollius europaeus*, Welsh poppy *Meconopsis cambrica*, Devilsbit scabious *Succisa pratensis*, Ox-eye daisy *Leucanthemum vulgare*, Wild Angelica *Angelica sylvestris*, Roseroot *Sedum rosea*, Lesser meadow rue *Thalictrum minus* and Common valerian *Valeriana officinalis.* • The flowering plants will be ungrazed and able to mature and set seed freely. **Conservation Objective for Feature 4: Calcareous rocky slopes with chasmophytic vegetation** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature must be stable or increasing in the long term. There will be no loss of calcareous chasmophytic vegetation and it will continue to occur in all of management units in which it currently occurs. • The feature must continue to support a range of arctic alpine plant populations. • The plants will be ungrazed and able to mature and set seed freely, or non-flowering plants reproduce by propagules or vegetative means.	• Livestock grazing • Alien species **Petrifying springs with tufa formation (*Cratoneuron*):** • Livestock grazing • Drainage **Alkaline fens:** • Livestock grazing • Recreational activity • Drainage **Alpine pioneer formations of the *Caricion bicoloris-atrofuscae*:** • Livestock grazing **Floating water plantain *Luronium natans:*** • Water quality **Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus:*** • Livestock grazing

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The feature will not be inhibited by invasive non-native plant species. **Conservation Objective for Feature 5: Alpine and subalpine calcareous grasslands** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • This habitat should remain in its current locations although there may be some shifts in its extent. • The feature should continue to support the characteristic plants including arctic alpine plant species. • The only acceptable losses of this habitat should be due to succession to other valuable montane communities such as tall herb ledge vegetation. **Conservation Objective for Feature 6: Siliceous rocky slopes with chasmophytic vegetation** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • This habitat should support a range of bryophytes and ferns in suitable crevices on acid rocks. • The feature should not be damaged by grazing. • It should be widespread on suitable moist acidic rock crevices on each massif.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Feature 7: Siliceous scree of the montane to snow levels The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The naturally mobile scree on each massif will have open vegetation on or among the boulders, with *Cryptogramma crispa, Deschampsia flexuosa, Festuca ovina, Galium saxatile, Huperzia selago* and an extensive and varied bryophyte flora. • There will not be excessive disturbance to the as a result of human or animal activity. **Conservation Objective for Feature 8: Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • Each of the lakes has a macrophyte flora which includes some of the characteristic species such as *Littorella uniflora, Lobelia dortmanna, Isoetes lacustris, Myriophorum alterniflorum, Juncus bulbosus, Potamogeton* species and *Subularia aquatica* • The lakes which have not been dammed for use as reservoirs retain a natural profile.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• All of the lakes show a characteristic vegetation zonation from the shore to the deeper water. • Water quality of each lake is within parameters which are suitable to support the characteristic flora and fauna. **Conservation Objective for Feature 9: North Atlantic wet heaths with *Erica tetralix*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature must be stable or increasing in the long term. • The habitat will typically comprise *Erica tetralix* and *Calluna vulgaris* and mosses on a wet peaty substrate with a range of small flowering plants such as bog asphodel *Narthecium ossifragum*, milkwort *Polygala serpyllifolia*, Common butterwort *Pinguicula vulgaris*, small sedges and round leaved sundew *Drosera rotundifolia.* **Conservation Objective for Feature 10: European dry heath** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature must be stable or increasing in the long term.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The habitat will be dominated by at least two dwarf shrub species, usually heather *Calluna vulgaris* and bilberry *Vaccinium mytillus*, but sometimes western gorse *Ulex gallii* or crowberry *Empetrum nigrum* may be prominent. • There will be a mixed age range of heath at an appropriate scale which includes stands of young vigorous dwarf shrubs, mature stands where the heather is becoming senescent, and all age ranges in between. • The heath shrubs will not exhibit forms characteristic of overgrazing. • There will be no signs of frequent burning nor reversion to grassland. • All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 11: Blanket bog** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The extent of this habitat should be of the order of 1342 ha (as notified on the N2K data form). This figure however includes a considerable amount of degraded blanket bog. At present it is unknown how much of this is capable of restoration to good quality blanket bog habitat. • The good quality blanket bog will support typical species e.g. oligotrophic *Sphagnum* spp., cotton	

grass *Eriophourm* spp, ling *Calluna vulgaris*, bell heather *Erica cinerea*, crowberry *Empetrum nigrum*, cow berry *Vaccinium vitis-idaea*, and cranberry *Vaccinium oxycoccus*.

- The intact habitat will not show any signs of degradation as a result of overgrazing, drainage, or burning, such as depletion of dwarf shrubs and sphagna with increased grass cover.
- The degraded habitat will not show any recent signs of further degradation as a result of overgrazing, drainage or burning.
- All factors affecting the achievement of these conditions are under control.

Conservation Objective for Feature 12: Depressions on peat substrates of the *Rhynchosporion*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The extent has not been fully measured because the nature of the habitat is small scale and patchy within mosaics of blanket bog and wet heath. However the extent should be at least that which has been mapped.
- The habitat, characterised by white beak sedge *Rhynchospora alba* will support a range of plant species such as bog pimpernel *Anagallis tenella*, ling *Calluna vulgaris*, round leaved sundew *Drosera rotundifolia*, cross-leaved heath *Erica tetralix*,

Habitats site	Conservation objectives	Pressures and threats to site integrity
	cottongrass *Eriophorum angustifolium*, marsh St John's wort *Hypericum elodes*, purple moor grass *Molinia caerulea*, bog asphodel *Narthecium ossifragum*, bog pondweed *Potamogeton polygonifolius*, *Sphagnum* spp., and short sedges. • There will be no signs of excessive grazing which would result in large areas of bare peat and possibly significant cover of rushes *Juncus* spp. • Drainage or burning would damage this habitat and neither activity should be consented where this habitat could potentially be affected. • At Cwmffynnon and other small areas in the Glyderau, the habitat supports the uncommon species, marsh clubmoss *Lycopodiella inundata*. Here we would expect to see frequent small patches of bare peat which support the species. Many of these areas may be caused by vigorous flushing of water rather than by grazing animals. **Conservation Objective for Feature 13: Species-rich *Nardus* grassland on siliceous substrates in mountain areas** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The extent will be at least 10 hectares of the habitat to include 5 ha on the slopes above LlynLlydaw. • The grassland will support a range of plant species such as Harebell *Campanula rotundifolia*, Eyebright	

Euphrasia spp. Devilsbit scabious *Succisa pratensis*, Wild thyme *Thymus polytrichus,* Heath speedwell *Veronica officinalis*, Spring sedge *Carex caryophyllea*, Flea sedge *Carex pulicaris*, Carnation sedge *Carex panicea*, Lady’s mantle *Alchemila glabr*.

- There will not be any significant cover of invasive species. New Zealand willowherb, *Epilobium brunnescens* is a long established alien plant on the site and is accepted at present as it doesn’t appear to adversely affect the feature. (At present CCW has no knowledge of any means of reducing or eliminating it)

Conservation Objective for Feature 14: Old sessile oakwoods with *Ilex* and *Blechnum*

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- The extent is increasing.
- The woodland comprises locally native canopy forming trees including: *Quercus petraea, Betula pubescens, B. pendula, Fraxinus excelsior* and *Sorbus aucuparia.*
- There is a mixed age structure within the woodland.
- Regeneration is occurring and sufficient seedlings can grow on to saplings and ultimately canopy trees.
- There are no significant alien species.

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Feature 15: Petrifying springs with tufa formation (*Cratoneuron*) The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • This feature on Eryri does not form tufa but should display a dominant cover of mosses such as *Cratoneuron communatum, Philonotis fontana* and *Bryum pseudotriquetrum* with frequent characteristic forbs such as *Montia fontana, Chrysosplenium oppositifolium* and *Saxifraga stellaris.* • There are no significant increases in grass or rush cover **Conservation Objective for Feature 16: Alkaline fens** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • *The* habitat consists of flushes, influenced by some base-enrichment, where brown mosses (such as *Scorpidium scorpioides, Cratoneuron commutatum* and *Drepanocladus revolvens*) are present. Small sedge species *such as Carex viridula, C. panicea, C. dioica C. pulicaris and Eriophorum* spp will be present and usually also *Pinguicula vulgaris.* **Conservation Objective for Feature 17: Alpine pioneer formations of the *Caricion bicoloris-atrofuscae***	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The feature consists of base rich flushes at high altitude which are flushed continuously with cold water. • This habitat should have a high bryophyte cover and support arctic alpines such as *Saxifraga oppositifolia, S. stellaris* and *Thalictrum alpinum*. *Juncus triglumis* should be present and sedges such as *Carex viridula.* • There should be no non-native species. • The flowering plants should be able to flower and set seed unhindered by grazing **Conservation Objective for Feature 18: Floating water plantain *Luronium natans*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • *Luronium natans* occurs in Llyn Cwmffynnon as a minimum **Conservation Objective for Feature 19: Slender green feather-moss *Drepanocladus (Hamatocaulis) vernicosus*** The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The moss is present at Cwm Afon Llafar Flush A and Flush B. • The associated vegetation should be dominated by rushes and sedges, with <20% rush cover. • There should be less than 10% disturbed bare ground within the flushes.	
Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **<u>Habitat Features</u>** **1. Range** - The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing. For the **intertidal mudflats and sandflats** feature these include: • Muddy gravel communities • Dwarf eelgrass, *Zostera noltei* beds • Sediment communities at Traeth Lafan For the **reef** feature these include:	The following threats/pressures to the integrity of the Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC have been identified in Natural Resources Wales Conservation Advice document:[15] • Docks, marinas & shipping • Civil engineering • Waste disposal • Exploitation of living resources • Cultivation of living resources • Exploitation of non-living resources • Pollution response • Recreation • Military activities Miscellaneous operations and uses

[15] https://naturalresources.wales/media/673892/Y%20Fenai%20a%20Bay%20Conwy%20R33%20Advice%20Feb%202009%20English.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• Reef communities in high energy wave-sheltered, tide-swept conditions • Under-boulder, overhang and crevice communities • Limestone reef communities • Clay outcrop reef communities For the **large shallow bay** feature these include: • Organically enriched muddy sediment areas **2. Structure and function** - The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded. Important elements include: • geology, • sedimentology, • geomorphology, • hydrography and meteorology, • water and sediment chemistry, • biological interactions. This includes a need for nutrient levels in the water column and sediments to be: • at or below existing statutory guideline concentrations • within ranges that are not potentially detrimental to the long-term maintenance of the features species populations, their abundance and range.	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Contaminant levels in the water column and sediments derived from human activity to be: • at or below existing statutory guideline concentrations • below levels that would potentially result in increase in contaminant concentrations within sediments or biota • below levels potentially detrimental to the long-term maintenance of the features species populations, their abundance or range. **3. Typical species** - The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded. Important elements include: • species richness: • population structure and dynamics, • physiological heath, • reproductive capacity • recruitment, • mobility • range As part of this objective populations of typical species subject to existing commercial fisheries need to be at an abundance equal to or greater than that required to achieve	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	maximum sustainable yield and secure in the long term the management and control of activities or operations likely to adversely affect the habitat feature, is appropriate for maintaining it in favourable condition and is secure in the long term.	
Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC	To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status. **Conservation Objective for Feature 1: Embryonic shifting dunes:** • There shall be no decrease in the total (aggregate) area of dune habitats for which this site was designated (i.e., the sum total of 675 Ha of dune habitat should not diminish). The extent and location of embryonic shifting dune features may be subject to periodic and seasonal variation. • Embryonic shifting dunes should be evident along the beach in late summer wherever sediment accretion and organic strandline material permits. • The typical dune zonation, from beach (through embryonic shifting dunes, white dunes, dune slacks) to fixed dune, shall be intact along 95% of the soft coastal frontage. There should be active erosion and	The following threats/pressures to the integrity of the Y Twyni o Abermenai i Aberffraw/Abermenai to Aberffraw Dunes SAC have been identified in Natural Resources Wales Conservation Advice document.[16] **Embryonic shifting dunes:** • Sediment and strand-line supply • Disturbance - Periodic disturbance to the vegetation such as fire, storm, trampling or grazing is required to initiate dune mobility. **Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"):** • Sediment and strand-line supply • Disturbance - Periodic disturbance to the vegetation such as fire, storm, trampling or grazing is required to initiate dune mobility

[16] https://naturalresources.wales/media/670652/abermenai-to-aberffraw-dunes-wes32-plan.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	deposition of the embryonic shifting dunes with at least 50% bare sand on these foredunes. • The strandline and embryonic dune vegetation should be made up of the typical species listed below. *Cakile maritima, Honkenya peploides, Salsola kali, Atriplex* spp., *Beta vulgaris, Matricaria matricoides, Elytrigia juncea (Elymus farctus), Leymus arenarius, Festuca rubra, Sonchus asper* • This feature requires a supply of sediment, opportunity for aeolian transport and naturally occurring organic strandline material. Sediment supply and mobility shall be maintained. Man-made obstructions shall be absent. A regular deposit of strandline organic material is required to initiate development. All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes"):** • There shall be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e., the sum *total* of 675 Ha of qualifying dune habitat should not diminish). The extent and location of individual dune habitat features may be subject to periodic and seasonal variation. Shifting dunes should ideally be 30% of the total dune habitat and not less than 15%. The distribution of shifting dunes with *Ammophila arenaria* within the site	**Fixed dunes with herbaceous vegetation (`grey dunes`)* (Habitats Directive priority feature):** • Undergrazing **Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae* and Humid dune slacks):** • Lowering of the water table at both sub-sites and consequential succession to drier vegetation. • Climate change. • Undergrazing **Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation:** • Eutrophication • Livestock access • Introduction of alien species • Water levels **Petalwort *Petallophyllum ralfsii:*** • *Groundwater* levels and quality **Shore dock *Rumex rupestris:*** • Scrub encroachment

Habitats site	Conservation objectives	Pressures and threats to site integrity
	may vary in response to dynamic processes and changes to other qualifying dune habitats for the site. • The typical dune zonation, including shifting dunes with *Ammophila arenaria*, from beach to fixed dune shall be intact along 95% of the soft coastal frontage. Bare sand should be present over at least 20% of the shifting dune habitat. This should include at least "occasional" active blow-outs and mobile sands. Active mechanical intervention may be appropriate to mobilise sand. Invasive species, especially Sea Buckthorn (*Hippophae rhamnoides*) Traveller's joy (*Clematis vitalba*) and Japanese rose (*Rosa rugosa*) should be rare or absent. • The shifting dunes should be vegetated by the typical species listed below. *Ammophila arenaria, Elytrigia juncea (Elymus farctus), Festuca rubra, Senecio jacobaea, Hypochoeris radicata, Carex arenaria, Eryngium maritimum, Euphorbia portlandica*, *Calystegia soldanella, Euphorbia paralias, Phleum arenarium.* There should be regular occurrence of: *Hypocaccus rugiceps, Broscus cephalotes, Hypocaccus rugiceps, Hydnobius punctatus, Aegialia arenaria* and *Xanthomus pallidus.* • Sand supply and mobility shall be maintained or restored. Man-made obstructions should be absent. All factors affecting the achievement of these conditions are under control.	• Undergrazing • Water supply and quality • Genetic threat

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Conservation Objective for Feature 3: Fixed dunes with herbaceous vegetation (`grey dunes`)* (Habitats Directive priority feature): • There shall be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e., the sum total of 675 Ha of qualifying dune habitat should not diminish). The extent and location of individual dune habitat features may be subject to periodic variation in response to dynamic processes and changes to other qualifying dune habitats for the site. The extent of fixed dune grassland habitat feature should not fall below 40% of total dune area (circa 58% in 2021). • The fixed dunes element of the typical zonation from beach to fixed dune shall be intact along 95% of the soft coastal frontage. Bare ground should be present over 5-15% of the fixed dune habitat comprising small blowouts and erosion scars. All successional stages of fixed dune grassland should be present, from early semi-fixed dune grassland to scattered scrub (no more than 5% cover) and dune heath where conditions allow. • The typical species of the fixed dune vegetation include *Aira praecox, Anacamptis pyramidalis, Carex arenaria, Carex flacca, Cerastium fontanum, Crepis capillaris, Cladonia spp., Erodium cicutarium, Euphrasia officinalis, Festuca rubra, Galium verum, Geranium molle, Hypnum cupressiforme, Hypochaeris radicata, Linum catharticum, Lotus corniculatus, Luzula campestris, Odontites verna, Ononis repens, Peltigera spp., Pilosella officinarum,*	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	Plantago lanceolata, Prunella vulgaris, Rhinanthus minor, Rhytidiadelphus squarrosus, R triquetrus, Sedum acre, Syntrichia (Tortula) ruralis spp. Ruraliformis, Thymus polytrichus, Veronica chamaedrys, Viola canina, V. riviniana and *V. tricolor.* Skylark *Alauda arvensis* should breed regularly in each main fixed dune grassland block. Viable populations of vernal bee *Colletes cunicularis* should be present on semi-fixed dunes at Tywyn Aberffraw. • Appropriate levels of grazing by livestock and/or rabbits should be maintained. Water levels should be appropriate and generally >50 cm below ground surface. Invasive species (e.g. *Hippophae rhamnoides* and *Rosa rugosa*) should be rare or absent. Active mechanical intervention may be needed to create bare mobile sand. **Conservation Objective for Feature 4 & 5: Dunes with *Salix repens* ssp. *argentea* (*Salicion arenariae* and Humid dune slacks):** • There shall be no decrease in the total (aggregate) area of qualifying dune habitats for which this site was designated (i.e. the sum total of 675 Ha of qualifying dune habitat should not diminish). The extent of individual dune habitat features may be subject to periodic variation due to dynamic processes. There should be no long-term loss of extent of these features (currently registered as 25% of total dune habitat on Abermenai to Aberffraw dunes SAC). The distribution of humid dune slacks and dunes with *Salix repens* ssp *argentea* should be	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	consistent with the typical pattern of dune zonation. The location of humid dune slacks and dunes with *Salix repens* ssp *argentea* within the site may vary periodically in response to dynamic processes and changes to other qualifying dune habitats for the site. • All successional stages of Humid dune slacks and Dunes with *Salix repens* shall be present, with >10% of each overall. **Embryo dune slacks** are defined as damp areas of bare sand with very sparse vegetation within the immediate area of an active blowout. *Salix repens* may occur in distinct clonal patches. **Successionally young dune slacks** habitat typically comprises a small amount of open ground with several pioneer dune slack species present including variegated horsetail *Equisetum variegatum*, brookweed *Samolus valerandi* and small-fruited yellow sedge *Carex viridula*. In optimum habitat, thalloid liverworts should also be present. **Mature dune slacks** form closed vegetation communities. *Salix repens* is generally present, sometimes abundant and canopy forming with a dense cover of bryophytes including *Calliergon cuspidatum* and *Pseudocalliergon lycopodiodes.* Where there appears to be an imbalance towards more mature stages of dune succession, management interventions are likely to be required to create or promote earlier successional dune slack stages. • Populations of the habitat's typical species must be being maintained or where appropriate increasing - *Agrostis stolonifera, Anagallis tenella, Calliergon cuspidatum, Carex arenaria, Carex flacca, Carex*	

nigra, Epipactis leptochila spp dunensis, Equisetum variegatum, Filipendula ulmaria, Galium palustre, Galium verum, Hydrocotyle vulgaris, Iris pseudacorus, Juncus acutus, Juncus articulatus, Juncus conglomeratus, Lotu corniculatus, Mentha aquatica, Myosotis scorpioides, Ononis repens, Petalophyllum rafsii, Potentilla anserina, Potentilla palustris, Ranunculus flammula, Sagina nodosa, Salix repens, Veronica scutellata, Petalwort *Petalophyllum rafsii* should occur in embryo and successionally young dune slacks at AberffraW. *Bryum callophyllum, B warneum, Meesia uliginosa* and *Southbya tophacea* should be present at Tywyn Aberffraw. The typical dune Coleoptera *Dyschirius politus, Bembidion pallidipenne, Bledius subniger, Gabrius osseticus, Dryops nitidulus* should be present.

- Opportunities for the initiation of embryonic dune slacks by wind erosion (such as bare erosion scars) should exist. The groundwater level should be appropriate in winter (<50 cm below surface) and summer. (50 to 130 cm below surface depending on slack type). Different slack communities have different hydrological requirements, wetter dune slack communities have prolonged surface water in winter. Groundwater quality should be unaffected by pollution.

Conservation Objective for Feature 6: Natural eutrophic lakes with *Magnopotamion* or *Hydrocharition*-type vegetation:

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• The extent (area) of the habitat shall be at least 30ha, except if reduced by natural succession to swamp or bog. The distribution of the lakes reflects their physiographic status as dune-dammed lakes of shallow valleys; Llyn Coron and Llyn Rhos-ddu. • Water quality should be characteristic of maritime, high alkalinity shallow lakes, such as to maintain pH 7-9, alkalinity 1500-2500µeq/l, dissolved oxygen and annual geometric mean Total Phosphorus ≤35µg/l. Nitrogen N 90%ile <1.5mg/l. No significant cyanobacteria blooms. Chlorophyll α values should be low, and sufficient to allow both lakes to be passed as 'Good' or better for a 'high alkalinity shallow lake' using Water Framework Directive classification methods. • Populations of the habitat's typical species must be being maintained or where appropriate increasing. Invasive or disruptive species such as *Crassula helmsii, Impatiens glandulifera* or coarse fish (especially bream, carp) or rainbow trout should be rare or absent. Other invasive non-native species (e.g. *Elodea nutalii*) should be no more than "occasional" in abundance. • Appropriate water level should be maintained throughout the year, (seasonal fluctuation +/- 30cm). The catchment of the lakes continues to provide adequate quality and quantity of water. There should be adequate stream spawning grounds connected to Llyn Coron to maintain native brown trout within the	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	catchment. All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 8: Petalwort *Petallophyllum ralfsii*:** • The population of petalwort shall be stable or increasing. • Petalwort shall occur in humid dune slacks (in which *Equisetum variegatum* or *Anagallis tenella* are frequent). • Early successional Humid dune slacks with bare sand or humus crust and short vegetation characterised by *Equisetum variegatum* should be present. • New embryonic dune slacks should be developing. The water table should be free to fluctuate with seasonal changes in rainfall and water quality should be appropriate for humid dune slacks. Competition (including shading) from other species should be controlled by light grazing and by periodic winter flooding. All factors affecting the achievement of these conditions should be under control. **Conservation Objective for Feature 9: Shore dock Rumex rupestris:** • The population of shore dock should be viable and dynamic, colonising new sites and periodically achieving high seed-outputs (over 500 fruiting plants).	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	• Shore dock occurs across the site as a 'meta-population' or series of mobile, self-perpetuating colonies, intermittently linked by dispersal and/or cross-pollination. • Adequate dynamic habitat (consisting of open streamside, coastal soft cliff seepages, shingle banks or dune slack) is available. Lateral water movement should occur unhindered to allow connectivity of the populations with the open coastline. Bare ground or disturbed areas (e.g. poaching by grazing animals, trampling or coastal erosion) are available to permit germination. • Competition (including shading) from other species, especially trees, does not threaten the colonies. Selective tree removal and grazing (in key stream corridors and fossil slacks) occurs to restore both open habitat and hydrology to allow population increase. Overshading must be avoided and over-deepened streams restored. Adequate quantity and quality of fresh-water supply is maintained. Opportunities occur for dispersal of seed to suitable habitat within and beyond the SAC. The threat of hybridization with other *Rumex* spp is minimised (absence of *R conglomeratus, R obtusifolius, R. crispus*). All factors affecting the achievement of these conditions are under control.	
Traeth Lafan/Lavan Sands, Conway Bay SPA	**Conservation Objective for Feature 1: Oystercatcher (*Haematopus ostralegus*)**	The following threats/pressures to the integrity of the Traeth Lafan/Lavan Sands, Conway Bay SPA have been identified in Natural Resources Wales

Habitats site	Conservation objectives	Pressures and threats to site integrity
	The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The 5 year mean peak of the number of wintering oystercatchers is at least 4,000. • The abundance and distribution of cockles of 15 mm or larger and other suitable food are maintained at levels sufficient to support the population with a 5 year mean peak of 4,000 individuals. • Oystercatchers are not disturbed in ways that prevent them spending enough time feeding for survival. • Roost sites, including high tide roost sites, remain suitable for oystercatchers to roost undisturbed. • The management and control of activities or operations likely to adversely affect the oystercatchers, is appropriate for maintaining the feature in favourable condition and is secure in the long term.	Conservation Advice document.[17] These are only listed for Feature 1. **Oystercatcher *Haematopus ostralegus:*** • Human disturbance associated with the cockle fishery • Recreational disturbance • Undergrazing
Llyn Idwal Ramsar	The Information Sheet on Ramsar Wetlands[18] does not specify any conservation objectives for this site.	The Information Sheet on Ramsar Wetlands does not specify any factors (past, present or potential) adversely affecting the site's ecological character.
Coedydd Aber SAC	**Conservation Objective for Feature 1: Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles**	The following threats/pressures to the integrity of the Coedydd Aber SAC have been identified in

[17] https://naturalresources.wales/media/674184/Traeth%20Lafan%20SAC%20Plan%2021%5B1%5D.4.08%20English.pdf

[18] https://jncc.gov.uk/jncc-assets/RIS/UK14007.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied: • The woodland is maintained as far as possible by natural processes. • The location of open glades or gaps varies over time. • Trees and shrubs are locally native, and neither beech nor conifers are dominant anywhere in the canopy or understorey. • Trees and shrubs of a wide range of ages and sizes are present. • Tree seedlings are plentiful throughout the site and where occurring in open glades develop into viable saplings. • Field and ground layers are a patchwork of various vegetation communities characteristic of local soil and humidity conditions. • There are abundant dead and dying trees (with holes and hollows, rot columns, torn off limbs and rotten branches) with associated dead wood dependent species present. • Humidity levels are high enough to favour the presence of ferns, mosses and liverworts. • The woodland continues to support populations of birds and mammals.	Natural Resources Wales Conservation Advice document[19] **Old sessile oak woods with *Ilex* and *Blechnum* in the British Isles:** • Livestock grazing • Invasive species **Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno – Padion, Alnion incanae, Salicion albae*):** • Livestock grazing • Water quality • Water quantity

[19] https://naturalresources.wales/media/671399/Coedydd%20Aber%20WES32%20plan.pdf

Habitats site	Conservation objectives	Pressures and threats to site integrity
	- All factors affecting the achievement of these conditions are under control. **Conservation Objective for Feature 2: Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno – Padion, Alnion incanae, Salicion albae*)** The vision for this feature is for it to be in favourable conservation status, where all of the following conditions are satisfied: - The woodland is maintained as far as possible by natural processes. - The trees and shrubs will be locally native broadleaved species with alder dominating the canopy. - The sparse shrub layer will comprise a scattering of hazel, willow and rowan. - Seedlings will be relatively sparse throughout the site with only a few native seedlings from non-self coppicing trees developing into saplings. - The majority of regeneration will be from the base of the alders by means of self-coppicing. - There will be abundant dead and dying trees with holes and hollows, rot columns, torn off limbs and rotten branches throughout the woodland. Dead wood, both standing and fallen, will be retained to provide habitats for other species. - Veteran trees will be favoured during any silvicultural management because they support a wide variety of	

Habitats site	Conservation objectives	Pressures and threats to site integrity
	species, including lichens. Old forest lichen species will be found throughout the sites, especially on well-lit trees around woodland edges and glades. • All factors affecting the achievement of these conditions are under control.	

7.4.A Screening for In-Combination Effects

1. Screening for In-Combination Effects

1.1.1 Table **1-1** and Table **1-2** identify the sensitive receptors from **Volume 2: Pentir Substation, Volume 3: Bryncir, Volume 4: Glaslyn Cables, Volume 5: Trawsfynydd Substation** and **Volume 6: Wider Works** that are exposed to residual effects with a significance of minor/slight, moderate or major. Sensitive receptors that have the potential for in-combination effects (where two or more topics effect the same receptor) have been taken forward into stage 2 of the assessment.

1.1.2 The relevant volumes are defined below:

- P = Volume 2, Pentir Substation.
- B = Volume 3, Bryncir.
- G = Volume 4, Glaslyn Cables.
- T = Volume 5, Trawsfynydd Substation.
- W = Volume 6, Wider Works.

Table 1-1 – Screening of receptors during the construction phase

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Landscape character									
Landscape Character area (LCA) 10 Central Llyn	Landscape and Visual Amenity		X				The presence of construction activity including storage of materials, tall machinery and movement of plant would result in a slight impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area.	Minor adverse	No
LCA 04 Moel Hebog Uplands	Landscape and Visual Amenity		X				Indirect perceptual impacts to the setting of the Eryri National Park LCA 04 Moel Hebog Uplands would be limited and would lead to a very slight alteration to the perceptual qualities of tranquillity from the perception of increased urban influence.	Minor adverse	No
				X			Glaslyn Cables There would be no direct loss or change to landscape elements within this LCA as the proposed works are not located within it. The elevated terrain of this LCA potentially increases the geographical extent, however the large size of the LCA, its intervening mountainous landform and the proposed size and scale of construction operations would result in highly localised indirect impacts to the foothills to the southernmost area of Craig-y-Gesail to Mynydd Gorllwyn.	Minor adverse	
LCA 09 Porthmadog	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity associated with the Glaslyn cables within LCA 09 Porthmadog, would influence a medium area. The presence of construction activity including	Moderate adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							removal of localised areas of vegetation, soil stripping, storage of materials, tall machinery and movement of plant would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area.		
				X			Wern cable sealing ends compound (CSEC) Construction activity would be short term and would temporarily influence a localised part of LCA 09 Porthmadog. Direct impacts during construction would result from a very small change in land use from agricultural land as the Wern CSEC footprint is extended.	Minor adverse	
				X			Minffordd CSEC and THH Activity would represent a partially incongruous activity within this LCA although its proximity to the existing CSEC and the EVIP works at Minffordd would lessen the impact. Direct impacts during construction would result from a small change in land use from agricultural land. The presence of construction activity including storage of materials, tall machinery and movement of plant would result in a slight alteration to the character which would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland.	Minor adverse	
Seascape Character Area (SCA) 20	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity associated with the Glaslyn cables within SCA 20 Porthmadog and Glaslyn Estuary would represent an incongruous activity within the rural land and seascapes. Construction activity would be short-term	Moderate adverse	No

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
Porthmadog and Glaslyn Estuary							with direct impacts resulting from vegetation clearance and the excavation and soil disturbance from Horizontal Directional Drilling (HDD) and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence.		
				X			Wern CSEC Construction activity at Wern CSEC would result in direct impacts on landscape characteristics to SCA 20 Porthmadog and Glaslyn Estuary. Construction activity including storage of materials, tall machinery and movement of plant would result in a very slight alteration to the character of the SCA, that would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland	Minor adverse	
				X			Minffordd CSEC and THH Direct impacts during construction would result from a very small change in land use from agricultural land as the CSEC footprint is constructed. The presence of construction activity including storage of materials, tall machinery and movement of plant would result in a slight alteration to the character which would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland.	Minor adverse	
SCA 21 Dwyryd Estuary and LCA 10 Morfa Harlech	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity associated with the Glaslyn cables within SCA 21 Dwyryd Estuary and Morfa Harlech would	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							represent an incongruous activity within the rural land and seascapes. Construction activity would be short-term with direct impacts resulting from vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the LCA and SCA would result from the loss of tranquillity from the perception of increased urban influence.		
				X			Minffordd CSEC and THH There would be a very limited loss or change to landscape elements in this SCA due in part to the existing works site for the EVIP works. The construction work would lead to a very slight alteration to tranquillity from construction activity including storage of materials, tall machinery and movement of plant. This would result in a slight alteration to the character which would be limited in extent due to the relative containment provided by landform, tall hedgerows and woodland. The proposed works would have some similar characteristics to the EVIP works .	Minor adverse	
SCA 19 Criccieth to Mochhras	Landscape and Visual Amenity			X			Glaslyn Cables There would be no loss or change to landscape elements in this SCA as the main construction works are not in it. The presence of construction activity including, vegetation clearance, excavation and soil disturbance from HDD and open trenching, storage of materials, tall	Minor adverse	No

Receptor	Relevant topic	P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							machinery, temporary scaffolding structures and site facilities would result in in-direct impacts to the SCA, resulting in a small loss of tranquillity and scenic quality that would be of very limited geographical extent.		
Visual amenity									
Viewpoint 1: Garndolbenmaen local road.	Landscape and Visual Amenity		X				Viewpoint 1: Garndolbenmaen local road would experience a significant change in view as a result of the introduction of construction activity.	Moderate adverse	No
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach.	Landscape and Visual Amenity		X				Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground.	Moderate adverse	No
Viewpoint 3: Llanystumdwy No 62 footpath.	Landscape and Visual Amenity		X				Any discernible elements of construction would be limited to tall construction plant in the background above the tree line.	Minor adverse	No
Viewpoint 1: PRoW Dolbenmaen No 107, Ty' n-y-berllan	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the Glaslyn cables route would be visible occupying part of the midground of the view. Views of construction activity would include excavation of soil, tall plant including HDD machinery and temporary structures, and the presence of temporary storage compounds and works buildings.	Minor adverse	No
				X			Wern CSEC	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							Construction on the Wern CSEC would only be intermittently visible as a small-scale addition within a largely unchanged panorama. Visibility of construction activity would be limited to tall plant above the tree line and only for the duration of the construction phase.		
Viewpoint 2: Garth Road, Porthmadog	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the central and eastern end of the Glaslyn cables route would be visible from a distance occupying part of the mid to background of the view. The main focus of visible construction activity would be excavation of soil, tall plant including HDD machinery and temporary structures, and the presence of temporary storage compounds and works buildings.	Minor adverse	No
				X			Minffordd CSEC and THH Construction activities would only be visible as a small-scale addition within a largely unchanged panorama due in part to the EVIP works. Visibility of construction activity would be barely perceptible and limited as a result of intervening vegetation and viewed at a long distance.	Minor adverse	
Viewpoint 3: PRoW Porthmadog No 31, Moel-y-Gest	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the eastern end and central section of the Glaslyn cables route would be visible from above and from a distance occupying part of the middle ground view. The main focus of visible construction activity would be excavation of soil, tall plant including HDD machinery and temporary structures, and	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							the presence of temporary storage compounds and works buildings. The movement of construction workers might add to the perception of development in the vicinity.		
				X			Minffordd CSEC and THH Construction activities would only be intermittently visible as a small-scale addition within a largely unchanged panorama due in part to the EVIP works. Visibility of construction would be limited to tall plant but would be set against the mountainous background.	Minor adverse	
Viewpoint 4: Moel-y-Gest Trig point	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the western end and central section of the Glaslyn cables route would be visible from above and from a distance occupying part of the middle ground view. The main focus of visible construction activity would be excavation of soil, tall plant including HDD machinery and temporary structures, and the presence of temporary storage compounds and works buildings.	Minor adverse	No
				X			Wern CSEC Visibility of construction activity would be barely perceptible and limited as a result of intervening vegetation and viewed at a long distance.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Viewpoint 5: PRoW Porthmadog No 6	Landscape and Visual Amenity			X			Construction activities would only be intermittently visible as a small-scale addition within a largely unchanged panorama. Visibility of construction would be limited to tall plant in the background above the tree line and only for the duration of the construction phase.	Minor adverse	No
Viewpoint 6: Wales Coast Path – The Cob (western end), Porthmadog	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Construction activities would be noticeable in the view, partially mitigated by distance.	Minor adverse	No
Viewpoint 7: Eastbound layby on Porthmadog Bypass	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along the central section of the Glaslyn cables route would be visible in the fore and middle ground of the view. Construction would be substantial within the view, partially mitigated by the temporary and short-term nature of the proposed works but forming an incongruous element.	Minor adverse	No
Viewpoint 8: PRoW Porthmadog No 11	Landscape and Visual Amenity			X			Glaslyn Cables Construction of the Glaslyn cables would be intermittently visible as a small-scale addition within a largely unchanged panorama. Visibility of construction would be limited to tall plant in the middle ground above the intervening hedgerows and tree line and only for the duration of the construction phase, which in this context would be short and reversible. Because of the direction of view, tall plant and structures would break the skyline.	Minor adverse	No

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							Work at ground level would be barely perceptible and when visible would focus on tall plant including HDD machinery and temporary structures, and the presence of temporary storage compounds and works buildings. The movement of construction workers might add to the perception of development in the vicinity. Views for users of the Welsh Highland Heritage Railway would be transient and viewed obliquely and would be most apparent upon approaching the urban edge of Porthmadog.		
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Views to the central section and western end would not be visible due to intervening landform, buildings and vegetation. Construction activities would be noticeable in the view, partially mitigated by distance.	Moderate adverse	No
				X			Wern CSEC Construction activity along parts of the eastern end of the Glaslyn cables route would be barely perceptible in the central background of the view. Views to the central section and western end would not be visible due to intervening landform, buildings and vegetation.	Minor adverse	
				X			Minffordd CSEC and THH	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							Construction activities would only be intermittently visible as a small-scale addition within a largely unchanged panorama due in part to the consented EVIP works. Visibility of construction would be limited to tall plant but would be set against the mountainous background and only for the duration of the construction phase. Views of the proposed works would remain a barely perceptible change in the panorama		
Viewpoint 10: Tan-y-Glannau, Minffordd	Landscape and Visual Amenity			X			Glaslyn Cables Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Views to the central section and western end would not be visible due to intervening landform, buildings and vegetation. Construction would be noticeable within the view, partially mitigated by the temporary and short-term nature of the proposed works, and also the existing works for EVIP but forming an incongruous element.	Moderate adverse	No
				X			Minffordd CSEC and THH Construction activities would be visible as a small-scale addition within a largely unchanged panorama that contains the existing EVIP site. Visibility of construction activity would be visible in the foreground to the right of the view.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Statutory designated sites									
Afon Gwyrfai a Llyn Cwellyn Special Area of Conservation (SAC) and Site of Special Scientific Interest (SSSI)	Ecology and Nature Conservation					X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
						X	Disturbance to associated species through noise, lighting, or visual disturbance.	Minor adverse	
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation.	Minor adverse	Yes
				X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
				X		X	Injury or mortality of associated species.	Minor adverse	
				X		X	Disturbance to associated species through noise, lighting, or visual disturbance.	Minor adverse	
	Water Quality, Resources and Flood Risk			X			Reduction of water availability to support existing groundwater or surface water designated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							breakout and leakage of bentonite during trenchless crossing.		
Corsydd Eifionydd/ Eifionydd Fens SAC	Ecology and Nature Conservation		X			X	Loss of functionally linked habitat for marsh fritillary (*Euphydryas aurinia*).	Minor adverse	No
						X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Pen Llyn a'r Sarnau/ Lleyn Peninsula and Sarnau SAC	Ecology and Nature Conservation			X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
				X			Injury or mortality of associated species.	Minor adverse	
			X	X		X	Disturbance to associated species through noise, lighting or visual disturbance.	Minor adverse	
Morfa Harlech a Morfa Dyffryn SAC Morfa Harlech SSSI and National nature Reserve (NNR)	Ecology and Nature Conservation			X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
				X			Injury or mortality of associated species.	Minor adverse	
				X		X	Disturbance to associated species through noise, lighting or visual disturbance.	Minor adverse	
Glynllifon SAC and SSSI Coedydd Dyffryn Ffestiniog (Gogleddol) SSSI	Ecology and Nature Conservation					X	Temporary disturbance to qualifying species of the (lesser horseshoe bat (*Rhinolophus hipposideros*) through noise, visual disturbance or lighting.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Dolorgan Barn SSSI									
Migneint-Arenig-Dduallt Special Protection Area (SPA) and SSSI Eryri SSSI	Ecology and Nature Conservation					X	Temporary disturbance to qualifying species (hen harrier (*Circus cyaneus*), chough (*Pyrrhocorax pyrrhocorax*), merlin (*Falco columbarius*), peregrine (*Falco peregrinus*)) through noise or visual disturbance.	Minor adverse	No
Northern Cardigan Bay/ Gogledd Bae Ceredigion SPA	Ecology and Nature Conservation			X			Indirect degradation impacts on the habitats and species associated with the SPA due to runoff during construction or other waterborne pollution or to construction dust.	Minor adverse	No
Afon Ddu SSSI	Ecology and Nature Conservation			X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
				X		X	Injury or mortality of associated species (freshwater pearl mussel (*Margaritifera margaritifera*), salmon (*Salmo salar*) and sea-trout (*Salmo trutta trutta*)) through impacts to water quality.	Minor adverse	
				X			Disturbance to associated species through noise, lighting or visual disturbance.	Minor adverse	
Coedydd De Dyffryn Maentwrog SSSI, Ceunant Llennyrch NNR	Ecology and Nature Conservation					X	Habitat loss or fragmentation.	Minor adverse	No
						X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
						X	Injury or mortality of associated species.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
						X	Disturbance to associated species through noise, lighting, or visual disturbance.	Minor adverse	
Cors Gyfelog SSSI and NNR	Ecology and Nature Conservation					X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
						X	Disturbance to associated species through noise, lighting, or visual disturbance.	Minor adverse	
Glaslyn SSSI	Ecology and Nature Conservation			X			Temporary and permanent habitat loss.	Minor adverse	Yes
				X			Habitat degradation – impacts to water quality through pollution and construction run off (sediment) and air quality from construction dust.	Minor adverse	
				X			**Injury or mortality of associated species.**	Minor adverse	
				X			Disturbance to cited species (such as otter (*Lutra lutra*) and bats) through noise, lighting or visual disturbance.	Minor adverse	
	Water Quality, Resources and Flood Risk			X			Reduction of water availability to support existing groundwater or surface water designated, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Minor adverse	
Llyn Padarn SSSI	Ecology and Nature Conservation					X	Temporary disturbance to qualifying species of the (freshwater pearl mussel, salmon and sea-trout) through impacts to water quality.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Llystan Isaf SSSI Pant Cae Haidd SSSI	Ecology and Nature Conservation					X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Tiroedd a Glannau Rhwng Cricieth ac Afon Glaslyn SSSI Pen y Banc Local Nature Reserve (LNR)	Ecology and Nature Conservation			X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
				X			Injury or mortality of associated species.	Minor adverse	
				X			Disturbance to associated species through noise, lighting or visual disturbance.	Minor adverse	
Traeth Glaslyn North Wales Wildlife Trust (NWWT) Reserve	Ecology and Nature Conservation			X			Temporary and permanent habitat loss.	Minor adverse	No
				X			Habitat degradation – impacts to water quality through pollution and construction run off (sediment) and air quality from construction dust.	Minor adverse	
				X			Injury or mortality of associated species.	Minor adverse	
				X			Disturbance to cited species (such as otter and bats) through noise, lighting or visual disturbance.	Minor adverse	
Ysbyty Bron y Garth SSSI	Ecology and Nature Conservation			X			Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
				X			Disturbance to cited species through noise, lighting or visual disturbance.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Water dependant SACs upstream of the Glaslyn works site Coed Tremadog (SAC, SSSI & NNR) Hafod Garregog (SAC, SSSI & NNR)	Water Quality, Resources and Flood Risk			X			Reduction of water availability to support existing groundwater or surface water designated or undesignated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Minor adverse	No
Water dependant SSSIs upstream of the Glaslyn works site Coedydd Beddgelert a Cheunant Aberglaslyn SSSI. Coedydd Nanmor SSSI. Tyn-Llan SSSI.	Water Quality, Resources and Flood Risk			X			Reduction of water availability to support existing groundwater or surface water designated or undesignated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Minor adverse	No
Non-statutory designated sites									
Pentir Substation candidate Wildlife Site (cWS)	Ecology and Nature Conservation	X					Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Near Breaker's Yard cWS	Ecology and Nature Conservation	X					Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Llystyn Isaf cWS	Ecology and Nature Conservation		X				Temporary habitat disturbance and loss.	Minor adverse	No
Tyddyn y Felin cWS	Ecology and Nature Conservation		X				Temporary habitat disturbance and loss.	Minor adverse	No
All Wildlife Sites (WS)/ cWS within 50 metres (m) of the Glaslyn works site or hydrologically linked to the Glaslyn works site	Ecology and Nature Conservation			X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Afon Dwyfach cWS Afon Rhythallt Mosaic cWS Below Bron Haul cWS Bont y Chrychddwr cWS	Ecology and Nature Conservation					X	Temporary habitat disturbance and loss.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Braich-y-saint cWS Bryncir cWS Bryn-ychain cWS Cae Haidd cWS Carmel cWS Coed Bryn-twr / Wern cWS Coed yr Eglwys cWS Derwin cWS Dolwar Heath cWS Dol-wenith cWS Ffynnon Beuno cWS Glanrafon Bach cWS Glan-yr-afon cWS Gwernddwyryd cWS Hafod-rhug isaf cWS Llecheiddior Ganol cWS Llystan Isaf cWS									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Moel Bron-y-rhiw (West) cWS									
North of Caerau cWS									
Tan y Coed Terrace cWS									
Ty'n-y-berllan cWS									
Westbank if Afon Dwyfor cWS									
Ymwlch Fawr cWS									
Ynys-ddu cWS									
Ystumcegid-isaf cWS									
Habitats									
Ancient Woodland	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation.	Minor adverse	No
		X		X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Ancient and veteran trees	Ecology and Nature Conservation		X			X	Habitat loss or degradation.	Minor adverse	No
			X	X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Coastal Floodplain grazing marsh Habitat of Principal Importance (HoPI)	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation.	Minor adverse	No
				X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Lowland fen and reedbed HoPI	Ecology and Nature Conservation			X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Saltmarsh HoPI	Ecology and Nature Conservation			X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Lowland dry acid grassland HoPI	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation.	Minor adverse	No
				X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Purple moor grass and rush pasture HoPI	Ecology and Nature Conservation		X	X		X	Habitat loss or fragmentation.	Minor adverse	No
				X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Traditional orchard HoPI	Ecology and Nature Conservation			X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Semi-natural woodland (broad-leaved) (HoPI and non-HoPI)	Ecology and Nature Conservation		X	X		X	Habitat loss or fragmentation.	Minor adverse	No
		X	X	X		X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Semi-natural woodland (mixed) (HoPI and non-HoPI)	Ecology and Nature Conservation	X	X			X	Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Planted broadleaved	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation	Minor adverse	No
		X		X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Planted mixed woodland	Ecology and Nature Conservation			X			Habitat loss and fragmentation	Minor adverse	No
		X		X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
				X		X	Habitat loss or fragmentation.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Semi-improved neutral grassland	Ecology and Nature Conservation			X		X	Habitat degradation- impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Marshy grassland	Ecology and Nature Conservation		X	X			Habitat loss or fragmentation.	Minor adverse	No
			X	X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Marginal and Inundation vegetation – marginal vegetation	Ecology and Nature Conservation			X			Habitat loss or fragmentation.	Minor adverse	No
				X			Habitat degradation - impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
Standing water	Ecology and Nature Conservation					X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
Running water	Ecology and Nature Conservation			X		X	Habitat loss or fragmentation.	Minor adverse	No
		X		X		X	Habitat degradation due to construction pollution or siltation.	Minor adverse	
Hedgerows	Ecology and Nature Conservation		X			X	Habitat loss or fragmentation.	Minor adverse	No
			X	X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
				X			Temporary and permanent habitat loss. Hedgerows will be enhanced where possible and with landowner permission.	Minor beneficial	
All habitats	Ecology and Nature Conservation		X	X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	No
			X	X		X	Introduction or spread of Invasive Non-Native Species (INNS) through vehicles, machinery or people.	Minor adverse	
Protected and notable species									
Small pearl-bordered fritillary butterfly (*Boloria selene*) and marsh fritillary butterfly	Ecology and Nature Conservation		X			X	Temporary habitat loss and disturbance of habitat, potentially used by terrestrial invertebrates resulting in species mortality.	Minor adverse	No
						X	Habitat degradation due to dust and other pollutants.	Minor adverse	
Breeding and non-breeding birds	Ecology and Nature Conservation			X		X	Loss and fragmentation of habitats used by breeding and non-breeding birds, resulting in species mortality.	Minor adverse	No
						X	Direct loss of nests and young through tree and vegetation removal or reduction, which could result in injuring or killing birds.	Minor adverse	
		X		X		X	Noise or visual disturbance.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
						X	Temporary noise and visual disturbance to nesting WCA Schedule 1 birds such as peregrine.	Minor adverse	
Bats	Ecology and Nature Conservation	X	X	X	X	X	Disturbance to roosting bats due to construction noise or lighting.	Minor adverse	No
			X			X	Temporary loss or severance of foraging or commuting habitat.	Minor adverse	
						X	Direct loss of roosts through tree removal, which could result in injuring or killing bats.	Minor adverse	
Badger (*Meles meles*)	Ecology and Nature Conservation			X		X	Damage or disturbance (construction noise, vibration or lighting) to active badger setts which could result in injuring or killing badgers.	Minor adverse	No
				X		X	Habitat loss or fragmentation.	Minor adverse	
Great crested newt (*Triturus cristatus*)	Ecology and Nature Conservation					X	Loss or fragmentation of terrestrial and aquatic habitats used by great crested newts for foraging, breeding, or shelter.	Minor adverse	No
						X	Incidental killing, injury or disturbance of great crested newts present in habitats on site.	Minor adverse	
Otter	Ecology and Nature Conservation	X	X	X		X	Disturbance to commuting, resting or foraging otter through construction noise, visual, or lighting.	Minor adverse	No
				X		X	Habitat loss or degradation where the proposed works cross or lie near to watercourses.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
				X		X	Habitat degradation impacts to water quality through pollution of watercourses.	Minor adverse	
Water vole (*Arvicola amphibius*)	Ecology and Nature Conservation					X	Disturbance to commuting, foraging or resting water vole through noise, lighting or visual disturbance in or near to watercourses.	Minor adverse	No
						X	Habitat degradation impacts to water quality through pollution of watercourses.	Minor adverse	
Reptiles	Ecology and Nature Conservation			X		X	Incidental killing, injury or disturbance of reptiles present in habitats on site.	Minor adverse	
				X		X	Loss or fragmentation of terrestrial and aquatic habitats used by reptiles for foraging, breeding, or shelter.	Minor adverse	
Other mammals (hedgehog, brown hare, harvest mouse and polecat) and common amphibians	Ecology and Nature Conservation			X		X	Incidental killing, injury or disturbance.	Minor adverse	No
				X		X	Habitat loss or fragmentation.	Minor adverse	
Notable flora, fungi and lichen	Ecology and Nature Conservation					X	Loss or damage of notable flora, fungi and lichen due to habitat loss.	Minor adverse	No
				X		X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Aquatic species									
Aquatic macroinvertebrates	Ecology and Nature Conservation			X			Habitat degradation and disturbance – impacts to water quality through pollution spills or surface run-off, leading to disturbance or mortality of aquatic species. (Glaslyn – freshwater pearl mussel (*Margaritifera margaritifera)* only).	Minor adverse	No
				X			Direct impact on species assemblage through disturbance and mortality during construction of temporary roads, bridges and culverts (freshwater pearl mussel only)	Minor adverse	
				X			Direct impact on species assemblage through disturbance and mortality during construction of permanent roads, bridges and culverts (freshwater pearl mussel only)	Minor adverse	
							Habitat loss though construction of access roads over watercourses.	Minor adverse (freshwater pearl mussel only)	
Aquatic macrophytes	Ecology and Nature Conservation				X		Habitat degradation and disturbance – impacts to water quality through pollution spills or surface run-off, leading to mortality of aquatic species.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
				X			Direct impact on species assemblage through disturbance and mortality during construction of temporary roads, bridges and culverts (dwarf spikerush only)	Minor adverse	
				X			Direct impact on species assemblage through disturbance and mortality during construction of permanent roads, bridges and culverts (dwarf spikerush only)	Minor adverse	
Fish	Ecology and Nature Conservation	X	X	X	X	X	Habitat degradation and disturbance – impacts to water quality through pollution spills or surface run-off, leading to mortality of aquatic species.	Minor adverse	No
			X	X		X	Disturbance to fish species from construction activities i.e. lighting, noise, vibration, human activity.	Minor adverse	
				X			Direct mortality or disturbance to fish species due to open-trench crossings of watercourses.	Minor adverse	
				X			Direct mortality or disturbance to fish species due to flume pipes or over-pumping of watercourses.	Minor adverse	
				X			Direct mortality or disturbance to fish species due to the temporary culverting of two watercourses.	Minor adverse	
				X			Direct mortality or disturbance to fish species due to culvert installation for permanent watercourse crossings.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
						X	Direct mortality or disturbance to fish species due to the installation and/or updating of watercourse crossings.	Minor adverse	
Designated heritage assets									
Craig-y-Tyddyn Camp (CN046)	Historic Environment		X				Any construction activities will result in minimal change in the ability to appreciate the archaeological value of these scheduled monuments.	Minor adverse	No
Ffestiniog: its Slate Mines and Quarries, 'City of Slates' and Railway to Porthmadog, Component 5 of the Slate Landscape of Northwest Wales World Heritage Site (UNESCO 1633)	Historic Environment			X			These proposed works to replace and install new cabling would also result in temporary visual impacts on the setting of the Ffestiniog Railway due to construction activities.	Minor adverse	No
Roman Bath House, Tremadoc (CN174)	Historic Environment			X			While the site of the Roman bath house is visible from the Glaslyn works site, the Glaslyn works site does not contribute to the understanding of the heritage interests of the asset. The presence of the Tremadog Roundabout has already diminished the setting of the bath house.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19(GWY)) (Grade II*)	Historic Environment			X			There is no visibility between Wern Manor and the proposed works as the building is heavily screened to the north and north-east with mature trees. However, temporary impacts on the setting of these buildings may be encountered by construction activities from noise and vehicular movements.	Moderate adverse	No
The Cob (Cadw 5234) & The Cob (partly in Penrhyndeudraeth) (Cadw 85406) (Grade II*)	Historic Environment			X			The setting of the listed structure would not be altered by the introduction of additional modern industrial infrastructure, with the raising of the EVIP Minffordd tunnel head house to the north-east already partially eroding the wider agricultural setting of Traeth Mawr. The proposed works will have minimal further impact to the erosion of this setting. These changes will not result in any substantive change in the ability to appreciate the heritage value of the asset which is derived from architectural and historic and archaeological interest.	Minor adverse	No
Tan-yr-Allt Registered Park and Garden (Cadw 4432) (Grade II*) (PGW(Gd)18(GWY)) (Grade II)	Historic Environment			X			The proposed works would result in temporary noise and visual impacts such on the setting of the parkland due to construction activities.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Rhos House (Cadw 5205) (Grade II)	Historic Environment			X			Given the proximity to the proposed works, there is also potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site.	Minor adverse	No
Plas Newydd Farmhouse (Cadw 4774) & Former Stable Range at Plas Newydd (Cadw 19800) (Grade II)	Historic Environment			X			Given the proximity to the proposed works, there is also potential for temporary setting changes during construction due to noise and visual impacts from construction activities and machinery in this part of the Glaslyn works site.	Minor adverse	No
Aberglaslyn Registered Historic Landscape HLW (Gw)7	Historic Environment			X			Whilst there will be some alterations and new construction associated with the proposed works, the new additions will be in the immediate environs of existing National Grid infrastructure or infrastructure which is currently undergoing construction. The existing infrastructure has already contributed to the erosion of the local landscape in which the asset lies and the proposed works will have minimal further impact to the erosion of this setting. The removal of the Garth CSEC will have a beneficial impact. These changes will also introduce temporary noise and visual impacts into the setting of the landscape which will temporarily alter the character of the surroundings in which the asset is experienced.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Non-designated heritage assets									
Route of old road, Garn Dolbenmaen (PRN 62168)	Historic Environment		X				The construction of the proposed Bryncir Substation, removal of the existing Tower 4ZC067 and the construction of a replacement tower 80 m north-west along the line would result in physical impacts to archaeological remains of the old road. However, given the limited extent of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Plas-Llecheiddior, Dolbenmaen (PRN 101994)	Historic Environment		X				These farmsteads would experience a permanent change in their settings due to the construction of the proposed Bryncir Substation, an access road and the replacement of the existing Tower 4ZC067 with another tower in its setting.	Minor adverse	No
Hedge-bank, North-East of Wern (PRN 37907)	Historic Environment			X			The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Hedge and Ditch, on Traeth Mawr (PRN 37908)	Historic Environment			X			The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Hedge and Ditch, on Traeth Mawr (PRN 37909)	Historic Environment			X			The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							proposed works in this area, it is unlikely that total loss of this asset will occur.		
Hedge-bank, on Traeth Mawr (PRN 37910)	Historic Environment			X			The proposed works would result in physical impacts to the hedge-bank. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33528)	Historic Environment			X			The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33531)	Historic Environment			X			The proposed works would result in physical impacts to the field boundary However, given the limited extent of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33532)	Historic Environment			X			The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33536)	Historic Environment			X			The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Culvert/Ditch, Porthmadog (PRN 33540)	Historic Environment			X			The proposed works would result in physical impacts to the culvert/ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Revetted Drain, Porthmadog (PRN 33545)	Historic Environment			X			The proposed works would result in physical impacts to the revetted drain. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Culvert/Ditch, Porthmadog (PRN 33548)	Historic Environment			X			The proposed works would result in physical impacts to the ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33550)	Historic Environment			X			The proposed works would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33551)	Historic Environment			X			The removal of the stone wall and vegetation clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Croesor Tramway, remains of,	Historic Environment			X			The removal of vegetation, topsoil and railway line would result in physical impacts to the tramway embankment. However, given the limited width of the proposed works	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Porthmadog (PRN 21174)							in this area, it is unlikely that total loss of this asset will occur.		
Field Boundary, Porthmadog (PRN 33552)	Historic Environment			X			The removal of the fence, vegetation clearance and topsoil clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Culvert/Ditch Portmadog (PRN 33553)	Historic Environment			X			The clearance of vegetation and topsoil, and the construction of an entry point for an access road would result in physical impacts to the culvert/ditch. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Field Boundary, Porthmadog (PRN 33554)	Historic Environment			X			The removal of the fence, vegetation clearance and topsoil clearance would result in physical impacts to the field boundary. However, given the limited width of the proposed works in this area, it is unlikely that total loss of this asset will occur.	Minor adverse	No
Building and Paddock, Cefn Faes (PRN 1814)	Historic Environment					X	The access route to Tower 4ZC012 crosses the area of the building and paddock. As the access route crosses pasture, trackway panels laid directly onto the ground may be required. This may involve ground disturbance such as stripping of topsoil for the new temporary access tracks. This would impact on any buried archaeological remains that might exist in the area.	Minor adverse	No
Geology									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Geology	Geology, Hydrogeology, Land Use and Agriculture (Soils)		X				Potential adverse impact and/or damage to sensitive geological receptors (i.e. the bedrock geology).	Slight adverse	No
Soils	Geology, Hydrogeology, Land Use and Agriculture (Soils)			X			Reduction of soil quality during handling and storage.	Slight adverse	No
				X			Reduction of soil quality due to construction traffic.	Slight adverse	
Geology and soils	Geology, Hydrogeology, Land Use and Agriculture (Soils)			X			Groundwater and ground pollution due potential for plant to leak or spill oil or fuel.	Slight adverse	No
				X			HDD drilling operation creating a preferential pathway for contaminants to migrate.	Slight adverse	
				X			Requirement to remove/reinstate spoil from construction of the buried cables posing a potential risk to human health and the environment.	Slight adverse	
				X			Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies, and changes to soil hydrology.	Slight adverse	
Hydrology and hydrogeology									
Running water, including wet ditches	Ecology and Nature Conservation	X					Habitat degradation due to construction pollution or siltation.	Minor adverse	Yes
				X		X	Habitat loss or fragmentation.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
						X	Habitat degradation – impacts to water quality through pollution and construction run off and air quality from construction dust.	Minor adverse	
	Geology, Hydrogeology, Land Use and Agriculture (Soils)	X	X		X		Requirement for dewatering, reducing flow to surface water bodies.	Slight adverse	
Groundwater	Geology, Hydrogeology, Land Use and Agriculture (Soils)		X	X			Groundwater and ground pollution due to chemical spillages and leaks.	Slight adverse	No
				X			Reduction of groundwater levels due to construction traffic.	Slight adverse	
				X			HDD drilling operation creating a preferential pathway for contaminants to migrate.	Slight adverse	
				X			Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies, and changes to soil hydrology.	Slight adverse	
		X	X		X		Requirement for dewatering, reducing flow to groundwater abstractions.	Slight adverse	
Private water supplies	Geology, Hydrogeology, Land Use and Agriculture (Soils)	X	X				Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies.	Slight adverse	No
			X				Groundwater and ground pollution due to chemical spillages and leaks.	Slight adverse	
Mineral resources									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Mineral resources	Geology, Hydrogeology, Land Use and Agriculture (Soils)		X				There may be temporary sterilisation of the mineral safeguarding area within the footprint of any temporary works: temporary access road or laydown area.	Slight adverse	No
				X			Mineral resources are present at depth in the Glaslyn works site and are already primarily covered by existing land use. The mineral resources across the Glaslyn works site would not be sterilised by the proposed works or render the sites inaccessible for future use due to the mineral resource being deep underground and accessed via sunken shafts.	Slight adverse	
Construction workers									
Human health	Geology, Hydrogeology, Land Use and Agriculture (Soils)	X	X		X		Risks from potential existing contamination.	Slight adverse	No
			X	X			Groundwater and ground pollution due to chemical spillages and leaks.	Slight adverse	
Flood Risk									
Third party receptors including third-party people, property and infrastructure within and	Water Quality, Resources and Flood Risk			X			The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the temporary infrastructure within the floodplain.	Moderate adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
outside of the Study Area									
Aquatic Environment									
Water Framework Directive (WFD) River Water Bodies *Afon Dwyfach (GB110065053730)*	Water Quality, Resources and Flood Risk		X				Potential for accidental contamination entering the watercourse. This could arise from cable installation or the leakage or spillage of fuels and chemicals from stores and vehicles onsite.	Minor adverse	No
WFD River Water Bodies intersected by the Glaslyn works site *Glaslyn - tidal to Afon Croesor (GB110065053860)* *Porthmadog Cut (GB110065053800)*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from cable installation or the leakage or spillage of fuels and chemicals from stores and vehicles onsite. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses. Changes to watercourse morphology as a result of works in or near watercourses (for example, installation of watercourse crossings and associated earthworks).	Minor adverse	No
WFD River Water Bodies upstream of the	Water Quality, Resources			X			Potential for accidental contamination entering watercourses. This could arise from cable installation or	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Glaslyn works site (Good Status) *Nanmor (GB110065053930)* *Croesor (GB110065053890)* *Glaslyn - Nanmor to Colwyn (GB110065053910)*	and Flood Risk						the leakage or spillage of fuels and chemicals from stores and vehicles onsite.		
Water dependant SSSIs upstream of the Glaslyn works site *Coedydd Beddgelert a Cheunant Aberglaslyn SSSI* *Coedydd Nanmor SSSI* *Tyn-Llan SSSI*	Water Quality, Resources and Flood Risk			X			Reduction of water availability to support existing groundwater or surface water designated or undesignated sites, ecosystems and features. This could arise from dewatering of the trenched excavations for cabling, ground disturbance for the development of temporary access track establishment, or the leakage or spillage of fuels and chemicals onsite. This includes the potential for breakout and leakage of bentonite during trenchless crossing.	Minor adverse	No
Residential properties									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Residential properties	Noise and Vibration	X					Increased noise levels from construction activities associated with enabling works, the highest noise would likely occur during the breaking of concrete.	Minor adverse	Yes
			X				Noise levels from construction activities associated with the landscaping and reinstatement works (NGA6) (Felin Llecheiddior Road From North Of Capel Beirdd Passing Hendy And Tyddyn Y Felin And Melin Llecheiddior To B4411, Ynys, Criccieth, LL51 9EZ only).	Minor adverse	
				X			NGA1 – Preliminary works, establishment of compounds, construction of access roads. Two residential receptors would experience daytime construction noise levels of between 70 and 75 decibels (dB) $L_{Aeq,T}$ and therefore major adverse effects. Four additional receptors would experience daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ and therefore a moderate adverse effect. It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect. 918 residential receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA2 – CSEC enabling works and EVIP THH construction. Seven residential receptors would experience daytime construction noise levels of between 65 and 70 dB $L_{Aeq,T}$ and therefore a moderate adverse effect. It is assumed	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect. 913 residential receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
				X			NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying. 920 residential receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA4 – Glaslyn Cable installation and decommissioning, HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other receptors that would not be occupied at night as a worst-case). Night time noise levels of greater than 55 dB $L_{Aeq,T}$ are predicted at three residential properties, resulting in a major adverse effect. It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect. 43 residential properties are identified as experiencing night-time construction noise levels of between 50 and 55 dB $L_{Aeq,T.}$ It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect.	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							The remaining 874 residential receptors are predicted with night-time noise levels below 50 dB $L_{Aeq,T}$.		
				X			NGA5 – Garth CSEC removal. 920 residential receptors, four educational facilities, 13 hotels, two medical receptors and four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
				X			NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil. 10 residential properties would experience construction noise levels of between 65 and 70 dB $L_{Aeq,T}$, resulting in a moderate adverse effect. It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect. The remaining 910 residential properties would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA7 – Demobilisation, removal of the construction compounds. Two residential properties would experience construction noise levels of between 65 and 70 dB $L_{Aeq,T}$, resulting in a moderate adverse effect. It is assumed that temporary barriers could screen line-of-sight from construction activities to sensitive receptors and would provide at least 5 dB attenuation, therefore reducing the effect. The remaining 918 residential properties would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
	Socio-Economics			X			The residence in the former Porthmadog Golf Range has the potential to be affected by the construction work, for example through access restrictions, disruption or disturbance to the individual(s) living there.	Minor adverse	
Educational/community facilities									
Educational facilities	Noise and Vibration			X			NGA1 – Preliminary works, establishment of compounds, construction of access roads. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	Yes
				X			NGA2 – CSEC enabling works and EVIP THH construction. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA4 – Glaslyn Cable installation and decommissioning, HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other receptors that would not be occupied at night as a worst-case). The four educational facilities would experience construction noise levels at all receptors are below the evening noise threshold of 55 dB $L_{Aeq,T}$.	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
				X			NGA5 – Garth CSEC removal. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$,.	Minor adverse	
				X			NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$,.	Minor adverse	
				X			NGA7 – Demobilisation, removal of the construction compounds. Four educational facilities would experience daytime noise levels below 65 dB $L_{Aeq,T}$,.	Minor adverse	
Ysgol Eifionydd Secondary School	Socio-Economics			X			Sections of the car park in the Ysgol Eifionydd Secondary School will be temporarily closed and fenced off to accommodate minor works to the existing cable. Works may include the use of an excavator.	Minor adverse	No
Business premises									
Hotels	Noise and Vibration			X			NGA1 – Preliminary works, establishment of compounds, construction of access roads. 13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	No
				X			NGA2 – CSEC enabling works and EVIP THH construction.	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
				X			NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying. 13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA4 – Glaslyn Cable installation and decommissioning, HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other receptors that would not be occupied at night as a worst-case). 13 hotels would experience construction noise levels at all receptors are below the evening noise threshold of 55 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA5 – Garth CSEC removal. 13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil. 13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA7 – Demobilisation, removal of the construction compounds.	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							13 hotels would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
EVIP Hochtief site office	Socio-Economics			X			The Hochtief site office for the EVIP project is in the Glaslyn works site. The Applicant will co-ordinate with the EVIP scheme to ensure any potential disruption to its activities are anticipated and mitigated.	Minor adverse	No
Medical facilities									
Medical	Noise and Vibration			X			NGA1 – Preliminary works, establishment of compounds, construction of access roads. Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	No
				X			NGA2 – CSEC enabling works and EVIP THH construction Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying. Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA4 – Glaslyn Cable installation and decommissioning, HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							receptors that would not be occupied at night as a worst-case). Two medical receptors would experience construction noise levels at all receptors are below the evening noise threshold of 55 dB $L_{Aeq,T}$.		
				X			NGA5 – Garth CSEC removal. Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil. Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$	Minor adverse	
				X			NGA7 – Demobilisation, removal of the construction compounds. Two medical receptors would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
Places of worship									
Places of worship	Noise and Vibration			X			NGA1 – Preliminary works, establishment of compounds, construction of access roads. Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	No
				X			NGA2 – CSEC enabling works and EVIP THH construction	Minor adverse	

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
				X			NGA3 – Glaslyn Cables installation and decommissioning, open cut cable laying. Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA4 – Glaslyn Cable installation and decommissioning, HDD crossings (assessed during the night-time period at residential and hotel receptors and evening at all other receptors that would not be occupied at night as a worst-case). Four places of worship would experience construction noise levels at all receptors are below the evening noise threshold of 55 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA5 – Garth CSEC removal. Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA6 – Land reinstatement, removal of temporary haul access roads and reinstatement of topsoil. Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.	Minor adverse	
				X			NGA7 – Demobilisation, removal of the construction compounds.	Minor adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							Four places of worship would experience daytime noise levels below 65 dB $L_{Aeq,T}$.		
Local economy									
Employment	Socio-Economics		X	X			Whilst unemployment rate in the Principal Economic Impact Area is slightly lower than the national average, the economic activity is also lower. There is likely to be a beneficial effect as a result of the construction employment generation as a result of the proposed works.	Minor beneficial	No
Skills and training	Socio-Economics		X	X			The Great Grid Partnership (GGP) partners are committed to creating opportunities for training, education, and apprenticeships across the UK energy sector. This work is done through creating direct opportunities for the local communities in which projects are based as well as through engagement with supply chain partners to develop both new and existing employees. On this basis, it is likely that there will be a beneficial impact on the local workforce relating to training and skills uplift.	Minor beneficial	No
Gross added value	Socio-Economics		X				It is estimated that construction activity will contribute approximately £1,280,000 to the national economy, of which approximately £320,000 would likely be within the Study Area.	Minor beneficial	No
				X			It is estimated that construction activity will contribute approximately £560,000 to the national economy, of	Minor beneficial	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							which approximately £140,000 would likely be within the Study Area.		
PRoW and recreational routes									
PRoW and recreational routes	Socio-Economics		X				During the construction phase, the section of the PRoW Dolbenmaen No 18 footpath running through the Bryncir works site will be temporarily closed. During this time, walkers would need to use the roads (B4411 and A487) as an alternative route, which would be 250 m longer than following the PRoW.	Minor adverse	No
				X			There is potential for changes to journey times, local travel patterns, and certainty of routes for users to arise from the closures and diversions of PRoWs. The majority of PRoWs within the Glaslyn works site will be retained during the construction phase and will not be diverted; effects have only been assessed for PRoWs that will experience either temporary closures or diversions.	Minor adverse	
Agricultural land holdings									
Landowners	Socio-Economics		X				Temporary land take would be required from the four landowners and the tenant farming the landholdings within the Bryncir works site. For the proposed Bryncir Substation, a new site access, laydown area, and site welfare and office facilities will be required. Alternative access tracks will be constructed to minimise disruption to landowners.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
				X			There is potential for impacts from temporary land take during construction on agricultural land holdings around the Glaslyn works site.	Minor adverse	
Open Space									
Ysgol Eifionydd playing field	Socio-Economics			X			The Ysgol Eifionydd Secondary School playing field will be closed for a maximum of 2.5 years during the construction period to accommodate excavating works to install cables. After the construction phase, the field will be returned to its previous use.	Minor adverse	No
Porthmadog Eisteddfod Stone Circle Park	Socio-Economics			X			Sections of the Porthmadog Stone Circle Park itself will need to be temporarily closed during construction. With regards to the stones themselves, if it possible for them to be left in then they will be fenced off. If removal is necessary, only the stones close to the works will be removed. They will be carefully stored and subsequently reinstated post construction.	Minor adverse	No
Bodawen Playground	Socio-Economics			X			This playground will be closed for approximately two years whilst the cables beneath the playground are removed and replaced. Upon completion of the proposed works, the current facilities will be reinstated to its original condition.	Minor adverse	No
Visitor Attractions									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Porthmadog Caravan Site off Snowdon Street	Socio-Economics			X			Porthmadog Caravan Site off Snowdon Street has the potential to be affected by the construction works associated with the removal of the existing cables. The works will last for a minimal length of time, approximately one to two days, with potentially one to two vehicles passing through the site during this time.	Minor adverse	No
Railway used by the Welsh Highland Heritage Railway and the Ffestiniog Heritage Railway	Socio-Economics			X			The railway will be closed for 8 weeks and compensation will be paid for the loss of service appropriate to when the works can be done. The works will be scheduled to avoid peak visitor times and minimise impacts.	Minor adverse	No
Private and community assets									
Private and community assets	Socio-Economics			X			There is potential for severance impacts arising from construction of the proposed works to impact on the use of private and community assets.	Minor adverse	No
Global atmosphere									
Global atmosphere	Climate Change	X	X	X	X	X	The proposed works are consistent with applicable UK and Welsh Government climate change policy and legislation. In accordance with the Institute for	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							Environmental Management and Assessment[1] (IEMA) Greenhouse Gas (GHG) Guidance.		
Materials and Waste									
Changes in available non-hazardous and inert waste landfill void capacity	Materials and Waste			X			It is estimated that the overall quantities of non-hazardous waste generated are likely to fall well below this threshold of significance.	Slight adverse	No

[1] The Institute of Environmental Management and Assessment (IEMA) changed its name to the Institute of Sustainability and Environmental Professionals (ISEP) on 17 July 2025. At the time of writing, guidance was still IEMA branded and will be referred to throughout this volume.

Table 1-2 – Screening of receptors during the operational phase

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Landscape character									
Operation year 1 (winter) – LCA 04 Moel Hebog Uplands	Landscape and Visual Amenity		X				There would be a limited change to landscape elements in this LCA as the presence of electrical infrastructure and industrial elements are already noted characteristics of the landscape. Based on the distance and size of construction works located within the view, there would be a very slight alteration to the aesthetic and perceptual aspects of the landscape receptor	Minor adverse	No
Visual amenity									
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	Landscape and Visual Amenity		X				Viewpoint 1: Garndolbenmaen local road would experience a significant change in view at operation year 1 (winter) due to the introduction of new permanent infrastructure.	Moderate adverse	No
Operation year 1 (winter) – Viewpoint 2: A487 settlement	Landscape and Visual Amenity		X				Viewpoint 2: A487 settlement edge in near Glan-Dwyfach would experience a significant change in view at operation	Moderate adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
edge in near Glan-Dwyfach							year 1 (winter) due to the introduction of new permanent infrastructure.		
Operation year 1 (winter) – Viewpoint 3: Llanystumdwy No 62 footpath	Landscape and Visual Amenity		X				New and replacement infrastructure will replace infrastructure of similar size and visual impact being removed resulting in no notable net change. The proposed works would not be discernible or occupy such a small part of the view as to represent no change.	Minor adverse	No
Operation year 2 (winter) – Viewpoint 2: Garth Road, Porthmadog	Landscape and Visual Amenity			X			Minffordd CSEC and THH The operation CSEC and THH would be barely discernible and viewed at a long distance as part of a wider panoramic view.	Minor adverse	No
Operation year 1 (winter) – Viewpoint 4: Noel-y-Gest Trig point	Landscape and Visual Amenity			X			Wern CSEC The operation CSEC would be barely discernible and viewed at a long distance as part of a wider panoramic view.	Minor adverse	No
Operation year 1 (winter) – Viewpoint 10: Tan-y-Glannau, Minffordd	Landscape and Visual Amenity			X			Minffordd CSEC and THH The operational CSEC and THH would be visible as a small-scale addition to the wider view.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Operation year 15 (summer) – Viewpoint 1: Garndolbenmaen local road	Landscape and Visual Amenity		X				By operation year 15 (summer), the reinstated and enhanced planting would assimilate the proposed works back into the landscape and would result in a limited change in views from most locations.	Minor adverse	No
Operation year 15 (summer) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	Landscape and Visual Amenity		X				By operation year 15 (summer), the reinstated and enhanced planting would assimilate the proposed works back into the landscape and would result in a limited change in views from most locations.	Minor adverse	No
Operational year 15 (summer) – Viewpoint 2: Garth Road, Porthmadog	Landscape and Visual Amenity			X			Minffordd CSEC and THH The operation CSEC and THH would be barely discernible and viewed at a long distance as part of a wider panoramic.	Minor adverse	No
Operation year 15 (summer) – Viewpoint 4: Moel-y-Gest Trig point.	Landscape and Visual Amenity.			X			Wern CSEC The operation CSEC would be barely discernible and viewed at a long distance as part of a wider panoramic view.	Minor adverse	No
Operation year 15 (summer) – Viewpoint 10: Tan-	Landscape and Visual Amenity			X			Minffordd CSEC and THH	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
y-Glannau, Minffordd							The operational CSEC and THH would be visible as a small-scale addition to the wider view.		
Protected and notable species									
Fish	Ecology and Nature Conservation			X			Direct impact on species assemblage through disturbance caused by electric and magnetic fields (EMF) from the High Voltage Cables (HVC).	Minor adverse	No
Geology									
Geology	Geology, Hydrogeology, Land Use and Agriculture (Soils)		X				Potential adverse impact and/or damage to sensitive geological receptors (i.e. the bedrock geology).	Slight adverse	No
Soils	Geology, Hydrogeology, Land Use and Agriculture (Soils)			X			Reduction of soil quality during handling and storage.	Slight adverse	No
				X			Reduction of soil quality due to construction traffic.	Slight adverse	

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
Geology and Soils	Geology, Hydrogeology, Land Use and Agriculture (Soils)			X			Groundwater and ground pollution due potential for plant to leak or spill oil or fuel.	Slight adverse	No
				X			Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies, and changes to soil hydrology.	Slight adverse	
				X			The use of imported aggregates during maintenance, for example for the construction of access tracks and compounds, may pose a risk to underlying soils, geology and groundwater quality, if the aggregates were to be contaminated.	Slight adverse	
Hydrology and hydrogeology									
Private water supply	Geology, Hydrogeology, Land Use and Agriculture	X	X				Groundwater and ground pollution due to chemical spillages and leaks.	Slight adverse	No
Groundwater	Geology, Hydrogeology,		X	X			Groundwater and ground pollution due to chemical spillages and leaks.	Slight adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
	Land Use and Agriculture			X			Reduction of groundwater levels due to construction traffic.	Slight adverse	
				X			The use of imported aggregates during maintenance, for example for the construction of access tracks and compounds, may pose a risk to underlying soils, geology and groundwater quality, if the aggregates were to be contaminated.	Slight adverse	
				X			Requirement for dewatering, reducing flow to groundwater abstractions and surface water bodies, and changes to soil hydrology.	Slight adverse	
Mineral Resources									
Mineral resources	Geology, Hydrogeology, Land Use and Agriculture			X			The mineral resources at the Mineral Site Buffer Zone will not be impacted by the proposed works (decommissioning of existing cables) or render the sites inaccessible for future use.	Slight adverse	No
Construction Workers									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Human health	Geology, Hydrogeology, Land Use and Agriculture	X	X		X		Risks from potential existing contamination.	Slight adverse	No
			X	X			Groundwater and ground pollution due to chemical spillages and leaks.	Slight Adverse	
Flood Risk									
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area.	Water Quality, Resources and Flood Risk			X			Changes to fluvial or tidal flood risk associated with loss of floodplain storage and change in floodplain flow conveyance, where permanent above ground infrastructure is in tidal or fluvial flood zones. Changes to surface water flood risk due to changes in flow pathways and runoff rates resulting from changed ground levels and creation of new impermeable surfaces for permanent above ground infrastructure. Changes to groundwater flood risk due to presence of underground infrastructure.	Moderate adverse	No
Aquatic Environment									

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
WFD River Water Bodies intersected by the Glaslyn works site *Glaslyn - tidal to Afon Croesor (GB110065053860)* *Porthmadog Cut (GB110065053800)*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses associated with spillage or leakage of fuels, lubricants or other chemicals operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses. Changes in channel morphology and fluvial geomorphological processes, should cables become exposed at watercourse crossings.	Minor adverse	No
WFD River Water Bodies upstream of the Glaslyn works site (Good Status) *Nanmor (GB110065053930)* *Croesor (GB110065053890)* *Glaslyn - Nanmor to Colwyn (GB110065053910)*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from the leakage and spillage of fuels and chemicals from stores and vehicles during operation and maintenance activities.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Water dependant SSSIs upstream of the Glaslyn works site *Coedydd Beddgelert a Cheunant Aberglaslyn SSSI* *Coedydd Nanmor SSSI* *Tyn-Llan SSSI*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.	Minor adverse	No
Water dependant SACs intersected by the Glaslyn works site *Coedydd Derw a Safleoedd Ystlumod Meirion / Meirionnydd Oakwoods and Bat Sites SAC*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles during operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Water dependant SSSIs intersected by the Glaslyn works site *Glaslyn SSSI*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles during maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses during maintenance activities.	Minor adverse	No
Water dependant SACs upstream of the Glaslyn works site *Coed Tremadog SAC, SSSI and NNR* *Hafod Garregog SAC, SSSI and NNR*	Water Quality, Resources and Flood Risk			X			Potential for accidental contamination entering watercourses. This could arise from the leakage or spillage of fuels and chemicals from stores and vehicles operation and maintenance activities. Ground disturbance and mobilisation of sediments and contaminants leading to silt laden or otherwise contaminated runoff entering watercourses operation and maintenance activities.	Minor adverse	No
PRoW and recreational routes									
PRoW and recreational routes	Socio-Economics		X				The footpath will be diverted around the proposed Bryncir Substation. The	Minor adverse	No

Receptor	Relevant topic	Relevant volume P	B	G	T	W	Impact(s)	Significance of residual effect	Taken forward into stage 2?
							diverted footpath will be 90 m longer than the current route.		
Agricultural land holdings									
Landowners	Socio-Economics		X				One landowner will be affected by permanent land take as acquisition of land is required for the proposed Bryncir Substation.	Minor adverse	No
				X			There is potential for permanent impacts on agricultural land holdings during the construction of the proposed works. Raised link boxes will be required to be installed in some locations on agricultural land. Where this occurs, the area will be fenced off and compensation will be provided as part of the easement. Agricultural land will also be acquired at Wern and Minffordd for the proposed works, where appropriate compensation will also be provided.	Minor adverse	
Global atmosphere									
Global atmosphere	Climate Change	X	X	X	X	X	The proposed works are consistent with applicable UK and Welsh Government	Minor adverse	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
							climate change policy and legislation. In accordance with the IEMA GHG Guidance.		
Climate Change Risk Assessment									
Flooding (coastal, pluvial & fluvial)	Climate Change			X			Flooding can impact the functioning of assets such as underground cables. Flooding can create health and safety hazards due to unsafe working conditions for maintenance staff. Flooding can cause vegetation becoming uprooted which can result in asset damage.	Significant (RCP 8.5 (2070-2099))	No
Extreme rainfall	Climate Change			X			Fluctuating soil moisture content can accelerate the degradation of soils. This can impact the stability of assets through the process of shrink-swell and ultimately cause asset damage. Extreme rainfall can result in damage to on-site electrical equipment and underground cables, leading to power outages and potential damage.	Significant (RCP 8.5 (2070-2099))	No

Receptor	Relevant topic	Relevant volume					Impact(s)	Significance of residual effect	Taken forward into stage 2?
		P	B	G	T	W			
Changing temperatures	Climate Change			X			There is potential for permanent impacts on agricultural land holdings during the construction of the proposed works. Raised link boxes will be required to be installed in some locations on agricultural land. Where this occurs, the area will be fenced off and compensation will be provided as part of the easement. Agricultural land will also be acquired at Wern and Minffordd for the proposed works, where appropriate compensation will also be provided.	Minor adverse	No
Increasing temperatures coupled with changing precipitation patterns	Climate Change			X			Warmer temperatures and prolonged periods of heat, coupled with increased precipitation can alter the growing seasons and create optimal growing conditions. This impacts overhead lines as an increased vegetation growing adjacent to the overhead lines can impact on minimum clearances. This can lead to asset damage.	Significant (RCP 8.5 (2070-2099))	No
Storm events	Climate Change			X			Storm events and strong winds can cause damage to equipment. Debris can also cause access issues if roads become blocked off.	Significant (RCP 8.5 (2070-2099))	No

7.4.B Cumulative Effects Assessment

nationalgrid

1. Cumulative Effects Assessment

1.1.1 Table **1-1** and

1.1.3 Table **1-2** below presents the assessment of the potential cumulative effects associated with the Project and other developments during construction and operation.

All receptors predicted to experience Moderate or Major residual effects as a result of the Project have been included in Table **1**-**1** and

1.1.4 Table **1**-**2**. The residual effects from the Project and the residual effects, if any, from the other development have been assessed to determine if there would be a cumulative effect.

Due to the significant number of receptors with predicted Minor effects, only those affected by both the Project and other development are included in Table **1**-**1** and

1.1.5 Table **1-2**. If a receptor with a predicted Minor effect will only be affected by either the Project or the other development, it has not been considered further.

Table 1-1 – Construction cumulative effects assessment

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
C24/0532/25/LL – Proposed Energy Storage facility					
Landscape Character Area (LCA) 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Seascape Character Area (SCA) 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	soil disturbance from Horizontal Directional Drilling (HDD) and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 –**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Landscape and Visual Amenity. Significant change in view as a result of the introduction of construction activities. Moderate adverse.				
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view.	Not assessed.	Cumulative effects are not anticipated.	-	Not significant

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Moderate adverse.				
Ancient woodland	**Volume 6: Wider Works, Chapter 5: Ecology and Nature Conservation.** Habitat loss (permanent and temporary) and degradation. Minor adverse **Volume 4: Glaslyn Cables, Chapter 5: Ecology and Nature Conservation** Habitat loss or fragmentation. Minor adverse **Volume 2: Pentir Substation, Chapter 5: Ecology and Nature Conservation** Temporary indirect habitat degradation Minor adverse	Mitigation proposed and secured through Construction Environmental Management Plan (CEMP) to avoid direct or indirect effects. No residual effects on ancient woodland from this development.	Cumulative effects are not anticipated.	None required	Not significant
Non-statutory designated sites for nature conservation: • Pentir sub-station Wildlife Site (WS)	**Volume 2: Pentir Substation, Chapter 5: Ecology and Nature Conservation.** Habitat degradation	Mitigation proposed and secured through CEMP to avoid direct or indirect impacts. No residual	Cumulative effects are not anticipated.	None required	Not significant

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Minor adverse	effects on WS from this development.			
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Residential properties	**Volume 2: Pentir Substation, Chapter 11: Noise and Vibration.** Noise levels from construction activities associated with enabling works, trench digging works and reinstatement works would result in increased noise levels at a single Minor adverse. **Volume 3: Bryncir, Chapter 11: Noise and Vibration.**	**Noise Survey and Acoustic Report** There are four residential properties in the surrounding area, the assessment identifies that the Proposed Development may give rise to rating sound levels that marginally exceed the measured background sound level in the area at night, thus giving rise to a 'low to potentially adverse impact'.	The cumulative development is a substantial distance (approximately 20 kilometres (km)) from the Bryncir and Glaslyn elements of the Proposed Development. No cumulative effects are considered for Bryncir and Glaslyn. However, due to the proximity of the cumulative development to Pentir Substation, potential cumulative noise	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Noise levels from construction activities associated with the landscaping works for reinstatement would result in an increased noise levels at a single residential property. Minor adverse. **Volume 4: Glaslyn Cables, Chapter 11: Noise and Vibration.** Residential receptors will experience increased noise levels associated with noise generating activities 1, 2, 3, 4, 5, 6 and 7. Minor adverse.		effects are considered. The residential property that is affected by proposed development construction noise is to the north-west of Pentir Substation whereas the 'other development follows the road to the south-west out of Pentir Substation and then southeast along the B457. As the same receptors would not be adversely affected by noise emissions from construction of either development, construction noise effects would remain as Minor at individual receptors and so cumulative construction noise effects are not anticipated.		

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Flood Consequence Assessment and Drainage Assessment The risk of flooding from fluvial, tidal, groundwater, sewers, reservoirs, canals and other artificial structures sources is deemed to be low. The risk of flooding from surface water flooding is deemed to be very low.	Cumulative effects are not anticipated.	-	-
C16/0886/15/LL – Installation of underground 132 kilovolt (KV) grid connection cables					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Moderate adverse.				
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.				
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	central background of the view. Moderate adverse.				
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Llyn Padarn Site of Special Scientific Interest (SSSI)	**Volume 6: Wider Works, Chapter 5: Ecology and Nature Conservation.** Temporary disturbance to qualifying species of the (Arctic charr (*Salvelinus alpinus*) and Floating water-plantain) through impacts to water quality. Minor adverse.	**Phase 1 Habitat Survey** The most likely potential disruption is through runoff water contaminated with concrete or other building materials ending up within the lake or feeder watercourse, but if managed properly this should be preventable. No potential effect given.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Habitats: • Scattered broadleaved trees • Broadleaved woodland • Plantation broadleaved woodland • Mixed woodland • Running water	**Volumes 2, 3, 4 and 6: Chapter 5: Ecology and Nature Conservation** Residual effects include habitat loss and degradation, both temporary and permanent. Up to Minor adverse.	Not an Environmental Impact Assessment (EIA). Extended Phase 1 habitat survey and desk study carried out[1]. The Phase 1 habitat report states: "*The major feature of ecological value in the area are the watercourses, and the potential to support protected species, and also the potential to affect large mature trees or woodland areas. Works which will affect the trees should ideally be avoided, if this is not possible, detailed surveys of the trees to be affected will be required to avoid potentially affecting bats or nesting birds which may be using the vegetation. Care should be taken to avoid polluting the watercourses, and to*	Cumulative effects are not anticipated.	None required	Not significant-

[1] Enfys ecology (2016). Snowdonia Pumped Hydro Glyn Rhonwy Pumped Storage Scheme: National Grid Connection Cable Route. Phase 1 Habitat Survey

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
		avoid any disturbance to animals which may use them as much as is possible through the use of buffer zones and other methodology… There are several stands of invasive non-native species within the route, of which two, Himalayan balsam and Japanese Knotweed, appear close enough to be directly affected by the works. These will need to be disposed of in accordance with regulations and care should be taken to avoid spreading either species.” Provided mitigation measures are adhered to and usually through planning conditions no residual effects on habitats are expected as a result of this other development.			

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Protected species: • Otter • Aquatic invertebrates • Aquatic Macrophytes • Fish	**Volumes 2, 3, 4 and 6: Chapter 5: Ecology and Nature Conservation** Residual effects to species include disturbance and habitat degradation. Up to Minor adverse.	Not assessed. Phase 1 habitat survey report[1] recommends further survey to identify presence or absence of protected species where necessary and identifies mitigation measures. Provided mitigation measures are adhered to and usually through planning conditions no residual effects on protected species are expected as a result of this development.	Cumulative effects are not anticipated.	None required	Not significant
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality,**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
outside of the Study Area	**Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.				
C25/0266/18/LL – Temporary planning permission for a period of 40 years for an Energy Storage System					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 –**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Landscape and Visual Amenity. Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	within the Bryncir Substation would be visible in the middle ground. Moderate adverse.				
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 –**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Landscape and Visual Amenity. Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.				
Marshy grassland	**Volume 3: Bryncir, Chapter 5: Ecology and Nature Conservation.** Habitat disturbance and loss. Minor adverse **Volume 4: Glaslyn Cables, Chapter 5: Ecology and Nature Conservation.** Habitat loss or fragmentation and indirect habitat degradation. Minor adverse	The Ecological Impact Assessment report[2] states for marshy grassland that *'the effect would not be ecologically significant at National or Regional level but is potentially significant at Local or Site level. It would be reversible once the site is decommissioned, subject to the implementation of a suitable habitat restoration plan.'* Loss of marshy grassland will be avoided where possible. Additional mitigation is	Cumulative effects are not anticipated.	-	-

[2] Environmental Gain Ltd. (2025). Tyddyn Forgan ESS, North Wales Ecological Impact Assessment.

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Volume 6: Wider Works, Chapter 5: Ecology and Nature Conservation. Habitat fragmentation and loss (permanent and temporary) and degradation. Minor adverse	proposed to enhance retained grassland in this other development and also off-site grassland habitats. No residual effects on marshy grassland as a result of this development.			
Breeding and non-breeding birds	**Volume 2: Pentir Substation, Chapter 5: Ecology and Nature Conservation.** Noise or visual disturbance. Minor adverse **Volume 4: Glaslyn Cables, Chapter 5: Ecology and Nature Conservation.** Loss and fragmentation of habitats. Noise or visual disturbance. Minor adverse **Volume 6: Wider Works, Chapter 5:**	The Ecological Impact Assessment report[2] states; '*In the absence of any avoidance, mitigation or compensation, birds nesting in shrubs or on the ground could be killed, injured or disturbed during construction of the proposed ESS, and their nesting and foraging habitat would be removed for the lifetime of the project.* *Considering the size of the site, this would only be likely to affect one or two pairs of any given*	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Ecology and Nature Conservation. Loss and fragmentation of habitats. Noise and visual disturbance. Minor adverse	*species, most of which are also to be found nesting amongst similar habitats across the local landscape. This would likely be significant at the Site or Local level, and the effect (the reduced breeding numbers / number of hatched chicks) might have an impact on local populations for one or more generations. The loss of habitat would be reversible once the site is decommissioned, subject to the implementation of a suitable habitat restoration plan. The installation of the perimeter fence will create additional perches from which predators such as corvids may prey upon nesting birds. This would be an adverse effect significant at a Site level, that would*			

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
		persist for the lifetime of the project.' No residual effects on breeding and non-breeding as a result of this development.			
Reptiles	**Volume 6: Wider Works, Chapter 5: Ecology and Nature Conservation.** Habitat loss and fragmentation. Injury or killing. Minor Adverse **Volume 4: Glaslyn Cables, Chapter 5: Ecology and Nature Conservation.** Habitat loss and fragmentation. Injury or killing. Minor Adverse	The Ecological Impact Assessment report[2] states; ' "*In the absence of any avoidance, mitigation or compensation, it is possible that small numbers of common lizards would be killed or injured during construction. The footprint of the development does not overlap substantially with the distribution of common lizards at the site, so it is likely that the population would persist and, all else being equal, numbers would recover in the long-term. The effect would therefore be significant at a Site or*	Cumulative effects are not anticipated	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
		Local level but not beyond." All reptiles will be translocated off-site and habitat enhancement is proposed. No residual effects on reptiles as a result of this other development.			
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to	**Flood Consequence Assessment** The site is in Flood Zone 1 and is completely compatible with the proposed land use.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	the permanent infrastructure. Moderate adverse.				
C25/0277/18/LL – Proposed development of a battery energy storage system					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	in the fore and middle ground of the view. Moderate adverse.				
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	**Flood Consequence Assessment** The Site would be expected to remain dry in all but the most extreme conditions. The consequences of flooding are acceptable and the development would be in accordance with the requirements of Technical Advice Note (TAN) 15.	Cumulative effects are not anticipated.	-	-
C23/0852/23/TC – Proposed siting of 323 holiday caravans/lodges					

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Moderate adverse.				
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.				
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
C24/0360/22/LL – Erection of 3 no. linked light industrial, storage and distribution units					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.				
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.				
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party	**Volume 4: Glaslyn Cables, Chapter 8:**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
people, property and infrastructure within and outside of the Study Area	**Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.				
C23/0549/08/LL – Erect 8 new flexible business/industrial units					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.				
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Wern Manor (Cadw 4626) (Grade **II***) (PGW(Gd)19 (GWY)) (Grade **II***)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the **Study Area**	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.				
C25/0554/18/LL - Installation of underground electricity cable in association with Pentir BESS energy storage scheme					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	in the fore and middle ground of the view. Moderate adverse.				
Ancient woodland	**Volume 6: Wider Works, Chapter 5: Ecology and Nature Conservation.** Habitat loss (permanent and temporary) and degradation. Minor adverse **Volume 4: Glaslyn Cables, Chapter 5: Ecology and Nature Conservation** Habitat loss or fragmentation. Minor adverse **Volume 2: Pentir Substation, Chapter 5: Ecology and Nature Conservation** Temporary indirect habitat degradation. Minor adverse.	Mitigation proposed and secured through CEMP to avoid direct or indirect impacts. No residual effects on ancient woodland from this development.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Non-statutory designated sites for nature conservation: • Pentir sub-station WS	**Volume 2: Pentir Substation, Chapter 5: Ecology and Nature Conservation.** Habitat degradation. Minor adverse.	Mitigation proposed and secured through CEMP to avoid direct or indirect impacts. No residual effects on the WS from this development.	Cumulative effects are not anticipated.	None required	Not significant
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	**Flood Consequence Assessment** The site is in Flood Zone 1. The cable route corridor does not increase flood risk to the surrounding area and has a negligible risk of flooding to and from the development.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Eryri Visual Improvement Provision (EVIP)					
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	**Chapter 6 – Landscape and Visual Appraisal.** The construction would have a direct impact on the immediate landscape character. The construction of the Proposed Project would affect the existing Garth SEC, small areas of roadside vegetation and flat agricultural fields.	It is anticipated that both the Project and EVIP project could have cumulative effects on LCA 09 Porthmadog as both construction works will run concurrently. The Project would result in a moderate adverse effect; however a significance has not been assigned for the EVIP Project. The cumulative effect is anticipated to be moderate adverse (significant).	No additional mitigation is proposed.	Moderate adverse
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	**Chapter 6 – Landscape and Visual Appraisal.** Viewpoint A – from the Cob at Porthmadog looking across Afon Glaslyn. It is anticipated that short to mid-term construction activities would be visible as a relatively small component in the mid-ground of this panoramic view.	Although the two viewpoints are taken from opposite ends of The Cob, they both look towards the Afon Glaslyn. It is anticipated that both the Project and EVIP project could have cumulative effects on views from The Cob as both construction works will run concurrently. The Project would result in a moderate adverse effect; however. a significance has not been assigned for the EVIP Project. The	No additional mitigation is proposed.	Moderate adverse

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
			cumulative effect is anticipated to be moderate adverse (significant).		
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	**Chapter 6 – Landscape and Visual Appraisal.** Viewpoint H – from Ffestiniog Heritage Railway Station, at Minffordd. During construction, very short-term construction machinery and activities would be visible as a small component in the foreground to mid-ground of this view.	Although the two viewpoints are taken from opposite ends of The Cob, they both look towards the Afon Glaslyn. It is anticipated that both the Project and EVIP project could have cumulative effects on views from The Cob as both construction works will run concurrently. The Project would result in a moderate adverse effect; however. a significance has not been assigned for the EVIP Project. The cumulative effect is anticipated to be moderate adverse (significant).	No additional mitigation is proposed.	Moderate adverse

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.** Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	None.	A minor increase in flood depth to residential receptors in Tremadog is indicated as a result of the Project. However, the flood modelling does not show any increase in flood risk or extent in the location of EVIP. The EVIP assessment concludes that there is no impact on flood risk during construction and no cumulative effect is anticipated.	-	-
Natural Resources Wales – Porthmadog Flood Defence Works					

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
LCA 09 Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** The presence of construction activity would result in an impact to the rural landscape characteristics and would result in a loss of tranquillity over a localised area. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
SCA 20 Porthmadog and Glaslyn Estuary	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity would represent an incongruous activity within the rural land and seascapes. Direct impacts include vegetation clearance and the excavation and soil disturbance from HDD and open trenching of the Glaslyn cable route. Indirect	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	effects on the SCA would result from the loss of tranquillity from the perception of increased urban influence. Moderate adverse.				
Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity** Construction activities would be visible in the fore to middle ground of the view as a medium-scale addition. Work within the Bryncir Substation would be visible in the middle ground. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	Cumulative effects are not anticipated.	-	-
Viewpoint 1: Garndolbenmaen local road	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Significant change in view as a result of the introduction of construction activities.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Moderate adverse.				
Viewpoint 9: Wales Coast Path – The Cob (eastern end), Porthmadog	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along parts of the eastern end of the Glaslyn cables route would be visible in the central background of the view. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Viewpoint 10: Tan-y-Glannau, Minffordd	**Volume 4: Glaslyn Cables, Chapter 4 – Landscape and Visual Amenity.** Construction activity along the eastern end of the Glaslyn cables route would be visible in the fore and middle ground of the view. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Wern Manor (Cadw 4626) (Grade II*) (PGW(Gd)19 (GWY)) (Grade II*)	**Volume 4: Glaslyn Cables, Chapter 6 – Historic Environment.**	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Temporary impacts on the setting may be encountered from noise and vehicular movements. Moderate adverse.	been undertaken to date; a cumulative assessment cannot be undertaken.			
Third party receptors including third-party people, property and infrastructure within and outside of the **Study Area**	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; t a cumulative assessment cannot be undertaken.	-	-	-

Table 1-2 – Operation cumulative effects assessment

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
C24/0532/25/LL – Proposed Energy Storage facility					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate	**Flood Consequence Assessment and Drainage Assessment** The development is classified within TAN 15 as 'highly vulnerable' and 'less vulnerable'	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
outside of the Study Area	a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	development and is considered to be suitable at this location			
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Significant.				
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C16/0886/15/LL – Installation of underground 132 KV grid connection cables					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C25/0266/18/LL – Temporary planning permission for a period of 40 years for an Energy Storage System					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	**Flood Consequence Assessment** The site is in Flood Zone 1 and is completely compatible with the proposed land use.	Cumulative effects are not anticipated.	-	-
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.				
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	cycles can result in greater erosion and reduce the stability of assets. Significant.				
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C25/0277/18/LL – Proposed development of a battery energy storage system					
Operation year 1 (winter) – Viewpoint 1:	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Garndolbenmaen local road	Significant change due to the introduction of new permanent infrastructure. Moderate adverse.				
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	**Flood Consequence Assessment** The Proposed Development would be operated with minimal risk from flooding, would not increase flood risk elsewhere and is compliant with the requirements of TAN15.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.				
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
C23/0852/23/TC – Proposed siting of 323 holiday caravans/lodges					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	receptors within Tremadog due to the permanent infrastructure. Moderate adverse.				
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C24/0360/22/LL – Erection of 4 no. linked light industrial, storage and distribution units					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C23/0549/08/LL – Erect 8 new flexible business/industrial units					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.				
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	cycles can result in greater erosion and reduce the stability of assets. Significant.				
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
C25/0554/18/LL - Installation of underground electricity cable in association with Pentir BESS energy storage scheme					
Operation year 1 (winter) – Viewpoint 1:	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.**	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Garndolbenmaen local road	Significant change due to the introduction of new permanent infrastructure. Moderate adverse.				
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.				
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Eryri Visual Improvement Provision (EVIP)					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	Not assessed.	Cumulative effects are not anticipated.	-	-
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential	None.	A minor increase in flood depth to residential receptors in Tremadog is indicated as a result of the Project. However, the flood modelling does not show any increase in flood risk or extent in the location of EVIP.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	receptors within Tremadog due to the permanent infrastructure. Moderate adverse.		The EVIP assessment concludes that there is no impact on flood risk during operation and no significant effect is anticipated.		
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
	Significant.				
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	Not assessed.	Cumulative effects are not anticipated.	-	-
Natural Resources Wales – Porthmadog Flood Defence Works					
Operation year 1 (winter) – Viewpoint 1: Garndolbenmaen local road	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Operation year 1 (winter) – Viewpoint 2: A487 settlement edge in near Glan-Dwyfach	**Volume 3: Bryncir, Chapter 4 – Landscape and Visual Amenity.** Significant change due to the introduction of new permanent infrastructure. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Third party receptors including third-party people, property and infrastructure within and outside of the Study Area	**Volume 4: Glaslyn Cables, Chapter 8: Water Quality, Resources and Flood Risk** The flood modelling results currently indicate a minor increase in flood depth to residential receptors within Tremadog due to the permanent infrastructure. Moderate adverse.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Flooding (coastal, pluvial & fluvial)	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Flooding can impact the functioning of assets such as underground cables, create health and safety hazards due to unsafe working conditions and could uproot vegetation which could damage assets. Significant.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Extreme rainfall	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Fluctuating soil moisture content can degrade soil and impact the stability of assets and extreme rainfall could damage electrical equipment. Significant.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Changing temperatures	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increasing temperatures can cause thermal expansion of conductors and overhead lines sagging. Higher temperatures can reduce the capacity of underground cable systems. Freeze-thaw cycles can result in greater erosion and reduce the stability of assets. Significant.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-

Common receptor	Residual effects from the Project	Residual effects from the other development	Assessment of cumulative effects of the Project and other development	Proposed mitigation	Residual cumulative effect
Increasing temperatures coupled with changing precipitation patterns	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Increased vegetation growth adjacent to the overhead lines can impact on minimum clearances and damage assets. Significant.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-
Storm events	**Volume 4: Glaslyn Cables, Chapter 13 – Climate Change.** Storm events and strong winds can cause damage to equipment Significant.	At the time of writing, assessment of the long list of options was being undertaken. No assessment work has been undertaken to date; a cumulative assessment cannot be undertaken.	-	-	-