Cyngor Gwynedd

Barmouth North Promenade FAS

Habitats Regulation Assessment Screening and Appropriate Assessment

Reference: BMTH-ARP-EBD-ZZ-RP-OE-000003

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Llywodraeth Cymru
Welsh Government

YGC

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Contents

Tables

1. Introduction

1.1 Purpose of this Report

1.1.1 This document has been prepared by Ove Arup and Partners Ltd. (Arup) on behalf of YGC in relation to the potential for adverse effects arising from the Proposed Development upon the integrity of the qualifying features on the National Site Network as required by Regulation 63(1) of the Habitats Regulations [1].

1.1.2 This document comprises a HRA Stage 1 Screening Assessment and a Stage 2 Appropriate Assessment. This report will be submitted to Natural Resources Wales (NRW), as the statutory advisor for designated nature conservation in Wales, to formally request their views on the assessment under Regulation 63 of the Habitats Regulations [1], and specifically to advise Cyngor Gwynedd, as the Competent Authority. An Environmental Impact Assessment (EIA) has been prepared in parallel with this HRA Report (refer to ES Chapter 6 Biodiversity and Protected Sites).

1.1.3 The document also supports an application for Planning Permission and a Marine Licence application.

1.2 Overview of the Proposed Development

1.2.1 The Proposed Development would provide new and improved sea defences at Barmouth North Promenade and reduce the risk to life and flood risk to over 900 properties.

1.2.2 The Proposed Development comprises the following elements:

- Patch repairs of the primary sea wall over a length of approximately 1.2km.
- Secondary flood wall to be re-built and increased in height (to a maximum of 1.55m) over a length of approximately 1.1km.
- New sheet piles will be installed directly seaward of the existing sheet piles under the concrete revetment to provide a cut-off, over approximately 950m length. Sheet piles will be placed either side of the area where the steps will be constructed reaching a height above MHWS, this will be carried out using a 70t piling rig.
- Rock armour to be provided at beach level to protect the primary sea wall, revetment and part of the railway line North of the promenade.
- Refurbishment of culverted outfall and reinstatement of non-return valve.
- Provision of demountable flood defences where access is required.
- Placemaking and landscaping improvements.

1.2.3 The Redline Boundary for the Proposed Development is shown in ES Volume 4, Figure 1.1 and further details have been provided in Section 2 below.

1.3 Legislative Context

1.3.1 Relevant policy guidance includes the following:

- Welsh Government (2025). Habitats regulation assessment (HRA guidance) [2]
- Welsh Government (2009). Technical advice note (TAN) 5: nature conservation and planning [3].
- Welsh Government (2025). Planning Policy Wales (12th Edition) [4].

Definitions and Terminology

1.3.2 Following the UK's withdrawal from the European Union, the network of sites previously referred to as "European sites" is now collectively termed the National Site Network (NSN)[1] in England and Wales, though the protection afforded under the Habitats Regulations remains unchanged.

1.3.3 For the purposes of this assessment, references to 'Protected Sites' include all sites forming part of the NSN, designated under the Habitats Regulations.

1.3.4 Responsibility for determining whether a project or plan will have a likely significant effect on any Protected site forming part of the NSN, lies with the 'competent authority', which in this case is Cyngor Gwynedd. In compliance with the requirements of the Conservation of Habitats and Species Regulations [1]; hereafter referred to as the 'Habitats Regulations', Regulation 63 [1] requires preparation of the Screening and Appropriate Assessment to assist the competent authority in determining the potential for likely significant effects of the project on Protected Sites in view of its Conservation Objectives, before deciding to undertake or give consent for a plan or project which:

(a) is likely to have a significant effect on a site forming part of the National Site Network (either alone or in combination with other plans or project), and

(b) is not directly connected with or necessary to the management of that site

1.3.5 In line with Government policy [3], potential SPAs (pSPAs), candidate SACs (cSACs) and Ramsar sites are treated as if they were formally designated European sites to ensure their qualifying features are fully safeguarded during assessment. Ramsar sites are important wetland areas designated under the Ramsar Convention on Wetlands of International importance. As with SACs and SPAs, Ramsar sites are underpinned by notification as SSSIs, but are not subject to the Habitats Regulations. However, Ramsar sites should be treated within the planning system in the same way as SACs and SPAs (Section 6.4.29 in PPW12 and TAN5 guidance) [3] [4].

1.3.6 A summary of these designations is detailed below:

- SACs are high-quality conservation sites that have been given strict protection under the Habitats Regulations [1]. These important sites are selected to conserve a range of rare and vulnerable animals, plants and habitats (excluding birds).

[1] The Habitats Regulations transpose the requirements of Articles 6(3) and 6(4) of the EU Habitats Directive (92/43/EEC) into domestic law for England and Wales. These Regulations were amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 to ensure continuity of protections following the UK's withdrawal from the EU.

- SPAs are strictly protected sites that have been implemented to protect rare and vulnerable bird species and their habitats.
- EMSs are marine areas protected typically where designations overlap, such as SACs and / or SPAs often managed through underlying Site of Special Scientific Interest (SSSI). These areas range from subtidal to intertidal and can comprise the entire SAC or SPA, or only part of it.
- Ramsar sites are Wetlands of International Importance that have been designated under the Ramsar Convention (1971) [5]. Sites are selected for their International significance relating to all ecology, botany, zoology, limnology or hydrology wetland components. The designation recognises the importance of wetlands as economic, social and environmental entities and the need to conserve them.

1.3.7 Sites contained within the NSN are designated for both Annex I habitat features and Annex II species. The statutory nature conservation organisation (NRW) has a duty to publish conservation advice for Protected Marine Sites (under Regulation 37 of the Habitats Regulations [1]). This information contains the Conservation Objectives and targets relating to maintaining the integrity of these features.

1.3.8 Functional land refers to off-site areas used by mobile qualifying species for feeding, roosting or movement, which are necessary to support the ecological function of the Protected site.

1.3.9 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 shall agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the site concerned, and if appropriate having obtained the opinion of the general public.

1.4 Structure of this Report

1.4.1 The report uses the following structure:

- Section 2 provides information and a description of the Proposed Development;
- Section 3 provides the HRA methodology and guidance;
- Section 4 provides a screening assessment for the potential pathways for effect;
- Section 5 provides a description of the identified Likely Significant Effects (LSE);
- Section 6 provides an appropriate assessment of likely significant effect, including in-combination effects; and
- Section 7 provides a conclusion.

2. Project Description

2.1 Background

2.1.1 The town of Barmouth lies behind a long sandy and fine-shingle beach in Cardigan Bay. The promenade is a valued asset, providing access to the blue flag beach and the seafront provides the local population with leisure and recreational amenity. Tourism is important to the local economy; the small town attracts around 280,000 visitors annually. The seafront forms an important part of the town's visitor appeal.

2.1.2 The Proposed Development is located along a 1.2km length of the North Promenade within Barmouth. The existing defences run parallel with the promenade and adjacent to Marine Parade. The existing defences comprise sheet piles at beach level (plus concrete platform at some locations), with a primary (recurve) sea wall at promenade level. Between the promenade and Marine Parade is a low central wall, and between the road and hinterland a secondary sea wall, which serves as a de-facto defence. Demountable defences are also used to fill gaps in the tertiary sea wall when flooding is predicted. The beach itself includes timber groynes, although these are in poor condition.

2.1.3 Beach levels decrease and defences deteriorate in condition towards the north of the study area. Part of the promenade failed due to unsafe voiding beneath the promenade slab, requiring emergency stabilising repairs in 2020 and 2021. The repair works were emergency measures required to extend the life of the existing structures until the preferred option is implemented. Studies have concluded that overall foreshore bed levels along North Promenade are lowering, and this lowering is expected to continue. The area is therefore at risk of coastal flooding.

2.1.4 Overtopping currently occurs at the northern end of the promenade in 'benign' conditions i.e. median level tides, without surge, swell, low pressure or high winds. In addition to the promenade failure mentioned above, overtopping from this frontage has also caused extensive damage to the Cambrian coastal railway. There is also a risk from tide-locking of two ordinary watercourse outfalls, and blockage of culverts. Flap valves on the outfalls have also failed, risking tidal ingress. In the absence of investment, 757 properties are predicted to have more than a 1 in 100 chance of flooding in any year. The rapid onset and depth of flooding presents a risk to life. Sea level rise due to climate change is predicted to accelerate, increasing the likelihood and severity of coastal flooding. By 2069, mean sea levels are predicted to have increased by 0.42m and by 2119, by 1.1m.

2.1.5 Cyngor Gwynedd, supported by YGC, are therefore seeking a solution to reduce coastal flood and erosion risk to Barmouth North Promenade, whilst improving the amenity and environmental value of this section of coastline.

2.1.6 The current SMP2 policy for this frontage is Managed Realignment (MR). A Major Change application has been submitted to amend the SMP2 Epoch 2 policy to Hold the Line (HTL), to align with the Proposed Development and its intended design life. A separate assessment has been prepared to address the proposed policy change.

2.2 Transportation optionality

2.2.1 Two methods of rock armour transportation have been included for the Proposed Development. Each option has been assessed within this report and are listed below:

- Option 1 – delivery of rock armour by road.
- Option 2 - delivery of rock armour by sea.

2.2.2 The worst-case marine activity assumes Option 2 (sea delivery) with Vessel A anchoring approximately 6 km offshore for approximately 2 weeks per load and a 3,000t shuttle barge (Vessel B) making 20 trips per load (up to four Vessel A return trips total), with works constrained to daylight/low-tide “in the dry” operations and appropriate navigation marking/Harbourmaster notification.

2.3 Environmental Design Measures

2.3.1 The Proposed Development includes a series of measures that have been embedded from the early-design stage to avoid or minimise impacts on ecological receptors during both the construction and operational phases.

2.3.2 This section summarises the embedded measures expected to be implemented as construction good practice measures. The mitigation hierarchy aligns with the stepwise approach which must be followed in Wales to comply with the achievement of Net Benefit for Biodiversity (NBB) and comply with requirements of Planning Policy Wales [6].

Embedded mitigation measures

2.3.3 Stage 1 of the stepwise approach is to avoid or eliminate potential impacts and adverse effects on biodiversity features throughout the design process. The project design team consulted with ecologists regarding sensitive receptors early in the design process. Sensitive ecological receptors were identified and avoided (where possible). Where it was not possible to avoid an impact entirely, the design next sought to minimise the impact, or to then mitigate and restore where possible or provide compensation for the impact on the feature. The embedded mitigation measures include:

- Construction activity within the Protected sites such as the adjacent SACs will be prohibited. Only transportation of rock armour is permitted through the SACs, as per Option 2 (delivering rock armour by sea), if selected. No rock armour will be stored in the adjacent SAC.
- Piling activity during construction will take place at low tide. This will prohibit noise and vibration travelling through the water column to the intertidal and offshore zones.
- Internationally important habitats (Annex I) such as the *Sabellaria alveolata* reef to the north of the Site and the nearshore mussel beds will be avoided, and no construction activity including storage, compounds or access would be permitted in proximity to this habitat.
- A Landscape and Environmental Masterplan (LEMP) will be developed to form part of the overall Environmental Masterplan required to secure commitments

for ecological mitigation. The LEMP will include the maintenance and monitoring required to ensure that mitigation and any compensatory measures are achieved.

- Appropriate measures for the treatment and control of invasive non-native species will be outlined in an INNS management plan produced by a specialist INNS contractor appointed by the Principal contractor and secured in the CEMP. Marine INNS are to be included within the management plan where Option 2 be chosen for the delivery of the rock armour. Any plant or machinery that has been used in areas with invasive species such as Japanese knotweed, will be thoroughly cleaned, checked and dried. Water used to clean vehicles will be controlled to prevent the spread of the plant (through seeds, rhizomes, fragments, etc.). INNS areas will be cordoned off with a 7m buffer to prevent any inadvertent spreading. Construction staff and visitors will undergo the appropriate INNS training and best practice biosecurity measures during construction to prevent the spread of INNS.

Embedded good practice measures

2.3.4 A range of measures relevant to the Proposed Development are set out for the construction phase within the Construction Environmental Management Plan (CEMP) (document reference- EN.F.15).

2.3.5 The following measures are of particular importance that will be put in place during construction:

- Ensuring that all site activities are controlled and are in accordance with relevant legislation and undertaken in compliance with the relevant Guidance for Pollution Prevention (e.g. GPP5 [7],) and industry best practice (CIRIA [8], CIRIA C741 [9]).
- Constant monitoring of dust levels and effective methods of work will be adopted to prevent dust becoming airborne at the source for example; using wet sweeping methods to prevent accumulation of dust and mud and using effective exhaust ventilation and filtering to minimise potential dust pollution.
- Plant will be regularly serviced and maintained.
- Plant will be located as far as reasonably practicable away from ecologically sensitive features and will be shut down when not in use.
- Trenches and holes will be covered when not being worked on to prevent entry by mobile species such as otters, and where this is not possible exits and escape routes such as ramps or mammal ladders will be provided.
- Use of noise control equipment such as jackets, hoods and shrouds on equipment such as generators.
- Temporary fencing will be installed prior to construction works to exclude fauna from working areas, including compounds.
- All construction works, especially those emitting high levels of noise and vibration, will be limited to daylight hours taken to be from 30 minutes after dawn and 30 minutes before dusk. Work to typically take place during daylight hours. Any work during hours of darkness (taken as the period 30 minutes

before sunset to 30 minutes after sunrise) will be avoided as far as practicable and where unavoidable, the Contractor will agree any exceptions with the ECoW in advance of construction activities. Should night working be required, these will be discussed with the ECoW and appropriate mitigation put in place as determined by the ECoW (particularly concerning lighting). These could include:

  - Temporary lighting used for construction will be switched off when not in use and positioned so as not to spill on to adjacent land, watercourses, sensitive receptors within the area surrounding the works.
  - Directed lighting will be used to minimise light pollution for construction compounds and to ensure no light spill over 0.5 Lux on any watercourses.
  - Lighting levels around construction compounds will be kept to the minimum necessary for security and safety by the contractor.

- Vegetation clearance will be supervised by an Ecological Clerk of Work (ECoW), with appropriate consideration given to protected and/or notable species with potential for harm or disturbance based on the location and/or timing of clearance. This will include avoidance of sensitive periods altogether wherever feasible (e.g. avoiding clearance within the breeding bird season).
- Any vegetation clearance that may be required between March and September (the nesting bird season) should be subject to a thorough nesting bird check by an ECoW no more than 24 hours prior to clearance. If a nest is identified within or close to vegetation to be removed then it must be left in-situ and protected from the works, with no further works in the area until the young birds have fledged from the nest. The suitable buffer of works to prevent disturbance and length of time for birds to fledge is dependent upon species identified.
- If any protected species or signs of protected species such as an otter holt, or other ecological receptors including new occurrences or increase in extent of INNS are encountered during the works, all work in the vicinity is to stop immediately and a suitably qualified ecologist contacted as soon as possible.

2.3.6 An Outline Construction Environmental Management Plan (CEMP) will be submitted in support of the consent applications. The outline CEMP will detail the requirement and timing required for pre-construction surveys for protected species and an ECoW to oversee management of ecological issues as they arise, to educate site personnel in ecological issues where needed, and ensure any method statements are implemented, mitigating potential impacts during construction.

2.3.7 The CEMP will include Toolbox Talks provided by a suitably qualified ecologist to all site personnel to inform them of ecological features including INNS, sensitive habitats, and protected and notable species prior to the commencement of construction. An associated register of attendance will be signed and kept as a record; and a copy of the toolbox talk left at the site office for reference. Should any new INNS be noted, a suitably experienced and competent ecologist would be contacted immediately for further advice.

Embedded pollution control

2.3.8 Best practice will be adopted in line with GPP 5 [10] to minimise the risk of pollution during the Proposed Development and all construction activities will be carried out in accordance with guidance outlined within CIRIA best practice guidance [9].

- The following groups of measures are of particular importance that will be put in place during construction:
- The Contractor would be required to develop and implement the CEMP detailing the practical and necessary measures required during construction to prevent the pollution of the surrounding environment.
- The CEMP will include a fuel spillage procedure, procurement of plant from a reputable supplier, with spill kits available and site personnel trained to use, refuelling only in designated bunded area within site compound, bunding requirements, requirements for fuel storage locations, restrictions on the quantities of fuels/ materials to be taken on to the foreshore, implementation of biodegradable hydraulic oils and Hydrogenated Vegetable Oil (HVO) fuel where possible, restrictions to tidal working times and general protocols to reduce adverse impacts on water quality.
- The CEMP will include a materials storage procedure to prevent loose sediment stored on site from being mobilised and dispersed into receiving watercourses. The CEMP will include methods to manage unintended mobilisation of materials stored on site.
- Regular on-the-spot visual monitoring would be undertaken during the construction phase to determine any visible changes to water quality in the marine environment.
- The Biosecurity Risk Assessment will cover the measures required to safely manage the import of materials from other sites into the intertidal area with respect to INNS and the recommendations would be incorporated into the CEMP.

3. HRA Guidance and Methodology

3.1.1 This section sets out the guidance and evidence base used in assessing the potential effects of the Proposed Development.

3.2 Guidance and Policy

3.2.1 This information has been informed by the following guidance and policy documents:

- Planning Policy Wales (PPW)- Technical Advice Note (TAN) 5: Nature Conservation and Planning [6];
- The assessment has been undertaken in accordance with the Habitats Regulations and relevant case law (including Waddenzee C-127/02 and People Over Wind C-323/17). It applies the Source–Pathway–Receptor model, the key elements of which are summarised in the Appendix.
- Defra (2021) *Habitats Regulations Assessments: protecting a European site* [11]*;*
- Welsh Government (2025) *Habitats Regulations Assessment (HRA) guidance* [12];

3.3 Consultation

3.3.1 An EIA Scoping Opinion was adopted by Cyngor Gwynedd/Gwynedd Council (supported by Ymgynghoriaeth Gwynedd Consultancy (YGC)) and Natural Resources Wales (NRW) in April 2024. The comments received in relation to the Proposed Development and the National Site Network are presented below in Table 3-1.

Table 3-1 Scoping Opinion Comments/Statutory Consultation summary

Scoping Opinion Comment	Response
NRW	
NRW has advised that marine mammals of the Pen Llyn a'r Sarnau Special Area of Conservation (SAC) (Lleyn Peninsula and the Sarnau SAC) would need to be considered due to possible noise disturbance from the piling activity.	Pen Llyn a'r Sarnau SAC has been scoped into the HRA assessment and supporting ES Chapter 6 - Biodiversity and Protected Sites.
NRW has highlighted that the potential for the piling activity to impact on migratory fish from underwater noise and vibration and should be considered for the Afon Eden – Cors Goch Trawsfynydd SAC which has Atlantic salmon as a feature and would migrate up the Mawddach estuary.	Afon Eden – Cors Goch Trawsfynydd SAC has been scoped into the HRA assessment and supporting ES Chapter 6 - Biodiversity and Protected Sites.
NRW advise that such an assessment should include surveys for otters (*Lutra lutra*) (also a feature of the Pen Llyn a'r Sarnau SAC/Lleyn Peninsula and the Sarnau SAC and bats so that suitable mitigation may be considered.	An otter habitat suitability and field sign survey were undertaken in November 2024. In addition, a Preliminary Roost Assessment (PRA) and presence/likely absence survey was undertaken for bats in 2025. These receptors have been scoped into the HRA assessment and supporting ES Chapter 6 - Biodiversity and Protected Sites.
Gwynedd Council	
Information on benthic habitat assessments, biodiversity enhancements and the presence of Piddocks will be needed for the Authority to undertake a HRA as the competent authority under the Conservation of Habitats and Species Regulations 2017 (as amended).	Each of these receptors has been scoped into the supporting ES Chapter 6 - Biodiversity and Protected Sites and assessed within this HRA (Stage 1 and 2) where relevant to the National Site Network.
Pre-application consultation (PAC) Comments relevant to the HRA	**Response**
NRW	
NRW expressed concerns that a likely significant effect from the proposed development on the Pen Llŷn a'r Sarnau SAC and Northern Cardigan Bay SPA cannot be ruled out. NRW advise that further information with respect to these sites is required to adequately consider the potential impacts on the features of protected sites and in particular to enable the decision maker to carry out a Habitats Regulations Assessment under Regulation 63 of The Conservation of Habitats and Species Regulations 2017 (as amended).	The receptor Red throated diver has been scoped into the supporting ES Chapter 6 - Biodiversity and Protected Sites and assessed within this HRA (Stage 1 and 2) for Northern Cardigan Bay SPA. Likely significant effects from the proposed development on the Pen Llŷn a'r Sarnau SAC have also been brought forward to appropriate assessment.
NRW advise that coastal squeeze should be assessed where a proposal involves works that would maintain or fix the shoreline position over the lifetime of the development and where Annex I habitats are present seaward of the defence. NRW note that, from the start of SMP2 Epoch 2, the relevant policy unit is no longer 'Hold the Line', and therefore coastal squeeze was not assessed at plan level for this epoch. As the Proposed Development seeks to hold the line over its design	A coastal squeeze addendum to the HRA (doc ref BMTH-ARP-EBD-OFFSH-TN-OE-000003) assesses the potential for coastal squeeze to occur.

life, NRW advise that the potential for coastal squeeze cannot be screened out and should be taken forward through the HRA process. Accordingly, NRW advise that a coastal squeeze assessment should be undertaken and submitted with the planning application, and that the HRA should proceed to Appropriate Assessment to consider potential effects on relevant features to the National Site Network.	
NRW advise in regard to the HRA Screening and Appropriate Assessment that the option of delivering rock amour by sea (i.e. Option 2) would require the vessel transits through Northern Cardigan Bay SPA to account for non-breeding red-throated diver (RTD) population, which are highly sensitive to vessel movements and have been shown to have a strong stress response to disturbance. NRW advise that the Appropriate Assessment is updated to include an assessment of Northern Cardigan Bay SPA red-throated diver disturbance/displacement due to vessel presence and movements through the SPA. NRW recommend that this should consider disturbance / displacement of the RTD feature based on the worst-case vessel presence and movements within the SPA, the assessment should include: - Maximum number of vessel transits through the SPA (to include vessel A transits to and from its proposed anchor location and vessel B transits to and from vessel A to the rock amour deposit location); and, - Maximum length of time vessel A would be anchored within the SPA. - The assessment should consider the impacts of the worst case vessel presence and movements on the Conservation Objectives for the RTD feature of the SPA, particularly those relating to the population distribution – details can be found in: Advice provided by Natural Resources Wales under Regulation 37(3) of the Conservation of Habitats and Species Regulations 2017, June 2025 NRW note additional proposed mitigation commitments in the Marine Vessel Management Plan (MVMP) could be of benefit to mitigating adverse construction impacts of the option for delivery of rock armour by sea for the RTD feature of the Northern Cardigan Bay SPA. The following additional mitigation measures to be considered for inclusion within the MVMP to reduce or eliminate potential adverse impacts	The final construction methodology will be confirmed by the appointed contractor. However, for the purposes of the HRA, a conservative worst-case scenario for vessel movements has been assumed, based on maximum thresholds and vessel capacities for both Vessel A and Vessel B. Mitigation measures are secured through the MVMP, which will limit vessel movements, anchoring duration and routing.

from disturbance/displacement due to vessel presence and movements at sea delivery option to the RTD feature of the Northern Cardigan Bay SPA were outlined as followed: - If possible avoid sea delivery of rock amour during the key RTD over-wintering period (November 1st to March 31st). - Select vessel anchoring and transit routes within the SPA to avoid known aggregations of birds, maintain direct transit routes to minimise travel distance, and where possible, use existing, well-established routes. - Maintain direct transit routes (to minimise transit distances through areas used by divers). - Minimise noise disturbance by avoiding engine over-revving. - Briefing of vessel crew on the purpose and implications of these vessel management practices (through, for example, toolbox talks).	
NRW advise that indirect effects and disruption to hydrology and sand supply have not been considered as part of the current HRA and Appropriate Assessment in relation to potential impact on biogenic reef *Sabellaria alveolata* habitat. NRW advise that this element is included as part of the HRA with information included in the Appropriate Assessment to rule out a potential impact pathway.	Habitat loss and justification from the coastal processes report has been included to rule out LSE on *Sabellaria alveolata* habitat through indirect effects from change of hydrology and sand supply.
NRW advise to include the underwater noise modelling updated guidance on noise injury to marine mammals.	The updated guidance and subsequently, the changes in dB for Permanent Threshold Shifts (PTS) and weighted Temporary Threshold Shift (TTS) has been included within the relevant sections of the HRA.
NRW welcome the commitment to maintaining slow vessel speeds, as stated in the HRA "the vessels will be moving slowly" and "overall speeds whilst travelling to and from the Site will be slow". And encourage implementation of overall speed restrictions for vessels operating both within and outside the SAC, as precautionary measure to minimise potential disturbance to marine mammals that may be present in the area.	Potential direct mortality or physical injury was considered at the screening stage and carried forward on a precautionary basis to Stage 2 Appropriate Assessment for the Lleyn Peninsula and the Sarnau SAC and the West Wales Marine SAC, to ensure vessel speed restrictions are incorporated within the MVMP.

3.4 Desk Study Information

3.4.1 In addition to the guidance noted above, several websites were used to gather information on the Protected Sites to inform this assessment. Sources used include:

- Natural Resources Wales (NRW) (and legacy body Countryside Council for Wales (CCW)[2]) website [13];
- DataMap Wales: Welsh Government's open-source data and maps from the Welsh public sector [14];
- Multi-Agency Geographic Information for the Countryside (MAGIC) website [15]; and
- Joint Nature Conservation Committee (JNCC) website [16].

3.4.2 Information on the qualifying features of the Protected Sites has been obtained from the information provided on the JNCC website and NRW website. In particular, the Core Management Plans for the Protected Sites were obtained and have been used to inform this assessment. These documents provide the main elements of NRW's management plan for the Protected Sites along with the Conservation Objectives for the features.

3.4.3 The features are considered to be in Favourable Conservation Status (FCS) only when the Conservation Objectives are being met. These Objectives therefore provide an indication of the type of effects which could affect the features of a Protected Site. An impact which could affect the ability of a Site or feature to meet its Conservation Objectives could be considered to be an adverse effect on the integrity of the Protected Site concerned.

3.5 Habitats Regulation Assessment Methodology

3.5.1 To understand the potential implications for the NSN from the Proposed Development it is necessary to identify those Sites that are located close to the Proposed Development or are linked by pathways such as hydrological connections, mobile features or other Functionally Linked Land (FLL).

3.5.2 All Protected Sites within the NSN, including Marine Sites, up to 10km of the Proposed Development were identified using Geographic Information System data from datasets downloaded from the JNCC, MAGIC and NRW. This search was extended to 15km for Sites notified for their population of marine mammals, fish or otter (*Lutra lutra*) where a direct hydrological connection is present (via Barmouth Bay and connected marine habitats) to the Protected Sites.

Understanding Qualifying Interests and Conservation Objectives

3.5.3 For each of the Protected Sites identified, 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 Development.

Identification of the Potential Effects of the Project

3.5.4 Any potential effects and pathways for effect on the Protected Sites resulting from the Proposed Development were identified *after* consideration of integral and embedded measures such as best practice procedures (for example,

[2] CCW has been amalgamated with the Environment Agency Wales and the Forestry Commission in Wales to form Natural Resources Wales.

Guidelines for Pollution Prevention and Construction Industry Research and Information Association (CIRIA) guidance). These measures are integral to the Proposed Development and have been incorporated from the early design stage and included in the overall construction programme.

Identification of Plans or Projects Considered for In-Combination Effects

3.5.5 An 'in-combination' assessment is required where the Proposed Development may have an effect on a Protected Site, but on its own the effects would not be significant. The potential effects of the Proposed Development is therefore considered in-combination with other plans or projects that similarly may have an effect, where the combined effects may become significant. Due to the impacts upon marine features being screened in within 15km, the in-combination assessment for the purpose of this HRA was considered at 1km for terrestrial impacts and 15km for marine impacts.

Consideration of the Significance of Potential Effects

3.5.6 The significance of potential effects was assessed taking into consideration the embedded measures outlined in Section 2. The assessment has been made with awareness of the Conservation Objectives for the features of NSN, although as stated in the relevant guidance, the assessment of the Proposed Development against the Conservation Objectives is not required until the Appropriate Assessment stage of the HRA process. In the assessment of the significance of effects, professional judgement was applied using the following criteria (as sufficient information about the elements and interests is often unavailable):

- The vulnerability/sensitivity of the receiving environment/features of interest;
- When the risk of effects is likely to occur (e.g. construction and/or operation);
- The likely geographical extent of the effects; and
- Likelihood of significant effects (e.g. those above negligible in magnitude) occurring based on previous experience with similar elements, where available.

3.5.7 Where there was not enough information about the risk of qualifying interest being present, or of the risk of effects, the assessment uses the precautionary principle to inform the judgement. The precautionary principle has been applied to ensure that any assessment errs on the side of caution, without being overly cautious. This principle means that the Conservation Objectives should prevail where there is uncertainty or that harmful effects will be assumed in the absence of evidence to the contrary.

3.6 The HRA Process

3.6.1 The assessment of a Proposed Development under the Habitats Regulations can be split into several sections as shown in Appendix A, however, there are effectively four stages to the assessment as described below.

- Stage 1 - HRA screening is the assessment of the likelihood of a plan or project having a significant effect on a Protected Site or its features without mitigation specific to the Protected Site alone or in-combination. This is the trigger for the need for an Appropriate Assessment as set out in Regulation 63(1). In this assessment, Stage 1 screening has been undertaken taking into consideration the embedded measures outlined in Section 2.
- Stage 2 - The Appropriate Assessment is the detailed consideration of the potential effects of the plan or project in relation to the Conservation Objectives for the Protected Site(s) to determine if there is likely to be an adverse effect on the integrity of the Site (i.e. an effect that would compromise the Site meeting its Conservation Objectives). Providing it can be demonstrated that with appropriate mitigation measures the plan or project would not give rise to an adverse effect on the integrity of a Protected Site, the plan or project can proceed.
- Stage 3 – Alternative Solutions. If adverse effects on the integrity of the Site cannot be ruled out, the HRA must explore if less damaging alternative solutions could deliver the overall objectives of the Proposed Development.
- Stage 4 - Imperative Reasons of Overriding Public Interest and Compensation (IROPI). If no alternative solutions exist, the Proposed Development can only proceed if IROPI applies and provides compensatory measures before consent is granted.

Considerations of Mitigation

3.6.2 In line with relevant case law, including the judgments in (Coillte vs People Over Wind [17]) and Eco-Advocacy CLG [2022] EWCA Civ 1391 [18], this assessment makes a clear distinction between measures that are considered part of the intrinsic design of the project and those that constitute mitigation. Mitigation, as considered through these judgments in regard to the case law, is interpreted to mean measures that are intended to avoid or reduce the harmful effects of the envisaged project on the specific Protected site concerned. Consequently, any proposed development, where a potential impact on a Protected Site is identified, and where avoidance and mitigation of potential impact may be applicable, will need to address these measures through a Stage 2 Appropriate Assessment.

3.6.3 However, features that are deemed “integral” to the design of physical characteristics of a project (e.g. design, layout, timing, location, health and safety considerations) may be considered at the screening stage. Integral measures will need to be determined on a case by case basis.

3.6.4 This screening assessment has been undertaken considering the embedded measures integrated into the design as detailed in Section 2. Whilst 3.6.2 above states that mitigation measures should not be considered during Stage 1 Screening, any integral measures (3.6.3) which are embedded into the design of a plan/project and construction programme can be assessed at Stage 1.

3.7 Assumptions and limitations

3.7.1 Information provided by third parties, including publicly available information and databases, is considered correct at the time of publication. Due to the dynamic

nature of the environment, conditions may change in the period between the preparation of this report, and the construction and operation of the Proposed Development.

3.7.2 The HRA has been undertaken in as detailed a way as possible, using all available data sources where they exist. However, the conclusions drawn from this is necessarily limited by the age, type, coverage and availability of data. Any uncertainties and the limitations of the assessment process are acknowledged and highlighted.

4. Stage 1 – Screening: Identification of Likely Significant Effects

4.1 Coastal Squeeze

4.1.1 The majority of the Proposed Development is within Policy Unit 11.15 (Barmouth North). For this unit, the policy plan is Hold the Line (HTL) for epoch 1 (to 2025), followed by Managed Realignment (MR) in epochs 2 and 3 (2025-2055 and 2055-2105 respectively). Importantly, the SMP2 also notes that there is significant benefit in continuing to manage the frontage, and that 'in all probability works will be needed to the north Barmouth frontage towards the end of Epoch 1'.

4.1.2 The Proposed Development deviates from the policy framework set out in SMP2 for epoch 2, in that it will essentially continue a HTL policy until 2075 by providing betterment of the existing defences. This was accepted by Welsh Government as part of the approved OBC in 2021.

4.1.3 The SMP2 Habitats Regulations Assessment (HRA) proposed MR in Epoch 2; as such, the SMP2 HRA did not require a coastal squeeze assessment for this location.

4.1.4 Therefore a HRA Coastal Squeeze Addendum (doc ref BMTH-ARP-EBD-OFFSH-TN-OE-000003) has been produced to provide a Coastal Squeeze Assessment, considering the proposed policy change. The purpose of this HRA Coastal Squeeze Addendum is to consider the potential for coastal squeeze impacts on the features of the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC). This HRA Coastal SqueezeAddendum has been prepared in accordance with Natural Resources Wales (NRW) Operational Guidance Note OGN62 (Assessment of Coastal Squeeze), following the appropriate screening steps to Stage 3: Appropriate Assessment.

4.1.5 Potential coastal squeeze effects associated with the proposed policy change and the Proposed Development have therefore been assessed separately within the Habitat Regulations Assessment Coastal Squeeze Addendum (doc ref BMTH-ARP-EBD-OFFSH-TN-OE-000003). Following an assessment of the potential likelihood and impacts of coastal squeeze associated with the Hold the Line scenario for Epoch 2, the HRA Coastal Squeeze Addendum concluded that there will be no adverse effect on the integrity of the Pen Llyn a'r Sarnau / Lleyn Peninsula and the Sarnau SAC site. Overall, the assessment confirms that the Proposed Development and proposed Policy Change from MR to HTL will not result in coastal squeeze impacts on the Annex I SAC features, nor any Section 7 Priority Habitats.

4.1.6 The addendum concludes that the proposed change to a 'Hold the Line' policy for Epoch 2 would not result in an adverse effect on the integrity of the Pen Llŷn a'r Sarnau SAC (Lleyn Peninsula and the Sarnau SAC). Coastal squeeze is therefore not detailed further within this HRA.

4.2 Relevant Protected Sites

4.2.1 Nine Protected Sites were identified via the criteria listed in Section 3.4 which includes all Protected Sites within 10km of the Site, and those within 15km notified for their population of marine mammals, fish or otter where there is a direct hydrological connection (via Barmouth Bay). Protected Sites are shown in Appendix B and are listed below in order of proximity to the Site:

- **Lleyn Peninsula and the Sarnau SAC (UK0013117)** (located 31m west - along the mean low water mark);
- **Meirionnydd Oakwoods and Bat Sites SAC (UK0030049)** (located 350m east);
- **Northern Cardigan Bay SPA (UK9020327)** (located 2.14km west);
- **Morfa Harlech a Morfa Dyffryn SAC (UK0030049)** (located 4.76km northwest);
- **Cadair Idris SAC (UK0030104)** (located 5.27km southeast);
- **Rhinog SAC (UK0012945)** (located 8.45km northeast);
- **Birds Rock SPA (UK9020283)** (located 9.37km south);
- **Afon Eden – Cors Goch Trawsfynydd SAC (UK0030075**) (located 11.41km east); and
- **West Wales Marine SAC (UK0030397)** (located 13.18km southwest).

4.3 Potential impact pathways

4.3.1 The following potential impact pathways have been identified (after integral embedded measures) as a result of the Proposed Development and are set out below in Table 4-1.

Table 4-1 Potential impact pathways

Potential impact	Pathway description
Loss of designated habitat or of Functionally Linked Land (FLL)	Construction works will take place within 31m of a Protected Site, but no land-take will be required within any Protected Site. Construction works outside of the designations have the potential to cause indirect effects and reduce areas of FLL for qualifying features of the designations. No operational impacts resulting in loss of designated habitat of FLL are reasonably foreseen.
Habitat damage or degradation	Direct and indirect impacts to qualifying habitats, or habitats upon which qualifying species rely, could occur as a result of construction or marine-based transport (Option 2) activities within or outside of the designations. No operational impacts resulting in habitat damage or degradation are reasonably foreseen.
Direct mortality or injury	Direct mortality or injury of qualifying species could occur within a designation or whilst using FLL during construction or marine-based transport (Option 2). No operational impacts resulting in injury or mortality are reasonably foreseen.
Disturbance	Disturbance of qualifying species could occur within the designations or while using FLL during construction or marine-based transport (Option 2), such as visual, noise and vibration disturbance / displacement. No operational impacts resulting in disturbance are reasonably foreseen.

4.4 Screening assessment

4.4.1 Screening for each relevant Protected Site identified in Section 4.1 against the potential pathways identified in Table 4-1 has been carried out. The following Protected Sites have been screened out of the assessment based on a lack of potential impact pathway, with a justification provided below for each Site:

- Meirionnydd Oakwoods and Bat Sites SAC (UK0013117);
- Morfa Harlech a Morfa Dyffryn SAC (UK0030049);
- Cadair Idris SAC (UK0030104);
- Rhinog SAC (UK0012945); and
- Birds Rock SPA (UK9020283).

Meirionnydd Oakwoods and Bat Sites SAC (UK0030049)

4.4.2 The Meirionnydd Oakwoods and Bat Sites SAC is located 350m east of the Site and is primarily designated for its old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0), Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (91E0), and populations of lesser horseshoe bat (*Rhinolophus hipposideros)* (1303). The Site is further notable for its qualifying habitats including watercourses of plain to montane levels with the *Ranunculion fluitantis* and *Callitricho-Batrachion* vegetation (3260), Northern Atlantic wet heaths with *Erica tetralix* (4010), European dry heaths (4030), *Tilio-Acerion* forests of slopes screes and ravines (9180), and bog woodland (91D0).

4.4.3 The nearest section of the SAC comprises Barmouth Hillside Site of Special Scientific Interest (SSSI) designated for its geological features and sessile oak woodlands. The nearest SSSI forming part of the wider SAC designation notified for its bat features is Tŷ Bach Ystlumod, located 4.5km southeast of the Site. No further SSSIs forming part of the SAC notified for their bat populations has been identified within 10km of the Site.

4.4.4 No impact pathways between the Site and the SAC have been identified. Habitats are not connected to the Site through green corridors or hydrological connections and so are not further considered within this report.

4.4.5 The Site is generally very exposed with limited foraging / commuting potential for bats. The seawall and culverts occurring within or under the sea wall do not have the potential to support bats as these are frequently inundated with sea water, and no trees are present within the Site. Structures that could potentially support roosting bats were limited to the east of the Marine Parade which provide low to moderate roosting potential for crevice dwelling bats, with less suitability for free-hanging *Rhinolophus* sp. Only one building, a small sub-station along the Promenade, would be impacted by the Proposed Development (permanently lost). This building was subject to presence/likely absence surveys (via a dusk emergence survey) in May 2025. No bats were identified during dusk emergence survey and roosting bats were considered to be absent from the building. The only SSSI unit designated for lesser horseshoe bats is located 4.5km southeast of the Site, beyond the urban centre of Barmouth. Lesser horseshoe bats are not typically associated with the coastal environment and

given the lack of vegetation present it is considered unlikely that this species would use this area to commute or forage and therefore no impact pathway is reasonably foreseeable.

4.4.6 Meirionnydd Oakwoods and Bat Sites SAC is **not considered further** within this report.

Morfa Harlech a Morfa Dyffryn SAC (UK0030049)

4.4.7 Morfa Harlech a Morfa Dyffryn SAC is located 4.76km from the Site and is designated for its Annex I coastal dune habitats including embryonic shifting dunes (2110), shifting dunes along the shoreline with *Ammophilia arenaria* (2120), fixed coastal dunes with herbaceous vegetation (2130), dunes with *Salix repens spp. Argentea* (2170), and humid dune slacks (2190). The SAC is also designated for the presence of Petalwort (*Petalophyllum ralfsii*) (1395), an Annex II species.

4.4.8 Given the distance between the Site and the SAC, it is considered that any construction activities would have a negligible effect with any localised impacts having dissipated a short distance from the Site. Chapter 12 of the Environmental Statement (Marine and Coastal Physical Processes) confirms changes to coastal processes are not anticipated; therefore, no physical impact pathways exist, and as such no likely significant effects are reasonably foreseeable.

4.4.9 Morfa Harlech a Morfa Dyffryn SAC is **not considered further** within this report.

Cadair Idris SAC (UK0030104)

4.4.10 Cadair Idris SAC is located 5.20km southeast of the Site and is designated for marsh fritillary butterfly (*Euphydryas aurinia)* (1065) and slender green feather moss (*Drepanocladus vernicosus*) (1393), both of which are Annex II species. It is also designated for several Annex I habitats including Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the Isoëto-Nanojuncetea (3130), siliceous scree of the montane to snow levels (*Androsacetalia alpinae* and *Galeopsietalia ladani* (8110), calcareous rocky slopes with chasmophytic vegetation (8210), and siliceous rocky slopes with chasmophytic vegetation (8220).

4.4.11 With regards to the marsh fritillary butterfly, this species is dependent on grassland habitats with foodplants including devil's-bit-scabious (*Succisa pratensis*) field scabious (*Knautia arvensis*) and small scabious (*Scabiosa columbaria*). None of the habitats present within the Site provide suitable plant species or resources for marsh fritillary.

4.4.12 Slender green feather moss is dependent upon base-rich flushes and springs, which are not present within the Site, nor is the SAC hydrologically connected to the Site. The Annex I habitats listed as primary qualifying features are associated with elevation, heathlands or wet ground conditions, none of which are present within the Site, and as noted above, no hydrological connectivity is present. No pathway for effect has been identified for any of the qualifying features of the SAC, and as such no likely significant effects are considered to be reasonably foreseeable.

4.4.13 Cadair Idris SAC is **not considered further** within this report.

Rhinog SAC (UK0012945)

4.4.14 Rhinog SAC is located 8.45km northeast of the Site and is designated for its Annex I habitats including European dry heaths (4030) and old sessile oak woods with *Ilex* and *Blechnum* in the British Isles (91A0) and presence of floating water-plantain (*Luronium natans*) (1831), an Annex II species. The Site is further notable for its other qualifying habitats including Oligotrophic to mesotrophic standing waters with vegetation of the *Littorelletea uniflorae* and/or of the *Isoëto-Nanojuncetea* (3130), Northern Atlantic wet heaths with *Erica tetralix* (4010), alpine and boreal heaths (4060), blanket bogs (7130) and depressions on peat substrates of the Rhynchosporion (7150).

4.4.15 The qualifying habitats and species present within the SAC are dependent upon heathland habitats and wet ground conditions, none of which are present within the Site. The SAC is also not hydrologically connected to the Site, therefore, no pathway for effect has been identified. As such no likely significant effects are considered to be reasonably foreseeable.

4.4.16 Rhinog SAC is **not considered further** within this report.

Birds Rock SPA (UK9020283)

4.4.17 Bird's Rock SPA is located 9.37km south of the Site and is designated for its breeding population of red-billed chough (*Pyrrhocorax pyrrhocorax*) (A346). The SPA is not hydrologically connected to the Site and the breeding bird habitat appraisal undertaken at the Site on 8 July 2024 concluded the habitats present were unsuitable for this species. The immediate urban surrounds are further considered to be unsuitable for this species (in consideration to any disturbance effects). As a result, no pathway for effect have been identified and no likely significant effects are considered to be reasonably foreseeable.

4.4.18 Bird's Rock SPA is **not considered further** within this report.

Sites with pathways screened *into* Stage 1

4.4.19 Table 4-2 includes a summary of all Protected Sites and their corresponding features, Conservation Objectives and vulnerabilities, which have been screened into the Stage 1 assessment based on the presence of potential impact pathways. This includes the following:

Lleyn Peninsula and the Sarnau SAC (UK0013117)

- 1110 Sandbanks which are slightly covered by sea water all the time.
- 1130 Estuaries
- 1150 Coastal lagoons *Priority feature
- 1160 Large shallow inlets and bays
- 1170 Reefs
- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1310 *Salicornia* and other annuals colonizing mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)

- 8330 Submerged or partially submerged sea caves
- 1349 Bottlenose dolphin *Tursiops truncatus*
- 1355 Otter *Lutra lutra*
- 1364 Grey seal *Halichoerus grypus*

Northern Cardigan Bay SPA (UK9020327)

- A001 Red-throated diver *Gavia stellata*

Afon Eden – Cors Goch Trawsfynydd SAC (UK0030075)

- 7110 Active raised bogs
- 1029 Freshwater pearl mussel *Margaritifera margaritifera*
- 1831 Floating water-plantain *Luronium natans*
- 1106 Atlantic salmon *Salmo salar*
- 1355 Otter *Lutra lutra*

West Wales Marine SAC (UK0030397)

- 1351 Harbour porpoise *Phocoena phocoena*

Table 4-2 Qualifying features of Protected sites

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
Lleyn Peninsula and the Sarnau SAC (UK0013117) [19] [20]				
Annex I habitats that are a primary reason for selection of this Site				
1110 Sandbanks which are slightly covered by sea water all the time.	On the north-west coast of Wales includes the sandbanks of Devil's Ridge, Bastram Shoal, the Tripods, and areas within and to the south of Tremadog Bay. These include examples of full salinity, tide-swept sandbanks and relatively sheltered sandbanks. On Devil's Ridge, Bastram Shoal and the Tripods, strong tides mean that the sand, shell and gravel sediments are constantly shifting, and as a result the sandbanks support animals that can tolerate these high levels of disturbance.	• These dynamic habitats rely on natural processes such as sediment transport and deposition, which must be maintained to support the species that depend on them. • A key objective is to conserve the biological communities associated with these sandbanks, including infaunal species such as polychaete worms, bivalve molluscs, crustacean, and echinoderms, as well as interstitial fauna that live between sand grains and contribute to ecosystem productivity. Epifaunal species, including mobile fauna and sessile organisms like hydroids attached to larger sediment particles, also form an important part of the ecosystem. • Ensuring water quality is essential to support these communities, with key parameters such as salinity, oxygenation, and nutrient levels needing to be maintained within natural ranges.	• Coastal squeeze due to sea level rise and the presence of hard coastal defences; • Water pollution, nutrient enrichment and eutrophication; • Spread of invasive non-native species (INNS). • Dredging, trawling, mooring and anchoring which can disrupt sediment structure and formation. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Harvesting of marine resources • Access and recreation disturbance.	31m west
1130 Estuaries	Pen Llyn a'r Sarnau has representative examples of bar-built estuaries in north-west Wales, and includes the Glaslyn/Dwyryd, Mawddach and Dyfi estuaries. There is a continuous gradient between the clean sands near the entrance to the sea and the mud or muddy sands in the sheltered extremes of the estuaries. The intertidal sandflats support communities of burrowing invertebrates, including dense populations of polychaete worms, crustaceans, bivalve molluscs and gastropod molluscs. Saltmarsh fringing the shores of the estuaries, and the saltmarsh creeks and pools, are important habitat features for juvenile fish.	• The Conservation Objectives for estuaries focus on maintaining their geomorphological integrity, hydrodynamic processes, and ecological function, ensuring they continue to support a diverse range of interdependent habitats and species. These transitional environments are shaped by tidal dynamics, sediment transport, and freshwater inputs, which must remain unaltered to sustain the estuarine ecosystem. • A key objective is to protect and enhance the biological communities that characterise estuarine habitats, including benthic infauna such as polychaete worms, bivalves (e.g., *Macoma balthica, Scrobicularia plana*), amphipod crustaceans, and echinoderms, which play a critical role in sediment bioturbation and nutrient cycling. • The estuary also provides essential spawning, nursery, and foraging grounds for a range of fish and bird species. Species abundance should be stable or increasing.	• Pollution and increased nutrient loads (e.g., from agricultural runoff) leading to eutrophication. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Developmental-induced hydrological changes. • Modifications to water flow or tidal exchange can disrupt the natural dynamics of the estuarine system. • Physical disturbance from activities such as dredging, trawling, and recreational use which damage benthic habitats. • Introduction INNS increasing competition and causing degradation of habitats.	2.5km south-east
1150 Coastal lagoons *Priority feature	Morfa Gwyllt lagoon is a small percolation lagoon that consists of a depression in a shingle bar across the mouth of the Afon Dysynni in mid Wales. This is the only example of a percolation lagoon in Wales. The substrate is a mosaic of medium sand over/amongst shingle, with muddier patches within the deeper pockets, and scattered larger pebbles. Three lagoonal specialists have been found at this site: the amphipod *Sphaeroma hookeri*, the bryozoan *Conopeum seurati* and the alga *Chaetomorpha linum*.	• The Conservation Objectives for the coastal lagoon present within the SAC include maintaining the hydrological integrity, ecological function, and biodiversity of these unique habitats. The lagoons must retain processes such as sediment deposition, and percolation/fluctuating salinity levels, which are necessary for supporting their communities. • Key objectives include the protection of species dependent on coastal lagoons, such as starlet sea anemone (*Nematostella vectensis*) and various lagoonal invertebrates. These lagoons also provide important nursery and feeding grounds for fish and support specialized brackish-water plants and a variety of other species.	• Changes in water quality, including nutrient enrichment, pollution, and eutrophication, which can alter species composition and reduce habitat quality. • Alterations to the lagoon's hydrology, such as modifications to tidal flows, water levels, or freshwater inputs. • Introduction of INNS increasing competition and causing degradation of habitats • Coastal development and land reclamation, leading to habitat loss and degradation through direct physical alteration or disturbance. • Disturbance from human activities, including recreation, fishing, and boat traffic, which can disrupt sensitive habitats and species.	3.5km south-east
1160 Large shallow inlets and bays	The seabed of Tremadog Bay on the south side of the Lleyn Peninsula, north-west Wales, consists of a mosaic of different sediment types, which support a diverse mixture of plant and animal communities. Areas of cobbles and pebbles in shallow water support algal	• These coastal features must retain their natural hydrodynamic processes, including tidal exchange, sediment movement, and freshwater inputs, to sustain the species and habitats they support.	• Pollution and increased nutrient loads (e.g., from agricultural runoff) leading to eutrophication. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime.	19km north

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
	species that can tolerate sand-scour, such as *Naccaria wiggii* and *Scinaia spp*. There are patchy areas of maerl around St Tudwal's Islands. Maerl has been found at only one other site in Wales, in Milford Haven. Burrowing bivalves, crabs, brittlestars, urchins and worms, dominate the muddier sediments in Tremadog Bay. There are also beds of eelgrass (*Zostera angustifolia)* and muddy gravel shores within Tremadog Bay, both of which are uncommon habitats. The gravel beach at Traeth Crugan supports the nationally rare amphipod *Pectenogammarus planicrurus*. Several unusual species that are more often seen in warmer Mediterranean waters have been found in Tremadog Bay, such as the bearded red seaweed (*Anotrichium barbatum)* and the mantis shrimp (*Rissoides desmaresti)*.	• Key objectives include the protection of benthic communities, such as bivalves, polychaetes, and other invertebrates that contribute to the overall ecological productivity of the system. These areas also support important nursery grounds for fish species, as well as vital feeding habitats for migratory birds.	• Developmental-induced hydrological changes • Modifications to water flow or tidal exchange can disrupt the natural dynamics of the estuarine system. • Physical disturbance from activities such as dredging, trawling, and recreational use which damage benthic habitats. • Introduction of INNS increasing competition and causing degradation of habitats	
1170 Reefs	The reefs are extremely varied and support a wide variety of communities of marine fauna and flora reflecting the broad range of physiographic factors such as wave action, tidal streams, variation in seabed type, scour regimes, water clarity and variation in water depth. The reef feature occurs throughout the entire SAC and incorporates a range of different habitat types. These include rocky intertidal and subtidal reefs, biogenic reefs (e.g. those formed by the horse mussel (*Modiolus modiolus)* or the honeycomb worm (*Sabellaria alveolata*) and carbonate reef structures formed by methane gas leaking from the seabed (the most prominent of these reefs is known as Holden's Reef). Relatively few Modiolus reefs are still known to exist within the Irish Sea, and the north Llŷn reef is considered one of the best examples in this area.	• The Conservation Objectives for the Pen Llŷn a'r Sarnau SAC reefs focus on maintaining their structural integrity, biodiversity, and ecological functionality. This includes the protection of rocky intertidal and subtidal reefs, extensive boulder and cobble reefs, and biogenic reefs formed by species such as horse mussels and honeycomb worms. • Key objectives include preventing physical degradation from anthropogenic activities, ensuring that water quality parameters support reef-associated communities, and conserving the diverse assemblages of species dependent on these habitats. This includes kelp forests (*Laminaria saccharina*, *Halidrys siliquosa*), turf-forming red seaweeds, and benthic invertebrates such as sponges, soft corals, anthozoans, bryozoans, ascidians, molluscs, echinoderms, and crustaceans. • Additionally, the natural ecological processes of these systems, including recruitment, succession, and interspecies interactions, should remain undisturbed to maintain the dynamic equilibrium of the reef ecosystem. Managing pressures such as pollution, climate change, and non-native species introductions is crucial to ensure the long-term resilience and conservation status of these ecologically significant marine habitats.	• Physical damage from fishing equipment, anchoring, and coastal developments (including alternations of water and sediment movement impacting reef integrity). • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Pollution and nutrient enrichment, chemical discharges, and sedimentation affecting water quality. • Recreational activities such as scuba diving, boat traffic, and shoreline access causing habitat disturbance (particularly trampling across honeycomb worm reefs). • Climate change and rising sea temperatures and ocean acidification impacting reef health. • INNS and competition or predation from non-native species.	100m west
Annex I habitats present as a qualifying feature, but not a primary reason for selection of this Site				
1140 Mudflats and sandflats not covered by seawater at low tide	The intertidal mudflats and sandflats of the SAC are present in two different situations; within the three estuaries of the SAC (the Glaslyn/Dwyryd, Mawddach and Dyfi estuaries), and in fully marine open coast situations on moderately exposed and exposed sandy shores at Porth Dinllaen on the north Llŷn coast, along the south Llŷn coast between Pen-ychain and Criccieth and between Criccieth and Afon Glaslyn and along the Meirionnydd coast at Harlech and the mouth of the Mawddach and Dyfi estuaries. They are of particular importance as feeding grounds for wildfowl and waders, and support a diverse array of burrowing amphipods, crustacea, bivalve molluscs and polychaete and oligochaete worms.	• The Conservation Objectives are to maintain the physical structure, ecological function, and biodiversity of these intertidal habitats. Natural sediment dynamics, including erosion, deposition, and stability, must be preserved to support the diverse communities of infaunal and epifaunal species that inhabit these areas. • These habitats provide essential feeding grounds for a variety of wading birds and wildfowl, as well as supporting key benthic invertebrate species such as polychaete worms, bivalve molluscs, and crustaceans. The maintenance of natural tidal exposure, sediment composition, and organic content is critical to sustaining these ecological communities. • Water and sediment quality must remain within natural ranges to prevent degradation from pollution, eutrophication,	• Pollution and increased nutrient loads (e.g., from agricultural runoff) leading to eutrophication. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Developmental-induced hydrological changes • Modifications to water flow or tidal exchange can disrupt the natural dynamics of the estuarine system. • Physical disturbance from activities such as dredging, trawling, and recreational use which damage benthic habitats. • Introduction of INNS increasing competition and causing degradation of habitats.	2.2km south-east

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
		and contamination. Additionally, the habitat should be safeguarded from physical disturbance, including activities such as coastal development, trampling, and shellfish harvesting, which could negatively impact species composition and sediment stability.		
1310 Salicornia and other annuals colonizing mud and sand	The Salicornia and other annuals saltmarsh communities are present as a pioneer zone on the marine fringe of saltmarshes in the Glaslyn/Dwyryd, Artro, Mawddach and Dyfi estuaries and fringing part of Tremadog Bay. The largest proportion of this feature occurs in the Dyfi estuary.	• The Conservation Objectives for the Salicornia habitats are to maintain the physical and ecological integrity of these pioneer saltmarsh communities. These habitats rely on natural sediment deposition and stability, which must be preserved to support the establishment and succession of glasswort species (*Salicornia spp.*) and other annuals. • The vegetation structure and composition should reflect natural conditions, ensuring the continued development of early-stage saltmarsh communities that contribute to coastal habitat succession. Maintaining the natural hydrological and salinity regimes is critical, as alterations could prevent colonisation and plant growth.	• Pollution and increased nutrient loads (e.g., from agricultural runoff) leading to eutrophication. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Developmental-induced hydrological change. • Modifications to water flow or tidal exchange can disrupt the natural dynamics of the estuarine system. • Physical disturbance from activities such as dredging, trawling, and recreational use which damage benthic habitats. • Introduction of INNS increasing competition and causing degradation of habitats.	3.5km south-east
1330 Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)	The Atlantic salt meadow within the SAC is located within the estuaries of the Meirionnydd and Ceredigion coasts: the Glaslyn/Dwyryd, Artro, Mawddach and Dyfi estuaries. The most extensive areas occur in the Dyfi Estuary with over 380ha, whilst the greatest variety of vegetation types occurs in the Mawddach Estuary. The saltmarsh communities vary from transitional low marsh vegetation to extreme upper marsh vegetation often dominated by sea couch (*Elytrigia atherica)*. In total these saltmarshes have zonation which include seven different communities. The SAC includes the rare slender spike-rush *(Eleocharis uniglumis)* saltmarsh community which occurs locally along the west coast from the Dyfi Estuary northwards. The Atlantic salt meadow also provides habitat for a variety of rare or uncommon plant species. Some areas are lightly grazed and have good vegetation structure, which may be important for breeding waders.	• The Conservation Objectives are to maintain the natural structure, function, and ecological diversity of these coastal habitats. The integrity of the salt meadow vegetation should be preserved, ensuring that characteristic plant communities, including species such as common saltmarsh-grass (*Puccinellia maritima*) and sea purslane (*Atriplex portulacoides*) are maintained across their natural range. • The natural hydrological regime must be protected, allowing for regular tidal inundation and sediment deposition to sustain habitat dynamics. The habitat should remain free from excessive physical disturbance, including erosion, trampling, or inappropriate grazing pressure, which could lead to degradation of vegetation structure and species composition. • Good water and sediment quality status is essential, preventing pollution and nutrient enrichment, which could alter the plant communities and reduce habitat quality. Additionally, the salt meadows must be allowed to respond naturally to sea level rise through landward migration, avoiding habitat loss due to coastal squeeze from hard sea defences or development.	• Coastal squeeze due to sea level rise and the presence of hard coastal defences. • Water pollution, nutrient enrichment and eutrophication. • Spread of INNS. • Dredging, trawling, mooring and anchoring which can disrupt sediment structure and formation. • Shipping (vessel traffic) and vessel wash induced substrate erosion and local modification of the wave exposure regime. • Harvesting of marine resources. • Access and recreation disturbance (particularly trampling and grazing pressures). • Changes in hydrology, such as drainage or altered tidal flows, which can affect the salinity regime and habitat conditions.	2.5km south-east
8330 Submerged or partially submerged sea caves	Sea caves are present around Pen Llŷn including the Tudwal Islands and along the Meirionnydd coast north of Tonfannau and the Ceredigion coast north of Clarach. Fully intertidal caves are present in the bedrock cliffs from Porth Towyn on the north-west side of Pen Llŷn to Clarach Bay north of Aberystwyth. Most caves in the SAC have an intertidal portion with varying proportions remaining permanently below sea level (e.g. St Tudwal's Islands) or, more unusually, are fully subtidal throughout (such as the subtidal tunnel at Pen y Cil). Thirty biotopes have been recorded from the sea caves of the SAC ranging from scoured sparse communities (lichens, red seaweed) to those rich in seaweeds, sponges, anthozoans and sea squirts.	• The Conservation Objectives state that the physical integrity, ecological function, and biodiversity of these habitats must be maintained. The structural stability of the caves, including their rock formations and sediment deposits, must be preserved to support their diverse biological communities. • These habitats provide important refuges for sessile and mobile marine species, including sponges, anemones, bryozoans, and sea squirts, which rely on the caves' stable conditions. The natural hydrodynamic and water quality conditions, such as light penetration, salinity, and oxygen levels, must be maintained to prevent habitat degradation.	• Physical disturbance from activities such as diving, anchoring, and coastal development, which can damage delicate cave communities. • Pollution including nutrient enrichment, chemical contaminants, and marine litter, which can degrade water quality and impact cave-dwelling species. • Changes in hydrodynamic conditions such as alterations to wave action, tidal flow, or sediment deposition, which can affect the cave environment. • Climate change impacts including rising sea temperatures and ocean acidification, which may alter species composition and ecosystem function.	5.6km south

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
			• Disturbance to sensitive species particularly sessile invertebrates and marine mammals, due to increased human activity in and around sea caves.	
Annex II species present as a qualifying feature, but not a primary reason for Site selection				
1349 Bottlenose dolphin *Tursiops truncatus*	Bottlenose dolphins are seen year-round in Cardigan Bay. The number of individuals increases during the summer months, as does group size reaching a peak in late September and October when quite large aggregations of more than 60 individuals may be seen. The dolphins are reported less frequently and in fewer numbers during the winter months, but this may partially reflect poorer weather conditions and fewer observers watching the coast. Aerial surveys in Cardigan Bay in winter 2007 showed a clear preference for the offshore areas of the bay. Bottlenose dolphins do not form a discrete site-based population within Pen Llŷn a'r Sarnau SAC but instead should be seen as part of a wider population that ranges across waters of the Irish Sea and includes the Cardigan Bay SAC.	• The Conservation Objectives for bottlenose dolphins are to maintain the population size, distribution, and natural behaviour of the species within the Site. The habitat must provide suitable conditions to support the dolphins' essential activities, including foraging, social interaction, breeding, and resting. • Key environmental factors such as water quality, prey availability, and acoustic environment must be preserved, ensuring that pollution, nutrient enrichment, and underwater noise disturbance do not negatively impact the population. The dolphins should be able to move freely throughout the SAC without disruption from human activities such as vessel traffic, tourism, and fishing operations.	• Disturbance from boat traffic and tourism, leading to potential disruption of natural behaviours such as feeding, resting, and social interactions. • Underwater noise pollution from vessels, industrial activities, and marine construction, which can interfere with communication, navigation, and foraging. • Pollution, including chemical contaminants and marine litter, which can accumulate in dolphin tissues and impact health. • Entanglement in fishing gear, which poses a risk of injury or mortality. • Impacts from climate change effects including changes in sea temperature and prey distribution, which may impact habitat suitability and food resources.	Suitable SAC habitat 100m west
1355 Otter *Lutra lutra*	The number of otters within the SAC is unknown, but there is evidence that they use areas of the coast within and adjacent to the SAC. Otters present within the Site at any one time do not form a discrete population but are part of a population living around freshwater habitats in Gwynedd and Ceredigion, which itself is not completely isolated but extends further afield and between which there are movements and exchanges. The proportion of the otter population within the Site at any one time and its distribution is likely to be dynamic. It is not known whether the numbers of animals that use the Site are an approximately fixed proportion of the wider population or are a variable proportion with a preference for using marine habitat. The SAC contributes to supporting the otter population as a foraging ground, access corridor and for social activity.	• The key Conservation Objectives for otter are to ensure the integrity of their habitat and allow natural behaviours. This includes preserving suitable breeding, feeding, and resting sites and ensuring access to a diverse and abundant prey base, particularly in freshwater and coastal environments. • Habitats should be free from disturbance from human activities, including recreational use, development, and pollution. Key environmental factors such as water quality and availability of prey species should be maintained within natural ranges to support healthy otter populations.	• Water quality deterioration, particularly from pollution such as chemical contaminants and nutrient enrichment, which can impact prey availability and otter health. • Disturbance from human activities, including recreational use of waterways, which can disrupt otter behaviour, particularly breeding and foraging. • Habitat loss and fragmentation due to infrastructure development, land use changes, and modification of watercourses. • Decline in prey availability, influenced by factors such as overfishing, pollution, and changes in freshwater and coastal ecosystems. • Road traffic collisions, posing a significant mortality risk where otter crossroads near watercourses.	Potential for functionally linked habitat onsite
1364 Grey seal *Halichoerus grypus*	Grey seals present within the Site at any one time do not form a discrete population but are centred (in terms of abundance) on Cardigan Bay and are considered part of the SW England and Wales Management Unit. This population itself is not isolated but extends from SW Scotland to SW England and SE Ireland. Pen Llŷn and Bardsey Island have the larger breeding colonies in North Wales.	• The Conservation Objectives for grey seal are to maintain the population size, distribution, and natural behaviours of the species. The habitat must provide sufficient haul-out sites for resting, breeding, and moulting, and ensure the availability of prey in the surrounding waters to support a healthy population. • The quality of the habitat must be preserved, with natural coastal conditions and water quality maintained to support grey seal health and reproduction. The seals should be able to carry out their essential activities without disturbance from human activities such as boating, tourism, and industrial operations.	• Disturbance from human activities, particularly from boating, tourism, and recreational activities, which can disrupt breeding, resting, and moulting. • Pollution, including chemical contaminants and marine litter, which can accumulate in seal tissues and affect health. • Entanglement in fishing gear, posing a risk of injury or drowning. • Climate change impacts, including changes in sea temperature, storm frequency, and habitat availability, which may affect haul-out sites and food resources.	Suitable SAC habitat 100m west, Grey seal pupping and haul out site located 1km south of the Site
Northern Cardigan Bay SPA (UK9020327) [21] [22]				
Annex Ⅱ species that are a primary reason for selection of this Site				

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
A001 Red-throated diver *Gavia stellata*	Red-throated diver is present within the Site over winter with approximately 1,186 individuals representing 7% of the wintering population in Great Britain.	• The wintering population of red-throated diver should be stable or increasing. • The foraging habitat of this species should not decrease significantly, and its quality should remain unaffected by anthropogenic factors.	• Exploration and extraction of oil or gas • Marine water pollution • Fishing and harvesting aquatic resources • Coastal development • High speed watercraft • Climate change issues (e.g. sea level rise, increased storminess, coastal squeeze) • Spread of INNS	2.22km west
Afon Eden – Cors Goch Trawsfynydd SAC (UK0030075) [23] [24]				
Annex I habitats present as a qualifying feature, but not a primary reason for selection of this Site				
7110 Active raised bogs	The Site 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.	• The location and distribution of the raised bogs and associated rands and fen laggs will increase. • The raised bogs will exhibit a near-natural zonation. • 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. • INNS are not present within the SAC boundary. • Each active raised bog Management Unit is free from trees.	• Hunting and collection of wild animals (terrestrial), including damage caused by game, and taking/removal of terrestrial animals. • Fishing and harvesting aquatic resources • Pollution to surface waters (limnic & terrestrial, marine & brackish) • Pollution to groundwater (point sources and diffuse sources) • Air pollution, air-borne pollutants • Soil pollution and solid waste (excluding discharges) • Grazing • Fertilisation • Outdoor sports and leisure activities, recreational activities • Mining and quarrying • Human induced changes in hydraulic conditions • Changes in abiotic conditions	11.6km east
Annex Ⅱ species that are a primary reason for selection of this Site				
1029 Freshwater pearl mussel *Margaritifera margaritifera*	The river contains the largest known population of freshwater pearl mussels surviving in Wales, and they are almost entirely confined to one section of the river. Historically the mussels were more widespread in the catchment.	• Flow regime, water quality and physical habitat including substrate quality should be at least maintained in, or restored as far as is possible to, a near-natural state, to support the ecosystem structure and function across the whole area of the SAC. • Existing INNS which threaten the conservation status of the SAC features will be controlled where feasible. • All known breeding, spawning and nursery sites should be at least maintained, or restored to suitable habitat. • As a minimum, all waterbodies should be meeting Good Ecological Status under the Water Framework Directive and all river SSSI habitat features should meet favourable condition. Water quality should not be injurious to any life stage. • The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. • The population will be at least maintained or increasing and there will be evidence of recent recruitment. Factors affecting the population or its habitat should be under appropriate control	• Pollution and nutrient enrichment leading to reduced water quality, oxygen depletion, and unsuitable conditions for all life stages. • Excessive siltation and fine sediment deposition smothering juvenile mussels and degrading substrates. • Alteration of natural river flow and hydrological regime (e.g. water abstraction, reservoir release and flow regulation) reducing habitat availability and destabilising mussel beds. • Decline or fragmentation of host fish brown trout (*Salmo trutta*) populations hindering reproductive success of mussels. • Physical river modifications (such as weirs, impoundments, channel alterations including gravel extraction) fragmenting habitats and impeding fish movement. • Increased sediment and pollution from bank erosion, agriculture, forestry operations, and livestock access. • Effects from climate change including altered flow regimes, higher water temperatures, and increased frequency of droughts or floods which may increase stress on populations.	11.6km east

Interest Features	Description of Features	Conservation Objectives	Key Vulnerabilities	Proximity to the Site (approximate)
			• The small and isolated freshwater pearl mussel population is highly vulnerable to stochastic events and loss of genetic diversity.	
1831 Floating water-plantain *Luronium natans*	In the slow-moving waters just upstream from Pont y Grible is a population of floating water plantain and is considered to be one of the best areas in the United Kingdom for this species.	• The populations will be viable throughout their current extent and will be able to maintain themselves on a long-term basis. There will be no contraction of the current distribution, and each population must be able to disperse and complete sexual and/or vegetative reproduction successfully. • The river will have sufficient habitat to support existing populations within their current distribution and future expansion.	• Competition from algal mats and INNS. • Enrichment from land-based activities • Dredging and gravel extraction including the loss of source material from riverbeds. • Water-based activities at low flow (e.g. canoeing and paddling).	11.6km east
Annex Ⅱ species present as a qualifying feature, but not a primary reason for selection of this Site				
1106 Atlantic salmon *Salmo salar*	Atlantic salmon is an important fish species that breeds in the Mawddach catchment. The site is considered to support a significant population of Atlantic salmon.	• The Conservation Objectives for Atlantic salmon are shared with the freshwater pearl mussel – see above.	• Pollution and nutrient enrichment leading to reduced water quality, oxygen depletion, and unsuitable conditions for all life stages. • Alteration of natural river flow and hydrological regime. • Physical river modifications, fragmenting habitats and impeding fish movement. • Increased sediment and pollution from bank erosion, agriculture, forestry operations, and livestock access. • Effects from climate change including altered flow regimes, higher water temperatures, and increased frequency of droughts or floods which may increase stress on populations. •	11.6km east with functionally linked land via hydrological connectivity via Afon Mawddach
1355 Otter *Lutra lutra*	The site is considered to support a significant population of otter.	• 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. • The natural range of otters in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. • The population size should not be limited by the availability of suitable undisturbed breeding sites. • The safe movement and dispersal of individuals around the SAC is facilitated.	• Reduction in number and quality of breeding sites. • Disturbance from recreation (e.g. humans and dogs). • Mining activity which may indirectly affect prey resources. • Deposition of atmospheric pollution which may cause eutrophication and acidification with indirect impacts on prey resources. • Climate change related changes in rainfall pattern and flood events affecting breeding cycles and success.	11.6km east with functionally linked land via hydrological connectivity via Afon Mawddach
West Wales Marine SAC (UK0030397) [25] [26]				
Annex Ⅱ species that are a primary reason for selection of this Site				
1351 Harbour porpoise *Phocoena phocoena*	The Site is located off the coast of Wales, from the Llŷn peninsula in the north, to Pembrokeshire in the southwest, and has been identified as an area of importance for harbour porpoise. The Site supports an estimated 5.4% of the UK Celtic and Irish Sea population.	• Harbour porpoise is a viable component of the Site. • There is no significant disturbance of the species. • The condition of supporting habitats and processes, and the availability of prey is maintained.	• Exploration and extraction of oil or gas. • Renewable abiotic energy use. • Shipping lanes, ports, marine constructions causing collision risks and noise disturbance. • Fishing and harvesting aquatic resources including risk of entanglement. • Military use and civil unrest. • Marine water pollution and bioaccumulation. • Anthropogenic underwater sound including injury or mortality.	13.19km southwest with functionally linked land via Cardigan Bay

5. Stage 1 – Screening: Identification of Likely Significant Effects

5.1 Potential Effects of the Proposed Works

5.1.1 The potential effects of the Proposed Development are considered in relation to Likely Significant Effects (LSE) that may arise on features of the following designations:

- Lleyn Peninsula and the Sarnau SAC (UK0013117)
- Northern Cardigan Bay SPA (UK9020327)
- Afon Eden – Cors Goch Trawsfynydd SAC (UK0030075)
- West Wales Marine SAC (UK0030397)

5.1.2 A significant effect should be considered likely if it cannot be excluded in the light of the best scientific knowledge in the field and if it might undermine a site's Conservation Objectives. A risk or a possibility of such an effect is enough to warrant the need for an Appropriate Assessment (Stage 2). Potential impact mechanisms or 'pathways' for effect for all designated sites and their associated qualifying features identified in Table 4-2 are included in Table 5-1 below.

Table 5-1 Potential for Likely Significant Effects (LSE) on each of the designations

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
Lleyn Peninsula and the Sarnau SAC (UK0013117)		
Loss of habitat or FLL	All construction works will take place outside of the SAC. The habitats that will be lost during construction are not functionally linked to the SACs qualifying features and the SAC is not reliant upon any habitats that will be lost. As such, the following habitats have been screened out for direct effects due to distance and lack of SAC functional linkage: 1160 Large shallow inlets and bays, 1150 Coastal lagoons, 8330 Submerged or partially submerged sea caves, 1330 Atlantic salt meadows (Glauco-Puccinellietalia maritimae), 1130 Estuaries, 1140 Mudflats and sandflats not covered by seawater at low tide and 1310 Salicornia and other annuals colonizing mud and sand. Most of the habitat loss within the Site is limited to urban habitats, or low ecological value barren sand-based biotopes. The highest value biodiversity feature was the blue mussel population growing on the timber groynes. The blue mussel assessment (BMTH-ARP-EBD-OFFSH-TN-E-000001) confirmed that the blue mussel population within the Site qualify as a Priority Habitat in Wales but is not a functionally linked feature of the SAC. The *Sabellaria* reef present 270m to the north of the Site was also noted as an important biodiversity feature and qualifies as an Annex I habitat but is not functionally linked to the SAC. The reef will not be directly affected during construction due to the distance between construction activities, in addition to integral measures embedded into the design (important habitats such as the reef will be avoided, and no construction activity is permitted in proximity to this habitat). Indirect effects from disruption to hydrology and sand supply on biogenic reef *Sabellaria*	No LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	alveolata habitat can be ruled out. The coastal processes modelling report has assessed potential impact pathways to *Sabellaria alveolata* reefs through changes to hydrodynamics, sediment transport and suspended sediments. The assessment identifies that effects on hydrodynamics and sediment processes are localised to the immediate footprint of the works (spatially restricted) and are either negligible or minor, and temporary in duration. Construction-phase sediment release is assessed as minor adverse and temporary, with works undertaken at low tide “in the dry” and stockpiling of sand and shingle above MHWS, limiting turbidity and preventing far field dispersion. Operational effects on waves, currents and longshore sediment transport are assessed as negligible, with no meaningful change to the wider coastal sediment regime. Importantly, the assessment explicitly concludes that turbidity effects on the adjacent *S. alveolata* reef are negligible, and that changes in waves and currents do not affect the reef. On this basis, there is no credible mechanism for smothering, erosion, or alteration of sediment supply or hydrodynamic conditions at the reef. As such, effects on *Sabellaria alveolata* via sand movement or hydrological change can be screened out at Stage 1, and no likely significant effect is identified. ***Mitigation*** The proposed intertidal mitigation includes 0.5ha of Sabellaria reef creation adjacent to existing Sabellaria to the north of the site, along with 0.063ha of blue mussel bed creation adjacent to existing SAC mussel beds. The placement of scattered substrate would create a localised loss of intertidal sand within the working area. The placement of substrate would be confined to carefully selected locations embedded within the habitat management plan, on intertidal sand surrounding the habitats, avoiding sensitive habitats and any key areas of ecological interest, and would not materially alter sediment supply. There is ample intertidal sand habitat within the site and surroundings, any loss is anticipated to be minimal in extent and highly localised when considered in the context of the wider area. Further, the mitigation would be creating a high value habitat that, through the HMMP, would be required to be maintained in favourable/target condition, protected from future disturbance and with embedded design and monitoring measures to protect adjacent habitat. It is therefore considered that construction of the Proposed Development will not result in a LSE on the Lleyn Peninsula and the Sarnau SAC as a result of permanent habitat loss. Chapter 12 of the Environmental Statement (Marine and Coastal Physical Processes) confirms changes to coastal processes are not anticipated as a result of the operation of the Proposed Development and therefore an operational impact in relation to loss of habitat is not anticipated.	
Habitat damage or degradation	All construction works will take place outside of the SAC, with integral embedded measures stating that important habitats will be avoided. As noted above for permanent habitat loss, none of the habitats within the Site are component features or linked to the SAC. Embedded pollution prevention measures will avoid any indirect impacts such as pollution events during construction in both the terrestrial and marine environments. This also includes the mitigation works in proximity to the blue mussel beds and *Sabellaria* reef, where embedded pollution prevention would be secured within the CEMP. However, without mitigation there is the potential for indirect effects to qualifying habitats	LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	and species of the SAC as a result of changes to water quality through sedimentation from mooring of marine vessels and transport of rock armour to the construction area. Depending on water depths and tidal state, there is a risk that vessels may ground, with potential for abrasion and/or propeller scour affecting sensitive benthic habitats (including mussel beds/rocky reef). The SAC which sits partially below MHWS and approximately 31m from the Site is hydrologically connected to the working area at high tide and could be affected by sedimentation events. Salicornia and other annuals colonizing mud and sand and Atlantic salt meadows are not within the footprint of the construction or operational impacts, as such, can be screen out. Therefore, in the absence of mitigation, a LSE cannot be ruled out on Annex 1 Habitat: reefs. INNS were noted within the Site, but their presence will not damage or degrade the qualifying feature of the SAC. Terrestrial INNS were all botanical species such as Japanese knotweed (*Reynoutria japonica*), and *Montbretia*, and the marine INNS was a modest barnacle (*Austrominius modestus)* listed as low risk in Wales. The presence of the non-native invasive barnacle will not negatively affect the SAC qualifying features and was only present on the man-made groynes that are due to be removed as part of the development, thus removing attachment sites for this Marine INNS. It is therefore considered that the Site will not result in a LSE on the Lleyn Peninsula and the Sarnau SAC because of INNS during construction or operation. Any excavated surplus materials (sands or shingles) during construction will be redistributed across the Site. There will be no alterations to the hydraulic conditions along Barmouth Beach or within the Site (See ES Chapter 12 – Marine and Coastal Physical Processes). It is therefore considered that the Proposed Development will not result in an operational LSE on the Lleyn Peninsula and the Sarnau SAC because of changes in hydraulic conditions.	
Direct mortality or injury	As noted above, construction will take place outside of the SAC and embedded measures will prevent any pollution events during construction, avoiding any direct or indirect injury or mortality to qualifying features in the SAC via pollution events. In the event Option 2 (transportation via sea) is selected, works in the marine environment will include transportation of rock armour between a large transport vessel and smaller barge vessel which will deposit the rock armour on the beach at high tide. With regards to mammals, the otter survey conducted 06 November 2024 recorded no evidence of otter within the survey areas and habitats within the Site were assessed as having low to negligible potential for otter, although occasional use of the coastal area cannot not be ruled out. ***Direct mortality or physical injury (non-auditory)*** Direct mortality or physical injury (non-auditory) refers to death or harm resulting from direct physical interaction with project activities or equipment, rather than effects mediated through sound, assessed separately. This may occur through mechanisms such as vessel collision or propeller strike (causing blunt trauma, lacerations, or fatal injury), crushing or entrapment (e.g. between a vessel and structure or within equipment), and physical abrasion or grounding-related contact (including close-range interaction with hulls or propeller wash where animals are in	LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	immediate proximity). The key distinguishing feature is that injury requires direct contact, or near contact, with a physical hazard and is not dependent on acoustic thresholds. Bottlenose dolphin, harbour porpoise and grey seal are present locally. The risk of killing or injuring any of the Annex II qualifying features via boat collision is considered negligible as the vessels will be moving slowly (secured within the MVMP), and spending most of their time being moored with engines turned off. Marine mammals typically disperse or move away when they detect an approaching vessel, making it unlikely they would remain close enough for direct physical injury to occur. However, mitigation of speed restrictions for vessels operating both within and outside the SAC will be included in the MVMP as a precautionary measure to minimise potential disturbance to marine mammals that may be present in the area. As such, in absence of mitigation, the Proposed Development may cause direct mortality/injury to marine mammals. ***Auditory injury*** Auditory injury for this assessment is defined as injury to the hearing system of a marine mammal caused by exposure to underwater sound, not physical contact, potentially resulting in either temporary (TTS) or permanent changes in hearing sensitivity. Permanent auditory injury causes physiological damage and they rely on their hearing for essential functions, including navigation, communication, and foraging. Piling activity for the placement of the sheet piles during construction that is not undertaken in the dry may also generate underwater noise and vibration disturbance impacts upon marine mammals. However, the construction works themselves will be undertaken at low tide only, which reduces piling noise travelling into the SAC during construction. No pathway for effect for marine noise impact is anticipated for piling undertaken in the dry. However, if Option 2 is selected, the presence of a large transport vessel entering and mooring within the SAC, in addition to the smaller barge to transport rock armour at high tide, may result in underwater noise disturbance to marine mammals, qualifying features of the SAC (bottlenose dolphin and grey seal). Noise sources may include the engines of the vessels during transport, engine noise if left running whilst moored, and mechanical sounds whilst rock armour is transferred between vessels. Without mitigation, the decibel (dB) levels from shipping vessels and piling could cause auditory injury to qualifying features. Anticipated unweighted noise levels for the large transport vessel are 191dB at source, and smaller vessels precautionarily are assessed as 200dB at source (worst case scenario). Noise levels at source are given unweighted, as such, are precautionary figures, which may overestimate the risk of auditory injury compared to using weighted values. Weighted auditory injury (INJ) thresholds [27] resulting in permanent and physical auditory damage to a bottlenose dolphin can occur from 201dB SEL_{24}, with weighted Temporary Threshold Shift (TTS) experienced from 181dB SEL_{24} (vessel are non-impulsive sound). For grey seal INJ can occur from 195dB SEL_{24} and TTS from 175dB SEL_{24}.	

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	Estimated modelled unweighted noise levels at the SAC boundary and edge of the Site at MLWS are 122dB (below both TTS and INJ thresholds for bottlenose dolphin and grey seal). At various stopping points along the transport route from the large vessel to the Site, the noise levels range from 125dB to 142dB (below both TTS and INJ thresholds for both species). It is considered that the construction phase of the Proposed Development would not result in a LSE on the Lleyn Peninsula and the Sarnau SAC as a result of auditory injury to grey seals or bottlenose dolphin. However, unweighted noise levels at source for the vessels are above the threshold, and, although deemed unlikely, if a marine mammal would be present in close proximity to the source vessels, auditory injury may occur in absence of mitigation within the MVMP. All other qualifying features are habitat-based and located offshore below MLWS at least 31m from construction works or are not present in proximity to the Site. It is therefore considered that in the absence of mitigation, the Proposed Development may result in a LSE on the Lleyn Peninsula and the Sarnau SAC as a result of killing/auditory injury of qualifying features.	
Disturbance	As noted above, embedded mitigation measures will safeguard any qualifying features from non-physical disturbance such as a pollution events. Auditory injury is not classed under noise disturbance. Noise disturbance refers to behavioural responses (such as avoidance or displacement) without physical harm. The noise thresholds for disturbance are lower than those for auditory injury, marine mammals will typically disperse or move away when exposed to noise levels below the injury threshold, making it unlikely they would remain close enough to experience noise disturbance. Noise disturbance arising from vessel movements would be spatially limited to a localised area around the vessel transit route/working area and would therefore affect only a small proportion of the overall designated site area. However, as there is a risk of disturbance in absence of mitigation within the MVMP, a likely significant effect is anticipated from the Proposed Development on the Lleyn Peninsula and the Sarnau SAC as a result of noise disturbance to qualifying features.	LSE
Northern Cardigan Bay SPA (UK9020327)		
Loss of habitat or FLL	All construction works will take place outside of the SPA, which is located 2.14km west of the Site. The habitats within the Site do not support the qualifying feature (red-throated diver) of the SPA either directly or indirectly. It is therefore considered that the Proposed Development will not result in a LSE on the Northern Cardigan Bay SPA as a result of habitat loss.	No LSE
Habitat damage or degradation	All construction works will take place outside of the SPA, with integral embedded measures stating that important habitats will be avoided during construction. The only associated activities within the SPA will include the passage of the large transport vessel as it travels towards Barmouth using Option 2 (transport by sea) (anticipated to be four deliveries over 3 months). None of the habitats within the Site are component features or linked to the SPA and there will be no alterations to the hydraulic conditions within the Site during operation which may	No LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	impact the SPA qualifying feature (See ES Chapter 12 – Marine and Coastal Physical Processes). Embedded measures will prevent any pollution events during construction in the SPA. Given the distance between the Site and the SPA, any localised sedimentation from marine transport activity is considered to be negligible. INNS were noted within the Site but will not impact the qualifying feature of the SPA. Terrestrial INNS were all botanical species such as Japanese knotweed and montbretia, and the marine INNS was a species of barnacle listed as low risk in Wales. The presence of the non-native invasive barnacle will not negatively affect the SPA qualifying feature (this invasive barnacle was only recorded on the man-made groynes that will be removed as part of the development). There will be no alterations to the hydraulic conditions within the Site (See ES Chapter 12 – Marine and Coastal Physical Processes). It is therefore considered that the Proposed Development will not result in a LSE on the Northern Cardigan Bay SPA because of habitat damage or degradation.	
Direct mortality or injury	All construction works will take place outside of the SPA and the habitats present within the Site are unsuitable for the qualifying species. In the event Option 2 is selected, the presence of transport vessels moored offshore will also be located outside of the SPA, reducing the likelihood of encountering the qualifying species. It is therefore considered that the Proposed Development will not result in a LSE on the Northern Cardigan Bay SPA as a result of killing/injury of qualifying features.	No LSE
Disturbance	Embedded mitigation measures will safeguard any qualifying features from non-physical disturbance such as a reduction in water quality resulting from a pollution event. The overwintering period can vary between years, however, red-throated diver overwintering period is generally between September and the end of February. Vessel use outside of this overwintering period would give no pathway for effect. Without mitigation, the presence of a large transport vessel entering Cardigan Bay and travelling through the SPA to transport rock armour to the Site could produce levels of visual disturbance that may cause short-term disturbance to qualifying features triggering displacement. However, the duration and exposure are *de minimis*. If visual disturbance is generated outside of the peak overwintering period for the qualifying feature, impacts would be avoided entirely. The option for delivery of rock armour by sea (Option 2) would require vessel movements through and anchoring within the Northern Cardigan Bay SPA. Red-throated diver is known to be highly sensitive to vessel presence and disturbance [28, 29]. Worst-case marine activity assumes Option 2 (sea delivery) with Vessel A anchoring approximately 6 km offshore for approximately 2 weeks per load and a 3,000t shuttle barge (Vessel B) making 20 trips per load (up to four Vessel A return trips total), with works constrained to daylight/low-tide “in the dry” operations and appropriate navigation marking/Harbourmaster notification.	LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	As vessel physical presence and movements, comprising anchoring and repeat transits within the SPA could result in disturbance and displacement of the qualifying feature, a likely significant effect cannot be ruled out. As such, it is therefore considered that the Proposed Development will result in a LSE on the Northern Cardigan Bay SPA as a result of non-physical disturbance.	
Afon Eden – Cors Goch Trawsfynydd SAC (UK0030075)		
Loss of habitat or FLL	All construction works will take place outside of the SAC. The habitats that will be lost during construction are not functionally linked to the SACs qualifying features and the SAC is not reliant upon any habitats that will be lost. The habitats lost because of the Proposed Development do not support the qualifying features of the SAC. Embedded measures will prevent any pollution events during construction and whilst the SAC and the Site are hydrological connected at high tide via Afon Mawddach, the SAC is situated over 11.41km upstream. There will be no alterations to the hydraulic conditions within the Site that may adversely affect the SAC (See ES Chapter 12 – Marine and Coastal Physical Processes). Without mitigation the terrestrial INNS identified within the Site have the potential to spread locally via tracked machinery and equipment and via the movement of earth and spoil. However, it is highly unlikely that terrestrial INNS would reach the SAC which is located over 11km upstream of the Site in an elevated location amongst the Snowdonia National Park. Marine based INNS would not spread into the SAC which is a freshwater based designation. It is therefore considered that the Proposed Development will not result in a LSE on the Afon Eden – Cors Goch Trawsfynydd SAC because of habitat loss.	No LSE
Habitat damage or degradation	All works will take place outside of the SAC and are located over 11.41km away. The habitats present across the Site do not support the qualifying features of the SAC. It is therefore considered that the Proposed Development will not result in a LSE on the Afon Eden – Cors Goch Trawsfynydd SAC as a result of habitat damage or degradation.	No LSE
Direct mortality or injury	All works will take place outside of the SAC and are located over 11.41km away. Several of the SAC qualifying species are immobile (floating water plantain and freshwater pearl mussel) and are not found several kilometres upstream in freshwater elevated positions far out of reach from tidal activity and are therefore not at risk from killing/injury. The other more mobile SAC species (otter and Atlantic salmon) are likely to be found in the wider Barmouth Bay and in Mawddach Estuary which is hydrologically connected to the Site. Nevertheless, that habitats present within the Site are unsuitable for these qualifying species and they would not be impacted as construction will take place at low tide only avoiding any noise or vibration into the water column. In the event Option 2 is selected (transport via sea) the presence of vessels moored offshore is highly unlikely to present any risks of injury or	No LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	mortality as they will largely be immobile during transfer of materials and will be moored offshore. It is therefore considered that the Proposed Development will not result in a LSE on the Afon Eden – Cors Goch Trawsfynydd SAC because of direct mortality and injury of qualifying species.	
Disturbance	Due to the distance between the SAC and the Site, no direct or indirect effects arising from disturbance are foreseen. In the event Option 2 is selected, the presence of transport vessel entering and travelling through Barmouth Bay could produce levels of underwater noise that may cause short-term disturbance to qualifying features. However, the duration and exposure are *de minimis*. If noise is generated outside of the peak migration period for the Atlantic salmon, the impacts would be negligible. It is therefore considered that the Proposed Development will not result in a LSE on the Afon Eden – Cors Goch Trawsfynydd SAC because of non-physical disturbance.	No LSE
West Wales Marine SAC (UK0030397)		
Loss of habitat or FLL	All construction works will take place outside of the SAC. The habitats that will be lost during construction are not functionally linked to the SACs qualifying feature and the SAC is not reliant upon any habitats that will be lost. The habitats lost because of the Proposed Development do not support the qualifying features of the SAC.	No LSE
Habitat damage or degradation	All construction works will take place outside of the SAC, with integral embedded measures stating that important habitats will be avoided. None of the habitats within the Site are component features or linked to the SAC. Embedded pollution prevention measures will avoid any indirect impacts such as pollution events during construction in the marine environment. INNS were noted within the Site, but their presence will not damage or degrade the qualifying feature of the SAC. Terrestrial INNS were all botanical species, and the marine INNS was a barnacle (*Austrominius modestus)* listed as low risk in Wales. The presence of the non-native invasive barnacle will not negatively affect the SAC qualifying features as this barnacle was only recorded on the man-made groynes that will be removed as part of the development. Any excavated surplus materials (sands or shingles) during construction will be redistributed across the Site. There will be no alterations to the hydraulic conditions along Barmouth Beach or within the Site (See ES Chapter 12 – Marine and Coastal Physical Processes). It is therefore considered that the Proposed Development will not result in a LSE on the West Wales Marine SAC because of changes in hydraulic conditions.	No LSE
Direct mortality or auditory injury	As noted above, construction will take place outside of the SAC and embedded measures will prevent any pollution events during construction, avoiding any direct or indirect injury or mortality to qualifying features in the SAC via pollution events. In the event Option 2 (transportation via sea) is selected, works in the marine environment will include transportation of rock armour between a large transport vessel and smaller barge vessel which will deposit the rock armour on the beach at high tide. ***Direct mortality or physical injury (non-auditory)***	LSE

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	Direct mortality or physical injury (non-auditory) refers to death or harm resulting from direct physical interaction with project activities or equipment, rather than effects mediated through sound, assessed separately. This may occur through mechanisms such as vessel collision or propeller strike (causing blunt trauma, lacerations, or fatal injury), crushing or entrapment (e.g. between a vessel and structure or within equipment), and physical abrasion or grounding-related contact (including close-range interaction with hulls or propeller wash where animals are in immediate proximity). The key distinguishing feature is that injury requires direct contact, or near contact, with a physical hazard and is not dependent on acoustic thresholds. Harbour porpoise are present locally. The risk of killing or injuring the Annex II qualifying feature via boat collision is considered negligible as the vessels will be moving slowly (secured within the MVMP), and spending most of their time being moored with engines turned off. Marine mammals typically disperse or move away when they detect an approaching vessel, making it unlikely they would remain close enough for direct physical injury to occur. However, mitigation of speed restrictions for vessels operating both within and outside the SAC will be included in the MVMP as a precautionary measure to minimise potential disturbance to marine mammals that may be present in the area. As such, in absence of mitigation, the Proposed Development may cause direct mortality/injury to marine mammals. ***Auditory injury*** Auditory injury for this assessment is defined as injury to the hearing system of a marine mammal caused by exposure to underwater sound, not physical contact, potentially resulting in either temporary (TTS) or permanent changes in hearing sensitivity. Permanent auditory injury causes physiological damage, and they rely on their hearing for essential functions, including navigation, communication, and foraging. Piling activity for the placement of the sheet piles during construction that is not undertaken in the dry may also generate underwater noise and vibration disturbance impacts upon marine mammals. However, the construction works themselves will be undertaken at low tide only, which reduces piling noise travelling into the SAC during construction. No pathway for effect for marine noise impact is anticipated for piling undertaken in the dry. However, if Option 2 is selected, the presence of a large transport vessel entering and mooring within the SAC, in addition to the smaller barge to transport rock armour at high tide, may result in underwater noise disturbance to marine mammals, qualifying features of the SAC (harbour porpoise). Noise sources may include the engines of the vessels during transport, engine noise if left running whilst moored, and mechanical sounds whilst rock armour is transferred between vessels. Without mitigation, the decibel (dB) levels from shipping vessels and piling could cause auditory injury to qualifying features. Anticipated unweighted noise levels for the large transport vessel are 191dB at source, and smaller vessels precautionarily are assessed as 200dB at source (worst case scenario). Noise levels at source are given	

Pathways under consideration	Potential Effects of the Proposed Development	Likely Significant Effects (LSE)
	unweighted, as such, are precautionary figures, which may overestimate the risk of auditory injury compared to using weighted values. Weighted auditory injury (INJ) thresholds [27] resulting in permanent and physical auditory damage to a harbour porpoise can occur from 181dB SEL_{24}, with weighted Temporary Threshold Shift (TTS) experienced from 161dB SEL_{24} (vessel are non-impulsive sound). Estimated modelled unweighted noise levels at the SAC boundary and edge of the Site at MLWS are 122dB (below both TTS and INJ thresholds for harbour porpoise). At various stopping points along the transport route from the large vessel to the Site, the noise levels range from 125dB to 142dB (below both TTS and INJ thresholds for harbour porpoise). It is considered that the construction phase of the Proposed Development would not result in a LSE on the Lleyn Peninsula and the Sarnau SAC as a result of auditory injury to harbour porpoise. However, unweighted noise levels at source for the vessels are above the threshold, and, although deemed unlikely, if a marine mammal would be present in close proximity to the source vessels, auditory injury may occur in absence of mitigation within the MVMP. It is considered that the construction phase of the Proposed Development may result in a LSE on the West Wales Marine SAC as a result of auditory injury to harbour porpoise in close proximity to the source vessels.	
Disturbance	Embedded mitigation measures will safeguard the qualifying feature from non-physical disturbance such as a pollution event. The construction piling works themselves will be undertaken at low tide only, which reduces noise travelling into the SAC during construction. Auditory injury is not classed under noise disturbance. Noise disturbance refers to behavioural responses (such as avoidance or displacement) without physical harm. The noise thresholds for disturbance are lower than those for auditory injury, marine mammals will typically disperse or move away when exposed to noise levels below the injury threshold, making it unlikely they would remain close enough to experience noise disturbance. Noise disturbance arising from vessel movements would be spatially limited to a localised area around the vessel transit route/working area and would therefore affect only a small proportion of the overall designated site area. However, as there is a risk of disturbance in absence of mitigation within the MVMP, a likely significant effect is anticipated from the Proposed Development on the West Wales Marine SAC as a result of noise disturbance to qualifying features.	LSE

5.2 Identification of Other Plans and Projects

5.2.1 Eryri National Park Authority planning portal and Gwynedd planning portal were used to search for planning applications within 1km of the Proposed Development for terrestrial impacts and 15km for marine impacts, submitted within the last 6 months. Only planning applications with the potential to have environmental impacts relevant to the identified protected sites are considered. This for example excludes applications of very small scale works e.g. household scale (minor extensions), listed building applications, changes of use (that does

not require faciliatory development) and applications relating to small-scale tree removals/surgery.

5.2.2 No applications with potential to have environmental impacts relevant to the identified designated sites were identified within 15km of the Proposed Development and therefore no in-combination effects are anticipated.

5.3 Screening Decision of the Plan or Project

5.3.1 The risk of likely significant effects on three Protected Sites from the Proposed Development cannot be ruled out with respect to the risks identified in Table 5-1 above, and therefore an Appropriate Assessment (Stage 2) is required.

5.3.2 Only certain features have been screened through: Northern Cardigan Bay SPA, Lleyn Peninsula and the Sarnau SAC and West Wales Marine SAC are screened in for Stage 2 should Option 2 (sea delivery) be opted for, which would involve vessel movements and potential anchoring that could cause disturbance/displacement of red-throated diver and underwater noise / vessel-related auditory injury at source and noise disturbance to marine mammals. Lleyn Peninsula and the Sarnau SAC is also screened in due to effects on sensitive Annex I habitats (including reefs), via pathways such as abrasion/propeller scour or sedimentation/water quality effects, in the absence of mitigation.

6. Stage 2 - Appropriate Assessment

6.1.1 Where the screening assessment determined that the Proposed Development may have an LSE on a Protected Site, a Stage 2 Appropriate Assessment is required.

6.1.2 This section considers the mitigation options proposed as part of the Proposed Development and the residual effects (if any) on Lleyn Peninsula and the Sarnau SAC, Northern Cardigan Bay SPA and the West Wales Marine SAC, as identified in Section 5. These measures have been considered with regards to the Conservation Objectives set for the Protected Sites as outlined in Table 4-1.

6.2 General Best Practice Mitigation Measures (embedded)

6.2.1 As outlined in Section 4.1, the mitigation hierarchy / stepwise approach has been adopted for the Proposed Development. Avoidance of impacts have been, where possible, secured through integral embedded design. However, there is a risk that construction and material transportation activities may inadvertently cause habitat damage or degradation, and disturbance to qualifying features within Lleyn Peninsula and the Sarnau SAC, Northern Cardigan Bay SPA and the West Wales Marine SAC.

6.3 Appropriate Assessment of the Project with Mitigation Measures

6.3.1 Where adverse effects to the Protected Sites integrity cannot be ruled out, mitigation must be provided. The following additional mitigation measures have been proposed to reduce the LSE on both SACs to a level where no LSE is anticipated.

Piling

6.3.2 Piling activity during construction will take place at low tide. This will reduce noise and vibration travelling through the water column to the intertidal and offshore zones where marine mammals may be present, including within the Llyn a'r Sarnau SAC located 31m from the Site, the West Wales Marine SAC located 13.18km from the Site, and the grey seal pupping and haul out site located 1km south of the Site.

Marine Vessel Management Plan (MWMP)

6.3.3 In the event that Option 2 (transportation of rock armour by sea) is selected, a Marine Vessel Management Plan (MVMP) will be produced. The MVMP will detail suitable avoidance measures to ensure sensitive and internationally important receptors are avoided, and any potential impacts arising from marine vessels are adequately mitigated for.

6.3.4 Receptors will include qualifying features such as sensitive sessile habitats at risk from damage or increased sedimentation, marine mammals including harbour porpoise, bottlenose dolphin and grey seal and Northern Cardigan Bay SPA feature the red-throated diver. The MVMP will include specific limits on vessel speeds, number of crossings and will provide suitable mooring and anchoring locations, and a low impact route through Barmouth Bay to the Site at high tide.

6.3.5 The relevant conservation objectives for each site that will inform the MVMP include:

Lleyn Peninsula and the Sarnau SAC:

Reefs, Atlantic salt meadows and Salicornia and other annuals colonizing mud and sand:

6.3.6 Objective 1 - The overall distribution and extent of the features within the SAC and each of its main component habitats are stable or increasing, subject to natural change.

6.3.7 Objective 2 - The hydro-morphological and chemical elements necessary for the structure and function of the features are stable or improving, subject to natural change

6.3.8 Objective 3 - The abundance, distribution and diversity of the species within communities and component habitats necessary for the structure and function of the features are stable or increasing, subject to natural change

West Wales Marine SAC:

6.3.9 Objective 1 - Harbour porpoise is a viable component of the site;

6.3.10 Objective 2 - There is no significant disturbance of the species; and

6.3.11 Objective 3 - The condition of supporting habitats and processes, and the availability of prey is maintained.

Northern Cardigan Bay SPA:

6.3.12 Objective 1 - The wintering population of red-throated diver should be stable or increasing.

6.3.13 Objective 2 - The foraging habitat of this species should not decrease significantly, and its quality should remain unaffected by anthropogenic factors.

6.3.14 Proposed mitigation for each of the anticipated impact pathways is described below in Table 6-1.

Table 6-1 Appropriate Assessment with mitigation measures in relation to effects on Lleyn Peninsula and the Sarnau SAC and West Wales Marine SAC

Pathways under consideration	Appropriate Assessment and required mitigation	Can Adverse Effects on Site Integrity be ruled out?
Lleyn Peninsula and the Sarnau SAC (UK0013117)		
Habitat damage and degradation	The screening assessment confirmed that embedded mitigation measures would be sufficient to mitigate for pollution events but would not mitigate for physical disturbance from vessels traveling through, grounding risk and mooring within the SAC during the transport of rock armour, which may cause increased sedimentation or direct damage to the reef (including the mussel reef) features. Qualifying features of the SAC include habitats which particularly are sensitive to increased turbidity and sedimentation including: • Reefs	Yes

Pathways under consideration	Appropriate Assessment and required mitigation	Can Adverse Effects on Site Integrity be ruled out?
	The Marine Vessel Management Plan (MVMP) will detail avoidance and mitigation measures to prevent sedimentation within the SAC. This plan will list suitable routing options, minimum under-keel clearance requirements and grounding/mooring locations or avoidance measures to avoid the most sensitive habitats All vessels will moor outside of the SAC boundary, where practicably possible. If mooring is required within the SAC, it will be limited to the most suitable areas with the least sensitive habitats. Vessels will be instructed to reduce their speeds when entering the SAC to prevent sedimentation from propellor scour. During transfer of rock armour from the main vessel to smaller barge vessel, a protocol will be in place to prevent unnecessary sedimentation through engine scour and to prevent materials being dropped overboard. Furthermore, the MVMP will identify the most appropriate locations for vessel management, anchoring and rock storage, to avoiding sensitive benthic habitats.	
Direct mortality or auditory injury	The MVMP will detail implementation of overall speed restrictions for vessels during construction operating both within and outside the SAC, as a precautionary measure to minimise potential direct mortality or physical injury (non-auditory) and reduced noise impact which may cause auditory injury to marine mammals that may be present in the area. The screening assessment as a precautionary basis confirmed that without further mitigation, noise and vibration from vessel movements may cause auditory injury to qualifying features (bottlenose dolphin and grey seal). The MVMP will detail avoidance and mitigation measures to significantly reduce the levels of noise emitted from vessels during construction. This plan will provide suitable routing and mooring options and will prescribe speed limitations based on anticipated engine noise when travelling within the SAC. All vessels will moor outside of the SAC boundary where possible, and engines will be turned off where practicable. During transfer of rock armour from the main transport vessel to the smaller barge vessel, a protocol will be in place to prevent underwater noise through unnecessary engine use. The protocol will prescribe sensitive handling of rock armour between the main transport vessel and barge to reduce underwater noise during the transfer of materials and to prevent materials being dropped overboard. It may be necessary to undertake in-situ noise monitoring to ensure decibel levels are kept below the TTS ranges for bottlenose dolphin and grey seal. If noise levels cannot be kept below the TTS range for these species, a Marine Mammal Observer (MMO) may be required on board to direct operations in a safe manner within the SAC.	Yes
Disturbance	The screening assessment confirmed that embedded mitigation measures would be sufficient to mitigate for pollution-based	Yes

Pathways under consideration	Appropriate Assessment and required mitigation	Can Adverse Effects on Site Integrity be ruled out?
	disturbance but, without further mitigation, noise and vibration from shipping vessel movements may cause disturbance to qualifying features (bottlenose dolphin and grey seal). The MVMP will detail avoidance and mitigation measures to significantly reduce the levels of noise emitted from vessels during construction. This plan will provide suitable routing and mooring options and will prescribe speed limitations based on anticipated engine noise when travelling within the SAC. All vessels will moor outside of the SAC boundary where possible, and engines will be turned off where practicable. During transfer of rock armour from the main transport vessel to the smaller barge vessel, a protocol will be in place to prevent underwater noise through unnecessary engine use. The protocol will prescribe sensitive handling of rock armour between the main transport vessel and barge to reduce underwater noise during the transfer of materials and to prevent materials being dropped overboard.	
West Wales MarineNorthern Cardigan Bay SAC (UK0030397) SPA (UK9020327)		
Disturbance	The screening assessment confirmed that embedded mitigation measures would be sufficient to mitigate for non-physical disturbance, however, would not mitigate for visual disturbance from vessel presence and movements from vessels traveling through and mooring within the SPA during the transport of rock armour, which may cause increased disturbance/displacement of qualifying species. The qualifying feature of the SPA comprises red-throated diver, which are particularly sensitive to visual disturbance from vessel movements. The worst-case-scenario for vessel movement disturbance has been outlined in the stage 1 screening, however, even under an upper limit of what would be reasonably required to deliver the material by sea, adverse effects on site integrity can be ruled out with mitigation. Nevertheless, Vessel A anchoring offshore is standard practice for this delivery method, Vessel B shuttle barge operations are short-duration, repeat transits, not continuous high-speed movements. Works are constrained to daylight and low-tide “in the dry” operations, inherently limiting activity windows. Should works be undertaken outside of the overwintering period, then no pathway for effect would be anticipated. The figures of vessel transits outlined in the stage 1 screening assessment represent a conservative worst-case upper bound for assessment purposes and would not be exceeded under the MVMP. Further, given the large extent of the SPA, and the localised nature of the working area and vessel activity, any disturbance would be spatially restricted and low in magnitude. Mitigation would include the following: • Select vessel anchoring and transit routes within the SPA to avoid known aggregations of birds, maintain direct transit routes to minimise travel distance through	Yes

Pathways under consideration	Appropriate Assessment and required mitigation	Can Adverse Effects on Site Integrity be ruled out?
	areas used by divers, and where possible, use existing, well-established routes. • Ensure addition of the vessels for the delivery of rock armour does not exceed the maximum number of vessel transits through the SPA (to include vessel A transits to and from its proposed anchor location and vessel B transits to and from vessel A to the rock amour deposit location). • Minimise length of time vessel A would be anchored within the SPA and ensure it does not exceed the maximum length of time allowed for mooring vessels in the SPA. • Minimise noise disturbance by avoiding engine over-revving and turning engines off when not in use. • Briefing of vessel crew on the purpose and implications of these vessel management practices (through toolbox talks). Following the implementation of the mitigation the wintering population of red-throated diver should be stable or increasing and the foraging habitat of this species would not decrease significantly, and its habitat quality would remain unaffected by anthropogenic factors. With these measures in place secured through the MVMP, disturbance would be insufficient in magnitude, duration and frequency to affect population distribution or prevent the wintering red-throated diver population from remaining stable or increasing.	
West Wales Marine SAC (UK0030397)		
Direct mortality or auditory injury	The MVMP will detail implementation of overall speed restrictions for vessels during construction operating both within and outside the SAC, as a precautionary measure to minimise potential direct mortality or physical injury (non-auditory) and reduced noise impact which may cause auditory injury to marine mammals that may be present in the area. The screening assessment as a precautionary basis confirmed that without further mitigation, noise and vibration from vessel movements may cause auditory injury to qualifying features (harbour porpoise). The MVMP will detail avoidance and mitigation measures to significantly reduce the levels of noise emitted from vessels during construction. This plan will provide suitable routing and mooring options and will prescribe speed limitations based on anticipated engine noise when travelling within the SAC. All vessels will moor outside of the SAC boundary where possible, and engines will be turned off where practicable. The disturbance mitigation for Northern Cardigan Bay SPA specifying management measures including for vessel routing, frequency, duration and noise generation are applicable to the West Wales Marine SAC. During transfer of rock armour from the main transport vessel to the smaller barge vessel, a protocol will be in place to prevent underwater noise through unnecessary engine use. The protocol	Yes

Pathways under consideration	Appropriate Assessment and required mitigation	Can Adverse Effects on Site Integrity be ruled out?
	will prescribe sensitive handling of rock armour between the main transport vessel and barge to reduce underwater noise during the transfer of materials and to prevent materials being dropped overboard. It may be necessary to undertake in-situ noise monitoring to ensure decibel levels are kept below the TTS ranges for harbour porpoise. If noise levels cannot be kept below the TTS range for these species, a Marine Mammal Observer (MMO) may be required on board to direct operations in a safe manner within the SAC.	
Disturbance	The screening assessment confirmed that embedded mitigation measures would be sufficient to mitigate for pollution-based disturbance but, without further mitigation, noise and vibration from shipping vessel movements may cause disturbance to qualifying features (harbour porpoise). The MVMP will detail avoidance and mitigation measures to significantly reduce the levels of noise emitted from vessels during construction. This plan will provide suitable routing and mooring options and will prescribe speed limitations based on anticipated engine noise when travelling within the SAC. All vessels will moor outside of the SAC boundary where possible, and engines will be turned off where practicable. During transfer of rock armour from the main transport vessel to the smaller barge vessel, a protocol will be in place to prevent underwater noise through unnecessary engine use. The protocol will prescribe sensitive handling of rock armour between the main transport vessel and barge to reduce underwater noise during the transfer of materials and to prevent materials being dropped overboard.	Yes

6.4 Residual Effects

6.4.1 With the inclusion of the additional mitigation measures summarised in 6.3 and provided in Table 6-1, it is concluded that the Proposed Development alone is unlikely to give rise to an adverse effect on the integrity of the Lleyn Peninsula and the Sarnau SAC, Northern Cardigan Bay SPA or West Wales Marine SAC.

6.5 In-Combination Effects

6.5.1 As detailed in Section 5.2 no projects that could act in combination have been identified. With the above mitigation measures described, combined with the lack of impact from nearby projects, no in combination effects are anticipated.

7. Conclusions

7.1.1 This document has been prepared by Ove Arup and Partners Ltd. (Arup) on behalf of YGC in relation to the Proposed Development at Barmouth North Promenade FAS, and the potential for effects on Protected Site as required by Regulation 63(1) of the Habitats Regulations [1]. This report considers the potential effects on Protected Sites for nature conservation in relation to the Conservation Objectives for the features of the Protected Sites and identified potential pathways for effect.

7.1.2 Nine Protected Sites were identified within 15km of the Site, several of which support highly mobile qualifying features.

7.1.3 Meirionnydd Oakwoods and Bat Sites SAC, Morfa Harlech a Morfa Dyffryn SAC, Cadair Idris SAC, Rhinog SAC, and Birds Rock SPA were screened out of the assessment, based on a lack of impact pathways.

7.1.4 At Stage 1 (Screening), it was concluded that LSE on Lleyn Peninsula, and the Sarnau SAC, Northern Cardigan Bay SPA and West Wales Marine SAC could not be ruled out in relation to habitat damage and degradation, direct mortality/ auditory injury of qualifying features (marine mammals) and disturbance.

7.1.5 Stage 2 (Appropriate Assessment) has considered these effects in relation to the Conservation Objectives for the qualifying features of both Protected Sites and has identified suitable mitigation measures. These mitigation measures are considered sufficient to ensure that the Proposed Development does not, either alone or in-combination with other plans or projects (none identified), give rise to any adverse effects on the integrity of Lleyn Peninsula and the Sarnau SAC, Northern Cardigan Bay SPA and West Wales Marine SAC.

7.1.6 This report is produced solely for the benefit of YGC and no liability is accepted for any reliance placed on it by any other party. This report is prepared for the proposed uses stated in the report and should not be used in a different context.

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