

Cyngor Gwynedd

Barmouth North Promenade FAS

ES Chapter 6 Biodiversity and Protected Sites

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6. Biodiversity and Protected Sites

6.1 Introduction

- 6.1.1 This chapter provides an assessment of the likely significant effects that may arise from the construction, operation and maintenance of Barmouth North Promenade Flood Defence Scheme (hereafter referred to as the 'Proposed Development'), on ecological receptors within the study area. The approach undertaken for this chapter has been supported by a Scoping Report submitted by Cyngor Gwynedd (Ymgynghoriaeth Gwynedd Consultancy (YGC)), engagement with statutory consultees, and Scoping Opinions received from Cyngor Gwynedd and Natural Resources Wales (NRW) in April 2024 and July 2025 respectively.
- 6.1.2 This chapter details the legislation, policy and guidance that is relevant to biodiversity and the Proposed Development, a summary of consultation undertaken, the methodology of assessment, and the embedded environmental design measures. This is followed by an assessment of likely significant effects of the Proposed Development on the ecological receptors within the study area, taking account of the embedded environmental design measures, and the need for any additional mitigation is then considered along with any proposals for enhancement. This chapter concludes with a summary of likely significant residual effects.
- 6.1.3 This chapter is supported by the following baseline report appendices, all contained in Volume 3:
- Appendix 6.1 – Arup (2025) Barmouth North Promenade, Intertidal Biotope Survey Report. Document Reference
 - Appendix 6.2 – Arup (2024) Barmouth North Promenade, Preliminary Ecological Appraisal Report.
 - Appendix 6.3 – Arup (2025) Barmouth North Promenade, Blue Mussel *Mytilus edulis* Assessment.
 - Appendix 6.4 – Arup (2024) Barmouth North Promenade, Otter and Water Vole Report.
 - Appendix 6.5 – Arup (2025) Barmouth North Promenade, Habitats Regulations Assessment Screening for Ground Investigation.
 - Appendix 6.6 – Castell Ecology (2025) Barmouth North Promenade, Wintering Bird Report (CE0289.01WeBS(0)).
 - Appendix 6.7 – Arup (2025) Barmouth North Promenade, *Sabellaria alveolata* Survey Report.
 - Appendix 6.8 YGC (2025) Bat Survey Report (CPF8718)
 - Appendix 6.9 – Castell Ecology (2024) Breeding Bird Habitat Appraisal (CE0287.01bbha(0))
 - Appendix 6.10 – Arup (2025) Indicative Underwater Noise Modelling.
- 6.1.4 This chapter should be read in conjunction with:
- ES Chapter 5 Air Quality

- ES Chapter 7 Climate Change
- ES Chapter 10 Flooding and Water Quality
- ES Chapter 11 Noise and Vibration
- ES Chapter 12 Marine and Coastal Physical Processes
- ES Chapter 13 Seascape and Landscape and Visual
- ES Chapter 15 Cumulative and In-Combination Effects
- Green Infrastructure Statement (GIS) (Doc Ref. BMTH-ARP-ELS-ZZ-RP-L-00003)
- Habitat Regulations Assessment Coastal Squeeze Addendum (Doc Ref BMTH-ARP-EBD-OFFSH-TN-OE-000003)

6.2 Legislation, Policy and Guidance

6.2.1 This section identifies the legislation, policy, guidance and other documentation that has informed the assessment of likely significant effects on the ecological receptors within the study area. This section is supported by the ES Volume 3, Appendix 1.1 Policy Context, which outlines overarching legislation and policy relevant to the Proposed Development.

Legislation

6.2.2 Table 6-1 lists the legislation relevant to this topic and the assessment of the likely significant effects.

Table 6-1 List of relevant legislation

Legislation	Relevance to Assessment
The Environment (Wales) Act 2016 [1]	Central to the Act is the aim to safeguard and build resilience of natural systems to continue to provide long-term benefits for the environment, economy, people and communities. Section 6 under Part 1 of the Act requires that “public authorities must seek to maintain and enhance biodiversity so far as consistent with the proper exercise of their functions and in so doing promote resilience of ecosystems”. Section 7 requires Welsh Ministers to publish, review and revise lists (‘S7 Lists’) of living organisms and habitats that are of principle importance in Wales. The Welsh Government have updated their lists on the 20 th March 2026, to include 69 Section 7 Habitats and 1322 Section 7 Species.
The Conservation of Offshore Marine Habitats and Species Regulations (2017) [2]	The regulations aim to protect and conserve offshore marine habitats and species by implementing measures to promote sustainable management of habitats and species in offshore waters and safeguard important habitats from disturbance or harm.
Well-being of Future Generation (Wales) Act 2015 [3]	The Act places legal duty on public organisation to maintain and enhance biodiversity, by thinking about the long-term impact of their decisions. This includes a well-being goal of resilience, promoting a nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems.
Wildlife and Countryside Act 1981 (as amended) (WCA) [4]	Underpins nature legislation in Wales covering the conservation and protection of wild animals, plants and habitats. The WCA protects a range of wildlife, including the protection of wild birds and their eggs whilst nests are in use (implementing the Birds Directive), making it an offence to injure or kill a number of species listed in Schedule 5, protecting wild

Legislation	Relevance to Assessment
	plants listed under Schedule 8, and making it unlawful to plant or otherwise cause to spread in the wild any plant which is listed under Part II of Schedule 9.
Conservation of Habitats and Species Regulations 2017 (as amended) (The Habitats Regulations) [5]	Transposes Council Directive 92/43/EEC on the Habitats Directive into law within England and Wales and provide for the designation and protection of sites of International importance, referred to as Protected Sites under the National Site Network within the assessments. The Habitat Regulations also convey special protection measures to a number of species (listed in Schedule 2) referred to as a European Protected Species (EPS).

National Policy and Strategies

6.2.3 Table 6-2 lists the relevant planning policy and strategies, with paragraphs of relevance to the assessment.

Table 6-2 List of relevant national policies

National Policy & Paragraph Number	Summary of Policy Requirement and Relevance
Planning Policy Wales (PPW) Edition 12 [6]	PPW sets out that planning authorities must seek to maintain and enhance biodiversity in the exercise of their functions, by ensuring development does not cause any significant loss in habitats or populations of species. The policy ensures any scheme applying for planning permission must demonstrate achievement of a net benefit for biodiversity and enhance ecosystem resilience (through applying a stepwise approach ¹). A Green Infrastructure Statement is required with all planning applications to demonstrate compliance with this approach.
DECCA Framework [7]	A framework for evaluating ecosystem resilience based on five attributes and properties specified in the Environment Wales Act and can be applied across different habitats and land uses and for a range of different scales: Diversity, Extent, Condition, Connectivity and Aspects of ecosystem resilience ("DECCA").
Welsh National Marine Plan [8]	The vision of the Marine Plan supports the shared UK vision of clean, healthy, safe, productive and biologically diverse oceans and seas and Welsh Government's commitments to supporting the Well-being of current and future generations. Objective 10 of the Plan concerns the protection, conservation and enhancement of marine biodiversity to halt/reverse decline. This includes the supporting of a well-managed and ecologically coherent network of Marine Protected Areas (MPAs) and resilient populations of representative, rare and vulnerable species. This includes Policy ENV_01, which requires proposals to safeguard, maintain and, where appropriate, enhance marine ecosystems and biodiversity, and to avoid, minimise and/or mitigate adverse effects on the marine environment.
UK Marine Policy Statement [9]	The framework for preparing Marine Plans and taking decisions affecting the marine environment, contributing to the achievement of sustainable development in the United Kingdom marine area. 'Living within environmental limits' is one of the high-level marine

¹ The stepwise approach refers to the application of the mitigation hierarchy whereby the first principle is to avoid impacts and adverse effects on biodiversity features. Where it is not possible to avoid an impact, the second principle is to seek appropriate mitigation and restoration, followed by compensation and enhancement. Enhancement measures to provide net benefits for biodiversity should be undertaken at each stage of this stepwise approach.

National Policy & Paragraph Number	Summary of Policy Requirement and Relevance
	objectives promoting conserving, protecting and recovering biodiversity, and healthy, resilient and adaptable marine ecosystems.
Future Wales – The National Plan 2040 [10]	Provides the National Development Framework for Wales, setting out the direction for development in Wales until 2040. It addresses national priorities through the planning system, including how biodiversity needs to be safeguarded, and how actions should secure the maintenance and enhancement (net gain) of biodiversity, ecosystem resilience and green infrastructure, and part of development proposals. The principles of the Well-being of Future Generations (Wales) Act 2015 are embedded within the plan, to facilitate sustainable development.
Marine Area Statements	The Marine Area Statement covers all inshore waters in Wales, extending out to 12 nautical miles. The key themes are building resilience of marine ecosystems, promoting nature-based solutions and adaptation at the coast, and maximising marine planning. Marine habitats present in north-west Wales are covered under the wider Marine Area Statements and are not listed separately within the north-west Wales Area Statement which primarily covers terrestrial habitats.

Local Policy and Strategies

6.2.4 The relevant local planning policy plans and strategies to the assessment are listed in Table 6-3.

Table 6-3 List of relevant local policy, plans and strategies

Local Policy, Plan & Strategy	Relevant policy	Relevance to Assessment
Anglesey and Gwynedd Joint Local Development Plan 2011 - 2026 (2017) [11]	Strategic Policy PS 5 [12, pp. 60-61]	Sustainable development – includes reference to protecting and improving biodiversity and ensuring all new development is resilient to the effects of climate change.
	Strategic Policy PS 19 [12, pp. 165-166]	Conserving and enhancing (where appropriate) the natural environment – consideration given to several factors when determining a planning application, including protecting, enhancing and/or restoring biodiversity and networks of natural habitats (in accordance with Local Biodiversity Action Plans / Policy AMG 5).
	General Policy and Policy AMG 5 [12, pp. 174-175]	Local biodiversity conservation – Proposals must protect and enhance biodiversity (where appropriate) that is identified as important to the local area by avoiding harmful impacts through sensitive location of the development and considering opportunities to create/improve/manage habitats and landscapes. Proposals can be refused if they do not conform with the criteria set out in this policy, such as ‘the need for the development outweighs the importance of the site for local nature conservation’.
	Policy AMG 4 [12, pp. 173-174]	Coastal protection – ensuring that proposals do not cause unacceptable harm to the area’s biodiversity interests (i.e., European Protected Areas) due to, for example, materials, noise or emissions.
Natur Gwynedd Local Biodiversity		Natur Gwynedd is the Local Biodiversity Action Plan (LBAP) for Gwynedd outside the Snowdonia National Park, also extending out to sea covering a range of marine habitats and species. The working

Local Policy, Plan & Strategy	Relevant policy	Relevance to Assessment
Action Plan (LBAP) [13]		document has several aims including contributing to the conservation and enhancement of biodiversity locally (in Wales) and at both a UK and global level. The document will be adopted as supplementary planning guidance by Gwynedd Council and unpin various strategies and research / monitoring.

Standards and Guidance

6.2.5 Guidance and standards for specific species, groups and other ecological receptors is discussed in individual relevant sections or is provided in the ecological baseline reports. The principal assessment source used for this topic is the following:

- The Guidelines for Ecological Impact Assessment in the United Kingdom and Ireland: Terrestrial, Freshwater Coastal and Marine (2018) CIEEM [14].

6.3 Stakeholder Engagement

EIA Scoping Opinion

6.3.1 An EIA Scoping Opinion was received by Cyngor Gwynedd Council (supported by Ymgynghoriaeth Gwynedd Consultancy (YGC)) and Natural Resources Wales (NRW) on 30th April 2024 and 19th April 2024 respectively. The comments received in relation to Biodiversity and Protected Sites are presented in Table 6-4 and Table 6-5, including how these have been addressed in the Environmental Statement and this chapter.

Table 6-4 NRW comments on scope of the Proposed Development and the response

Scoping Opinion Comment	Response
NRW have advised that marine mammals of the Pen Llyn a'r Sarnau Special Area of Conservation (SAC) would need to be considered due to possible noise disturbance from the piling activity.	Marine mammals have been scoped into the assessment as receptors. This is covered in the statutory sites and species sections.
NRW have 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 assessment as a receptor. This is covered in the statutory sites and species sections.
NRW have advised that The Aber Mawddach / Mawddach Estuary Site of Special Scientific Interest (SSSI) should be scoped in.	The Aber Mawddach / Mawddach Estuary SSSI has been scoped into the assessment as a receptor. This is covered in the statutory sites section.
NRW welcome a survey for Invasive Non-Native Species (INNS) to identify the range and location of any species in the vicinity. However, they suggest that this includes all species of medium and high concern on the Marine Invasive Non-native Species Priority Monitoring and Surveillance list for Wales.	Marine INNS were recorded during the Intertidal Biotope survey in October 2024. An invasive species of barnacle was identified amongst the timber groynes. This species is listed as low risk on the Marine Invasive Non-native Species Priority Monitoring and Surveillance list for Wales. No

Scoping Opinion Comment	Response
	further INNS surveys were deemed necessary as no additional INNS were identified.
NRW advise that such an assessment should include surveys for otters (<i>Lutra lutra</i>) (also a feature of the Pen Llyn a'r 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 are covered in the corresponding species section.
With regards to physical processes a spatial maximum zone of influence for potential impacts of the proposed works has not been presented. A suitable spatial maximum zone of influence should be confirmed.	The addition of transport Option 2 (delivery of rock armour by sea) has resulted in an increase to the study area. This study area covering the Zone of Influence (Zol) has been reflected throughout the assessment. Further details on the spatial maximum Zol can be found in Chapter 12 Marine and Physical Coastal Processes.
NRW have noted the Scoping Report submitted provides insufficient detail regarding potential direct and indirect impacts of the Construction, Operation and Decommissioning phases of the proposed works to Physical Processes.	Please see ES Chapter 12 Marine and Coastal Physical Processes for full details on potential direct and indirect impacts of the Construction and Operation phases of the Proposed Development on physical processes. Decommissioning has not been assessed due to the assumption that the defences will remain in place past 2075.

Table 6-5 Gwynedd Council comments on scope of the Proposed Development and the response

Scoping Opinion Comment	Response
The applicants should follow the relevant guidance for benthic habitat assessments for marine development.	The following NRW Guidance Notes have been used during surveys to inform the assessment of likely significant effects within this Chapter: - Benthic habitat assessment guidance for marine developments and activities (2021) [15]. - Benthic habitat assessment guidance (intertidal sediments, horse mussel (<i>Modiolus modiolus</i>) reefs, <i>Sabellaria</i> reefs, subtidal habitats, subtidal sediments) (2021) [16]. Environmental Impact Assessment (EIA) for marine development (2021) [17]
As highlighted by the Gwynedd Biodiversity Officer the project should look to incorporate biodiversity enhancements into the design of the scheme where possible.	Terrestrial and marine enhancements for a range of receptors have been incorporated into the assessment. This is covered in the mitigation and enhancement section.
The Biodiversity Unit have advised that there is the possibility that piddocks could be present within old wooden groynes or intertidal clays.	Piddock were not recorded during the Intertidal Biotope survey in October 2024 or during the detailed <i>Sabellaria</i> survey in May 2025. However, their potential presence has been considered within the intertidal habitat assessment section.
The above information will also be needed for your Authority to undertake a HRA as the competent authority under the Conservation of Habitats and Species Regulations 2017 (as amended).	A Habitat Regulation Assessment (HRA) Report (Stage 1 and Stage 2 screening) has been produced for the Proposed Development. Please see BMTH-ARP-EBD-ZZ-RP-OE-000003 for reference.

Table 6-6 NRW comments relevant to the ES Chapter 6 on the Proposed Development post PAC

Scoping Opinion Comment	Response
NRW welcome the inclusion of a Marine Vessel Management Plan (MVMP) to avoid potential impact on subtidal blue mussel habitat. Should Option 2 (transportation of rock armour by sea) be the preferred development option, NRW would welcome further discussion to select the most appropriate locations for vessel management and rock storage. NRW further 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.	Measures have been included within the ES and HRA to address habitat disturbance for subtidal blue mussel habitat under the Option 2 development option. Commitments to slow vessel speeds are included within the assessment and will be secured through the MVMP as a precautionary measure to minimise disturbance to marine mammals and other receptors. An MVMP has been included within the assessment framework and will be secured should Option 2 (sea delivery of rock armour) be taken forward. The MVMP will set out vessel management, routing, anchoring and operational controls to minimise potential impacts on marine receptors and habitats.
NRW advised that allis and twaite shad, mobile features of the Aber Mawddach / Mawddach Estuary SSSI, may be present near the works and, as hearing-specialist fish, could be sensitive to vessel noise under Option 2. Whilst modelling indicates that source noise from the large transport vessel could theoretically affect hearing-specialist fish under prolonged exposure, predicted noise levels at the SAC boundary and vessel stopping points are below TTS thresholds, and sustained exposure is unlikely given offshore anchoring and fish mobility. With implementation of the MVMP, residual risk is considered low.	Potential effects on hearing-specialist fish have been considered using available modelling outputs and outlined under construction effects for clarity. The intermittent nature of vessel activity, anchoring location offshore, and implementation of vessel management measures are expected to reduce the likelihood of significant effects. The assessment concludes no significant residual effects on fish, supported by construction timing at low water and the application of embedded mitigation measures/MVMP.
Updated auditory injury criteria for marine mammals have recently been published and NRW advise that these revised thresholds are to be reflected in future assessments to ensure current best practice.	Thresholds from updated guidance has been integrated into the ES and HRA reports. Underwater noise has been assessed using modelling outputs and embedded mitigation measures. Noise levels have been interpreted in the context of construction timing, activity type and distance from receptors, with conclusions based on modelled noise levels rather than source levels alone.
Regarding Chapter 12 – Marine and Coastal Physical Processes, NRW state that the main driver for dune formation is wind driven (aeolian) sand transport from the west to north-west, with the construction of the causeway blocking the northern estuary channel, providing space for the dunes to develop and the construction also trapping aeolian transport. NRW advise amending this section of the report and that the impact of the revetment on dunes is assessed. It should be noted that it is NRW's initial opinion that the change to the revetment (slight loss of upper intertidal beach) is unlikely to	The ES Chapter 6 has incorporated the impact on dunes and proposed dune mitigation/enhancement within the updated ES Chapter 6. The assessment has been informed by existing coastal process evidence. The potential influence of revetment works and groyne removal on aeolian sand transport and dune dynamics has been considered, with conclusions reflecting the limited scale of change anticipated.

Scoping Opinion Comment	Response
cause a material reduction in sand supply to the dunes. The removal of the groynes impact on aeolian transport should also be considered: this could lead to increased sand supply if the groynes are currently trapping wind driven sand.	
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 <i>Sabellaria alveolata</i> 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.	Potential indirect effects on biogenic reef habitat have been considered within the assessment framework and ruled out due to the localised impact.
NRW advise that the location of the <i>Sabellaria alveolata</i> habitat recorded as part of the Phase 1 intertidal survey should be confirmed in Appendix 6.1 Intertidal Biotope Survey Report, Figure 4 Intertidal Biotope Survey.	Habitat extents and locations are confirmed within the relevant appendices.
NRW have proposed amendments to the coastal squeeze assessment.	A Habitats Regulations Assessment Coastal Squeeze Addendum has been produced to consider coastal squeeze impacts (doc ref BMTH-ARP-EBD-OFFSH-TN-OE-000003)
Regarding otters, NRW advise that to reduce any potential impact on otters during the operational phase as a result of lighting impacts, the planning authority should include the following condition on any planning permission granted: Condition: Prior to its installation, full details of lighting shall be submitted to and agreed in writing by the Local Planning Authority. The Lighting Plan should include: - Details of the siting and type of external lighting to be used - Drawings setting out light spillage in key sensitive areas - Details of lighting to be used both during construction and/or operation - Measures to monitor light spillage once development is operation. - The lighting shall be installed and retained as approved during construction and operation. Justification: A lighting plan should be submitted to ensure lighting details are agreed prior to installation and to reduce the impacts of lighting in the interest of protected species, protected sites, habitats, commuting corridors, dark skies, visual amenity and nighttime tranquillity of designated landscapes.	Otter mitigation measures are to be included within the CEMP, and a lighting strategy will be secured to control light spill during construction and operation, reducing potential effects on otters and other sensitive receptors.
Regarding removal of groynes, NRW advise that details on groyne removal and any environmental	Groyne removal will be undertaken at low water where practicable and controlled through method

Scoping Opinion Comment	Response
impact from this activity is to be considered, including water quality. Detail the method on how the groynes will be removed and possible sediment suspension from the works. With approximately 27 rows of groynes to be removed, the cumulative impact of disturbing sediment that may contain pollutants should be considered further. NRW would encourage the work to remove the groynes should be done at low water, reducing the risk of sediment resuspension.	statements within the CEMP. Measures will be implemented to manage sediment disturbance, machinery positioning and pollution risk. Groyne removal has been considered within the assessment and will be controlled through the Construction Environmental Management Plan (CEMP). Measures will be implemented to minimise sediment disturbance, pollution risk and effects on water quality during removal works.

Non-Statutory Engagement

- 6.3.2 Non-Statutory Stakeholder consultation has not been undertaken in relation to the Proposed Development.

6.4 Methodology

Study area

- 6.4.1 This section describes the spatial scope (the area which may be impacted) for the assessment. It applies to the potential impacts on statutory and non-statutory nature conservation sites, and habitats and species of conservation importance (ecological receptors).
- 6.4.2 In this chapter the study area includes all land directly affected by the Proposed Development. For certain ecological receptors, such as those that are hydrologically connected or considered to represent Functionally Linked Land (FLL), the study area has been extended to also include land or sea beyond the Site to adequately capture any impacts to “off-site” receptors.
- 6.4.3 Due to the coastal location of the Proposed Development, the study area used for this assessment covers both terrestrial and marine habitats. The terrestrial extent of the study area includes the existing primary and secondary sea walls along 1.6km of the Barmouth Promenade, in addition to the North Promenade Car Park. The marine extent covers the intertidal zone, from the primary sea wall along the Barmouth Promenade down to the MLWS (approximately 125m from primary sea wall to the seaward edge of the Site boundary).
- 6.4.4 The study area also includes an assessment of offshore designations, habitats and species, as a result of material transportation optionality:
- Option 1 – delivery of rock armour by road.
 - Option 2 - delivery of rock armour by sea.
- 6.4.5 Should the rock armour be transported by sea, the study area includes an assessment of potential vessel routes, anchorage locations, and beach landing points, to account for potential impacts from vessel traffic, sedimentation, turbidity, reduced water quality and disturbance via noise and vibration.
- 6.4.6 The methodologies for establishing the baseline conditions are set out in the following sections along with the assessment methods for evaluating ecological receptors, characterising impacts and determining significance of effects. The distances for each ecological receptor and the assumed Zone of Influence (Zoi)

from the Proposed Development are listed in Table 6-7 below. The ZOI correlates with the study area used for this chapter of the impact assessment.

Table 6-7 Assumed zone of Influence for ecological receptors

Ecological Receptors	Assumed Zone of Influence
Internationally Designated Sites notified for their population of marine mammals, fish or otter (<i>Lutra lutra</i>) where a direct hydrological connection is present	15km buffer around the Proposed Development
Other Internationally Designated Sites	10km buffer around the Proposed Development
Nationally Designated Sites	2km buffer around the Proposed Development
Locally Designated Sites	2km buffer around the Proposed Development
Priority Habitats, main rivers, Priority Ecological Networks and NRW priority areas	2km buffer around the Proposed Development
Irreplaceable habitat ((Ancient woodland, Ancient/veteran trees)	2km buffer around the Proposed Development
Relevant habitats and species records (including protected and invasive species)	2km around the Proposed Development
Standing waterbodies	0.5km around the Proposed Development

Baseline Methodology

6.4.7 The environmental baseline data for the Site has been obtained from desktop study and baseline surveys. The following sources have been used to complete the baseline assessments:

- Multi-Agency Geographical Information for the Countryside (MAGIC) website [18] for locations of statutory designated sites.
- Joint Nature Conservation Committee (JNCC) website [19] for citations of statutory designated sites.
- NRW Protected Areas of Land and Sea [20] website for information on statutory designated sites.
- Welsh Government DataMapWales [21] for notable habitats including ancient woodlands and main rivers.
- Welsh Government DataMapWales for priority ecological networks.
- Woodland Trusts Ancient Tree Inventory [22] for ancient and veteran trees.
- Welsh Marine Planning Portal [23] for information on marine protected and priority species.
- OS Open Maps [24] for locations of any ponds potentially suitable for great crested newts (*Triturus cristatus*) within 500m of the Site.
- Shoreline Management Plan [25].
- Wales Environmental Information Portal [26].
- Wales Invasive Non-Native Species (INNS) Portal [27].

6.4.8 Field surveys have been conducted to establish the ecological baseline of the Site and study area. The surveys undertaken and methodology for establishing

baseline conditions regarding habitats and protected and notable species is summarised in Table 6-8, together with details including dates and survey extents. For details on the individual survey methodologies, locations of surveys, equipment used, and survey limitations, refer to the associated baseline reports provided in Appendix 6.1 – 6.9.

Table 6-8 Summary of methods for field surveys

Survey	Date	Summary of Method	Survey Area	Report & Appendix
Intertidal Biotope Survey	30 September 2024 and 01 October 2024	Surveys were undertaken in accordance with the Marine Nature Conservation Review (MNCR) Intermediate Level survey for rapid biotope assessment, comprising broad biotope appraisal and identification of conspicuous flora and fauna [28]. Identification of the soft sediment biotopes in situ was undertaken in accordance with the Marine Monitoring Handbook Procedural Guideline No. 3-1 [29].	The Site plus extended to OS grid reference SH 60750 15923 (south) and SH 59957 17750 (north)	Intertidal Biotope Survey Report – ES Volume 3, appendix 6.1
Extended Phase 1 Habitat Survey	25 September 2024	Following JNCC's Extended Phase 1 Habitat Survey methodology [30] which included an assessment of habitats on site, and the potential for habitats to support protected/notable species and INNS.	The Site plus 30m outside the boundary (where accessible)	Preliminary Ecological Appraisal (PEA) Report – ES Volume 3, appendix 6.2.
Blue mussel Assessment	06 May 2025	Desk based assessment following the Intertidal Biotope Survey to quantify the extent of blue mussel across the Proposed Development and adjacent designated sites using online sources (DataMap Wales).	The Site plus up to 800m offshore	Blue Mussel Assessment File Note – ES Volume 3, appendix 6.3
Otter and Water Vole Survey	06 November 2024	Survey of all watercourses and suitable habitat for signs of otter and water vole (<i>Arvicola amphibius</i>), using 'Monitoring the Otter' [31] and 'Water Vole Field Signs and Habitat Assessment' [32].	All suitable habitat within and up to 500m of the Site	Otter and Water Vole Survey Report – ES Volume 3, appendix 6.4
Wintering Bird Surveys	Monthly from September	Surveys followed the Wetland Bird Survey (WeBS) methodologies	The Site plus 500m outside the boundary	Wintering Bird Survey Report – ES Volume

Survey	Date	Summary of Method	Survey Area	Report & Appendix
	2024 to March 2025	[33], employing monthly core counts at high tides (September 2024 to March 2024), and at low tides (November 2024 to February 2025).		3,Appendix 6.6
<i>Sabellaria alveolata</i> Survey	01 – 02 May 2025	Survey methods were aligned with the NRW Guidance Note 030d [15] and informed by the results of the previous Intertidal survey report covering the Proposed Development.	Approximately 200m north of the Site where <i>Sabellaria alveolata</i> was previously recorded during the Intertidal Biotope Survey	<i>Sabellaria alveolata</i> Report — ES Volume 3, Appendix 6.7
Bat Surveys	25 February and May 2025	Preliminary Roost Assessment (PRA) of buildings and presence/likely absence survey of the substation (via dusk emergence survey). .	The Site plus 30m outside the boundary (where accessible)	Bat Survey Report – ES Volume 3, appendix 6.8
Breeding Bird Habitat Appraisal Survey	08 July 2024	A walkover survey was carried out by an experienced ornithologist to record both the species present, and to examine the types and extents of potential breeding bird habitats within and adjacent to the Proposed Development.	The Site and immediately adjacent habitats	Breeding Bird Habitat Appraisal Report– ES volume 3, appendix 6.9
Indicative underwater noise modelling	July 2025	Desk-based assessment of underwater noise levels from source to receiver (sensitive ecological receptors)	Study area based on transshipment zones and routing locations provided by Keynvor Morlift Limited (KML).	Indicative underwater noise modelling – ES volume 3 Appendix 6.10

Assessment Methodology

- 6.4.9 The assessment of impacts from the construction and operational phases of the Proposed Development has followed the methodology set out in CIEEM guidance [14]. In line with this guidance, the following definitions are used for impacts and effects:
- Impact – actions resulting in changes to an ecological receptor. For example, the construction activities of a development removing a hedgerow.
 - Effect – outcome to an ecological receptor from an impact. For example, the effects on a dormouse (*Muscardinus avellanarius*) population from the loss of a hedgerow.
- 6.4.10 The assessment of impacts considers the ecological baseline within the study area at the time of survey. Methods of valuing or determining the importance of the ecological receptors within a geographic context are detailed below.

Valuing Habitat and Species

- 6.4.11 The CIEEM guidelines [14] recommend that the value of ecological receptors is determined based on a geographic frame of reference. For this assessment, the following geographic frame of reference is used:
- International.
 - National (i.e. UK).
 - Regional (i.e. northwest Wales).
 - County (Gwynedd).
 - Local (i.e. within circa 5km of the Site).
- 6.4.12 In accordance with the CIEEM guidelines [14], in assigning a level of value to each ecological receptor considered in the assessment, it is necessary to consider its distribution and status, including a consideration of trends based on available historic records. Rarity (including inclusion of lists of species of conservation importance, such as Red Data Lists, Birds of Conservation Concern, Biodiversity Action Plans and Lists of Habitats and Species of Principal Importance for the Conservation of Biodiversity: Section 7 Species and Habitats (also referred to as priority species and habitats) is an important consideration because of its relationship with threat and vulnerability; although since some species and habitats are inherently rare, it is necessary to consider rarity in the context of status. A habitat or species that is rare and declining should be assigned a greater level of importance than one that is rare but known to have a stable distribution or population.
- 6.4.13 Those ecological receptors which have been identified as being of sufficient value to be material to decision-making (e.g. those considered to be of 'Local' importance or above), and which it is considered could experience significant effects as a result of the Proposed Development (i.e. effects that could adversely affect the habitat or the favourable conservation status of a species' local population), have been classified as 'Important Ecological Features' ("IEF") (as outlined in CIEEM Guidelines [14]), and thus are considered in the detailed assessment.
- 6.4.14 Other ecological receptors (i.e. those which are of less than 'Local' importance) are scoped out, and not subject to any further assessment within this document (unless there are legal obligations such as for invasive non-native species ("INNS")).

Predicting and Characterising Ecological Impacts

- 6.4.15 In accordance with CIEEM guidelines [14] when describing impacts on receptors of at least local importance, reference is made to the following:
- Positive or negative – i.e. an impact that either increases or reduces quality of the environment or factor being assessed.
 - Magnitude – i.e. the size of an impact in quantitative terms where possible.
 - Extent – i.e. the area over which an impact occurs.
 - Duration – i.e. the time for which an impact is expected to last.
 - Reversibility – i.e. a permanent impact is one that is irreversible within a reasonable timescale or for which there is no reasonable chance of action

[34] being taken to reverse it. A temporary impact is one from which a spontaneous recovery is possible.

- Timing and frequency – i.e. whether impacts occur during critical life phases or seasons and how often impacts occur.

6.4.16 Both direct and indirect impacts are considered: direct impacts are changes that are directly attributable to a defined action, e.g. the physical loss of habitat occupied by a species during the construction process. Indirect ecological impacts are attributable to an action, but which affect ecological resources through impacts on an intermediary ecosystem, process or receptor, e.g. a pollution event reducing the food source for a receptor such as otter or water vole.

6.4.17 The integrity of a site is also assessed and defined within TAN 5 [15] as:

‘...the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and / or the levels of populations of the species for which it was classified.’

Significance Criteria

6.4.18 In accordance with the CIEEM guidelines [14] a significant ecological effect, in broad terms:

‘encompass impacts on structure and function of defined sites, habitats or ecosystems and the conservation status of habitats and species (including extent, abundance and distribution)’.

6.4.19 Furthermore, a significant effect:

‘is an effect that either supports or undermines biodiversity conservation objectives for ‘important ecological features’ or for biodiversity in general.’

6.4.20 It is important to note however that the actual determination of whether an impact is ecologically significant is made irrespective of the value of the receptor in question. In this respect the CIEEM methodology differs from some other approaches to EIA.

6.4.21 The assessment relies on professional judgement and guidance as provided within CIEEM guidelines [14].

6.4.22 Any significant effects remaining after mitigation (the residual effects), together with an assessment of the likelihood of success of the mitigation, are the factors to be considered against legislation, policy and development management in determining the Proposed Development.

Mitigation, Compensation and Enhancement

6.4.23 It is important as part of any environmental impact assessment, wherever possible, to clearly differentiate between mitigation, compensation and enhancement. These terms are used in this assessment as follows:

- **Avoidance** of impacts is sought at design stage where possible to avoid harm to identified ecological receptor (for example changing the construction footprint or avoiding lighting).
- **Mitigation** is used to refer to measures to avoid, reduce or remedy a specific negative impact in situ for the same receptor.

- **Compensation** is where there are significant residual negative ecological effects despite the mitigation proposed, these should be offset by appropriate compensatory measures.
- **Enhancement** is used to refer to measures that seek to provide net benefits for biodiversity over and above requirements for avoidance, mitigation or compensation.

Green Infrastructure Statement

- 6.4.24 A Green Infrastructure Statement (GIS) has been produced (following compliance with PPW 12 and the Environment (Wales) Act) which demonstrates how the stepwise approach has been followed throughout the Proposed Development design. The Building with Nature Standards Framework v2.0 [35] have been used to inform the Green Infrastructure Statement in the absence of any formal guidance.

Limitations and Assumptions

Blue mussel

- 6.4.25 A review of aerial imagery indicated that there is a sub-tidal reef feature within <100m of the Site. This feature can be seen extending from the intertidal zone off Barmouth beach, stretching towards the SAC boundary and further offshore. Given the presence of known blue mussel beds and subtidal biogenic reef features locally, it has been assumed that this visible feature may be a blue mussel bed – this is supported by prior mapping of this habitat as blue mussel bed by NRW [20]. For the purposes of this assessment, a precautionary approach has been applied whereby the presence of blue mussels has been assumed, to ensure sufficient consideration has been given to the Proposed Development and any associated impacts.
- 6.4.26 The review of aerial mapping is caveated as it was not possible to derive subtidal features past approximately 800m offshore as the aerial mapping resolution declined significantly past this point.
- 6.4.27 No subtidal surveys have been undertaken to inform this assessment.

Intertidal biotope

- 6.4.28 The intertidal biotope survey was undertaken within the recommended months of April to October. Monday 30 September experienced strong winds and heavy rain, whilst 1 October was fine with moderate winds and occasional showers. The strong onshore wind may have influenced the low tide level such that access to the full low tide was restricted by the low pressure and strong onshore winds. This may have limited access to the lowest available tides. However, the survey was timed to take advantage of spring tides with the biotopes in the vicinity of MLWS assessed at each low tide. It is therefore considered that the biotopes and species identified are representative.

Sabellaria alveolata

- 6.4.29 The guidance states that surveys are undertaken in late summer to early autumn following the main spring/summer settlement period, to ensure *Sabellaria* reefs are sampled during optimal periods of peak biomass.

Programme constraints necessitated survey in early May; however, results are considered representative of conditions.

- 6.4.30 Habitat characterisation of *S.alveolata* provides a snapshot of the condition of the reefs at the time of survey. Intertidal and shallow subtidal reefs in particular can suffer significant damage from increased wave action during winter storms.
- 6.4.31 No coring or destructive sampling was undertaken.

Bats

- 6.4.32 Good practice guidance recommends that bat activity surveys begin at least 15 minutes before sunset and continue for 1.5 to 2 hours afterwards. The survey of the substation building was completed 1 hour after sunset, which is shorter than recommended. The building is in an exposed location adjacent to the promenade, with limited surrounding vegetation and likely lightspill from nearby streetlights and properties. The Site was assessed as having low suitability for foraging and commuting bats, with pipistrelles (known to emerge earlier) being the only species identified in the desk study.
- 6.4.33 The structure did not present typical features of a horseshoe bat roost and was considered suitable only for crevice-dwelling species, though it is unclear whether internal access was gained for the PRA survey. However, as the building is being retained, the risk of an impact as a result of any missed roosting features is considered to be low.

6.5 Baseline

- 6.5.1 This section sets out existing conditions and identifies potential ecological receptors and their value, as per the methodology listed in Section 6.4.

Designated Sites

- 6.5.2 Nine International designated sites are present within 15km of the Site (see Table 6-7 for details on the ZOI applied). This included both terrestrial and marine-based SACs and SPAs. Two nationally designated sites are present within 2km of the Site, both being SSSIs, and seven non-statutory (local) sites, consisting of Candidate Wildlife Sites (CWSs) were recorded within 2km.
- 6.5.3 Details of these sites can be found in Table 6-9 and their locations are shown in ES Volume 3, Appendix 6.2 – Arup (2024) Barmouth North Promenade, Preliminary Ecological Appraisal Report .

Table 6-9 Statutory Designated Sites and Non-Statutory (local) Sites.

Designated Site	Description	Minimum distance & direction from the Site
International Designated Sites		
Pen Llŷn a'r Sarnau SAC	Annex I habitats (primary reason for site selection): • 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	31m west

Designated Site	Description	Minimum distance & direction from the Site
	Annex I habitats (qualifying feature, but not a primary reason for site selection): • 1140 Mudflats and sandflats not covered by seawater at low tide • 1310 <i>Salicornia</i> and other annuals colonizing mud and sand • 1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>) • 8330 Submerged or partially submerged sea caves Annex II species (present as a qualifying feature, but not a primary reason for site selection): • 1349 Bottlenose dolphin (<i>Tursiops truncatus</i>) • 1355 Otter (<i>Lutra lutra</i>) • 1364 Grey seal (<i>Halichoerus grypus</i>)	
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	Annex I habitats (primary reason for site selection): • 91A0 Old sessile oak woods and <i>Ilex</i> and <i>Blechnum</i> in the British Isles • 91E0 Alluvial forests with black alder (<i>Alnus glutinosa</i>) and ash (<i>Fraxinus excelsior</i>) (Aldno-Padio, <i>Alnion incanae</i>, <i>Salicion albae</i>) Annex I habitats (qualifying feature, but not a primary reason for site selection): • 3260 Water courses of plain to montane levels with the <i>Ranunculion fluitantis</i> and Callitricho-Batrachion vegetation • 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> • 4030 European dry heaths • 9180 <i>Tilio-Acerion</i> forests of slopes, screes and ravines * Priority feature • 91D0 Bog woodland * Priority feature Annex II species (primary reason for site selection): • 1303 Lesser horseshoe bat (<i>Rhinolophus hipposideros</i>)	350m east
West Wales Marine SAC	Annex II species (primary reason for site selection): • 1351 Harbour porpoise (<i>Phocoena phocoena</i>)	13.18km southwest
Morpha Harlech / a Morpha Dyffryn SAC	Annex I habitats (primary reason for site selection): • 2110 Embryonic shifting dunes • 2120 Shifting dunes along the shoreline with <i>Ammophila arenaria</i> (white dunes) • 2130 Fixed coastal dunes with herbaceous vegetation (grey dunes) * Priority feature • 2170 Dunes with <i>Salix repens</i> ssp. <i>argentea</i> (<i>Salicion arenariae</i>) • 2190 Humid dune slacks Annex II species (primary reason for site selection): • 1395 Petalwort (<i>Petalophyllum ralfsii</i>)	4.76km northwest
Cadair Idris SAC	Annex I habitats (primary reason for site selection):	5.20km southeast

Designated Site	Description	Minimum distance & direction from the Site
	• 3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> • 8110 Siliceous scree of the montane to snow levels (<i>Androsacetalia alpinae</i> and <i>Galeopsietalia ladani</i>) • 8210 Calcareous rocky slopes with chasmophytic vegetation • 8220 Siliceous rocky slopes with chasmophytic vegetation Annex I habitats (qualifying feature, but not a primary reason for site selection): • 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> • 4030 European dry heaths • 6410 <i>Molinia</i> meadows on calcareous, peaty or clayey-silt-laden soils (<i>Molinion caeruleae</i>) • 6430 Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels • 7130 Blanket bogs (* if active bog) * Priority feature • 7230 Alkaline fens • 91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles Annex II species (primary reason for site selection): • 1065 Marsh fritillary butterfly (<i>Eurodryas</i>, <i>Hypodryas</i>) • 1393 Slender green feather-moss <i>Drepanocladus vernicosus</i>	
Rhinog SAC	Annex I habitats (primary reason for site selection): • 4030 European dry heaths • 91A0 Old sessile oak woods with <i>Ilex</i> and <i>Blechnum</i> in the British Isles Annex I habitats (qualifying feature, but not a primary reason for site selection): • 3130 Oligotrophic to mesotrophic standing waters with vegetation of the <i>Littorelletea uniflorae</i> and/or of the <i>Isoëto-Nanojuncetea</i> • 4010 Northern Atlantic wet heaths with <i>Erica tetralix</i> • 4060 Alpine and Boreal heaths • 7130 Blanket bogs (* if active bog) * Priority feature • 7150 Depressions on peat substrates of the Rhynchosporion Annex II species (primary reason for site selection): • 1831 Floating water-plantain (<i>Luronium natans</i>)	8.45km northeast
Afon Eden – Cors Goch Trawsfynydd SAC	Annex I habitats (qualifying feature, but not a primary reason for site selection): • 7110 Active raised bogs *Priority feature Annex II species (primary reason for site selection): • 1029 Freshwater pearl mussel (<i>Margaritifera margaritifera</i>) • 1831 Floating water-plantain (<i>Luronium natans</i>)	11.41km east

Designated Site	Description	Minimum distance & direction from the Site
	Annex II species (present as a qualifying feature, but not a primary reason for site selection): • 1106 Atlantic salmon (<i>Salmo salar</i>) • 1355 Otter (<i>Lutra lutra</i>)	
Northern Cardigan Bay Special Protection Area (SPA)	Annex II species (primary reason for site selection): A001 Red-throated diver (<i>Gavia stellata</i>)	2.14km west
Bird's Rock SPA	Annex II species (primary reason for site selection): A346 Red-billed chough (<i>Pyrrhocorax pyrrhocorax</i>)	9.37km south
National Statutory Sites		
Barmouth Hillside SSSI	Nationally important geological site, woodland and botanical interest. The woodland supports a varied mammal and bird population.	350m east
Aber Mawddach/ Mawddach Estuary SSSI ²	The special features of the site are the estuarine habitats, particularly muddy sediments and saltmarshes, reed beds and raised mire. There is also a substantial species interest, including breeding wading birds, scarce vascular and invertebrates. Otter (<i>Lutra lutra</i>) and migratory fish species allis shad (<i>Alosa alosa</i>) (non-spawning populations), twaite shad (<i>Alosa fallax</i>), sea lamprey (<i>Petromyzon marinus</i>) and Atlantic salmon (<i>Salmo salar</i>) are also features of interest.	302m south
Non-Statutory Sites		
Wern Mynach/Gwynedd CWS	Wet woodland and marshy grassland.	157m east
Ceilwart-ganol/ Gwynedd CWS	Acid grassland and bracken (<i>Pteridium aquilinum</i>).	468m east
Garn/ Gwynedd CWS	Dry heath/acid grassland mosaic.	799m east
Dinas Oleu/ Gwynedd CWS	Dry dwarf shrub heath.	807m southeast
Ffridd y Graig & South to Garn/ Gwynedd CWS	Acid grassland and dry dwarf shrub heath.	819m east
Orielton Wood/ Gwynedd CWS	Broadleaved woodland and dry dwarf shrub heath.	1.53km south
Tyddyn-y-nant/ Gwynedd CWS	Acid grassland and marshy grassland.	1.66km north

² Mawddach Estuary is also a Shellfish Waters Protected Area (SWPA).

Irreplaceable Habitats

- 6.5.4 There are no irreplaceable habitats located within the study area. The desk study identified eleven areas of ancient woodland (either unknown category, plantation on ancient woodland site or restored ancient woodland site) within 2km of the Site. The closest lies 145m to the east. The locations of ancient woodland in relation to the Site are shown in ES Volume 3, Appendix 6.2 – Arup (2024) Barmouth North Promenade, Preliminary Ecological Appraisal Report. No ancient trees were recorded within 2km of the Site. Given the distance between the Proposed Development and these features and lack of impact pathway and connective features, no effects on these receptors are foreseeable and as such they are not further considered within this chapter.

Priority Habitats

- 6.5.5 An area to the north of the Site is classified as a Priority Ecological Network owing to its 'semi-natural grassland'. Most of this area includes the grassland associated with residential properties, caravan parks and further afield. The entire Barmouth coastline is categorised as a Marine Priority Ecological Network.
- 6.5.6 Several priority and notable habitats are present within 2km of the study area as summarised below:
- Section 7 and OSPAR: Marine Habitats:
 - Mussel Beds (within study area).
 - Estuarine Rocky Habitats (approximately 1km southeast).
 - Intertidal Mudflats (approximately 1km southeast).
 - Atlantic Salt Meadow (approximately 1.5km southeast).
 - Marine Article 17 Habitats:
 - Intertidal Reef (Rocky) (within study area).
 - Mudflats and Sandflats (within study area).
 - Estuaries (immediately south, associated with Mawddach Estuary).
 - Estuaries Associated Sediment (approximately 200m south).
 - Water Framework Directive (WFD) Higher Sensitivity Habitats [36]:
 - Mussel Beds (*Modiolus modiolus*, *Mytilus edulis* & others) (A1.22, A2.72, A5.62, A4.24, A3.361) (within study area).
 - Saltmarsh (A2.5) (approximately 1.5km southeast).
 - WFD Lower Sensitivity Habitats:
 - Gravel & Cobbles (intertidal & subtidal coarse sediment A2.1, A5.1) (within study area).
 - Intertidal Soft Sediment (Sand, Mud & Mixed A2.2, A2.3, A2.4) (within study area).
 - Rocky shore (Intertidal rock A1) (within study area).
 - Subtidal Soft Sediment (Sand, Mud & Mixed A5.2, A5.3, A5.4) (within study area).

Waterbodies

- 6.5.7 There are no major watercourses (main rivers) or waterbodies within the Site, with the closest 'river' being Afon Mawddach (1km southeast) and the Melin Plas

Drain (1.5km north). A small watercourse/ditch feature (unnamed) is located just north of the Promenade Café and measures approximately 46m in length within the Site, before flowing off-site. This watercourse culverts under the railway track (to the northeast).

- 6.5.8 The search on MAGIC highlighted six waterbodies within 500m of the Site: the closest being 80m east (a small pond at the end of a watercourse and culvert just off Heol-Y-Llan). All other waterbodies were located on the east side of the railway track.

Habitat Surveys

Extended Phase 1 Habitat Surveys

- 6.5.9 An Extended Phase 1 Habitat Surveys identified 14 habitat types within the Site. These are shown in ES Volume 3, Appendix 6.2 – Arup (2024) Barmouth North Promenade, Preliminary Ecological Appraisal Report and described in detail below in Table 6-10, along with corresponding habitat descriptions.

Table 6-10 Phase 1 Habitat field survey results

Phase 1 Habitat Type	Area coverage	Habitat Description
Dense scrub (A2.1) and scattered scrub (A2.2)	0.06ha	Dense scrub and bracken (<i>Pteridium aquilinum</i>) occur adjacent to a small lane to the north of the Site, off-site and on the hillside. Scattered scrub is infrequent within the Site, with a small area which bounds the former compound area. Species noted include bramble (<i>Rubus fruticosus</i>), gorse (<i>Ulex europaeus</i>) and willow (<i>Salix</i> sp).
Tall ruderal herb (C3.1)	0.20ha	This habitat was associated with areas around the formerly used compound site, to the south of the Site and areas adjacent to the watercourses and railway line. Throughout most of the tall ruderal vegetation were stands of Japanese knotweed (<i>Reynoutria japonica</i>). Other species noted included bracken, willow, common reed (<i>Phragmites australis</i>) and bramble.
Introduced shrub (J1.4)	n/a	This habitat is associated with the ornamental planting within gardens which were not directly accessible for survey.
Running water (G2)	46m	Two watercourses were recorded off-site during the survey, with a small section (approx. 46m) falling within the Site. The larger of the two off-site watercourses is densely choked with vegetation with Japanese knotweed present. Other species noted include willow scrub, common reed, bindweed (<i>Convolvulus arvensis</i>) and bramble. The watercourse flows through the wooded Wern Mynach CWS prior to being culverted under the railway line, it is open for a small section and fenced off, prior to it being culverted under the road. The section inspected had a gravel substrate and slow flow. The watercourse furthest north (by the Promenade Café) is culverted under the railway line and is routed through grassland. This section of the watercourse surveyed is dominated by common reed and Japanese

Phase 1 Habitat Type	Area coverage	Habitat Description
		knotweed. The watercourse is approximately 1m wide and 0.5 – 1m deep with clear water and slow flow.
Intertidal mud/sand (H1.1)	17.75ha	This habitat forms the larger part of the intertidal habitats. Wooden groynes dissect the intertidal habitat which are home to blue mussels, barnacles and brown algae (<i>Fucus</i> sp.).
Intertidal cobbles / shingle (H1.2)	1.65ha	An area of intertidal cobbles and shingle occurs within the other intertidal habitats, adjacent to the existing sea wall and extends seaward. Isolated patches also occur along the existing sea wall. A wider expanse occurs to the north and forms a long stretch, extending north.
Coastal grassland (H8.4), formerly classified as Dune grassland (H6.5)	0.10ha	This area, previously recorded as dune grassland (H6.5), has been reclassified as coastal grassland (H8.4). The habitat extent is considered too limited to constitute a dune system; however, dune associated species are present within the grassland. There was a very small patch of coastal grassland to the north of the Promenade Café, with plant species of a similar composition to the other coastal grassland areas on site, but with less diversity, and a few clumps of marram grass (<i>Ammophila arenaria</i>) within the area cleared and formerly used as a compound site. The area extent is limited and has become encroached with bramble scrub and INNS including Japanese knotweed and Montbretia. A small ditch runs through this habitat.
Coastal grassland (H8.4)	1.21ha	Coastal grassland occurs in small strips on the verges located adjacent to the residential flats and properties. This area is managed as a short sward. Some areas where the substrate of the adjacent walls and masonry are showing have become colonised by stonecrop (<i>Sedum</i> sp.), common restharrow (<i>Ononis repens</i>), yarrow (<i>Achillea millefolium</i>) common birds-foot-trefoil (<i>Lotus corniculatus</i>), mouse-ear hawkweed (<i>Hieracium pilosella</i>), sea plantain (<i>Plantago maritima</i>) and lady's bedstraw (<i>Galium verum</i>). Other species noted include red fescue (<i>Festuca rubra</i>), creeping bent (<i>Agrostis stolonifera</i>) and white clover (<i>Trifolium repens</i>). A small area of coastal grassland occurs adjacent to the formerly used compound site. Species noted here include small patches of marram grass, red fescue, cocksfoot (<i>Dactylis glomerata</i>), dock (<i>Rumex</i> sp.), yarrow, sea plantain, gorse (<i>Ulex europaeus</i>) and bramble scrub.
Bare ground (J.4)	0.65ha	Bare ground/gravel substrate is associated with the formerly used compound site.
Buildings (J3.6)	0.005ha	There are numerous residential, commercial and leisure facilities and buildings to the east of Marine Parade.
Wall (J2.5)	2,403m	A masonry walls run the entire length of Marine Parade, both sides, with gaps associated with entrances to roads and or buildings.
Artificial sea wall (J3.5)	1.52ha	The seawall is present along the entire length of Marine Parade, bordering where the land meets the coast. It is of masonry composite and is enhanced by areas of sheet metal piling in sections.

Phase 1 Habitat Type	Area coverage	Habitat Description
Hardstanding (J5)	2.15ha	Hardstanding within the Site includes the Marine Parade, residential roads, footpaths and carparking.
Dunes (H6)	Off site, to the south of site	Sand dunes to the south of the Site, not within the Site. The dunes are proposed for mitigation/enhancement as part of the mitigation for the scheme but have not been subject to survey.

Intertidal Biotope Surveys

- 6.5.10 An intertidal biotope survey was conducted across the intertidal zone of the study area, with the results shown in Table 6-10 and in ES Volume 3, Appendix 6.1 – Arup (2025) Barmouth North Promenade, Intertidal Biotope Survey Report. The upper shore was characterised either by *barren littoral shingle* (LS.LCS.Sh.BarSh) or *barren littoral coarse sand* (LS.LSa.MoSa.BarSa) with the lower shore dominated by the impoverished fine sand biotope LS.LSa.MoSa.AmSco.Sco - *Scolecipis spp. in littoral mobile sand* – a community defined by very low macroinfaunal biodiversity and very low abundance / biomass. This community dominates the proposed policy change area due to the high exposure presented by the westerly aspect of the site creating constant natural disturbance to the substrate. Consequently, all three main intertidal biotopes are either devoid of conspicuous fauna or defined by their lack of diversity and biomass.
- 6.5.11 Twenty-eight timber groynes situated along the beach hosted the most biodiverse communities recorded within the Site, and were colonised by a range of algae, crustaceans and molluscs. Blue mussels were observed growing in relatively high densities on approximately two thirds of the timber groynes, and on an outfall pipe. The outfall pipe will be retained and incorporated into the proposed revetment, whilst removal of the groynes is proposed.
- 6.5.12 In addition, honeycomb worm reefs comprising of *Sabellaria alveolata* were observed in the rocky intertidal area approximately 270m north/northwest of the Site. Noting the importance of the ‘reefs’ as supportive of wider biodiversity, *Sabellaria* reefs are listed as ‘Biogenic Reefs’, a sub-category of the ‘Reefs’ feature under Annex I of the Habitats Directive. *Sabellaria alveolata* and *Sabellaria spinulosa* reefs are Section 7 Habitats. The extent of the area identified during the survey meets the minimum requirements (20 metres squared) to be defined as a distinct biotope (approximately 1,553m² squared).
- 6.5.13 An invasive barnacle (*Austrominius modestus*) was widespread across the study area, predominantly associated with the timber groynes. This species is considered lower risk for Wales according to the Marine Invasive Non-Native Species Priority Monitoring and Surveillance List for Wales [37].

Table 6-11 Intertidal Biotope field survey results

Zonation	Biotope Code	Biotope	Locality	Comment / Status
Supralittoral Upper Littoral Fringe Lower Littoral Fringe	LS.LCS.Sh.BarSh	Barren littoral shingle	Cobble ridge – variable width, throughout the study area	No conspicuous flora or fauna - barren

Zonation	Biotope Code	Biotope	Locality	Comment / Status
Supralittoral Upper Littoral Fringe Lower Littoral Fringe	LS.LSa.MoSa.B arSa	Barren littoral coarse sand	Upper beach with larger expanses to south of the Site	No conspicuous flora or fauna - barren
Upper Eulittoral	LR.MLR.BF.Fv esB [summer-variant; reduced exposure]	<i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock	North of the Site, located shoreward of <i>S. alveolata</i> reef	Seasonal variation linked to exposure. LR.HLR.MusB.Sem.Fve sR [winter variant] <i>Semibalanus balanoides</i> , <i>Fucus vesiculosus</i> and red seaweeds on exposed to moderately exposed eulittoral rock
Mid Eulittoral	LS.LBR.Sab.Sa lv	<i>Sabellaria alveolata</i> reefs on sand-abraded eulittoral rock	North of the Site	Priority habitat
Upper Eulittoral	LR.HLR.MusB. Sem.LitX	<i>Semibalanus balanoides</i> and <i>Littorina</i> spp. on exposed to moderately exposed eulittoral boulders and cobbles	Centre of the Site	Stable embedded cobbles in sediment
Upper Eulittoral Mid Eulittoral	LR.FLR.Eph.Ul vPor	<i>Porphyra purpurea</i> and <i>Ulva</i> spp. on sand-scoured mid or lower eulittoral rock	Central and south of the Site	Stable embedded cobbles in sediment
Mid Eulittoral Lower Eulittoral	LS.LSa.MoSa.A mSco.Sco	<i>Scolecopsis</i> spp. in littoral mobile sand	Majority of sandy beach	Potential muddy sand biotope at MLWS – as per NRW mapping – no conclusive evidence

Protected and notable species survey results

6.5.14 Table 6-12 details the desk study and field survey results for protected and notable species assessed within the study area. Full details are provided within the PEA report at Appendix 6.2.

Table 6-12 Protected and notable species survey results

Species	Summary Description of Results
Otter	<u>Desk Study Results</u> Two records of otter were returned within 2km of the Site. One record was for a dead otter recorded 500m south within the marine habitat, and the other, a live sighting, was noted foraging and feeding on Barmouth Breakwater 1.5km south. <u>Otter and Water Vole Survey (November 2024)</u> No evidence of otter was recorded during the survey. All waterbodies within 500m of the Site were assessed as having low to negligible potential for otter, owing to their fragmented nature, lack of food supply and poor condition. The habitat within the Site is also modified by existing coastal defences and increased human use, in addition to a

Species	Summary Description of Results
	lack of concealment which would limit the ease of access and movement for otters in this area. The off-site Mawddach Estuary provides more optimal habitat in terms of foraging and refugia for this species. The off-site woodland associated with Wern Mynach CWS does offer suitable habitat for refuge and laying up, though no evidence was noted.
Water vole	<u>Desk Study Results</u> No records of water vole were returned within 2km of the Site. <u>Otter and Water Vole Survey (November 2024)</u> The watercourses surveyed were of low to negligible suitability for water vole owing to limited open areas, dense overshadowing, limited suitable bank substrate for burrowing, and flow regime. All watercourses are fragmented and unlikely to support viable populations, and as such this species is not further considered within this chapter.
Bats	<u>Desk Study Results</u> A single record of a pipistrelle bat (<i>Pipistrellus pipistrellus</i>) was returned within 2km of the Site, foraging southeast close to the Lion Hotel. <u>PEA Walkover (September 2024)</u> No trees which offer bat roosting potential occur within the Site. There are several properties to the east of Marine Parade which offer low – moderate roosting potential, as follows: • Moderate roosting potential: – Min Y Mor Hotel (approximately 25m east of the Site) – Substation building (within the Site boundary) • Low roosting potential: – Residential properties / apartments associated with Hoel Y Sarn (approximately 10m from the Site) – Residential properties / apartments associated Hoel Llywelyn (approximately 15m from the Site) – Garages along Hoel Y Plas (approximately 10m from the Site) – Promenade Café and Wine Bar (directly adjacent to the Site boundary) The seawall and culverts do not have the potential to support bats as these are frequently inundated with sea water. The Site in general is exposed, with low to negligible potential for foraging and/or commuting along the coast and Marine Parade. There is some lighting along the highway, though this is limited. The main foraging and commuting habitat are associated with the off-site vegetated railway corridor, and the woodland beyond this located to the east. A presence/likely absence survey of the substation (conducted via a dusk emergence survey) confirmed no bats emerged from the substation and a roost is therefore considered unlikely to be present.
Hazel dormouse	<u>Desk Study Results</u> No records of hazel dormouse were returned within 2km of the Site. Dormice populations in North Wales are small, scattered and isolated from each other [38]. <u>PEA Walkover (September 2024)</u> The coastal environments and habitats within the Site are considered unsuitable for dormice based on a lack of suitable habitat and as such this species is not further considered within this Chapter.
Badger	<u>Desk Study Results</u>

Species	Summary Description of Results
	Two records of badger (<i>Meles meles</i>) were returned within 2km of the Site. The closest record was 400m east recorded near the A496 and was noted going into adjacent woodland at dusk. <u>PEA Walkover (September 2024)</u> No badger setts or badger activity was noted during the survey. Off-site woodland habitat to the east associated with the CWS (located 150m from the Site, beyond the railway track) provides the most optimal habitat for the construction of setts. The habitat corridor along the railway network provides some suitable foraging and dispersal habitat.
Other notable mammals	<u>Desk Study Results</u> Eight records of hedgehog (<i>Erinaceus europaeus</i>) were returned within 2km of the Site. These were all live sightings, located in and around residential areas. <u>PEA Walkover (September 2024)</u> Small mammals such as hedgehog could use the grassland habitat, boundary vegetation and railway line for foraging and dispersal into the wider landscape. Most of this habitat occurs outside the Site. The coastal habitats and Marine Parade offer no suitable habitat.
Birds (breeding and wintering)	<u>Desk Study Results</u> Sixteen records of bird were returned within 2km of the Site and were largely waterbirds. Records included black headed gull (<i>Chroicocephalus ridibundus</i>), common scoter (<i>Melanitta nigra</i>), oystercatcher (<i>Haematopus ostralegus</i>) and common sandpiper (<i>Actitis hypoleucos</i>). <u>PEA Walkover (September 2024)</u> The tall ruderal habitat and scattered trees / scrub may provide suitable nesting and foraging habitat for birds. During the walkover survey approximately 90 gulls were present including herring gull (<i>Larus argentatus</i>), lesser black-backed gull (<i>Larus fuscus</i>) and black headed gulls which were noted loafing/resting/feeding on the sand, with an additional 30 foraging over water. Cormorants (<i>Phalacrocorax carbo</i>) and oystercatchers were recorded flying along the shoreline and a suspected rock pipit (<i>Anthus petrosus</i>) was recorded on the beach. Other birds recorded or heard in the scrub included stonechat (<i>Saxicola rubicola</i>), robin (<i>Erithacus rubecula</i>), blackbird (<i>Turdus merula</i>), wren (<i>Troglodytes troglodytes</i>), magpie (<i>Pica pica</i>) and house sparrows (<i>Passer domesticus</i>). Birds flying overhead included barn swallow (<i>Hirundo rustica</i>), carrion crow (<i>Corvus corone</i>) and jackdaws (<i>Coloeus monedula</i>). <u>Breeding Bird Habitat Appraisal (July 2024)</u> No species typically associated with coastal breeding habitats were recorded during the survey. The absence of reedbeds and saltmarsh within or in proximity to the Site removes the potential for the presence of the Mawddach Estuary SSSI species. Marram grass growing in the dunes south of the works area provides some opportunity for nesting grasshopper warbler (<i>Locustella naevia</i>) (noted in the SSSI citation) but the suitability of the habitat diminishes towards the northern extent of the dune system and is largely non-existent within the Site. It is, therefore, extremely unlikely that this species would be impacted by the Proposed Development. With the exception of the very southern portion of the Site, the majority of the beach is inundated at high tide making it unsuitable for ground-nesting species such as ringed plover (<i>Charadrius hiaticula</i>) and oystercatcher. Areas where shoreline remains exposed during high tide experience such a high volume of pedestrian activity or, in the case of

Species	Summary Description of Results
	pebble beach to the north of the promenade, is also unsuitable due to its steep profile, that any ground-nesting along the beach is considered highly improbable. Small, walled areas of hardstanding between the promenade and the railway line do, however, offer limited potential for nesting oystercatcher and ringed plover, but again, this is considered improbable due to high recreational use. <u>Intertidal Biotope Surveys (September and October 2024)</u> The following species were recorded during the survey; twelve oystercatchers, one curlew (<i>Numenius arquata</i>), three carrion crow, five jackdaw, and twelve herring gull – all observed feeding on the lower areas of the shore and in the vicinity of the mussel-laden outfall pipe. <u>Wintering Birds Surveys (2024 - 2025)</u> A total of 11 species were recorded within the study area between September 2024 to March 2025. This included eider (<i>Somateria mollissima</i>), common scoter, goosander (<i>Mergus merganser</i>), oystercatcher, turnstone (<i>Arenaria interpres</i>), black-headed gull, herring gull, guillemot (<i>Uria aalge</i>), red-throated diver, and cormorant (<i>Phalacrocorax carbo</i>). In all surveys, feeding was the predominant behaviour observed; no roosting sites were encountered. Counts were generally low across each survey, with a peak observed in September 2024. Gull species represented 72% of all registrations of the high tide surveys, wildfowl 11%, waders 8%, and other species that fall outside these groups, 9%.
Amphibians	<u>Desk Study Results</u> No records of amphibians were returned within 2km of the Site. Great crested newt are considered absent from this region of Wales³ and as such, this species is not further considered within this chapter. <u>PEA Walkover (September 2024)</u> The habitats within the Site have poor suitability for amphibians, and no ponds are present. There are some suitable areas of terrestrial habitat for amphibians which offer more habitat structure and diversity such as the ditch and fringing habitats, however generally within the Site, these are isolated.
Reptiles	<u>Desk Study Results</u> Five records of reptiles were returned within 2km of the Site. Species noted included adder (<i>Vipera berus</i>), slow worm (<i>Anguis fragilis</i>) and common lizard (<i>Zootoca vivipara</i>). The closest record was that of an adder 500m to the north located within a private garden, not directly connected to the Site and to the north of the A496. <u>PEA Walkover (September 2024)</u> The habitats within the Site have poor suitability for reptiles. However, there are some sub-optimal areas which offer more habitat structure and diversity such as the coastal grassland. The off-site railway line running parallel to the Site and ruderal habitats associated may acts as a dispersal corridor.
Fish	<u>Desk Study Results</u> No records of fish were returned within 2km of the Site. Additional searches of the offshore areas adjacent to the Site recorded nursery grounds for anglerfish (<i>Lophius piscatorius</i>), whiting (<i>Merlangius merlangus</i>), spotted ray (<i>Raja montagui</i>), thornback ray

³ Review of the Current Conservation Status (CCS) of the Great Crested Newt in Wales, with specific references to its long-term prospects and within its stronghold in NorthEast Wales. 2018. NRW and Amphibian and Reptile Conservation Trust, Report No. 259.
<https://cdn.naturalresources.wales/media/687859/eng-evidence-report-259-review-of-the-current-conservation-status-ccs-of-the-great-crested-newt-in-wales.pdf>

Species	Summary Description of Results
	(<i>Raja clavata</i>) and forage fish, and spawning grounds for cod (<i>Gadus morhua</i>), plaice (<i>Pleuronectes platessa</i>), sole (<i>Solea solea</i>), and sand eel (<i>Ammodytes</i> spp.). Migratory fish species allis shad (non-spawning populations), twaite shad, sea lamprey and Atlantic salmon are also features of interest of the Mawddach Estuary SSSI 302m south of the site. <u>PEA Walkover (September 2024)</u> The tidal areas just outside the Site may support a wide range of marine species, including migratory species in passage. The watercourse/ditch may provide suitable habitat for a limited range of common freshwater species, however, are suboptimal due to dispersal barriers.
Marine mammals	<u>Desk Study Results</u> No records of marine mammals were returned within 2km of the Site. Additional searches returned records adjacent to the Site including a grey seal pupping and haul out site approximately 1km south of the Site (approximate grid reference - SH 60940 15019), in addition to bottlenose dolphin and harbour porpoise. <u>PEA Walkover (September 2024)</u> The tidal areas immediately adjacent to the Site are suitable to support foraging and commuting marine mammals.
Invertebrates (Terrestrial and Marine)	<u>Desk Study</u> Five records of terrestrial invertebrates were returned within 2km of the Site. The closest records of notable species included wall (<i>Lasiommata megera</i>) 274m east, coastal silver-stiletto (<i>Acrosathe annulata</i>) 581m north and cinnabar (<i>Tyria jacobaeae</i>) 793m east. <u>PEA Walkover (September 2024)</u> The majority of the Site is unsuitable for terrestrial invertebrates owing to the extent of hard standing and tidal influences. The only suitable habitat is associated with the unmanaged areas including the tall ruderal habitat, railway line and gardens which provides habitat for some coastal species and or common species, dependent upon habitat type. <u>Intertidal Biotope Surveys (September and October 2024)</u> Blue mussels were observed growing on approximately two thirds of the existing timber groynes and on the outfall pipe in relatively high densities and were observed to be a key forage resource to local waders (oystercatcher, etc.). <i>Sabellaria alveolata</i> was also identified to the north of the Site (off-site).
Notable plants	<u>Desk Study</u> No plant records were provided as part of the desk study. <u>PEA Walkover (September 2024)</u> No species of note were recorded during the field survey. The off-site dunes to the south-east of the Site may provide suitable habitat to support a range of notable flora.
INNS (Flora and fauna)	<u>Desk Study Results</u> Eleven species were recorded within 2km of the Site. The nearest record was of Japanese knotweed which was recorded to the rear of the formerly used compound site. Other species recorded within 500m include Montbretia (<i>Crocasmia pottsii</i> x <i>aurea</i> = <i>C. x crocosmiiflora</i>) and Japanese rose (<i>Rosa rugosa</i>). No marine INNS records were identified within or immediately surrounding the Site on the Wales INNS Portal. <u>PEA Walkover (September 2024)</u>

Species	Summary Description of Results
	Dense stands of Japanese knotweed occur frequently within the study area, mainly associated with disturbed habitat adjacent to the formerly used compound and along the off-site railway embankment and the watercourse. Montbretia was recorded in the coastal grassland adjacent to a small ditch. <u>Intertidal Biotope Surveys (September and October 2024)</u> One Marine INNS, an invasive barnacle (<i>Austrominius modestus</i>), was identified and found to be widespread across the Site, predominantly associated with the timber groynes. However, this species is deemed to be of low risk in Wales according to the Marine Invasive Non-native Species Priority Monitoring and Surveillance List for Wales [37].

Evaluation of Ecological Receptors

- 6.5.15 This section evaluates the nature conservation importance of the habitats and species (receptors) known to be present, or considered to be present, within the study area. The receptors are valued in terms of their importance at an international, national, regional, county, local context and less than local (or site) context. The values are shown in Table 6-13 below.

Table 6-13 Nature conservation evaluation of ecological receptors

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
Designated Sites		
Pen Llŷn a'r Sarnau SAC	International ⁴	Annex I habitats and species listed as qualifying features that are relevant to the assessment include sandbanks which are slightly covered by sea water all the time, estuaries, reefs, sandflats not covered by seawater at low tide, bottlenose dolphin, otter and grey seal.
Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC	International	Annex I species listed as qualifying features that are relevant to the assessment include lesser horseshoe bats.
Northern Cardigan Bay SPA	International	Annex I species listed as qualifying features that are relevant to the assessment includes red-throated diver.
West Wales Marine SAC	International	Annex I species listed as qualifying features that are relevant to the assessment includes harbour porpoise.
Morpha Harlech / a Morpha Dyffryn SAC	International	Annex I habitats and species listed as qualifying features that are relevant to the assessment include embryonic shifting dunes, shifting dunes along the shoreline, fixed coastal dunes with herbaceous vegetation, humid dune slacks and petalwort.
Cadair Idris SAC	International	None of the Annex I habitats and species listed as qualifying features are relevant to the assessment based on a lack of potential impact pathways.
Craiyr Aderyn (Bird's Rock) SPA	International	Annex I species listed as qualifying features that are relevant to the assessment include the red-billed chough.
Rhinog SAC	International	None of the Annex I habitats and species listed as qualifying features are relevant to the assessment based on a lack of potential impact pathways.

⁴ International Sites are designated at an international level and are therefore of international value.

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
Afon Eden – Cors Goch Trawsfynydd SAC	International	Annex I species listed as qualifying features that are relevant to the assessment include the freshwater pearl mussel, floating water-plantain and Atlantic salmon.
Barmouth Hillside SSSI	National ⁵	None of the habitats listed as features are relevant to the assessment based on a lack of potential impact pathways.
Aber Mawddach/ Mawddach Estuary SSSI	National	The habitats and species listed as features that are relevant to the assessment include estuarine habitats, muddy sediments, saltmarshes, reed beds, raised mire, breeding wading birds, scarce vascular and invertebrates, otter and migratory fish species (such as allis shad, twaite shad, sea lamprey and Atlantic salmon).
CWS's (seven sites, see Table 6-9).	County ⁶	None of the habitats listed as features are relevant to the assessment based on a lack of potential impact pathways.
Intertidal Biotopes		
Intertidal cobbles/ shingle (H1.2) LS.LCS.Sh.BarSh (Barren littoral shingle)	Less than local	This habitat was defined as a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). These habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity and are therefore valued at less than local (site) value.
Intertidal mud/ sand (H1.1) LS.LSa.MoSa.BarSa (Barren littoral coarse sand)	Less than local	This habitat was defined as a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). These habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity and are therefore valued at less than local (site) value.
LR.MLR.BF.FvesB (<i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock)	Local	This habitat is located outside the Site and shoreward of a <i>S.alveolata</i> reef (Annex I habitat). Due to the connectivity and proximity to the <i>S.alveolata</i> reef, this habitat is valued at a local level as it may support other species associated with the reef.
LS.LBR.Sab.Salv (<i>Sabellaria alveolata</i> reefs on sand-abraded eulittoral rock)	International	Areas of honeycomb worm reefs were identified in the rocky intertidal area north of the Site. Noting the importance of the 'reefs' as supportive of wider biodiversity, <i>Sabellaria spp.</i> reefs are listed as 'Biogenic Reefs', a sub-category of the 'Reefs' feature under Annex I of the Habitats Directive. <i>S.alveolata</i> reef is also listed as a Priority Habitat under Section 7 of the Environment (Wales) Act 2016 and is also part of the Annex I reef feature of the Pen Llŷn a'r Sarnau SAC, adjacent to the Site. The extent of the area identified during the survey meets the minimum requirements to be defined as a distinct biotope. Therefore, this habitat is valued at an international level.
LR.HLR.MusB.Sem.LitX (<i>Semibalanus balanoides</i> and <i>Littorina spp.</i> on	Local	Small distinct areas of this habitat type are recorded within the Site and extend seaward into the SAC and are valued at a local level.

⁵ SSSIs are designated at a national level and are therefore of national value.

⁶ CWS's are designated for their presence of habitats or species of local or regional importance by local authorities and are therefore of county value

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
exposed to moderately exposed eulittoral boulders and cobbles)		
LR.FLR.Eph.UlvPor (<i>Porphyra purpurea</i> and <i>Ulva</i> spp. on sand-scoured mid or lower eulittoral rock)	Local	Small distinct areas of this habitat type are recorded within the Site and extend seaward into the SAC and are valued at a local level.
Intertidal mud/ sand (H1.1) LS.LSa.MoSa.AmSco.Sco (<i>Scolecopsis</i> spp. in littoral sand)	Less than local	This habitat was defined as a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). These habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity and are therefore valued at less than local (site) level.
Other Marine Habitats		
Blue mussel habitat (non-S7 mussel bed Habitat)	County	Blue mussels were observed growing on approximately two thirds of the existing timber groynes – 22 of 28 groynes, with 11 groynes comprising densities of Abundant or Common. This habitat is valued at a County level.
Phase 1 Habitats		
Coastal grassland (H8.4)	Less than local	These habitats are common and widespread in the wider geographical area. They are not notable in terms of extent or botanical diversity, and the majority of these areas have a short sward subject to regular maintenance. This habitat is found in small strips across the Site and is largely managed as a short sward, therefore supporting less species than more diverse areas of off-site grassland. Therefore, this habitat is valued at a less than local (site) level. The patch of coastal grassland, formerly classed as dune grassland; although there are dune species throughout, it is limited in extent and in poor condition, due to the presence of multiple INNS. Therefore, this habitat is valued at less than local (site) level.
Running water (G2)	Local	A small section (approximately 46m) of watercourse/ditch falls within the Site. The ditch is largely culverted running through the urban areas and will not be impacted by the Proposed Development. This habitat is valued at a local level.
Dense scrub (A2.1) and Scattered scrub (A2.2)	Less than local	Scrub is not considered to form part of any Priority Habitat. Due to the small infrequent areas of scrub within the Site it will support less species than the denser/ more biodiverse areas of off-site scrub which is more widespread. Therefore, this habitat is valued at a less than local (site) level.
Tall ruderal herb (C3.1)	Less than local	Tall ruderal habitat is not considered to form part of any Priority Habitat. Due to the small areas of ruderal growth within the Site and the presence of INNS within this habitat, it is valued at a less than local (site) level.
Amenity grassland (J1.2)	Less than local	This grassland type is within the Priority Ecological Network for 'Semi-Natural Grassland'. However, due to the

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
		regular management and disturbance they will support less species than more biodiverse areas further north. This habitat also falls outside the Site and is won't be impacted by works. Given these habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity they are therefore valued at less than local (site) level.
Artificial sea wall (J3.5)	Less than local	The sea wall on the seaward side (including existing sheet piles) has been colonised by barnacles and algae, with no notable communities present. Due to the low diversity present this habitat is valued at a less than local (site) level.
Dunes (H6)	International	Sand dunes located south of the Site (outside the Site boundary) are proposed for mitigation/enhancement but have not been surveyed. They are a Section 7 Priority Habitat and potentially likely fixed coastal dunes (Annex I 2130) and are therefore precautionarily classed as international.
Bare ground (J.4) Buildings (J3.6) Wall (J2.5) Hardstanding (J5)	Negligible	Minimal biodiversity value provided by these habitat types (excluding buildings and their roosting potential for bats, which is assessed under 'species'). Therefore, they are valued as negligible.
Species		
Bats	Local	The Meirionnydd Oakwoods and Bat Sites SAC is located 350m east of the Site and supports lesser horseshoe bat (Annex I species). However, no records of bats were returned for within the Site, with a single record of a common pipistrelle recorded foraging close to the Lion Hotel (off-site). No suitable roosting structures are present within the Site, with six properties / structures outside the Site offering low to moderate roosting potential to crevice dwelling bat species, but not lesser horseshoe bats for which the SAC is designated. The area in general is very exposed, with low to negligible potential for foraging and/or commuting along the coast and Marine Parade. Bat surveys (PRA and presence/likely absence) undertaken in 2025 confirmed no bat roosts were identified within a small substation situated alone the Marine Parade. Therefore, bats are valued at a local level.
Badger	Less than local	No records of badger were returned during the desk study, with no signs recorded during the field survey. Minimal sett building habitat is present within the Site. More suitable habitat for badgers is present off-site to the north of the railway line (within woodland). Therefore, badgers are valued at a less than local level.
Otter	International (non-breeding)	The potential of the waterbody/ditch adjacent to the Site to support otter is limited. Surveys for otter found no field signs, including possible resting spots within the Site. Otters are likely to use the more optimal intertidal areas for foraging and movement and are a qualifying feature of the Pen Llŷn a'r Sarnau SAC and the Afon Eden – Cors Goch Trawsfynydd SAC, as well as being a feature of interest of the Mawddach Estuary SSSI. They are also a Gwynedd

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
		BAP species. Therefore, otters are considered important in an international context.
Notable mammals	Local	Records for hedgehog were returned within 2km of the Site. Notable mammals such as hedgehogs could use grassland and scrub habitats within the Site for foraging, however it is unlikely to support significant populations of notable mammal species. Therefore, notable mammals, specifically hedgehog, are valued at a local level.
Marine mammals	International	The tidal areas within or adjacent to the Site are suitable to support foraging and commuting marine mammals. A seal pupping and haul site was recorded 1km south of the Site near the mouth of the Mawddach Estuary. Grey seal and other marine mammals such as bottlenose dolphin and harbour porpoise are all features of the adjacent Pen Llŷn a'r Sarnau SAC and West Wales Marine SAC which is hydrologically connected to the Site. Therefore, marine mammals are valued at an international level.
Birds	Breeding (Local) Wintering (international)	Breeding: No species typically associated with coastal breeding habitats or cited for the adjacent Mawddach Estuary SSSI were recorded during the breeding bird habitat appraisal. Vegetation present onsite was generally fragmented and species poor offering minimal breeding habitat for locally common and widespread species. As such, are valued at local level. Winter: A number of notable bird species have been recorded during winter bird surveys using the nearshore marine habitat, including red-throated diver which is a qualifying feature of the Northern Cardigan Bay SPA located 2.1km from the Site. Due to the association with designated Sites nearby, the wintering bird assemblage has been valued at an international level.
Amphibians	Less than local	No records of amphibians were returned within the Site, with an absence of ponds and suitable terrestrial habitat to support viable populations of amphibians. There is potential for dispersal and foraging within the adjacent habitats (via the off-site railway and ditches). Therefore, amphibians are valued at less than local (site) level.
Reptiles	Local	Record of adder, slow worm and common lizard were returned within 2km of the Site, with adder listed as a Gwynedd BAP species. Small areas of sub-optimal habitat present include grassland, scrub and tall ruderals. There is potential for dispersal and foraging within the adjacent habitats (via the off-site railway and ditches). Given the records of a BAP species locally, reptiles are valued at local level.
Invertebrates (Terrestrial)	Less than local	The majority of the Site is unsuitable for terrestrial invertebrates owing to the extent of hard standing and tidal influences, with small pockets of suitable habitat located off-site. Therefore, terrestrial invertebrates are valued at less than local (site) level.
Invertebrates (Marine)	National (blue mussels)	See assessment for blue mussels and biotope code LS.LBR.Sab.Salv above.

Ecological Receptors	Evaluation	Conservation Value in the Context of the Proposed Development
	International (<i>Sabellaria alveolata</i>)	
Fish	International	The marine areas intertidal and subtidal zones may support a wide range of marine fish species, including migratory species in passage. The freshwater watercourse/ditch may provide suitable habitat for a limited range of common freshwater species, however, are not considered optimal to support migratory species due to dispersal barriers. Although no records were returned during the desk study, Atlantic salmon are a qualifying feature of the Afon Eden – Cors Goch Trawsfynydd SAC, with migratory fish species such as allis shad and twaite shad, and sea lamprey being features of interest for the Mawddach Estuary SSSI. Therefore, fish are considered important within the marine environment in an international context.
INNS (flora and fauna)	Not applicable	INNS (flora) were recorded within the Site, which included Schedule 9 species Japanese knotweed and Montbretia. Marine INNS, an invasive barnacle (<i>Austrominius modestus</i>), was identified and found to be widespread across the intertidal study area, predominantly associated with the timber groynes. However, this species is deemed to be of low risk in Wales [39]. Therefore, INNS are considered to have less than local (site) value.

6.5.16 Those receptors with negligible or less than local value are not assessed any further within the Ecological Impact Assessment (EclA) context unless there are related legal compliances and/or positive outcomes and enhancements to be assessed such as INNS (and the habitats where INNS are).

6.5.17 Receptors not taken forward for further assessment are as follows.

- Intertidal mud and sand (LS.LCS.Sh.BarSh - Barren littoral shingle).
- Intertidal mud and sand (LS.LSa.MoSa.AmSco.Sco - *Scolecopsis spp.* in littoral sand).
- Intertidal cobbles/shingle (LS.LSa.MoSa.BarSa - Barren littoral coarse sand).
- Coastal grassland (H8.4).
- Dense scrub (A2.1) and scattered scrub (A2.2).
- Amenity grassland (J1.2).
- Artificial sea wall (J3.5).
- Bare ground (J4).
- Buildings (J3.6).
- Wall (J2.5).
- Hardstanding (J5).
- Hazel dormouse.
- Water vole.

- Notable mammals.
- Amphibians.
- Terrestrial invertebrates.

6.6 Embedded Environmental Design Measures

- 6.6.1 The Proposed Development includes a series of integral 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.
- 6.6.2 This section summarises the integral embedded measures that will 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 the requirements of PPW.

Embedded environmental design measures

- 6.6.3 Principle 1 of the stepwise approach is to avoid or eliminate potential impacts and adverse effects on biodiversity receptors 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 receptor. The embedded measures include:
- Construction activity within Internationally designated 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 during dry conditions either side of low tide. This will prohibit noise and vibration travelling through the water column to the intertidal and offshore zones, including the Pen Llyn a'r Sarnau SAC located 31m west of the Site.
 - Internationally important habitats (Annex I) such as the *Sabellaria alveolata* reef to the north of the Site 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 compensatory measures are achieved.

Embedded good practice measures

- 6.6.4 A range of measures relevant to the Proposed Development are set out for the construction phase within the Construction Environmental Management Plan (CEMP) EN.F.15 Barmouth North Promenade FAS – CEMP.

- 6.6.5 The following measures are of particular importance that will be put in place during construction to prevent direct and indirect impacts on ecological receptors arising from pollution, disturbance and entrapment:
- Ensuring that all construction activities are controlled and are in accordance with relevant legislation and undertaken in compliance with the relevant Guidance for Pollution Prevention (e.g. GPP5) and industry best practice (CIRIA).
 - Constant monitoring of dust levels and effective methods of work should 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 receptors 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.
 - To minimise potential effects on light-sensitive receptors, including otter, a Lighting Strategy will be prepared and secured prior to installation of any permanent lighting. The Lighting Strategy will apply to both construction and operational phases and will set out the siting, specification and directional control of external lighting, supported by drawings illustrating predicted light spill in sensitive areas. Measures to monitor and manage light spill post-installation will be included.
 - 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 (where possible) 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.
- Appropriate measures for the treatment and control of invasive non-native species will be implemented. Any plant or machinery that has been used in areas with invasive species such as Japanese knotweed (7 metre buffer around Japanese knotweed recommended), 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 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.

6.6.6 The CEMP will also 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.

6.6.7 The CEMP will include Toolbox Talks provided by a suitably qualified ecologist to all site personnel to inform them of ecological receptors 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

6.6.8 Best practice will be adopted in line with GPP 5 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.

6.6.9 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, requirements for fuel storage locations, including 110% bunding requirements and refuelling only in bunded areas, restrictions on use of fuel when working in the intertidal (use of biodegradable hydraulic oils and hydrogenated vegetable oil (HVO) only), 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 covers 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.

6.6.10 Removal of the existing timber groynes will be undertaken during low water conditions where practicable to minimise sediment disturbance and reduce the risk of sediment resuspension. Works will be controlled through method statements within the Construction Environmental Management Plan (CEMP), including measures to manage sediment mobilisation, sediment contaminant testing, machinery positioning and pollution risk. Given the temporary and localised nature of the works, and the application of embedded mitigation, no significant effects on water quality are anticipated.

6.7 Assessment of Likely Significant Effects

6.7.1 This section presents the assessment of likely significant effects on the ecological receptors valued in Table 6-13 (at local level and above) resulting from the construction and operational phases of the Proposed Development. Potential effects have also been assessed against each of the transportation options during construction, as follows:

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

6.7.2 The likely significant effects of the Proposed Development have been identified taking into account the embedded measures outlined above in Section 6.6. Further mitigation may be proposed if the embedded measures are insufficient, and if required these measures are presented in Section 6.8. Refer to ES Chapter 4 EIA Approach, for assumptions and limitations.

6.7.3 Legally protected species will be assessed regardless of their nature conservation value.

6.7.4 Ecological receptors of negligible or less than local level have been scoped out of further ecological impact assessment unless further legal considerations

apply. However, general mitigation and best practice measures as detailed in Section 6.6, will be applied during construction of the Proposed Development to ensure individual species are not harmed and no offence is committed under the relevant legislation.

6.7.5 On this basis, the following receptors have been taken forward for detailed assessment (those above less than local value, or where legislative requirements apply such as with INNS):

- Designated sites.
- Intertidal ecology.
- Subtidal ecology.
- Running water (G.2).
- Dunes (H6)
- Bats.
- Badger.
- Otter.
- Marine mammals.
- Birds.
- Reptiles.
- Invertebrates (Marine).
- Fish.
- INNS

Construction Effects

6.7.6 This section presents the assessment of potential effects on the ecological receptors listed above resulting from the construction of the Proposed Development.

6.7.7 Construction is defined as all the works undertaken to build the Proposed Development and typically the majority of the impacts on the ecological receptors will occur during this phase as this is when physical changes occur. The potential effects are assessed based on detailed design presented in ES volume 2, Chapter 2 Project Description,.

Designated sites

6.7.8 The following statutory and non-statutory designated sites are included within the assessment:

- Pen Llŷn a'r Sarnau SAC (international value).
- Coedydd Derw a Safleoedd Ystlumod Meirion/ Meirionnydd Oakwoods and Bat Sites SAC (international value).
- West Wales Marine SAC (international value).

- Afon Eden – Cors Goch Trawsfynydd SAC (international value).
- Rhinog SAC (international value).
- Cadair Idris SAC (international value).
- Morpha Harlech / a Morpha Dyffryn SAC (international value).
- Northern Cardigan Bay SPA (international value).
- Craiyr Aderyn (Bird's Rock) SPA (international value).
- Barmouth Hillside SSSI (national value).
- Aber Mawddach/ Mawddach Estuary SSSI (national value).
- CWS's (county value).

6.7.9 Potential impacts upon designated sites and their qualifying features include impacts upon the sites themselves, but also any areas considered to qualify as Functionally Linked Land (FLL) which may support the designation and associated qualifying features.

6.7.10 Potential impacts upon designated sites include:

- With regards to Option 1 (delivering rock armour by road), direct damage to habitats and species from the movement and storage of machinery and plant during construction.
- With regards to Option 2 (delivering rock armour by sea), damage to habitats and species from increased turbidity via sediment disturbance from activities including rock dumping, presence of multiple vessels (tugboats and transport barge) engine scour, mooring and anchor/chain scour, and underwater noise disturbance in absence of mitigation. This includes direct mortality and injury.
- Indirect damage or degradation of habitats and species from reduced water quality as a result of a pollution event(s).
- Disturbance to species listed as qualifying features of the designated sites from noise, vibration and visual disturbance from physical presence / movement of vessels.

Effects from direct habitat loss

6.7.11 The HRA Report concluded **no likely significant effects** arising from direct habitat loss on any designated sites. No designated sites are located within the Site and therefore no direct losses are reasonably foreseen.

6.7.12 The nearest designated site (Pen Llŷn a'r Sarnau SAC) is located 31m west of the Site, below MLWS. Embedded measures will ensure piling activity and any other percussive or noise generating construction activities are undertaken in dry conditions, which will reduce any impacts to mobile species associated with the SAC which may otherwise be present in proximity to the active works areas during high tide.

6.7.13 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.

- 6.7.14 Construction activity associated with Option 1 (delivering rock armour by road) will not result in direct habitat loss within any designated site. It has been assumed that the major road networks will be used to transport rock armour, none of which run through any designated sites in proximity to the Site.
- 6.7.15 Transportation activity associated with Option 2 (delivering rock armour by sea) will not result in direct habitat loss within any designated site. It is anticipated that all vessels will moor offshore. The smaller vessel, Vessel B, will make a limited number of journeys to the Site at high tide, to deposit materials on the upper sections of the beach, before returning to moor offshore. No materials will be deposited within any designated sites causing habitat loss.

Effects from damage or degradation

- 6.7.16 The HRA Report concluded a likely significant effect upon the Pen Llŷn a'r Sarnau SAC due to potential indirect damage or degradation if Option 2 (delivering rock armour by sea) was selected.
- 6.7.17 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.
- 6.7.18 Whilst embedded measures would negate any direct damage or degradation to qualifying features during the transportation of materials, these measures will only safeguard against pollution events and would not prohibit indirect impacts through increased sedimentation in sensitive marine habitats caused by vessel and propeller scour, or from mechanical damage from anchor and chain scour if vessels are inappropriately moored. The presence of multiple vessels with engines producing a scour effect on sand-based substrate will temporarily increase turbidity. Increased turbidity may negatively affect the qualifying features (habitats supporting sessile filter feeding species) associated with Pen Llŷn a'r Sarnau SAC approximately 31m west of the Site.
- 6.7.19 All other designated sites are considered to be located at a sufficient distance from the Proposed Development that they would not be subject to any direct or indirect impacts arising from damage or degradation.
- 6.7.20 The Proposed Development has been assessed as having **no likely significant effects** on designated sites due to damage or degradation, with the exception of Pen Llŷn a'r Sarnau SAC.

Effects from disturbance

- 6.7.21 The HRA Report concluded a **likely significant effect** upon the Pen Llŷn a'r Sarnau SAC, Northern Cardigan Bay SPA and West Wales Marine SAC due to potential noise disturbance, physical presence of vessels causing visual disturbance and vessel transit on marine mammals and red-throated diver if Option 2 (delivering rock armour by sea) was selected. Fish within the Mawddach Estuary SSSI are also considered for disturbance from the likely significant effects of noise if Option 2 is chosen.
- 6.7.22 In the event Option 1 is selected, no disturbance impacts are anticipated due to a lack of impact pathways to designated sites. In the event Option 2 is selected, the embedded measures will be sufficient to prohibit qualifying features from non-physical disturbance such as a pollution event, but they will not be adequate to protect marine mammals and red-throated diver from disruptive noise levels underwater and vessel presence and movements.
- 6.7.23 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.
- 6.7.24 The presence of a large transport vessel entering and mooring within the SAC, in addition to the smaller vessel to transport rock armour at high tide, may result in noise disturbance to sensitive marine mammals (e.g. bottlenose dolphin, harbour porpoise and grey seal) and disturbance from vessel presence and movements to red-throated diver. 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 could cause behavioural shifts. Red-throated diver is known to be highly sensitive to vessel presence and disturbance [40, 41].
- 6.7.25 Auditory injury to marine mammals 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 Pen Llŷn a'r Sarnau SAC and West Wales Marine SAC as a result of noise disturbance to qualifying features
- 6.7.26 As vessel physical presence and movements, comprising anchoring and repeat transits within the SPA could result in disturbance and displacement of the qualifying feature red throated diver, a likely significant effect cannot be ruled out.
- 6.7.27 The HRA Report also concluded that Atlantic salmon (a qualifying feature of the Afon Eden SAC) would not be impacted by the Proposed Development due construction works being undertaken in dry conditions either side of low tide,

avoiding any noise or vibration disturbance entering the water column. In the event Option 2 is selected; the presence of transport vessels could produce noise that may cause short-term disturbance (avoidance behaviour) to Atlantic salmon, however, the duration and exposure are considered to be *de minimis* and would not cause any physiological impacts and are therefore **not significant**. If noise is generated outside of the peak migration period for the Atlantic salmon, the impacts would be negligible.

- 6.7.28 All other designated sites are considered to be located at a sufficient distance from the Proposed Development that they would not be subject to any disturbing noise levels. The Proposed Development has been assessed as having **no likely significant effects** on designated sites, with the exception of Pen Llŷn a'r Sarnau SAC, Northern Cardigan Bay SPA and West Wales Marine SAC with effects limited to the immediate vicinity of the source (large transport vessel).

Direct mortality or injury

- 6.7.29 The HRA Report concluded that in absence of mitigation, a **likely significant effect** upon the Pen Llŷn a'r Sarnau SAC and West Wales Marine SAC due to potential direct mortality or auditory injury on marine mammals if Option 2 (delivering rock armour by sea) was selected.
- 6.7.30 Direct mortality or physical injury (non-auditory)⁷ risk on bottlenose dolphin, harbour porpoise and grey seal present locally was assessed. 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.
- 6.7.1 Regarding marine mammal auditory injury⁸ it was concluded that without mitigation, the decibel (dB) levels from shipping vessels could cause auditory injury to qualifying features. 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 that may result in auditory injury to sensitive marine mammals (e.g. bottlenose dolphin, harbour porpoise and grey seal) and disturbance from vessel presence and movements to red-throated diver. 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

⁷ As defined in the HRA, 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.

⁸ 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.

mitigation, the decibel (dB) levels could cause physical damage to qualifying features or cause significant behavioural shifts. Red-throated diver is known to be highly sensitive to vessel presence and disturbance [40, 41].

- 6.7.2 Indicative desk-top noise modelling was undertaken via calculations using cylindrical and spherical sound, taking into account depth, sound absorption and weighted results (based on hearing sensitivity of receptors such as marine mammals and fish) [42] [43] [44]. Weighted auditory injury (INJ) thresholds [30] resulting in permanent and physical auditory damage to a bottlenose dolphin can occur from 201dB SEL₂₄, with weighted Temporary Threshold Shift (TTS) experienced from 181dB SEL₂₄ (vessel are non-impulsive sound). For grey seal INJ can occur from 195dB SEL₂₄ and TTS from 175dB SEL₂₄.
- 6.7.3 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 the three marine mammal species). Worst case 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.
- 6.7.4 It is considered that the construction phase of the Proposed Development would not result in a LSE on the Pen Llyn a'r Sarnau SAC as a result of auditory injury to grey seals, harbour porpoise 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.
- 6.7.5 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.
- 6.7.6 Fish within the Mawddach Estuary SSSI, allis and twaite shad (*Alosa spp.*), are hearing-specialist species for which Temporary Threshold Shift (TTS) onset is dependent on both sound level and duration of exposure. This group is assigned a TTS onset threshold of 186 dB SEL₂₄, equivalent continuous level of 158 dB assumes a 12-hour exposure duration. Indicative modelling shows that predicted underwater noise levels at the SAC boundary and vessel stopping points are well below thresholds associated with TTS. Given the intermittent nature of vessel activity, offshore anchoring, and the mobility of shad, sustained exposure sufficient to cause auditory injury is unlikely. With implementation of measures within the Marine Vessel Management Plan, any residual effects are expected to be limited to short-term behavioural responses and are not considered significant.
- 6.7.7 Mitigation of speed restrictions for vessels operating both within and outside the SAC should be included as a precautionary measure to minimise potential disturbance to the qualifying features that may be present in the area. As such,

in absence of mitigation, the Proposed Development may cause direct mortality/ auditory injury to marine mammals.

- 6.7.8 It is therefore considered that in absence of mitigation the Proposed Development will result in a LSE on the West Wales Marine SAC and the Pen Llyn a'r Sarnau SAC as a result of killing/ auditory injury of qualifying marine mammal features.

Habitats

- 6.7.9 The Proposed Development would require the permanent loss of terrestrial and intertidal habitats valued at or above local level and which potentially support protected and notable species. The following impacts have been identified and are assessed for each receptor (habitats and species):

- Habitat loss and fragmentation.
- Habitat damage or degradation.
- Disturbance.
- Species mortality and injury.

- 6.7.10 Groyne removal will be undertaken at low water where practicable and managed through CEMP method statements to minimise sediment disturbance, sediment resuspension and potential effects on habitats and the species they support. A watching brief for any olfactory or visual clues to potential contamination will be implemented.

Intertidal ecology

- 6.7.11 The following intertidal biotopes assessed as being of local value or higher are included within this section:

- LR.MLR.BF.FvesB (*Fucus vesiculosus* and barnacle mosaics on moderately exposed mid eulittoral rock).
- LS.LBR.Sab.Salv (*Sabellaria alveolata* reefs on sand-abraded eulittoral rock).
- LR.HLR.MusB.Sem.LitX (*Semibalanus balanoides* and *Littorina spp.* on exposed to moderately exposed eulittoral boulders and cobbles).
- LR.FLR.Eph.UlvPor (*Porphyra purpurea* and *Ulva spp.* on sand-scoured mid or lower eulittoral rock).

- 6.7.12 Local or higher value intertidal biotopes identified within the Site are limited to LR.HLR.MusB.Sem.LitX and LR.FLR.Eph.UlvPor. Both LS.LBR.Sab.Salv and LR.MLR.BF.FvesB are situated approximately 120m north of the Site and are therefore within the study area but will not be subject to direct or indirect impacts including loss or fragmentation, damage or degradation, disturbance, or mortality and injury of associated species. Please refer to Chapter 12 Marine and Coastal Physical Processes which confirms no changes to the coastal regimes or processes are anticipated within the study area).

- 6.7.13 Overall, the intertidal zone was considered to be species poor, with LR.HLR.MusB.Sem.LitX and LR.FLR.Eph.UlvPor representing the higher value biodiversity features within the Site. Both biotopes are present in two discreet patches towards MLWS, the largest coverage being associated with an outfall

pipe within the centre of the Site (approximate grid reference SH 60561 16350), running diagonally to the shore, into the subtidal area. The outfall pipe which supports these sessile biotopes will be retained throughout construction, with the upper shore section of the outfall pipe being integrated into the proposed revetment; this upper section does not support either LR.HLR.MusB.Sem.LitX or LR.FLR.Eph.UlvPor biotopes. Construction will not result in any habitat losses or damage and degradation and overall, the Proposed Development will have **no significant residual effects** upon these intertidal biotopes.

- 6.7.14 Large extents of blue mussels were observed growing on approximately two thirds of the existing timber groynes situated along Barmouth Beach. The blue mussels on site do not constitute a mussel 'bed' as per the Section 7 description, due to being associated with anthropogenic groyne structures. Blue mussels were also recorded on the outfall pipe discussed above which will be retained. All groynes within the Site will be removed to facilitate construction works and reduce risks to public safety, including approximately 514m of groynes (posts and boards) containing blue mussel growth. This represents a loss in intertidal biodiversity from within the Site. Removal of the groynes supporting blue mussels is also likely to result in mortality of the blue mussels. The loss of blue mussels is considered to represent a negative impact to intertidal biodiversity, and the Proposed Development will therefore have a **significant negative effect**.

Subtidal ecology

- 6.7.15 This section considers "off-site" subtidal features below MLWS that are not qualifying features of designated sites but may include habitats mentioned above in the Intertidal Ecology section which are located within the study area and Zol for Option 2. This will include subtidal habitats that are deemed to be of local value or higher.
- 6.7.16 The desk-based Blue Mussel Assessment (see ES Volume 3, Appendix 6.3) confirmed blue mussel beds are highly likely to be present below MLWS in proximity to the Site. Blue mussel beds are a Priority Habitat and are sensitive to changes in water quality (e.g. pollution), mechanical disturbance, and increased sedimentation and turbidity. In the event Option 2 is selected, and without mitigation, the transportation and landing of the barge vessel (and associated tugboats) may cause direct habitat loss, damage and degradation, disturbance, and injury and mortality to blue mussel beds. This would represent a **significant negative effect** upon the local subtidal ecology.

Running water (G.2)

- 6.7.17 A small section (approximately 46m) of watercourse/ditch falls within the Site and was the only terrestrial habitat assessed of being local value or higher. The watercourse/ditch is partly culverted and runs through the urban area adjacent to the Promenade Café and will be retained during construction. Embedded measures, including pollution prevention measures will ensure that this habitat is not negatively affected and there will be no loss or fragmentation, damage or degradation, or disturbance to this receptor. As a result, any potential impacts to the watercourse/ditch arising during construction are negligible and the Proposed Development will have **no significant residual effect**.

Dunes (H6)

- 6.7.18 Sand dunes located to the south of the Site are outside the Site boundary and will not be directly affected by construction activities. Potential construction-phase effects are limited to indirect pathways, namely changes to sand supply and aeolian transport. Construction works are localised to the upper intertidal zone and promenade and will be undertaken in the dry around low tide. These works will not introduce physical barriers to wind-driven sand transport, nor will they result in a material alteration to longshore sediment processes. Temporary disturbance to beach sediments during construction is expected to be highly localised, short-term and reversible, with no measurable reduction in sand availability to the off-site dune system. In the absence of direct interaction with the dunes and taking into account the scale, duration and nature of the construction works, the Proposed Development during construction will have **no significant residual effect**.

Bats

- 6.7.19 No trees are present within the Site or study area, resulting in a lack of roosting opportunities for tree roosting bat species. Several properties to the east of Marine Parade offer low to moderate roosting potential but will be retained during construction and the seawall and culverts do not have the potential to support bats. A dusk emergence survey confirmed no bat roosts were identified in the small substation building located along the Promenade. Overall, the habitats situated within the study area are exposed and offer sub-optimal foraging and commuting opportunities. Any impacts arising during construction will therefore have a negligible impact upon bats and the Proposed Development will have **no significant residual effect**.

Badger

- 6.7.20 No badger setts or evidence of badgers were recorded within the Site or study area. Woodland habitats located outside of the study area along the railway line do however provide suitable sett building and foraging habitat for badger. Badger may therefore be present locally and have the potential to travel in proximity to the Site and areas of active construction. Embedded measures include avoidance of construction activity during nocturnal hours, sensitive lighting of compounds, installation of temporary fencing around active construction, and provision of escape ramps/mammal. These measures will ensure there is no loss, fragmentation, damage or degradation to suitable badger habitat, and badgers themselves will not be disturbed or at risk of mortality or injury. Any impacts arising during construction will have a negligible impact upon badgers and the Proposed Development will have **no significant residual effect**.

Otter

- 6.7.21 No evidence of otter was recorded within the Site or study area. The terrestrial habitats present within the Site provide limited opportunities for otter as the watercourse is short (approximately 46m) and partly culverted. The habitats along Barmouth Promenade are also heavily disturbed by members of the public and dog walkers. The intertidal habitats provide opportunities for foraging and commuting otter and are hydrologically connected to the Pen Llŷn a'r Sarnau SAC and the Afon Eden SAC; otter are a qualifying feature of these sites as well as being a feature of interest of the Mawddach Estuary SSSI.

- 6.7.22 The HRA Report concluded that embedded measures which includes avoidance of construction activity during nocturnal hours, pollution prevention controls, sensitive lighting of compounds, installation of temporary fencing around active construction, and provision of escape ramps/mammal ladders, will negate any potential impacts to otter which may arise during construction. These embedded measures will ensure there is no loss, fragmentation, damage or degradation to suitable otter habitat, and otters themselves will not be disturbed or at risk of mortality or injury.
- 6.7.23 With the implementation of the Lighting Strategy and embedded mitigation measures, no significant residual effects on otter are anticipated during operation. As such, construction will have a negligible impact upon otter and the Proposed Development will have **no significant residual effect**.

Marine mammals

- 6.7.24 Marine mammals known to be present locally include grey seal, bottlenose dolphin, and harbour porpoise, all of which are associated with the Pen Llŷn a'r Sarnau SAC and West Wales Marine SAC. These species are assessed in greater detail in the designated sites section at 6.7.7 – 6.7.26.
- 6.7.25 The desk study did not return any records of further marine mammals, but an absence of records is indicative of under-recording and does not suggest species are absent locally. Other species of marine mammal are likely to be present within Barmouth and Cardigan Bay, and their presence is included as a precaution within this assessment. The disturbance impacts listed in 6.7.20 – 6.7.25 are also applicable to all other marine mammals that aren't listed as a qualifying feature of a SAC.
- 6.7.26 Two grey seal pupping sites were identified during the desk study. The closest site, Dinas Mawddach pupping site, is located approximately 4km south of the Site, in the mouth of the Mawddach Estuary. The second site, Dyffryn Ardudwy pupping site, is located approximately 4km north of the Site.
- 6.7.27 The construction works themselves will be undertaken in dry conditions, either side of low tide, which negates any noise travelling to both pupping sites during construction, however if Option 2 is selected, the operation of marine vessels in proximity to the pupping sites would fall under the TTS for grey seals. It should be noted that both pupping sites are situated outside of the SAC boundaries and have been assessed as qualifying features of the designations based on the presence of FLL.
- 6.7.28 Indicative modelling (Appendix 6.10) shows that unweighted noise produced by the larger transport vessel which will reach the Dinas Mawddach pupping site are estimated to be in the range of 140dB which is below the TTS threshold and the auditory injury threshold for grey seal (INJ can occur from 195dB SEL₂₄ and TTS from 175dB SEL₂₄). At the further Dyffryn Ardudwy pupping site, the noise levels are estimated to be in the range of 137dB which is below the INJ and TTS thresholds for grey seal. Any transportation taking place in closer proximity than the large vessel (e.g. smaller vessel at 200dB making repeat journeys to the Site) will produce slightly higher dB ranges, however these are anticipated to remain below the auditory injury threshold for grey seals at the pupping sites.
- 6.7.29 Without mitigation, Option 2 may therefore result in a **significant temporary, negative effect** upon marine mammals, if marine mammals are present in the immediate area around the noise sources.

Birds

- 6.7.30 The Breeding Bird Habitat Appraisal concluded that the habitats present within the Site are unlikely to support any notable assemblages or high numbers of species associated with nearby designated sites such as North Cardigan Bay SPA, Bird's Rock SPA and Mawddach Estuary SSSI. Birds recorded during the PEA, Intertidal Biotope Survey and Winter Bird Surveys included common or widespread terrestrial and coastal species. Only one red-throated diver (the qualifying feature of the North Cardigan Bay SPA) was recorded nearshore, indicating the habitats within the Site and study area do not typically support this species. This designation is discussed in greater detail in the designated sites section at 6.7.7 – 6.7.21.
- 6.7.31 However, in the absence of mitigation, the HRA Report concluded that a likely significant effect could not be ruled out on the Northern Cardigan Bay SPA, due to potential visual disturbance and displacement of red-throated diver arising from vessel presence and movement associated with Option 2 (delivery of rock armour by sea). Overall, during construction Option 2 may therefore result in a **significant temporary, negative effect on red-throated diver**.
- 6.7.32 Embedded measures will ensure there is no loss, fragmentation, damage or degradation to suitable nesting or foraging habitats, and other bird species themselves will not be disturbed or at risk of mortality or injury. Overall, construction and both Options 1 and Option 2 will have a negligible impact upon birds and the Proposed Development will have **no significant residual effect for other bird species**.

Reptiles

- 6.7.33 The PEA walkover concluded that the habitats present within the Site were largely unsuitable for reptiles, being dominated by tidal and urban habitats. However, small pockets of tussocky dune and coastal grassland and ruderal vegetation provide potential for dispersal and foraging via the railway and watercourse/ditch, both of which will be retained. In addition, records of adder (a BAP species), slow worm and common lizard were provided by Cofnod within 2km of the Site indicating reptiles are present locally. Embedded measures will ensure there is no loss, fragmentation, damage or degradation to suitable habitats, and reptiles themselves will not be disturbed or at risk of mortality or injury. Overall, construction and Options 1 and 2 will have a negligible impact upon reptiles and the Proposed Development will have **no significant residual effect**.

Invertebrates (Marine)

- 6.7.34 During EIA Scoping Reporting and Opinions, NRW's Biodiversity Unit raised the potential presence of piddocks (*Pholas dactylus* and *Barnea candida*) in the wooden groynes and intertidal clays within the Site. No evidence of piddocks were recorded during the Intertidal Biotope Survey or *Sabellaria alveolata* surveys which assessed the biotic community structure present on the groynes and *Sabellaria* reefs. However, no detailed grab or core sampling was conducted other than to confirm biotopes and associated biota in the littoral sand-based biotopes.
- 6.7.35 No piddocks were recorded on the groynes, and other habitats on site were not deemed suitable. The Proposed Development will result in the loss of 0.8ha of sand-based habitat through the placement of rock armour, with the sand-based

substrate still being present underneath, but with reduced availability to burrowing species. Given the extent of suitable intertidal habitat which will be retained as part of the Proposed Development and the niches/crevices created by the rock armour, the overall impact of construction on piddock is negligible and the Proposed Development will have **no significant residual effect**.

- 6.7.36 Blue mussels have been discussed in greater detail in the Intertidal Ecology section at 6.7.16.

Fish

- 6.7.37 Marine and freshwater fish are known to be present locally, including Atlantic salmon, which is a qualifying feature of the Afon Eden SAC. This species is assessed in greater detail in the designated sites section at 6.7.8– 6.7.9. All other fish species which are not listed as a feature of a designated site are assessed within this section and their presence is included as a precaution within this assessment. The desk study did not return any records of fish, but an absence of records is indicative of under-recording and does not suggest fish are absent locally.
- 6.7.38 Embedded measures will ensure construction works are undertaken in dry conditions either side of low tide, avoiding any noise or vibration disturbance entering the water column. In addition, the short section of watercourse will be retained and protected during construction, resulting in no impacts to fish.
- 6.7.39 In the event Option 1 is selected, no disturbance impacts are anticipated due to a lack of impact pathways to the marine or freshwater environments.
- 6.7.40 In the event Option 2 is selected, the embedded measures will be sufficient to prohibit impacts from non-physical disturbance such as a pollution event, but they will not be adequate to protect marine fish from underwater noise. The presence of transport vessels could produce noise that may cause short-term disturbance (avoidance behaviour) to marine fish; however, the duration and exposure are considered to be *de minimis* and would not cause any physiological impacts and are therefore not significant. The overall impact of construction on fish will be negligible and the Proposed Development will have **no significant residual effect**.

Invasive Non-native Species (INNS)

- 6.7.41 Three species of INNS are known to be present within the Site and study area, two of which are terrestrial plant species (Japanese knotweed and Montbretia) with one marine species (modest barnacle). Embedded good practice measures will ensure that none of the terrestrial INNS are spread via construction activity. The marine INNS is registered as “low risk” in Wales and is present on the timber groynes which will be removed from Site and disposed of, therefore unlikely to spread. The biodiversity enhancement measures listed in Section 6.8 includes the recommended removal of Japanese knotweed from the Site, which will increase the condition of the underlying and surrounding habitats. The Proposed Development will have a positive residual effect if terrestrial INNS are removed.
- 6.7.42 In the event Option 2 is selected, without mitigation there could be an increased risk of spreading or introducing new INNS via high-risk activities such as ballast water release in proximity to the Site. The overall impact of this would be dependent upon the species of INNS which could be spread (e.g. a “low risk” species would not result in a significant residual effect). However, with the

implementation of biosecurity measures which are to be outlined within the MVMP, the risk is negated.

Operational and Maintenance Effects

- 6.7.43 Operation is defined as the post-construction phase of the Proposed Development, including maintenance activities, until there is further development or until the project ceases to operate as a standard of protection against coastal flooding. Refer to ES volume 2, Chapter 2 Project Description, the description and period of maintenance activities, and the design life of the Proposed Development.

Otter

- 6.7.44 With the implementation of the Lighting Strategy, **no significant residual effects** on otter are anticipated during operation.

Habitats; Dunes (H6)

- 6.7.45 Sand dunes located to the south of the Site are outside the Site boundary and are proposed for mitigation/enhancement. Dune development and maintenance in this location are primarily driven by wind-driven (aeolian) sand transport rather than marine sediment supply alone. The Proposed Development involves localised works to the upper intertidal and promenade and does not introduce a barrier to aeolian sand transport or materially alter longshore sediment processes. While the dunes have not been surveyed and the precise Annex I habitat type is unconfirmed, the scale and nature of the works are not anticipated to result in a material reduction in sand supply to the off-site dune system. On this basis, and taking into account the proposed enhancement measures, no significant adverse effects on dune extent, condition or function are anticipated and the Proposed Development will have **no significant residual effect**.
- 6.7.46 There would be no further significant effects to ecological receptors from the operation or maintenance of the Proposed Development as, with embedded mitigation, there would be no anticipated changes to coastal processes, water and air quality, or any increase in lighting, recreational pressures or noise disturbance compared to the baseline.
- 6.7.47 Given the need to provide coastal flood protection up to 2075, maintenance provisions will be made up until this date. Given the planned change to managed realignment after this date, maintenance after this date is expected only to be in relation to ensuring public safety. It is therefore assumed that the defences will remain in place past 2075. The standard of protection will reduce over time, but decommissioning of the Proposed Development has not been assessed.

6.8 Ecosystem Resilience

6.8.1 This section considers the effects of the Proposed Development on ecosystem resilience. Ecosystem resilience has been assessed using the DECCA framework (Diversity, Extent, Condition, Connectivity and Adaptability), to provide a structured appraisal of how the Proposed Development may influence the resilience of ecological receptors within the study area.

6.8.2 Table 6-14 presents an assessment of the baseline resilience of relevant ecosystems and indicates how the Proposed Development is anticipated to change these attributes.

Table 6-14. Resilience Assessment of the Existing Ecosystems along with Indication of how the Scheme may change this Resilience (Increase +/- Decrease -).

Ecosystem	Diversity	Extent / size	Condition	Connectivity	Aspect
Intertidal Biotopes					
Intertidal cobbles/shingle (H1.2) LS.LCS.Sh.BarSh (Barren littoral shingle)	This habitat was defined as a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). These habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity. Due to low diversity, impacts would not significantly alter diversity of this habitat on site No change anticipated (0)	1.65ha of this habitat is present within the site, 0.7136ha of intertidal cobbles/shingle is anticipated to be lost. Decrease in extent anticipated (-)	Condition would remain the same as baseline for this habitat, a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). No change anticipated (0)	Reduction in cobbles/shingle which may provide shelter for some species, would be reduced with loss of extent. A wider expanse occurs to the north and forms a long stretch, extending north. Decrease in connectivity anticipated (-)	These habitats are common and widespread within the wider geographical context and are not notable in terms of extent or botanical diversity. This habitat may provide upper shore invertebrate refuge, may improve storm buffering, as such a reduction in storm resilience in absence of recovery to baseline. As such, aspect would remain similar to baseline, but with reduction in service of storm resilience. Decrease in resilience anticipated (-)
LR.MLR.BF.FvesB (<i>Fucus vesiculosus</i> and barnacle mosaics on moderately exposed mid eulittoral rock)	This habitat is located outside the Site and shoreward of a <i>S.alveolata</i> reef (Annex I habitat). Due to the connectivity and proximity to the <i>S.alveolata</i> reef, this habitat is valued higher as it has potential to support other species associated with the reef. There is no anticipated direct or indirect impacts including loss or fragmentation, damage or degradation, disturbance, or mortality and injury of associated species. No change anticipated (0)	LR.MLR.BF.FvesB is situated approximately 120m north of the Site and therefore within the study area but will not be subject to direct or indirect impacts including loss or fragmentation, damage or degradation or disturbance, and as such, no loss of extent anticipated. No change anticipated (0)	Condition would remain the same as baseline for this habitat. No change anticipated (0)	Connectivity would remain as per baseline. No change anticipated (0)	Aspects of resilience would remain similar to baseline, as there is no anticipated change from Proposed works. Climate-related pressures (e.g, temperature increase, storm intensity) are external drivers and not materially altered by the Proposed Development. No change anticipated (0)
LS.LBR.Sab.Salv (<i>Sabellaria alveolata</i> reefs on sand-abraded eulittoral rock)	Honeycomb worm reefs comprising of <i>Sabellaria alveolata</i> were observed in the rocky intertidal area north/northwest of the Site. Noting the importance of the 'reefs' as supportive of wider biodiversity, <i>Sabellaria spp.</i> reefs are listed as 'Biogenic Reefs', a sub-category of the 'Reefs' feature under Annex I of the Habitats Directive. <i>S.alveolata</i> reef is also listed as a Priority Habitat under Section 7 of the Environment (Wales) Act 2016 and is also part of the Annex I reef feature of the Pen Llŷn a'r Sarnau SAC, adjacent to the Site. The extent of the area identified during the survey meets the minimum requirements to be defined as a distinct biotope. There is no anticipated direct or indirect impacts including loss or fragmentation, damage or degradation, disturbance, or mortality and injury of associated species. No change anticipated (0)	Honeycomb worm reefs comprising of <i>Sabellaria alveolata</i> were observed north/northwest of the Site. The extent of the area identified during the survey meets the minimum requirements (20 metres squared) to be defined as a distinct biotope (approximately 1553m ² squared). No change in hydrodynamics, no change in suspended sediment beyond baseline tolerance, no smothering risk and no change to wave exposure regime is anticipated. LS.LBR.Sab.Salv is situated north of the Site and therefore within the study area but will not be subject to direct or indirect impacts including loss or fragmentation, damage or degradation, disturbance, or mortality and injury of associated species and in absence of mitigation, no loss of extent anticipated. However, creation of 0.5ha of honeycomb worm reef has been proposed, increasing the extent of this habitat.	Condition would remain the same as baseline for this habitat. No change anticipated (0)	Connectivity would remain as per baseline in absence of mitigation. With creation of additional <i>Sabellaria</i> habitat outlined in the intertidal mitigation below and BMTH-ARP-EAC-ZZ-DR-OE-000002, an increase in connectivity is anticipated. Increase in connectivity anticipated (+)	Aspects of resilience would remain similar to baseline, as there is no direct anticipated change from Proposed works. Climate-related pressures (e.g, temperature increase, storm intensity) are external drivers and not materially altered by the Proposed Development. However, an increase in extent would positively affect aspects of resilience. Increase in aspects of resilience with anticipated mitigation (+)

Ecosystem	Diversity	Extent / size	Condition	Connectivity	Aspect
		Positive change anticipated (+)			
LR.HLR.MusB.Sem.LitX (<i>Semibalanus balanoides</i> and <i>Littorina</i> spp. on exposed to moderately exposed eulittoral boulders and cobbles)	Small distinct areas of this habitat type are recorded within the Site and extend seaward into the SAC. This is a common habitat and diversity is not notable within this habitat. No change anticipated (0)	The eulittoral rock is unlikely to be subject to changes in extent, these species would likely be able to recolonise any temporary changes, as they are prone to seasonal variation. No change anticipated (0)	Condition would remain the same as baseline for this habitat. No change anticipated (0)	Connectivity may be subject to temporary disturbance but would return to baseline, and remaining areas retained would remain unchanged. No change anticipated (0)	Aspect would remain similar to baseline, and remaining areas retained would remain unchanged. No change anticipated (0)
LR.FLR.Eph.UlvPor (<i>Porphyra purpurea</i> and <i>Ulva</i> spp. on sand-scoured mid or lower eulittoral rock)	Small distinct areas of this habitat type are recorded within the Site and extend seaward into the SAC. This is a common habitat and diversity is not notable within this habitat. No change anticipated (0)	Unknown, loss of this habitat would be temporary where present on existing structures to be removed, however, the seaward eulittoral rock is unlikely to be subject to changes in extent, these species would likely be able to recolonise, as they are prone to seasonal variation. No change anticipated (0)	Condition would remain the same as baseline for this habitat. No change anticipated (0)	Connectivity may be subject to temporary disturbance but would return to baseline, and remaining areas retained would remain unchanged. No change anticipated (0)	Aspect would remain similar to baseline, and remaining areas retained would remain unchanged. No change anticipated (0)
Intertidal mud/ sand (H1.1) LS.LSa.MoSa.AmSco.Sco (<i>Scolecopsis</i> spp. in littoral sand) LS.LSa.MoSa.BarSa (Barren littoral coarse sand)	This habitat was defined as a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). These habitats are common and are not notable in terms of botanical diversity. No change anticipated (0)	These habitats are common and widespread within the wider geographical context and are not notable in terms of extent. 17.75ha is present on site and 1.718ha would be lost. <i>Scolecopsis</i> spp habitat extent in littoral sand lost. However, residual effects would be minimal after recovery as remaining habitat is contiguous. Loss of sand-based habitat from the placement of rock armour, would maintain the sand-based substrate still being present underneath, but with reduced availability to burrowing species. Decrease in extent anticipated (-)	Condition would remain the same as baseline for this habitat, a species-poor community, lacking macrofaunal diversity (during intertidal biotope field surveys). No change anticipated (0)	Connectivity is expected to remain similar to baseline, as there would be ample habitat on site which connects to the large extents of this common habitat in along the coast. No change anticipated (0)	No anticipated change, ecosystem function and resilience to be supported in retained areas. Temporary functional loss of sand-based habitat beneath rock armour. Residual effects are considered negligible. No change anticipated (0)
Other Marine Habitats – Blue Mussels on Groynes and Creation of Blue Mussel Bed S7 Habitat					
Blue mussels (located on the timber groynes and the proposed blue mussel bed S7 habitat created)	Blue mussels were observed growing on approximately two thirds of the existing timber groynes, as well as on the outfall pipe. Blue Mussel 'Beds' are listed as a Priority Habitat under Section 7 of the Environment (Wales) Act 2016; it is noted that the mussels, that are associated with the anthropogenic structures on site, do not constitute mussel 'beds' and do not align with the Section 7 description. Removal of the groynes supporting blue mussels is also likely to result in mortality to the blue mussels. The loss of blue mussels is considered to represent a negative impact to intertidal biodiversity. The Proposed Development will be creating 0.063ha of blue mussel bed in a natural habitat, as such, will mitigate for loss of diversity on groynes. No change of diversity anticipated (0)	514m of groynes are present on Site with existing surface area of suitable habitat currently approximately 514m ² . Large extents of blue mussels were observed growing on approximately two thirds of the existing timber groynes situated along Barmouth Beach. Blue mussels were also recorded on the outfall pipe discussed above which will be retained. All groynes within the Site will be removed to facilitate construction works and reduce risks to public safety, including approximately 514m of groynes (posts and boards) containing blue mussel growth. However, although blue mussel bed is not being lost, blue mussel habitat will decrease. With the addition of 0.063ha of blue mussel bed proposed, no change to mussel habitat extent is anticipated once the mitigation habitat is instated and favourable. No change in extent anticipated (0)	Condition on groynes would deteriorate due to loss of anthropogenic attachment structures and blue mussel mortality. However, with mitigation creating 0.063ha extension of existing blue mussel beds, the condition would remain as baseline. No change in condition anticipated (0)	Connectivity would decrease due to loss of suitable supporting habitat on site – albeit artificial and deteriorating. However, as mitigation seeks to increase connectivity between existing mussel beds within the SAC, the loss is adequately mitigated for. No change in connectivity anticipated (0)	The future baseline in which the groynes would naturally continue to decay and be lost from the Site has been accounted for, however, with the increase in habitat extent within the existing natural habitats within the protected SAC from proposed mitigation, a positive increase in aspects of resilience is anticipated. Climate-related pressures (e.g, temperature increase, storm intensity) are external drivers and not materially altered by the Proposed Development. Increase in aspects of resilience anticipated (+)
Terrestrial / Phase 1 Habitats					
Grassland Coastal grassland (H8.4) Amenity grassland (J1.2)	The coastal grassland occurs in small, managed verge strips dominated by short sward, with limited areas supporting greater species diversity, including some dune-associated species. Overall, this habitat is common and widespread, with limited extent and low botanical diversity. A coastal grassland area with higher composition of dune grassland species is limited in extent and in poor condition.	Coastal grassland on site comprises 1.31 ha. 0.244 ha of coastal grassland will be lost through construction. Creation of 0.066ha of amenity grassland, with a mix of coastal species.	The grassland on site is relatively species poor, in comparison to grassland within the wider area. As grassland created will be amenity grassland, increase in condition cannot be determined. This would result in a	The created grassland proposed will have similar connectivity to the existing situation in terms of location. As such, the created grasslands will provide the same connectivity as baseline, which at baseline does provide a 'stepping	No anticipated change in adaptability. With correct management of ongoing removal of invasive species recorded in other habitats within the area, there may be a positive increase. No change anticipated (0)

Ecosystem	Diversity	Extent / size	Condition	Connectivity	Aspect
	The baseline amenity grassland recorded is outside the site and included for habitat creation. Extent of coastal grassland will be reduced; however, grassland created on site to be tailored to coastal species. No change anticipated (0)	Extent of coastal grassland will be reduced; net loss of 0.13ha of grassland (9.9% of baseline). Decrease of extent anticipated (-)	decrease in ecological distinctiveness, however, with correct management, would remain in similar condition to baseline. No change anticipated (0), dependent on successful implementation	stone' habitat for protected species and seed dispersal. No change anticipated (0)	
Dunes (H6)	Sand dunes to the south of the site, not within the Site, Diversity not recorded. The dunes are proposed for mitigation/enhancement Increase in diversity anticipated (+)	Extent to remain unchanged, sand dune enhancement to preserve extent. Maintenance of extent anticipated (0)	Sand dunes to the south of the site, not within the Site, increase in condition anticipated with enhancement. Increase in condition anticipated (+)	Dunes will provide the same connectivity as baseline, which at baseline does provide an important habitat for protected species and seed dispersal. However, with increase in condition from enhancement, an increase in connectivity could indirectly be anticipated. Increase in connectivity anticipated (+)	Opportunities to enhance condition of the dunes would increase the aspects of resilience of this habitat. Climate-related pressures (e.g, temperature increase, storm intensity) are external drivers and not materially altered by the Proposed Development. However, the enhancement of the dunes would increase the aspects of resilience. Anticipated increase in aspects of resilience (+)
Running water (G2)	The ditch is largely culverted running through the urban areas and will not be impacted by the Proposed Development. No change anticipated (0)	A small section (approximately 46m) of watercourse/ditch falls within the Site Extent within the site is limited, approximately 46m. No change to extent. No change anticipated (0)	Condition not significant. This habitat is valued for riparian mammals and aquatic species. However, there is no anticipated change. No change anticipated (0)	Connectivity is hindered by culverts and as such, baseline levels demonstrate poor connectivity. No change in water quality, no change in flow regime, no culvert modification and no further barrier effects from proposed works. No change anticipated (0)	This habitat is valued as moderate for riparian mammals and aquatic species. However, no anticipated change No change anticipated (0)
Dense scrub (A2.1) and Scattered scrub (A2.2)	Due to the small infrequent areas of scrub within the Site it will support less species than the denser/ more biodiverse areas of off-site scrub which is more widespread. The diversity is limited. No change anticipated (0)	0.06ha of scrub is present, no scrub is anticipated to be lost. 0.04ha of introduced shrub (raised planters) are to be installed, however, these are not native species. No change anticipated (0)	Scrub is not considered to form part of any Priority Habitat this habitat would maintain the same condition. No change anticipated (0)	Scrub provides some connectivity along the terrestrial habitats and railway line, however, no anticipated changes in connectivity. No change anticipated (0)	Ongoing aspects of resilience likely to remain unchanged due to no loss. No change anticipated (0)
Tall ruderal herb (C3.1)	The ruderal occurs in small, strips around the former compound site, with limited species diversity. Throughout most of the tall ruderal vegetation were stands of Japanese knotweed, which outcompetes native species for resources (such as light, space). A minimal area of ruderal is to be lost (0.004ha), as such, this would not cause significant change in the diversity as ruderal is a transitional habitat. No change anticipated (0)	The extent of the ruderal occurs in small, strips around the former compound site, at 0.20ha. 0.004ha of ruderal is to be lost. This would not cause significant change in the extent due to the small size of the area and the transitional nature of this habitat. Minor negative change anticipated (-)	Small areas of low diversity ruderal growth within the Site and the presence of INNS within this habitat render the condition poor, as such, no change anticipated. No change anticipated (0)	Ruderal on site is predominantly around the compound areas, this would provide the same connectivity as baseline, with any ruderal within the scrub still likely providing some heterogeneity to the habitat. Further, the ecotone that ruderal provides between scrub and shorter vegetation swards would remain intact across remaining areas of the site, as the majority is preserved. No change anticipated (0)	Ruderal vegetation can be transitional and ephemeral in nature, however, ongoing resilience likely to remain unchanged due to the minimal loss of ruderal vegetation on site. No change anticipated (0)
Artificial sea wall (J3.5)	The sea wall has been colonised by barnacles and algae, with no notable communities present. Low diversity present in this habitat. The proposed works will allow for recolonisation of the new structures, as such, no significant change in diversity is anticipated. Consideration for habitat enhancements would increase diversity. No change anticipated (0) accounting for recolonisation of new materials.	The seawall is present along the entire length of Marine Parade, bordering where the land meets the coast. It is of masonry composite and is enhanced by areas of sheet metal piling in sections. the sea wall extent is 1.52ha. This area is to be replaced, and rock armour installed. As such, although there would be a change it would be a like-for-like neutral basis. No change anticipated (0)	The sea wall has been colonised by barnacles and algae, with no notable communities present. Low diversity present in this habitat and as such, not in a notable condition, with lack of heterogeneity of the surface area. No change anticipated (0) accounting for recolonisation of new materials.	Connectivity along shoreline to remain as baseline with the replacement of the sea wall. No change anticipated (0)	Aspect of resilience in this habitat not in a notable condition to support a diverse range of species, with current lack of heterogeneity of the surface area. No change anticipated (0)

Ecosystem	Diversity	Extent / size	Condition	Connectivity	Aspect
Bare ground (J.4), Buildings (J3.6), Wall (J2.5), Hardstanding (J5)	N/A	N/A	N/A	N/A	N/A

6.9 Mitigation and Enhancement

- 6.9.1 This section outlines the mitigation required where significant effects have been identified in Section 6.7 and the ecosystem resilience table in Section 6.8.

Additional Mitigation of Construction Effects

- 6.9.2 Where adverse effects to receptors cannot be ruled out, additional mitigation must be recommended. The following mitigation measures have been proposed to reduce any adverse effects during construction. These measures will cover the following receptors:

- Designated Sites.
- Birds (red-throated diver).
- Intertidal ecology.
- Subtidal ecology.
- Marine mammals.

Marine Vessel Management Plan (MVMP)

- 6.9.3 Designated sites, subtidal ecology, red-throated diver and marine mammals may all be subject to negative impacts associated with the selection of transportation Option 2 (transportation of rock armour by sea).
- 6.9.4 In the event that Option 2 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.
- 6.9.5 Receptors include sensitive sessile habitats at risk from direct impact and increased sedimentation, red-throated diver and marine mammals including bottlenose dolphin, harbour porpoise and grey seal at risk from visual and noise disturbance and displacement.
- 6.9.6 Pen Llŷn a'r Sarnau SAC contains habitats which are sensitive to increased sedimentation which may occur as a result of vessel movement within the SAC. This includes reefs- blue mussel beds are known to be present nearshore between the SAC boundary and the Site. Blue mussel beds are listed as a Section 7 Priority Habitat in Wales.
- 6.9.7 The MVMP will prescribe avoidance measures to prevent sedimentation within the SAC. This will include suitable routing options and mooring locations 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 and lowest risk of sedimentation. Vessels will be instructed to reduce their speeds when entering the SAC to prevent excessive turbidity and sedimentation from propellor scour at shallow depths, as well as mitigate any risk of direct mortality/auditory injury to marine mammals from collision or noise impacts. As such, speed restrictions both within and outside the SAC are to be implemented and specified within the MVMP as a precautionary measure to minimise potential disturbance and injury/mortality to marine mammals that may be present in the area. 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.

- 6.9.8 The MVMP will include measures (Biosecurity Risk Assessment) to avoid the spread of marine-based INNS, through sensitive management of materials and high-risk activities such as ballast water transfer.
- 6.9.9 The Pen Llyn a'r Sarnau SAC and West Wales Marine SAC support bottlenose dolphin, harbour porpoise and grey seals. Two grey seal pupping sites are also present in proximity to the Site but are not listed as qualifying features of the designated sites. The Northern Cardigan Bay SPA supports the red-throated diver qualifying species. The presence of transport vessels may result in underwater noise disturbance to sensitive marine mammals, direct mortality or injury to marine mammals and the physical presence and movement visual and noise disturbance to red-throated diver. Sources of noise disturbance may include the engines of the vessels during transport, engine noise if left running whilst moored, and mechanical sounds whilst transferring rock armour. Excessive noise levels could cause behavioural shifts. Excessive presence of vessels may increase the disturbance / displacement of red-throated diver.
- 6.9.10 The MVMP will describe avoidance and mitigation measures to reduce the levels of noise emitted from vessels during construction. This will include consideration of 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 engine management will be reviewed (e.g. turned down where practicable). During transfer of rock armour, a protocol will be in place to prevent underwater noise through unnecessary engine use and other mechanical noise. The protocol will prescribe sensitive handling of rock armour to reduce underwater noise during the transfer of materials and to prevent materials being dropped overboard.
- 6.9.11 The qualifying feature of the SPA comprises red-throated diver, which are particularly sensitive to vessel movements. The worst-case-scenario for vessel movement disturbance has been outlined in the HRA, 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. The figures of vessel transits outlined in the worst-case-scenario represent a conservative worst-case upper bound for assessment purposes and are not to be exceeded. 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 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 armour 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.
- Briefing of vessel crew on the purpose and implications of these vessel management practices (through toolbox talks).

- 6.9.12 Following the implementation of the mitigation the wintering population of red-throated diver would 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 or frequency to affect population distribution or prevent the wintering red-throated diver population from remaining stable or increasing. No significant effect is anticipated as work will be avoided withing the overwintering season.
- 6.9.13 In the event that confidence in the MVMP cannot be obtained, it may be necessary to undertake in-situ noise monitoring to ensure decibel levels are kept below the TTS for bottlenose dolphin (181dB), harbour porpoise (161dB) and grey seal (175dB). Minimal vessels will be operating in localised area over a temporary period, whilst there is a vast expanse of alternative habitat for cetaceans and red throated diver to use. Continuous noise output will allows individuals to stay clear of any noise, thus significant effects are extremely unlikely and impact range would be within tens or metres only.

Intertidal/subtidal mitigation

- 6.9.14 The assessment of likely significant effects concluded that the Proposed Development would result in a negative impact to intertidal ecology. Although there is a loss of blue mussel habitat via the loss of approximately 514m of groynes (post and boards) maintaining blue mussels. To mitigate for the loss of groynes and the associated mussels that cannot feasibly be reinstated into the design, bespoke intertidal habitat creation measures have been proposed through creation of 0.5ha of *Sabellaria alveolata* habitat off site (north of the red line boundary refer to Appendix 6.1 Intertidal Biotope report, figure 4) and to enhance the existing offshore blue mussel beds through 0.3% increase in area.
- 6.9.15 The figure BMTH-ARP-EAC-ZZ-DR-OE-000002 outlines the phase 1 plan post-development, including the proposed indicative intertidal mitigation locations.
- 6.9.16 The LEMP and Habitat Management and Monitoring Plan (HMMP) will define the adaptive plan for *Sabellaria* reef and blue mussel habitat creation, outlining how the habitats will be constructed, monitored, and managed over time. This ensures that the habitat creation can respond to changing conditions and achieves its intended ecological outcomes, delivering a net benefit for biodiversity.

Proposed Sabellaria habitat creation approach

- 6.9.17 This habitat creation has been proposed to support the natural expansion of the existing *Sabellaria* reef through facilitation of passive larval recruitment and sediment retention. A reef expansion buffer of approximately 0.5 ha would be identified in proximity to the existing reef, located where abiotic and physical conditions (including hydrodynamic regime, seabed composition and sediment mobility) most closely reflect those supporting the reef structures. The proximity

of the buffer to the existing reef is intended to maximise exposure to locally retained larvae while maintaining functional connectivity with the source population.

- 6.9.18 Within this expansion area, a field of low profile, high-stability hard substrates (rock armour) would be deployed, arranged in spatially discrete clusters. Units would be oriented broadly perpendicular to the dominant tidal flow to locally reduce near-bed flow velocity, creating micro-habitats conducive to sediment deposition while avoiding large-scale alteration of sediment transport processes.
- 6.9.19 The hard substrates are intended to act as initial attachment points and sediment capture focal points, supporting natural reef colonisation processes rather than functioning as replacement reef. Design emphasis is placed on maintaining an adequate supply of medium-grained sand (approximately 125-350 µm) within the buffer, recognising that *Sabellaria alveolata* reef development is fundamentally dependent on sediment availability for tube construction and stabilisation.
- 6.9.20 Where specifically permitted and subject to marine licensing constraints, the limited translocation of small reef fragments into the created habitat may be considered as a supplementary measure to accelerate local colonisation. However, passive larval recruitment from the adjacent reef would remain the primary mechanism for reef establishment, with transplantation not relied upon for delivery of habitat extent.
- 6.9.21 Over the monitoring period, the area would be assessed for evidence of reef development, recognising the inherently dynamic and episodic nature of *Sabellaria* reef growth. Monitoring would focus on morphometric indicators, including reef patch area, thickness, tube density and degree of fragmentation, to track trajectory rather than guarantee outcomes. The approach is intended to remain adaptable, allowing modification in response to observed sediment dynamics, colonisation patterns and hydrodynamic feedback.

Proposed blue mussel habitat creation approach

- 6.9.22 A blue mussel bed habitat creation approach is proposed to support natural expansion of existing habitat extents in the study area, primarily through passive recruitment and subsequent aggregation. The creation area would be located adjacent to established beds, in areas where key conditions (tidal regime, hydrodynamic exposure and salinity) are comparable, to ensure suitability and increase ecological connectivity between the beds.
- 6.9.23 Habitat creation would be achieved by placing discrete patches of stable, heterogeneous hard substrate, to be defined within the LEMP and HMMP, principally hard substrate such as rock armour or, if appropriate, cobbles, ensuring sufficient size to reduce mobility under wave and tidal forcing. The material would be installed as low profile clusters to provide settlement surfaces and interstitial refuge, and to encourage the development and coalescence of mussel patches without materially altering local sediment transport or flow patterns.
- 6.9.24 The substrates are intended to act as colonisation nuclei. Where permitted and subject to licensing, limited seeding or translocation of small mussel clumps from adjacent donor areas may be considered to accelerate early establishment, however, passive recruitment would remain the primary mechanism for the bed development.

- 6.9.25 Monitoring would be undertaken to confirm substrate stability and track bed formation, focusing on indicators such as mussel density, areal extent, patch connectivity and vertical structure, alongside evidence of associated fauna. The approach would remain adaptive, allowing refinement of layout and substrate grading in response to observed recruitment, hydrodynamic conditions and bed development.
- 6.9.26 Overall, provision of these intertidal enhancements will provide a Net Benefit for intertidal ecology as the habitats created are highly likely to support a wider diversity of intertidal species in natural habitats than currently present. Therefore, providing longer term resilience for the intertidal habitats on Site. This would therefore result in a longer-term net benefit for biodiversity providing a beneficial impact.

Mitigation of Operational Effects

- 6.9.27 No operational effects are anticipated therefore no further mitigation is proposed.

Enhancements

PPW [6] states that development should not cause any significant loss of habitats or populations of species (not including non-native invasive species), locally or nationally and must work alongside nature and it must provide a Net Benefit for Biodiversity (NBB). All schemes applying for planning permission must therefore demonstrate they have achieved a NBB and enhanced ecosystem resilience through applying the stepwise approach. In addition, where works require a Marine Licence, the determination will be made in accordance with the Welsh National Marine Plan [8], including Policy ENV_01, which requires proposals to assess and address impacts on marine ecosystems by applying the mitigation hierarchy to avoid, minimise and mitigate adverse effects, and to support the protection, restoration and enhancement of marine ecosystem resilience.

- 6.9.28 Several habitats would be directly impacted (lost) by the footprint of the Proposed Scheme. This included the following habitats which can be seen at ES Volume 4, Figure 6.1 Baseline Phase 1 Habitat Plan:
- Tall ruderal vegetation (C3.1) – 0.004ha lost.
 - Intertidal mud/sand (H1.1) – 1.718ha lost/covered.
 - Intertidal shingle/cobbles (H1.2) – 0.7136ha lost/covered.
 - Coastal grassland (H8.4) – 0.244ha lost.
 - Artificial seawall (J3.5) – 0.259ha lost.
 - Buildings (J3.6) – 0.004ha lost.
 - Bare ground (J4) – 0.008ha lost.
 - Other habitat (hardstanding) (J5) – 0.860ha lost.
- 6.9.29 Each of the habitats listed above were categorised as being of less than local value based on poor species diversity, low biomass, presence of INNS, or being limited in terms of coverage, or being an artificial urban feature. Their loss was

therefore not significant, and the habitats were not carried through as sensitive receptors into the assessment of likely effects. All other habitats identified within the Site would be retained (no losses).

- 6.9.30 The Proposed Development would result in the creation of 0.066ha of amenity grassland and 0.04ha of introduced shrub (raised planters) and an increase in coverage of hardstanding and sealed surfaces, which includes the revetment itself (see ES Volume 4, Figure 6.2, Post-development Phase 1 Habitat Plan).
- 6.9.31 The amenity planting will comprise a mixture of native and climate resilient species (non-native) that are suitable for coastal environments and will provide pollen and nectar for a range of invertebrates. In the long-term, the shrub planting may provide nesting opportunities for breeding birds.
- 6.9.32 The intertidal mitigation will provide 0.5ha of *Sabellaria alveolata* habitat creation, and 0.063ha of blue mussel habitat, an overall increase of the 0.3% of blue mussel bed extent identified within the study area. The habitat creation and method statement is to be detailed within the LEMP. This off-site enhancement will comprise an extension to the existing *Sabellaria* boulder field to the north of the Site to provide opportunities for new *Sabellaria alveolata* reefs which can colonise from the existing population, along with expansion of existing mussel beds seaward of the site.
- 6.9.33 The reduction of 0.004ha of tall ruderal vegetation (C3.1) and 0.244ha of coastal grassland (H8.4) which is currently in poor condition and lacking in diversity does not represent a significant loss. Habitat loss will be mitigated and a net-benefit for biodiversity achieved through the enhancement of approximately 4ha of dune habitat to the south of the site.
- 6.9.34 The mitigation/enhancement strategy of approximately 4ha of existing dune habitat located immediately to the south of the Site would be designed following advice set out in *NRW 207 Advice options for sand dune management for flood and coastal defence report, 2017* [45], which includes studies on the Fairbourne Dunes, and as such, is most relevant on a local scale. The Fairbourne Dunes are in close proximity to the dune area proposed for enhancement, to the southern extent of the Mawddach Estuary SSSI. The strategy will seek to enhance ecosystem resilience by improving habitat condition, diversity and functional connectivity within the wider sediment cell⁹. The works will specifically support the restoration and maintenance of the dune habitats, recognising that these features are dependent on active sediment movement and early successional stages. Dune condition and compliance with Annex I criteria is improved through the presence of dynamic processes, bare sand and habitat mosaics rather than overstabilisation. Enhancement measures will undergo dynamic management appropriate to the baseline conditions. Measures would include the following, where appropriate: targeted dune re-profiling using existing sand, installation of biodegradable sand fencing to promote aeolian sand trapping and embryo dune formation, selective vegetation management including the use of native sand-binding species where appropriate, and if necessary, managed access controls to reduce trampling pressure. Collectively,

⁹ The dune proposed for enhancement is located within the same coastal sediment cell as the footprint of the proposed works, ensuring that mitigation operates within the functional geomorphological system that governs sediment transport, beach-dune sand exchange and coastal resilience. Managing dunes at a sediment-cell scale reflects NRW advice on dune management, which emphasises that dune systems should not be considered in isolation, but as part of a wider sediment pathway supplying and redistributing material along the coast.

these measures will increase dune mobility, support natural recovery processes following storm events, and enhance structural and ecological diversity, resulting in a measurable improvement in dune system function, coastal resilience, and biodiversity value consistent with the adaptive, nature-based management approach promoted at the Fairbourne dunes. The LEMP and Habitat Management and Monitoring Plan (HMMP) will define the adaptive plan for the dune enhancement, outlining how the enhancement measures will be constructed, monitored, and managed over time. This ensures that the habitat can respond to changing conditions and achieves its intended ecological outcomes, delivering a net benefit for biodiversity.

6.9.35 Further enhancements which could possibly be incorporated into the design (depending upon third party agreements) to provide further benefits as part of the Proposed Development include the following:

- It is possible to enhance the amenity grassland to a more species rich neutral grassland in areas designated as “green space”. Species-mixes and management regimes will need to be altered to achieve this. With the proposed additions to the species-mix and changes to long-term management proposed this will represent an improvement in the *diversity* and *condition* of the habitats present onsite.
- Where feasible at lower tidal elevations, ecological enhancement structures can be integrated within sheet piles, which can create shallow water-retention features (with controlled drainage/overflow), providing refuge and improving species richness on otherwise smooth vertical surfaces.
- Removal of Japanese knotweed across the Site. This will require the expertise of a suitably qualified INNS specialist who will work directly with the Contractor. The removal of INNS will directly improve the quality and condition of the scrub, ruderal and grassland habitats surrounding the INNS, allowing native species to succeed thereby contributing to the resilience of this habitat.
- The permanent lighting design will include measures to reduce light spill onto sensitive habitats or features which could be used by light-sensitive species such as bats, birds and terrestrial mammals. A reduction in light levels on vegetative habitats will increase their suitability for light sensitive species and may provide new foraging resources in combination with the other measures that may be considered.
- A large area of bare ground to the east of the Promenade (formerly used as a compound) could be considered to create up to 0.6ha of species-rich coastal grassland habitat with native scrub to provide long-term opportunities for a range of protected and notable terrestrial species (e.g. nesting bird, invertebrates). However, this would be dependent upon third party agreements.

6.10 Residual Effects

6.10.1 Cumulative and in-combination effects are addressed within ES Chapter 15 Cumulative and In-Combination Effects.

6.10.2 No cumulative or in-combination effects from other projects or applications have been identified, therefore there are no residual effects.

6.11 Assessment Summary

6.11.1 All potential effects identified in the main assessment including those identified as negligible are presented in Table 6-14.

Table 6-15 Summary of effects matrix

Receptor	Potential Impact	Significance of effect	Mitigation proposed	Residual effect
Designated sites	• Damage and or degradation to sensitive habitats (reefs, <i>Salicornia</i> and other annuals colonizing mud and sand, and Atlantic salt meadows) • Disturbance and auditory injury (to marine mammals, bottlenose dolphin, harbour porpoise and grey seal as well as red-throated diver)	Negative (significant)	Mitigation outlined in the Marine Vessel Management Plan (MVMP)	Negligible (not significant)
Intertidal ecology	Loss of blue mussel habitat ¹⁰	Negative (significant)	Bespoke intertidal mitigation including <i>Sabellaria alveolata</i> habitat creation. Increase in extent of subtidal blue mussel beds, both S7 Habitats	Positive
Subtidal ecology	Damage and or degradation to sensitive habitats (blue mussel beds)	Negative (significant)	Marine Vessel Management Plan (MVMP).	Negligible (not significant)
Dunes (H6)	Negligible	Negligible	Mitigation for habitat loss and enhancement proposed	Positive
Running water (G.2)	Negligible	Negligible	None proposed	Negligible (not significant)
Bats	Negligible	Negligible	None proposed	Negligible (not significant)
Badger	Negligible	Negligible	None proposed	Negligible (not significant)
Otter	Negligible	Negligible	None proposed	Negligible (not significant)

¹⁰ (not qualifying as a S7 habitat blue mussel bed)

Receptor	Potential Impact	Significance of effect	Mitigation proposed	Residual effect
Marine mammals	Disturbance and auditory injury from the main transport vessel (to all marine mammals present locally, but particularly grey seal at the nearby pupping sites)	Negative (significant)	Marine Vessel Management Plan (MVMP)	Negligible (not significant)
Birds (Red-throated diver assessed within designated sites)	Negligible	Negligible	None proposed	Negligible (not significant)
Reptiles	Negligible	Negligible	None proposed	Negligible (not significant)
Invertebrates (Marine)	Negligible	Negligible	None proposed	Negligible (not significant)
Fish	Disturbance from vessels	Negligible	Marine Vessel Management Plan (MVMP)	Negligible (not significant)

Abbreviations List

CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CWS	Candidate Wildlife Site
DECCA	DECCA Framework: “Diversity, Extent, Condition, Connectivity and Aspects of ecosystem resilience”
EclA	Ecological Impact Assessment
EcOW	Ecological Clerk of Works
EIA	Environmental Impact Assessment
EPS	European Protected Species
ES	Environmental Statement
FLL	Functionally Linked Land
GIS	Green Infrastructure Statement
GPP	Guidance for Pollution Prevention
HRA	Habitats Regulations Assessment
IEF	Important Ecological Features
INJ	Auditory Injury regarding marine mammals
INNS	Invasive Non-Native Species
JNCC	Joint Nature Conservation Committee
LBAP	Local Biodiversity Action Plan
LEMP	Landscape Environmental Management Plan
LSE	Likely Significant Effect
MAGIC	Multi-Agency Geographical Information for the Countryside
MLWN	Mean Low Water Neaps
MLWS	Mean Low Water Springs
MNCR	Marine Nature Conservation Review
MPA	Marine Protected Area
NRW	Natural Resources Wales
PEA	Preliminary Ecological Appraisal
PPW	Planning Policy Wales
PRA	Preliminary Roost Assessment
S7	Section 7 (Priority Habitats listed under the Environment (Wales) Act 2016)
SAC	Special Area of Conservation
SPA	Special Protected Area
SSSI	Site of Special Scientific Interest
TTS	Temporary Threshold Shift
UKBAP	UK Biodiversity Action Plan
WeBS	Wetland Bird Survey
WFD	Water Framework Directive
WCA	Wildlife and Countryside Act
YGC	Ymgynghoriaeth Gwynedd Consultancy
ZoI	Zone of Influence

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