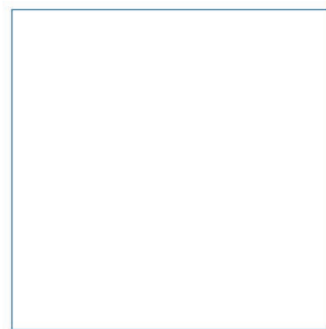
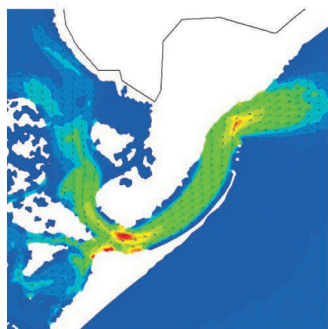
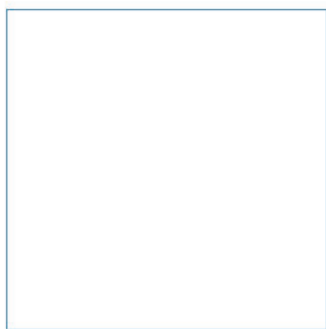
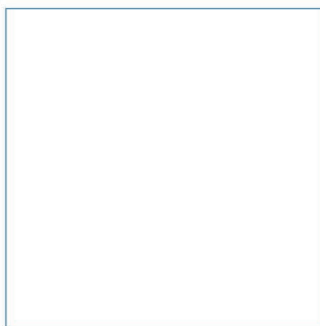


Bourne Leisure Ltd.

# Hafan y Môr Holiday Park '2030 Vision' Masterplan

Environmental Statement, Habitats Regulations Appraisal and  
Water Framework Directive Compliance Assessment -  
Volume 1: Main Report

December 2019



Innovative Thinking - Sustainable Solutions

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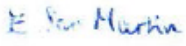
December 2019



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|  |  |  |

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# Non-Technical Summary

This Non-Technical Summary (NTS) provides a brief description of the Environmental Statement (ES) that has been prepared to inform Haven Leisure Ltd.'s application for permission to modernise and upgrade Hafan y Môr Holiday Park (the "Proposed Development"). The Hafan y Môr Holiday Park is situated on the south coast of the Llŷn peninsula, east of Pwllheli, Gwynedd and Figure NTS1 shows the red line application boundary for the Proposed Development.

The NTS follows the same structure as the ES, providing a summary of each section. The full results of the comprehensive investigations that have been undertaken, together with the analyses and conclusions that have been used to underpin the environmental assessment of these proposals, can be found in the main ES.

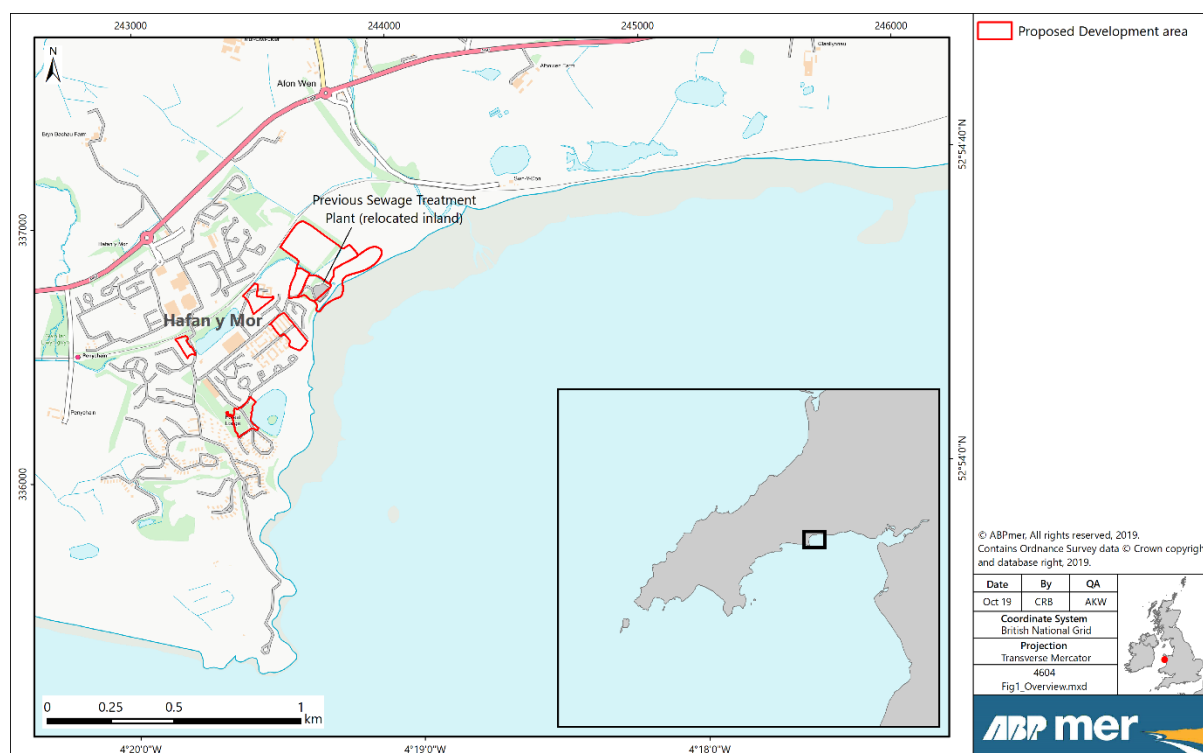


Figure NTS1. Location of the Hafan y Môr Holiday Park

## Project Summary (Section 1)

Haven Leisure Ltd. is seeking permissions to modernise and upgrade their Hafan y Môr Holiday Park which is situated on the south coast of the Llŷn peninsula, east of Pwllheli, Gwynedd (Figure NTS1). They have developed a proposed '2030 vision masterplan' which will involve extending and improving the park as well as ensuring that it has appropriate long-term coastal erosion protection.

The Proposed Development includes landside areas and also works below the Mean High Water Spring (MHWS) elevation (the intertidal zone) and therefore will require planning permission from Gwynedd Council and a marine licence from Natural Resources Wales (NRW). The ES considers both landside areas and works below MHWS and will be used to support both the planning application and the marine licence application.

A scoping report was issued to Gwynedd Council and NRW in October 2018 who confirmed in their Screening and Scoping Opinions that the Proposed Development requires a statutory Environmental Impact Assessment (EIA), along with other assessment requirements, including a Habitats Regulations Assessment (HRA), a Water Framework Directive (WFD) Compliance Assessment and a Flood Consequences Assessment (FCA). The Screening and Scoping Opinions also clarified the scope of the assessment work required.

To inform the EIA, a range of site-specific field surveys and studies have been carried out across the landside area and the intertidal zone to describe the present (baseline) conditions and environmental value of areas that are likely to be directly and indirectly affected by the Proposed Development.

Consultation is a crucial element of the EIA and has been carried out with key stakeholders throughout the development of the project. These have included regular meetings with regulators and a public exhibition at the Hafan y Môr site.

## Project Description and Methodology (Section 2)

The key components of the Proposed Development are as follows:

- The demolition of 56 existing two storey apartments;
- The addition of 165 static caravan pitches (a net increase of 40 units from the total approved in 2011<sup>1</sup>);
- The creation of an at-grade car park;
- The construction and operation of a new 950 m<sup>2</sup> beach café (650 m<sup>2</sup> at ground floor and 300 m<sup>2</sup> at first floor) as well as a children's play area;
- Selected new and improved landscaping measures;
- Changing 120 m of existing linear coastal rock revetment to groynes with sand/gravel; and
- Introducing a further 210 m of coastal protection made up of rock armour breakwaters with intervening areas of beach (sand/gravel) recharge.

Much of the Proposed Development work will take place on the eastern side of the existing park area which is within Haven Leisure Ltd.'s landholdings and includes an area of grassland and the site of a previous sewage treatment plant (STP) which has been demolished (see Figure NTS1). The area vacated by the previous STP and the park extension will be protected by the proposed coastal defences. The land parcels allocated for the park and coastal defence development are shown in the masterplan (Appendix A).

### Landside Works

The proposals for each parcel of land (see the masterplan in Appendix A) that comprise the landside element of the Proposed Development are as follows:

- **Parcel B - Lakeside West:** Currently an unmanaged woodland with an access road that runs through towards Forest Lodge. It is proposed to site up to 27 static caravan pitches in this area.
- **Parcel C - Secondary Sales Area:** Currently hardstanding and used for the sale of second-hand caravans and for storage purposes. It is proposed to site up to 8 static caravan pitches in this area.

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<sup>1</sup> Taking the park as a whole (and what is currently existing), the masterplan would result in a 3.25 % increase in unit numbers at the Park overall.

- **Parcel E – Boating Lake Site:** Currently a car parking area. It is proposed to develop up to 3 new static caravan pitches and staff accommodation with associated internal access road, car parking and landscaping.
- **Parcel F – Beachside and Old Chalet Site:** Currently occupied by four, two-storey apartment blocks with grass areas and trees located in-between the blocks. It is proposed to develop 26 new static caravan pitches with associated internal access road and landscaping.
- **Parcel G – West of New STP:** Currently comprises two fields, separated by established planting, with an access road running through to the new STP. It is proposed to site 84 static caravan bases with associated access and landscaping<sup>2</sup>. A wildflower grassland corridor within a buffer zone of at least 10 m will also be provided to mitigate impacts on semi-improved meadow grassland and to allow the movement of species.
- **Parcel H – Site of Old STP:** Currently vacant following the demolition of the old STP<sup>3</sup> that was located on the beachfront, overlooking the Wales Coast Path. An access road runs through the site. A tree belt also exists along the southern part of the western boundary and along the eastern boundary. It is proposed to erect a new beach café with terrace, a play area and a car park. Landscaping will be introduced around the built form and a landscaped green corridor is to be retained along the stream that runs along the north-eastern boundary. The Wales Coast Path will be protected and enhanced.
- **Parcel I – Site North of Old STP:** The north-west to north-east boundaries of this parcel comprise a tree belt with a stream. The parcel is bound to the north by Harlech View and the south by Cardigan Bay View. To the east is the vacant site of the previous STP. It is proposed to develop 17 new static pitches in this parcel with associated internal access roads, car parking spaces for each pitch, soft landscaping and associated infrastructure.

The full details of the construction methods for the landside works (including quantities of materials for construction) will be finalised once the detailed design of the Proposed Development has been developed. A comprehensive landscaping scheme is also proposed to ensure adequate screening from viewpoints such as the railway and the Wales Coast Path.

The proposed surface water drainage strategy embraces the new Sustainable Drainage Systems (SuDS) legislation, exploring means of disposal in hierarchical order. Surface water will be discharged to the sea at land Parcels E, F, G, H and I with overflow areas incorporated to allow flows during more infrequent events to discharge freely into Watercourse B, located within the site. Within Parcels B and C, surface water will be discharged to the existing lakes, where it will be stored before being discharged via an outfall to the sea.

All land parcels include sustainable surface SuDS features such as filters drains/bioretention areas and associated planting. It is also proposed that all foul drainage from the new development areas will be conveyed via totally separate networks of pipework by gravity and a system of pumping stations and pumped mains to connect into the existing private system.

## Coastal Defences – Design

The proposals for the parcel of land (see the masterplan in Appendix A) that comprises the coastal defence element of the Proposed Development are as follows:

<sup>2</sup> Planning permission exists for the development of 71 static caravan pitches on the north-western extent of Parcel G and Parcel I (ref C10D/0141/40/LL).

<sup>3</sup> Full planning permission (C17/0739/40/LL) was granted on 21 September 2017 for the demolition of the STP and the construction of a new plant to the north west of the site.

- **Parcel J - Coastal defences:** Existing habitats within this land parcel predominantly include sand and shingle on the upper intertidal and semi-improved neutral grassland on the landside. Currently there is an existing linear rock revetment over a 120 m stretch of the western section of the upper shoreline. There is no formal protection over the remaining 200 m of the shoreline which comprises a stretch of upper-shore barren shingle, with some rock and demolition material providing a low level of coastal erosion protection. The proposed coastal defences involve removing the existing linear rock revetment and rock/demolition material on the upper shore and constructing a combination of 'fish-tail' shaped rock-armour groynes (breakwaters) and intervening 'beach' areas. These proposals are detailed further below.

The proposed breakwaters will be aligned to create a stable coastline orientation and the beaches between them will be created by recharging with imported sand and gravel of a similar grade to the current beach. The proposed design of the coastal defences will ensure that the new defence line is not 'fixed' and that resilience and adaptability to climate change is built into the design. This is because the materials used to form the coastal defences can be dismantled and moved to new configurations of place and elevation in response to future sea level rise if required.

An approximately 10 m wide coastal strip landward of the coastal defences will remain undeveloped. This will provide a flexible contingency zone for any storm events and to deal with the inherent uncertainty of the natural future evolution of the shoreline in this area. It also provides the facility to adaptively set the Proposed Development back further if rates of sea level rise exceed the present range limit forecasts. In addition, this undeveloped area will provide a wildlife corridor of wildflower grassland that links to surrounding habitats to achieve and/or maintain habitat connectivity as well as providing space for maintenance access. The Wales Coast footpath will also be situated in this area as an unsurfaced, grassed path.

Although such rock-armour breakwaters and intervening beach recharge methods have often been used for coastal defence at many other locations in the UK, the proposed coastal defences at Hafan y Môr are novel because the rock-armour breakwaters will be placed 30 m back from the existing MHWS elevation in a way that will result in a net landward realignment of part of the coastal margin.

This approach will provide shoreline stability within the upper beach and protect Hafan y Môr Holiday Park from coastal erosion but, crucially, will also allow these defence features to adjust in response to sea level rise in the future. It will also minimise the extent to which the design footprint will extend into intertidal habitat and overlap with Pen Llŷn a'r Sarnau Special Area of Conservation (SAC) and Glanllynau a Glannau Pen-Y-Chain I Gricieth Site of Special Scientific Interest (SSSI). In order to achieve this design and to form a shallow beach profile, the existing landform will need to be excavated so that the breakwaters and the intervening beach areas will be partially sunk into the ground.

## Coastal Defences – Construction

The coastal defences will require the overall importation of around 18,000 m<sup>3</sup> of sand, gravel and rock armour by road from regional sources. Final quantities of materials for construction will be confirmed once the detailed design of the Proposed Development has been developed. The imported rock is likely to be granite that will be derived from a local source at Minffordd quarry (near Porthmadog). This was also the source of granite used for the linear rock revetment that is now present on the site. This *in situ* granite will be re-used for the new defences. The gravel will probably come from the Cefn Graianog quarry (near Penygroes) which is geologically equivalent to the indigenous shingle. The sand will be of marine origin and is likely to be taken from the consented Hilbre Swash extraction site at the mouth of the Dee Estuary. The imported sand is from the same geological source as the *in situ* sand with the angularity, mineralogy and colour also being the same.

Rock, aggregate and plant machinery will be delivered to site via lorries using the existing road network and routes through the Haven Leisure Ltd. site and avoiding the Afon Wen. It is not envisaged that any material will be delivered by sea. It is anticipated that 10,000 tonnes of rock armour will be needed and that, to import this, there will need to be around 500 wagon return journeys to and from the selected local quarry (around 19 km away) over 10 working days. A similar scale and duration of wagon movement is anticipated for the delivery of the beach materials. Details about the number of vehicles and the number of their movements will be finalised during the pre-construction and procurement processes.

At the construction site, two tracked extraction vehicles and dumper trucks will be used for the demolition of the existing rock revetment and construction of the new breakwaters. The details of the cut and fill requirements for the coastal defences will be finalised as part of the final design of the Proposed Development. It is estimated however that approximately 15,000 to 20,000 m<sup>3</sup> of sediment will be excavated in preparation for installing the breakwaters. As summarised further in the next section, the coarser sediments will be beneficially relocated within the intertidal area while other less suitable material (finer sediments) will be used as part of the on-site landscaping or for terrestrial habitat enhancements and will not be taken off site or to landfill.

Following completion of the work there will be a need for on-going site maintenance during operation. The sand recharge areas are likely to require regular litter collection and surface management to deal with sediment consolidation, compaction or surface vegetation/algal growth. Some relocation of boulders within the structure and sand may be needed on occasion (e.g. following a storm). There is also expected to be a loss of sand from the recharge zones over time and these areas will need to be topped up with imported sand on occasion.

### Coastal Defences – Sediment re-use and enhancements

Following discussions with NRW it has been agreed that any suitable sediment of marine origin which needs to be excavated from the footprint of the coastal defences during construction will be reused within the coastal zone. This suitable sediment will include coarser-grained sands and shingle which mainly lie at the surface of intertidal areas below the mean high-water spring (MHWS) tide level. It will also include comparable coarse sediment that is present, as discrete areas that can feasibly be separated out, in the excavations above the MHWS level (i.e. in the area where the defences are set back 30 m back from the existing MHWS). These coarser sediments will be relocated in front of the defences and to the east of the development footprint to build up the shingle at the top of the shore and feed into the prevailing easterly longshore drift of existing *in situ* sands in this area.

Any finer clays and silts that are excavated from the coastal defence footprint will be relocated into the hinterland for use in development landscaping and/or terrestrial habitat enhancement as appropriate. This is because relocating and re-using these finer sediments in the intertidal zone is likely to result in unnecessary ecological and water quality effects.

Across the development footprint and in an area that extends around 150 m to the east, existing anthropogenic material will also be removed from the site. This rubble has evidently been placed here historically to provide an informal coastal protection function. Its removal will further add to the ecological enhancements in the wider the area and act as a mitigation/compensatory measures for habitat losses and changes within the development footprint.

## Project Aims and Alternatives (Section 3)

The main aims of, and need for, the full Proposed Development are to:

- Provide long-term site-security in the context of coastal erosion and sea level rise;
- Extend the site and improve the overall quality of the visitor experience; and
- Enhance the amenity value of the site at its coastal margins by providing better and safer shoreline access and greater opportunities for coastal interaction by visitors.

These aims contribute to social and economic benefit, human health and public safety, and beneficial consequences of primary importance to the environment. The Proposed Development is in keeping with planning policy objectives as it will reinforce Hafan y Môr Holiday Park's contribution to the local economy by supporting the tourism sector and jobs.

The Proposed Development is also expected to enhance the enjoyment of, and safe access to, the shoreline area, whilst addressing coastal protection issues and climate change. This maximises the potential for human health and public safety benefits to be realised. Furthermore, the Proposed Development provides an optimal solution which minimises impacts to the SAC and adjacent shoreline and has resilience and adaptability to climate change as a central tenet of its design.

### Consideration of alternatives

Several alternative options to the landside works and coastal defence element of the Proposed Development have been considered within the ES. These included 'extending and reinforcing the existing linear rock revetment', 'beach nourishment alone', 'using alternative cross-shore structure', 'doing nothing/no intervention', and 'increasing and/or decreasing the scale of the existing coastal defence design'. All these alternative options were discounted on the basis that the proposed coastal defences will have the smallest effect on the shoreline while also achieving the desired aims, as well as being sustainable, resilient and adaptable to future change over its service life of 25 years.

## Consents, Approvals and Policy Guidance (Section 4)

The Proposed Development requires a range of consents and approvals under different legislative provisions, supported by detailed technical and environmental investigations. The principal consents/approvals and supporting studies that are required are as follows:

- Planning permission under the Town and Country Planning Act 1990;
- Marine licence under the Marine and Coastal Access Act 2009 for works below MHWS;
- Permission from The Crown Estate for works below MHWS;
- Evidence of compliance with national, regional and local planning policy and guidance, including the draft Welsh National Marine Plan, the Well-being of Future Generations (Wales) Act and Shoreline Management Plan (SMP);
- An EIA in accordance with the EIA Regulations;
- An HRA in line with the Habitats Regulations;
- A WFD Compliance Assessment in line with the Water Framework Regulations;
- An FCA as required under Planning Policy Wales Technical Advice Note 15: Development and Flood Risk (TAN15);
- Protected species licences for otters and bat;
- A Construction Environmental Management Plan (CEMP) following the submission of the planning and marine licence applications to present the final design of the Proposed Development, including detailed construction methodology and mitigation plan.

## Impact Assessment Approach (Section 5)

This section describes the methods used to assess the potential impacts of the Proposed Development on the environment. To undertake such an EIA, advice has been provided by regulators and stakeholders to inform the final scope of and approach to the assessment. ABPmer operates an accredited quality management system and has extensive experience and technical competency in their field. ABPmer has furthermore been awarded an EIA Quality Mark by the Institute of Environmental Management and Assessment (IEMA) for its service excellence in the co-ordination of EIAs and production of ESs.

### Scoping and consultation

Comprehensive pre-application consultation has taken place to date. Formal comments have been received on the Scoping Report, Coastal Defences Numerical Modelling Report and HRA Note. Furthermore, aside from the formal scoping and further pre-application advice, eight meetings with the Gwynedd Council and/or NRW and their advisors have taken place. Additional contact with stakeholders has also been undertaken via email and telephone.

### Impact assessment scope

The assessment considers the potential effects on the following environmental topics (receptors):

- Physical and coastal processes;
- Water and sediment quality;
- Marine ecology and nature conservation;
- Terrestrial ecology and nature conservation; and
- Coast protection and flood defence.

Environmental topics not considered to have the potential to be affected by the Proposed Development and therefore not considered in the assessment are:

- Fish and fisheries;
- Commercial and recreational navigation;
- Archaeology (cultural heritage);
- Landscape/seascape and visual;
- Transport and access;
- Airborne noise and vibration;
- Air quality and Greenhouse Gas emissions;
- Infrastructure and other marine users; and
- Human health.

The Gwynedd Council Scoping Opinion confirmed 'landscape/seascape' and 'transport and access' do not need to be subject to a formal assessment as part of the EIA. Instead these topics are dealt with as standalone appraisals.

### Impact assessment methodology

To facilitate the impact assessment process, a standard analysis methodology has been applied. For each environmental topic this involved describing the current conditions (baseline), identifying all the potential pathways by which an impact could occur, assessing the significance of the potential impact and identifying ways in which any adverse effects can be reduced.

The significance of each potential impact has been assessed using a standard approach. The four key significance levels for either beneficial or adverse impacts are Insignificant, Minor, Moderate or Major. A definition of each of these is provided in the full ES.

## Impact Assessment

The following sections summarise the findings of the impact assessment for each topic assessed.

### Physical and Coastal Processes (Section 6)

The impact assessment considered how the Proposed Development, and specifically the coastal defence element of it, will influence physical and coastal processes along the shoreline fronting Hafan y Môr Holiday Park. This assessment included reviews of the baseline coastal character, hydrodynamic/tidal regime and the sediment regime. The main data sources used to characterise the baseline conditions of the study area included a range of bathymetric datasets, topographic and Particle Size Analysis (PSA) survey data, water level data, previous wave, tide and surge models, hydrodynamic and sediment modelling, a detailed coastal processes review, the SMP and UK Climate Projections 2018 (UKCP18).

The assessment considered two key impact pathways, which addressed the potential for changes in sediment transport/supply and the potential for coastal squeeze due to presence of new defences during the operational phase. The methods adopted for this assessment of the physical and coastal processes changes are slightly different to those adopted for other EIA topics. This is because the Proposed Development has the potential to result in changes to hydrodynamic and sedimentary processes but, in themselves, these processes are not recognised as EIA features/receptors and therefore do not equate to 'impacts'. The impacts will instead be the consequence of these changes on other environmental features. This topic, therefore, focuses on the potential 'exposure to change' resulting from the impact pathways that have been scoped into the assessment and not the significance of any effects.

The exposure to change of all potential impact pathways related to physical and coastal processes were considered to be **Negligible** due to the Negligible magnitude of change. This assessment has taken account of the measures that have already been built into the design of the coastal defences work to minimise and/or avoid the potential for effects, including the 'setting back' of the coastal defence design to minimise changes in coastal processes; ensuring the design is not 'fixed' and able to adapt with future climate change; and maintaining all sediment of marine origin within the existing intertidal environment.

### Water and Sediment Quality (Section 7)

The impact assessment considered the potential effects of the Proposed Development on water and sediment quality receptors. The main data sources used to characterise the baseline conditions of the study area included the latest information on bathing waters, WFD protected areas, Shellfish Water protected areas, Nitrate Vulnerable Zones (NVZS), as well as site specific Particle Size Analysis (PSA) data and borehole data.

The assessment considered three key impact pathways, which addressed the risk of accidental plant spillages during construction; the potential introduction of construction materials and/or disturbance of sediment; and the changes in status of nearby WFD water bodies.

The assessment considered the potential impacts on water and sediment quality to be **Insignificant** due to the negligible exposure to change changes and that appropriate mitigation (i.e. adherence to guidance and best working practice measures) will be incorporated into the construction methodology. The WFD compliance assessment concluded that the Proposed Development is not likely to have a permanent (i.e. non-temporary) effect on the status of WFD parameters that are significant at water body level. Therefore, deterioration to the current status of WFD water bodies is not predicted, nor a prevention of these water bodies achieving future WFD status objectives.

## Marine Ecology and Nature Conservation (Section 8)

The impact assessment considered marine ecology and nature conservation receptors to include designated nature conservation sites, intertidal habitats, waterbirds and geology. The main data sources used to characterise the baseline conditions of the study area included MAGIC (Multi-Agency Geographic Information for the Countryside) Interactive Map, the Joint Nature Conservation Committee (JNCC) website, Natura 2000 standard data forms/information sheets for each designation, as well as related Geographic Information System (GIS) shapefiles, published marine biotope and waterbird data, and the results of a site specific marine ecology survey.

The assessment considered five key impact pathways, which addressed the physical disturbance to intertidal habitats; direct loss of intertidal habitat; hydromorphology and sediment transport changes; disturbance to waterbirds; and potential impact on geology.

The assessment considered the majority of potential impacts on marine ecology and nature conservation to be **Insignificant to Minor Adverse** due to the small-scale changes predicted to occur and Low to Moderate sensitivity of receptors. The direct loss of 0.15 ha of upper shore intertidal sandflat habitat under the development footprint is considered to be of **Moderate Adverse** significance given the High sensitivity of the receptor to habitat loss and its High level of importance as an interest feature of the Pen Llŷn a'r Sarnau SAC and the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI.

In order to address the loss of SAC intertidal sandflat habitat under the footprint of the coastal defence works, compensatory measures will be provided. These will comprise the removal of rubble and debris from the top of the shore in an area to the east of the defences to enhance the shingle habitat in this area. This measure was agreed in consultation with NRW (during pre-application consultations) as the mechanism for offsetting the losses of intertidal sand and will reduce the impact to **Minor Adverse**.

## Terrestrial Ecology and Nature Conservation (Section 9)

The impact assessment considered terrestrial ecology and nature conservation receptors to include designated nature conservation sites, terrestrial habitats and vascular plants, otter, bats, reptiles, terrestrial birds, non-native and potentially invasive plant species, and large mason bee and other bees and wasps. The main data sources used to characterise the baseline conditions for the study area included Cofnod (the North Wales Environmental Information Service) data, previous and recent site-specific terrestrial ecology surveys, information from Gwynedd Council and NRW, and the National Biodiversity Network (NBN) Atlas.

The assessment considered 12 key impact pathways, which addressed the damage or disturbance to habitats; loss of semi-improved grassland habitats; weakening or loss of ecological corridor along the coast; loss of soft maritime cliff; habitat loss and disturbance to otters during construction and operation; loss of bat roosts and potential for harm to bats; loss of reptile habitats and direct impacts

on reptiles; direct impacts on nesting birds; potential for increase in abundance and/or distribution of invasive non-native plant species; potential effects on bee and wasp fauna, potential effects on black oil beetle.

The assessment considered that without mitigation, the potential impacts on terrestrial ecology and nature conservation would be **Minor Adverse to Moderate Adverse** due to the scale of changes predicted, and the sensitivity and importance of respective receptors. A range of mitigation measures are proposed to avoid and/or minimise significant adverse impacts. These include a grassland mitigation plan; a minimum 10 m wide belt of wildflower grassland landward of the proposed coastal defences; a soft maritime cliff enhancement plan; the creation of a new 'bee bank' and installation of 'bee hotels' where possible; pollution prevention control guidelines; the provision of two artificial pipe and chamber holts for otters; adopting a bridge design over the existing watercourse for otters; reptile habitat management techniques and/or trapping and translocation; and vegetation management for nesting birds. All these measures would adopt best practice advice and would be included in the Construction Environment Management Plan (CEMP).

## Coast Protection and Flood Defence (Section 10)

The impact assessment considered coast protection and flood defence receptors to include coastal erosion and flooding. The main data sources used to characterise the baseline conditions of the study area included hydrodynamic and sediment modelling, a detailed coastal processes review, the SMP, Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management, NRW long term flood risk maps and UKCP18.

The assessment considered two key impact pathways, which addressed the changes to coastal protection and changes to flood regime as a result of the Proposed Development. The Proposed Development requires planning permission in Zone C (a floodplain without significant flood defence infrastructure) as per the Development Advice Maps accompanying TAN15: Development and Flood Risk and therefore should be supported by a Flood Consequence Assessment (FCA) which is proportionate to the size and scale of the development and the flood risks. Given the small scale and nature of the proposed coastal defences that are located within Zone C, this section of the ES has assessed the potential changes to coastal protection as a result of this element of the Proposed Development and provides the necessary information in support of an FCA. The details of the flood risk are then set out in the separate FCA report.

The assessment considered the potential impacts on coastal protection to be **Major Beneficial** at Hafan y Môr Holiday Park and **Insignificant** in adjacent areas. Changes to the existing flood regime are considered **Insignificant** due to the Negligible exposure to change, despite the High sensitivity and High importance of human features and/or infrastructure. This assessment has taken account of the measures that have already been built into the design of the coastal defences work to minimise and/or avoid the potential for effects, including the 'setting back' of the coastal defence design to minimise changes in coastal erosion; ensuring the coastal defence design is not 'fixed' and able to adapt with future climate change; and ensuring that sustainable drainage system (SuDS) features are implemented as part of the Proposed Development.

## Cumulative and In-combination Effects (Section 11)

No plans, projects or activities have been identified with which the Proposed Development (and its pathways) could interact spatially and/or temporally. There is also considered to be no potential for

any residual impacts as a result of the Proposed Development itself to result in a significant cumulatively and/or in-combination effect on any environmental receptors. In summary, it is concluded that the proposed works at the Hafan y Môr Holiday Park are unlikely to result in significant cumulative and/or in-combination effects with any other development, project or plan in the vicinity of the site, or within the project itself.

## Mitigation and Monitoring (Section 12)

Various measures have been considered as part of the design development process and the EIA of the Proposed Development to avoid, minimise and/or reduce the potential impacts environmental receptors. The key mitigation measures that will be undertaken are as follows:

- Coastal defences have been designed to minimise both the direct effects on intertidal habitats and the indirect effects from changes in coastal processes;
- Coastal defence design will be adaptable and able to accommodate future sea level rise and hence avoid indirect impacts on intertidal habitats from coastal squeeze;
- Reuse of materials excavated for the coastal defence either within the intertidal zone (coarser sediments) or (finer sediments) within the park extension as part of the landscaping and/or terrestrial habitat enhancement as appropriate in order to avoid impacts to areas (or landfill sites) outside the development footprint;
- Measures to avoid impacts to otter species including having an undisturbed green corridor along the watercourse within the site and ensuring that otters can gain access to it from the sea (between Parcels G and H), the creation of artificial lying-up site/holts, and the use of bridges rather than culverts for stream crossings;
- Measures to avoid impacts to bat species such as replacement roosting sites within any new or retained buildings, the installation of bat boxes and/or European Protected Species (EPS) licences for the removal of roosts where necessary;
- Measures to avoid impacts to reptile species including either a habitat management approach to facilitate the displacement of reptiles, or a trapping and translocation programme;
- Measures to avoid impacts to breeding birds including a careful programme of clearance works to ensure nests are not harmed during site clearance (in breeding season);
- Removing debris/'foreign material' from the top of the shore for reuse predominantly as a core to the rock groyne armour (all suitable sediment of marine origin will be retained within the existing intertidal environment as described above);
- Adoption of appropriate on-site construction measures to minimise the risk of accidents and spillages into the watercourse including the use of bunding and/or storage facilities to contain and prevent the release into the marine environment of fuels, oils etc.;
- Landscaping and planting measures at selected locations within the site and especially alongside the central drainage creek and the inclusion of a 10 m-wide buffer along the margins of this channel to avoid significant disturbance impacts on otter using this area;
- Timing of the construction works in winter to minimise effects on road traffic as well as on users of the park and the Wales Coast Path;
- Using local sources for construction materials such as rock armour and sand in order to minimise traffic increases (and associated effects) during construction; and
- Measures to mitigate for impacts on semi-improved meadow grassland and soft maritime cliff and to compensate/offset impacts to intertidal sandflat habitats;
- Inclusion of a wildflower grassland corridor within a buffer zone of at least 10 m along the coastal frontage and behind the coastal defences;
- Development of a terrestrial mitigation strategy, including terrestrial habitat creation in former car park north of A497, as well as the enhancement and management of existing areas of semi-

improved meadow grassland and soft maritime cliff habitat east and west of the coastal works to enhance invertebrate interests, and especially bee and wasp fauna. In addition, the construction of extensive 'bee banks' within the former car park and the inclusion of 'bee hotels' where possible.

A detailed monitoring programme is expected to be written into the licence conditions, following common industry practice and up-to-date requirements from the regulators and their advisors.

## Conclusions (Section 13)

The potential environmental impacts associated with the Proposed Development on all relevant environmental receptors have been assessed. Consultation with key stakeholders has been undertaken prior to and throughout the assessment to inform the assessment and ensure that the Proposed Development will have the lowest environmental impact of any available alternative.

The residual impacts identified in this ES have been assessed to be at worst of minor adverse significance following the application of best practice procedures, and appropriate mitigation and compensation measures. Once the Proposed Development has been constructed, no significant impacts are anticipated during operation.

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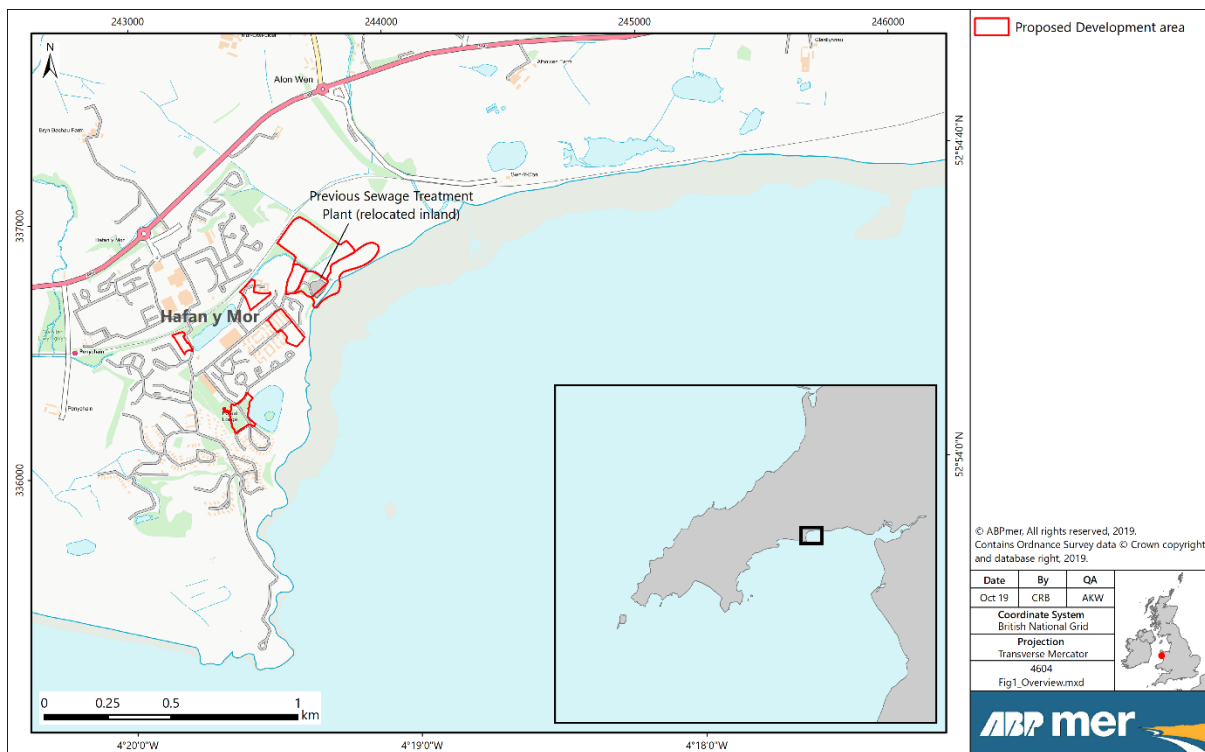
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# 1 Project Summary

## 1.1 Project background

Haven Leisure Ltd. is seeking permissions to modernise and upgrade their Hafan y Môr Holiday Park which is situated on the south coast of the Llŷn peninsula approximately 5 km east of Pwllheli, Gwynedd. Figure 1 shows the red line application boundary for the Proposed Development. They have developed a proposed '2030 vision masterplan' which will involve extending and improving the park as well as ensuring that it has appropriate long-term coastal erosion protection. Further details about the proposal are presented in Section 2 of this Environmental Statement and a masterplan of the whole 'Proposed Development' is included in Appendix A.



**Figure 1. Location of the Hafan y Môr Holiday Park**

This Proposed Development will require planning permission from Gwynedd Council as well as a marine licence from Natural Resources Wales (NRW). These two permissions are needed because the Proposed Development includes landside areas and also works below the Mean High Water Spring (MHWS) elevation (the intertidal zone). Therefore, the work falls under the jurisdiction of the Town and Country Planning (TCP) Act 1990, and the Marine and Coastal Access Act (MCAA) 2009. Haven Leisure Ltd. will therefore be submitting planning and marine licence applications to Gwynedd Council and NRW, respectively.

In respect of the planning permissions, it is intended that a full application will be applied for that will cover the following:

- The coastal defence works;
- The extension of Hafan y Môr Holiday Park into an area on the east of the existing park estate (which lies landward of the proposed coastal defences); and

- A range of other the landside works within the park estate that are designed to improve areas that are currently occupied.

## 1.2 Report background

To inform the proposed '2030 vision masterplan' a series of public and regulatory consultations have been undertaken and, as part of this process, EIA Screening and Scoping Opinions were sought from Gwynedd Council and NRW. To inform these requests, and in anticipation of an EIA being required for both the planning permission and the marine licence, an EIA scoping exercise was carried out and a Scoping Report prepared (ABPmer, 2018a).

In addition to the potential need for an EIA (or appropriate environmental appraisal), it was recognised that a Habitats Regulations Appraisal/Assessment (HRA) will be required under the 'Habitats Regulations' for this Proposed Development (and especially because of the actual and potential effects arising from the coastal defence element of the work). For completeness, therefore, the Scoping Report also performed the function of an HRA screening report by identifying that there will be a 'likely significant effect' (LSE) of the project on European sites (specifically, the Pen Llyn a'r Sarnau Special Area of Conservation (SAC)). It was expected, therefore, that an accompanying Appropriate Assessment report will need to be produced by the lead Competent Authority.

An HRA process is additional to, and distinct from, the EIA process. However, it is established good practice to provide the information needed for an HRA within an Environmental Statement. This is because the information required to underpin these two separate assessments is the same even if the judgements and processes are different. Also, this approach (of integrating EIAs and HRAs) is expected to assist the planning authorities with the co-ordination of both processes as is required under the latest EIA legislation and guidance.

The Scoping Report clarified the main characteristics of the Proposed Development and identified the key environmental issues for which there could be a significant effect which needed to be assessed within an EIA. This preceding report also determined the likely scope of any survey and analysis work needed to address these issues. In preparing this Scoping Report, comparatively detailed consideration was given to the baseline environment, key issues and mitigation measures. These details were collected to inform the planning and marine licence applications in a manner that is also in-keeping with the new EIA Regulations (Wales) (from May 2017) and recent NRW marine scoping guidance note GN13 (NRW, 2017) which require that there is a 'front loading' of information early in any EIA process. This is to 'ensure that the EIA retires any potential effects that are not significant at as early a stage as possible'. The methods and findings from the scoping review were also informed by the project team's previous planning and assessment experience.

This scoping report was issued to Gwynedd Council and NRW in October 2018 who confirmed that the Proposed Development requires a statutory Environmental Impact Assessment (EIA) under both:

- The Town and Country Planning (EIA) (Wales) Regulations 2017 (as amended)<sup>4</sup>; and
- The Marine Works (EIA) Regulations 2007 (as amended)<sup>5</sup> (collectively referred to as the EIA Regulations hereafter).

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<sup>4</sup> This implements the EIA Directive (2014/52/EU) and has been amended by the Environment, Planning and Rural Affairs (Miscellaneous Amendments) (Wales) Regulations 2018, the Town and Country Planning (EIA) (Wales) (Amendment) Regulations 2019, and the Environmental Assessment of Plans and Programmes and the Environmental Impact Assessment (Miscellaneous Amendments) (Wales) (EU Exit) Regulations 2019.

<sup>5</sup> The Marine Works (EIA) Regulations 2007 were amended by the Marine Works (EIA) (Amendment) (England and Wales) Regulations 2009, the Marine Works (EIA) (Amendment) Regulations 2011, 2015, 2017 (implementing EIA Directive

The responses provided by the Gwynedd Council (Screening Opinion on 22 November 2018 and Scoping Opinion on 11 January 2019) and NRW (scoping advice to Gwynedd Council on 21 December 2018 and integrated Screening and Scoping Opinion on 5 February 2019) are provided in Appendix B. These responses confirmed the need for an EIA, along with other assessment requirements. These Screening and Scoping Opinions also clarified the scope of the assessment work required.

In accordance with the requirements set out in these Scoping Opinions, this Environmental Statement (ES) presents the findings from the assessment phase of the EIA for the following topics:

- Physical and coastal processes;
- Water and sediment quality;
- Ecology and nature conservation; and
- Coast protection and flood defence.

The Gwynedd Council Scoping Opinion clarifies that i.e. 'landscape/seascape', 'transport and access' and 'public and residential amenity' do not need to be subject to a formal assessment as part of the EIA. Instead these topics are dealt with as standalone appraisals.

This report also includes the necessary HRA information that is required for Gwynedd Council and NRW (as Competent Authorities) to produce an Appropriate Assessment (AA) under the Conservation of Habitats and Species Regulations 2017 (as amended) (see Section 4.4). In addition, a range of other studies that are needed to underpin the planning and consents processes have been undertaken. These include a Water Framework Directive (WFD) Compliance Assessment (see Section 4.5) and a Flood Consequences Assessment (FCA) (see Section 4.6).

## 1.3 Key studies and consultations

To inform this assessment, and the scoping study which preceded it, a range of site-specific surveys and studies were carried out (including field surveys across the landside area and the intertidal zone) to describe the present (baseline) conditions and environmental value of those areas that are likely to be directly and indirectly affected by the Proposed Development. These investigations include the following:

- **Coastal Defences Field Studies:** Topographic surveys across the area for the proposed coastal defences, including the beaches, were undertaken in May 2015, April 2016, November 2017 and June 2019. A bathymetry survey was undertaken in July 2015. The topographic and bathymetry surveys provided elevation data to inform the design and numerical modelling study of the coastal defences (see below). Geotechnical site investigations were undertaken in September 2017 and September 2019 to further inform the design and construction of the proposed coastal defences. The second site investigation was carried out to understand the depth of the clay underlayer below the surface sand at one of the beach recharge locations as it was recognised that this will influence the nature and depth of the sand recharge work<sup>6</sup> (NRW Marine Licence RML1923 dated 31 July 2019);

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(2014/52/EU)), the Marine Works (EIA) and Marine Strategy (Amendment) Regulations 2018, and the Environment, Food and Rural Affairs (EIA) (Amendment) (EU Exit) Regulations 2019.

<sup>6</sup> This survey confirmed that there was a shallow sub-surface clay layer at the relevant site and that there should as a result be no change to proposals to excavate and recharge sand at this location. Thus, the original design of the coastal defences, as used to underpin the scoping report, will not be altered following this investigative work. Had the clay layer been deeper it would have been possible to reduce the small-scale beach excavation works at this one location because the beach surface would have been stable enough on its own without intervention.

- **Coastal Defences Numerical Modelling:** A numerical modelling study was undertaken to inform and validate the design of the coastal defences and understand the implications for coastal processes and the changes to hydrodynamic conditions and sediment transport pathways (ABPmer, 2018b). A copy of this report is included in Appendix C;
- **Coastal Defences Design and Processes Technical Review:** Based on expert judgement and informed by the findings from the numerical modelling work, a stand-alone coastal processes review was undertaken (Shoreline Management Partnership, 2019). This reviews the design principles for the defences and the anticipated coastal processes effects this is included in Appendix D;
- **Marine Ecology Surveys:** Baseline surveys of the foreshore habitats were undertaken by ABPmer in 2016 covering the Proposed Development site and areas between Porth Fechan beach and the mouth of the Afon Wen (ABPmer 2016; 2017). A copy of the survey report is included in Appendix E. It should be noted that the design of the coastal defences presented in this report are outdated. They represent an initial proposed design that was later revised in light of the survey findings to become the now proposed smaller-scale and novel approach which was developed to minimise ecological effects. The figures in this report have not been retrospectively changed as they represent a situation that was understood at the time of the report's production.
- **Terrestrial Ecology Surveys:** Baseline field surveys of the terrestrial habitats and priority species covering the Proposed Development site and desk-based studies extending for 1 km surrounding this site, and several previous surveys at the Hafan y Môr Holiday Park were undertaken by specialist ecologists including, particularly Peter Tattersfield. A copy of this report is included in Appendix F and figures supporting the terrestrial ecology assessment are provided in Appendix G;
- **Landscape Appraisal:** A review of the anticipated landscape and visual impacts was undertaken by Andrew Davis Partnership LLP. A copy of this report is included in Appendix H; and
- **Traffic Appraisal:** A review of the anticipated traffic impacts was undertaken by Integrated Transport Planning Ltd. A copy of this report is included in Appendix I and
- **Economic Statement:** A review of the economic impacts of the proposed development, prepared by Lichfields. A copy of this report is included in Appendix J.

Consultation is a crucial element of the EIA and has been carried out with key stakeholders throughout the development of the project. This has included the following key consultation processes and events:

- **Meeting with Gwynedd Council on 22 November 2017:** Meeting with planning officers to discuss the principle of the project;
- **Meeting NRW on 20 December 2017:** Meeting to introduce the Proposed Development and review of the application and issues including the boundary of the SAC;
- **Meeting with Gwynedd Council Senior Biodiversity Officer on 24 August 2017:** Meeting on site to introduce the scheme and discuss scoping of terrestrial ecology assessment;
- **Meeting with Gwynedd Council on 23 February 2018:** Meeting on site with coastal officers;
- **Public Exhibition at Hafan y Môr on 23 and 24 February 2018:** Exhibition to explain the proposals and to answer questions that members of the public and local councillors may have had;
- **Meeting with NRW (2 May 2019):** Meeting to review SMP Policy and HRA topics;
- **Meeting with Gwynedd Council on 25 July 2019:** Meeting on site with officers to provide an update on progress of the Masterplan project and to seek their views on aspects of the proposals prior to finalising the planning application documents;
- **Pre-application consultations with chair of Gwynedd Coastal Group (February to August 2019):** This was undertaken to agree the implications of the Proposed Development in the context of the established Shoreline Management Policy;

- **Pre-application consultations with NRW (August and September 2019):** Following the May 2019 meeting, and as agreed actions arose, further pre-application advice was sought from NRW regarding the HRA process and the details of the modelling report which validated the coastal defence design and marine assessment work;
- **Meeting with Gwynedd Council Senior Biodiversity Officer on 5 September 2019:** Meeting on site to discuss assessment and terrestrial mitigation measures; and
- **Meeting with Gwynedd Council on 9 September 2019:** Meeting with planning officers, coastal officer and Senior Biodiversity Officer to provide an update on project progress and on the proposed terrestrial ecology strategy.

In addition to these meetings, a formal Pre-Application Consultation (PAC) process was undertaken in November and early December 2019 in advance of the planning submission.

## 1.4 Report structure

The structure of this ES is as follows:

- **Non-Technical Summary (NTS):** Included at the beginning of the ES to summarise the contents of the main document. This is also available as a separate document.
- **Section 1 Project Summary:** A brief project summary and background information, legislative background, and the information that has been provided in the ES.
- **Section 2 Project Description and Methodology:** A description of the proposed landside and coastal defence works, and the construction methodology and site maintenance activities required during operation.
- **Section 3 Project Aims and Alternatives:** Information on the need for the proposed works and alternative options considered by Haven Leisure Ltd.
- **Section 4 Consents, Approvals and Policy Guidance:** Overview of the requirements to inform and accompany the marine licence and planning application.
- **Section 5 Impact Assessment Approach:** Sets out the key issues identified during the scoping phase of the Proposed Development and assessment methodology employed.
- **Sections 6 to 10 Baseline Characterisations and Impact Assessments:** Baseline information is presented together with an assessment of potential impacts for the 'scoped in features';
- **Section 11 Cumulative and In-combination Effects:** Assessment of the cumulative and in-combination impact(s) of the Proposed Development alone and also with other plans/projects in the area.
- **Section 12 Mitigation and Monitoring:** A summary of the potential impacts and mitigation measures that would avoid or reduce potential impacts, including monitoring requirements.
- **Section 13 Conclusions.**

## 1.5 References

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## 2 Project Description and Methodology

### 2.1 Introduction

This section presents an overview of the design of the Proposed Development. This is based on the text and information submitted within the detailed Scoping Report that was prepared and issued in October 2018 (ABPmer, 2018). Much of this text remains relevant because the fundamental principles of the proposed design have not been substantially altered. However, during the assessment pre-application phase, several notable adjustments were made in response to the findings from surveys and the outcome of consultations (especially those with Gwynedd Council and NRW). These include changes to the development made in response to the scoping opinions as well as the inclusion of compensation and mitigation measures that are required and were developed as an outcome of the assessment processes.

To clarify these changes to the masterplan, further details are presented in Section 2.2. Also, it is now possible to provide details on the Proposed Development timeline and, therefore, this is included in Section 2.3. A full overview of the Proposed Development is then presented in Section 2.4.

### 2.2 Post-scoping proposal adjustments

The masterplan for Hafan y Môr has evolved significantly as a range of alternatives have been considered and adjusted over the last two years. This process of review has been informed by comprehensive discussions with Gwynedd Council planning and coastal officers, NRW and the general public as well as expert input from Haven's project team (see Section 1.3). This consultation process has included numerous meetings, a two-day public exhibition, telephone calls and e-mail communication. The first pre-application meeting with the Gwynedd Council took place on 22 November 2017 and the public exhibition took place on the 23 and 24 February 2018. The exhibition purposefully took place very early in the process to allow comments to be made and taken into account by the team.

Numerous project team meetings have also taken place to review the plan and adjust it in order to ensure that the scheme meets the operational requirement of Haven Leisure Ltd. whilst respecting and preserving the local environment. This review process and the consideration of the environmental issues has been informed by the outcomes of the EIA work.

Over this review process, the masterplan has gone through 18 iterations, and amendments have been made to take into account ecological, cultural, landscape and visual impact, drainage, design and amenity considerations. Some of the fundamental changes include:

- Removal of Parcel A which was proposed to incorporate 12 static caravans in the old stables area. There were proposals to develop the old stables, but these were removed in response to concerns by the project team about the removal of this building which is historic (albeit not listed) and could have impacts on bats and barn owl. Not developing this parcel would also mean that the trees in this area would not need to be removed;
- The comprehensive redevelopment of the Bonga Wonga building and the outdoor activity area was initially envisaged to form part of the masterplan application. However, due to the need for this area to be operational for the 2019 season it was decided to remove it from the masterplan and apply for permission separately;

- Development of 20 static caravan units to the south east of the owners fishing lake removed from the scheme due to concerns about the loss of grassland, landscape and visual impact and potential coastal erosion issues. Development is no longer proposed here, and it has been decided that the 1.36 ha of grassland will be retained and managed for biodiversity purposes;
- Removal of houseboats on the fishing lake. This was done owing to concerns about ecology as the lake holds 'medium' value, lies within Butlins 2 candidate wildlife site and is used by otters;
- Comprehensive redesign of Parcel G to create a more varied layout, incorporating areas of open space, above ground drainage features that also provide amenity value and greater landscaping. The front two rows of caravans have been re-aligned to create a more natural, less regimented layout, providing more space between the coast and the caravans. Additional landscaping has been provided in and amongst the caravans to break up the view from the beach. In addition, a commitment has been made to plant established heavy standard trees to the eastern boundary as a result of a concern about the sensitivity of views from the coastal path. These trees will provide an immediate screening effect;
- Complete overhaul of the design of the beach café as a result of feedback from Gwynedd Council planners. The revised building is now more sympathetic to its situation on the coast. Care has been taken to ensure that the building sits below the tree line so as not to have any landscape or visual impact. The car park has been reduced in size as a result of comments from planners regarding the need to promote sustainable modes of transport;
- Following feedback from the Council's ecologist the masterplan was amended to incorporate a wildflower grassland corridor within a 10 m buffer zone along coastal frontage and behind the new coastal defences, and also within the body of Parcel G. This assists in providing grassland mitigation and creating a wildlife corridor;
- This 10 m corridor of hinterland between the top of the recessed shoreline (i.e. at the back of the sea defences) and the nearest caravan pitch within which the coastal path is to be sited also provides a zone for further recession of the top of the beach if required over the service life of the scheme. As described in Section 2.6, the coastal defence scheme has been designed to ensure that it can be adapted/modified because it is formed of adjustable materials including rock, marine gravel and marine sand with no hard infrastructure (such as jetties, slipways, vehicular access within the new groynes).
- Following feedback from the Council's ecologist it was agreed to enhance, via a management plan about 390 m of existing soft cliff adjacent to the south/fishing lake area, and a further 200 m to the east of the new beaches towards the Afon Wen's outlet to the sea. This would mainly involve clearance of scrub, bramble etc from the cliff faces;
- Following feedback from the Council's ecologist it was agreed to incorporate habitat creation in former car park north of A497 (*circa* 0.75 ha), including wildflower grassland. A management plan would be required. It is envisaged that this area could contain a range of new habitats, possibly including wildflower grassland, pond/wetland, bee banks, dwarf shrub heath, native scrub/woodland;
- Following feedback from the Council's ecologist it was agreed to create bee banks within development parcels, and also within the 'Car Park' habitat creation area. It is envisaged that up to about 100 linear metres of such cliff replacement habitat could be constructed in the car park site; and
- Following discussions with NRW, measures to enhance the shingle at the top of the shoreline and to re-use suitable sediments of marine origin within the intertidal areas were agreed.

The planning application has been the subject of statutory Pre-Application Consultation (PAC) prior to submission of the application. This involved consulting on the application documents for at least 28 days. This provided another opportunity for specialist consultees (e.g. NRW), neighbouring landowners/occupiers, councillors and community councils to give feedback ahead of formal submission of the application to Gwynedd Council. This has allowed the plans to evolve again to address feedback received.

It is notable also that the coastal defence elements of the proposal were greatly reduced in scale prior to the submission of the scoping report. It was formerly proposed that they would be much larger groyne structures (150 m long rather than 40 m long – see details and figures in the marine baseline survey report in Appendix E). However, to minimise environmental effects they were reduced in scale and were set back into the landform. Also, any hard infrastructure (e.g. jetties, slipways) that had been proposed for inclusion in the coastal defences was removed. In its final design (not changed since the scoping stage), the coastal defence only includes rock, marine gravel and marine sand, in order to ensure that it is a flexible structure that can be adapted in the future if needed. The removal of jetties and slipways will also have the effect of moderating the extent of beach access and disturbance effects on the shoreline.

In addition to these adjustments to the masterplan, mitigation and compensation measures have been included in the proposal to reflect the outcome of the assessments:

- **Identification of compensation to address effects on intertidal habitat:** In response to the marine ecology survey and Habitats Regulations Assessment (HRA) work, and in consultation with NRW, compensation measures were developed to address the impacts to intertidal habitat within the Pen Llŷn a'r Sarnau Special Area of Conservation (SAC);
- **Development of terrestrial habitat mitigation plan:** In response to the terrestrial ecology survey and assessment work, and in consultation with the Gwynedd Council's Senior Biodiversity Officer, a mitigation strategy was developed to address the impacts to semi-improved meadow grassland and soft maritime cliff habitats, and to retain a coastal wildlife corridor; and
- **Clarification of landscape screening/mitigation proposals:** The detail of the vegetation/tree screening that will be included as landscape impact mitigation for the development of Parcel G has been further developed.

## 2.3 Anticipated timeline

The timeline of the Proposed Development, based on the progress that has been made at the pre-application stages, is now as follows:

- **November/December 2019:** Planning and marine licence applications to be submitted;
- **Winter 2020 – March 2021**- Installation of the coastal defences;
- **Winter 2020 – March 2021** Infill Pitches (Parcel B, C, E, F, H and I);
- **Winter 2021 – March 2022** Beach Café to be constructed; and
- **Winter 2022 – March 2023** Parcel G to be constructed although the first two rows could be delivered later (during the 2023/24 close period) to allow for the vegetation screening to establish.

## 2.4 Project overview and aims

The '2030 vision' has been developed by Haven Leisure Ltd as part of their overriding aim to continually invest in and improve their holiday sites (Lichfields, 2017). To achieve this investment and improvement at the Hafan y Môr Holiday Park, this Proposed Development will include the following main components:

- The demolition of 56 existing two storey apartments;
- The addition of 165 static caravan pitches (a net increase of 40 units from the total approved in 2011<sup>7</sup>);

<sup>7</sup> Taking the park as a whole (and what is currently existing), the masterplan would result in a 3.25 % increase in unit numbers at the Park overall.

- The creation of an at-grade car park;
- The construction and operation of a new 950 m<sup>2</sup> beach café (650 m<sup>2</sup> at ground floor and 300 m<sup>2</sup> at first floor) as well as a children's play area;
- Selected new and improved landscaping measures;
- Changing 120 m of existing linear coastal revetment to groynes with sand/gravel; and
- Removing debris and introducing a further 210 m of coastal protection made up of rock armour breakwaters with areas of beach (sand/gravel) recharge.

Further details about the '2030 vision' proposal are presented in the draft consultation document that has been prepared for this Proposed Development (Appendix A). This document includes further details about the project aims and the site's history along with information about the ecology of the area. In summary, however, the principal aims of these measures can be summarised as follows:

- Provide long-term site-security and help to maintain the coastal path in the context of coastal erosion and sea level rise;
- Extend the park and improve the overall quality of the visitor experience; and
- Enhance the amenity value of the park at its coastal margins by providing better and safer shoreline access and greater opportunities for coastal interaction by visitors.

A further benefit of this enhancement of the Hafan y Môr Holiday Park, is that it will reinforce the park's contribution to the local economy by supporting the tourism sector and jobs. It is recognised that the economy in the region surrounding Hafan y Môr Holiday Park is dominated by agriculture but underpinned by tourism as an important component of employment to the wider population. The industry is characterised by water-sports and recreational boat use and is dependent on the holiday and caravan parks along the coast (Royal Haskoning, 2011). In this context, the Hafan y Môr Holiday Park plays a valuable role. As of August 2019, Hafan y Môr Holiday Park employs a total of 100 permanent staff all year round, all of which are full time, and approximately 400 seasonal staff, of which 280 are full-time and 120 part-time (see also Appendix J).

Much of the Proposed Development work will take place on the eastern side of the existing park area. A masterplan showing the parcels of land allocated for the park development is included in Appendix A. This is within Haven Leisure Ltd.'s landholdings and includes an area of grassland and the site of a previous sewage treatment plant (STP) which was located close to the foreshore edge (see Figure 1). This STP was threatened by coastal erosion in the late 1990s and at that time, a linear rock revetment was constructed to protect it and the adjacent Hafan y Môr Holiday Park.

The previous STP (which is visible behind the existing rock armour in Image 1) has been demolished and a replacement STP facility has been constructed and installed in a new location to the north of the holiday park in accordance with Planning Consent C17/1739/40/LL which was received in 2017. The area vacated by the previous STP will be used as part of the park's 2030 Vision development and will be protected by the existing and proposed coastal defences.

Further details about the development are presented in Section 2.5 (landside works in Parcels B to I) and Section 2.6 (coastal defences in Parcel J). As any significant environmental effects are expected to principally arise from the coastal defences, a more detailed overview of this part of the proposed works is presented in the Section 2.6.



Image 1. Previous sewage treatment plant (STP) that has been demolished and existing revetment that will be redesigned and realigned

## 2.5 Landside works (Parcels B to I)

In accordance with the North Wales Regional Tourism Strategy (2010-2015), Haven Leisure Ltd is committed to investing in 'product excellence' at the park and providing an 'outstanding experience for visitors' by ensuring the whole park is upgraded and improved as necessary to provide a '5 star' holiday destination. To achieve this, the primary aims of the Proposed Development are to:

- Provide new beachside facilities to make the most of the park's location and encourage the use of this across the season, having positive human health and wellbeing outcomes;
- Creation of new high-quality accommodation pitches and units to continue to improve the range and type of accommodation options available at the park for guests; and
- Introduce new and improved landscaping to improve the overall amenity of the park.

The proposals will boost tourism to the area, creating jobs and improving the local economy. These aims are reflected in Planning Policy Wales, and the Gwynedd/Anglesey Local Development Plan. It is intended for the proposals to the park to be completed in a sustainable manner, accommodating and enhancing where possible the social and environmental setting of the existing site.

The proposals for each parcel of land (see masterplan in Appendix A) that comprise the landside element of the Proposed Development are as follows:

- **Parcel B - Lakeside West:** Currently occupied by trees; an unmanaged woodland located on the bank of the owners' exclusive fishing lake. An access road runs through the site towards Forest Lodge. It is proposed to site up to 27 static caravan pitches in this area.
- **Parcel C - Secondary Sales Area:** Located to the west of the boating lake, the site is currently hardstanding and used for the sale of second-hand caravans and for storage purposes. It is proposed to site up to 8 static caravan pitches in this area.

- **Parcel E – Boating Lake Site:** This parcel adjoins the northern end of the 'Boating Lake' and is located adjacent to the existing Lakehouse central facilities building<sup>8</sup>. The site currently comprises an area of car parking. The parcel is now included in this new masterplan for the park to reflect the updated pitch numbers and layout proposed<sup>9</sup>. Within this parcel it is proposed to develop up to 3 new static caravan pitches and staff accommodation with associated internal access road, car parking and landscaping.
- **Parcel F – Beachside and Old Chalet Site:** This parcel is located between the existing 'Waterside' and 'Cardigan Bay View' caravan communities on the Park. The site is bound to the east by the coast and its northern part (formerly identified as Parcel D at Scoping stage) is currently occupied by four, two-storey apartment blocks with grass areas and trees located in-between the blocks. The parcel is now included in this new masterplan for the park to reflect the updated pitch numbers and layout proposed<sup>10</sup>. Within this parcel it is proposed to develop 26 new static caravan pitches with associated internal access road and landscaping.
- **Parcel G – West of New STP:** The site comprises two fields, separated by established planting. The site is to the west of the new STP. The access road to the new sewage treatment plant will run through this parcel. Within this area it is proposed to site 84 static caravan bases with associated access and landscaping<sup>11</sup>. A wildflower grassland corridor within a buffer zone of at least 10 m will also be incorporated within the body of Parcel G to mitigate impacts on semi-improved meadow grassland and allow the movement of species.
- **Parcel H – Site of Old STP:** This site is currently vacant following the demolition of the old STP<sup>12</sup> that was located on the beachfront, overlooking the Wales Coast Path. An access road runs through the site to the parcel. A tree belt exists along the southern part of the western boundary and along the eastern boundary. A new access road is to be constructed through Parcel G. Within this area it is proposed to erect a new beach café with terrace, a play area and a car park. Landscaping will be introduced around the built form and a landscaped green corridor is to be retained along the stream that runs along the north-eastern boundary. The Wales Coast Path will be protected and enhanced.
- **Parcel I – Site North of Old STP:** The north-west to north-east boundaries of this parcel comprise a tree belt with a stream. The parcel is bound to the north by Harlech View and the south by Cardigan Bay View. To the east is the vacant site of the former STP. The Parcel is now included in this new masterplan for the Park to reflect the updated pitch numbers and layout proposed<sup>13</sup>. It is proposed to develop 17 new static pitches in this parcel with associated internal access roads, car parking spaces for each pitch, soft landscaping and associated infrastructure (above and below ground).
- **Parcel J - Coastal defences:** These are reviewed in Section 2.6.

The full details of the construction methods (including quantities of materials for construction) will be finalised once the detailed design of the Proposed Development has been developed. A comprehensive landscaping scheme is also proposed for this development. This will assist in screening the Proposed Development from viewpoints such as the railway and the Wales Coast Path. Some tree removal will be required in all areas although it is noted that the majority of trees are of low value due to either their

<sup>8</sup> The area of which is subject to enhancement under current application ref. C18/0619/40/LL

<sup>9</sup> This parcel forms part of planning permission ref. C10D/0141/40/LL for which extant consent exists for the development of 18 pitches.

<sup>10</sup> This parcel forms part of planning permission ref. C10D/0141/40/LL for which extant consent exists for the development of 14 pitches.

<sup>11</sup> Planning permission exists for the development of 71 static caravan pitches on the north-western extent of Parcel G and Parcel I (ref C10D/0141/40/LL).

<sup>12</sup> Full planning permission (C17/0739/40/LL) was granted on 21 September 2017 for the demolition of the STP and the construction of a new plant to the north west of the site.

<sup>13</sup> Planning permission exists for the development of 71 static caravan pitches on the north-western extent of Parcel G and Parcel I (ref C10D/0141/40/LL).

condition or young age, and the impacts can be mitigated through replacement tree planting. The small wooded section within Parcel B is one of the larger areas where tree removal is required.

The Proposed Development seeks to make efficient use of some of the under-utilised areas of the park. In particular, the Beach Café, terrace and play area will encourage public use of an area which is currently a vacant brownfield site following the demolition of the old STP.

The proposed surface water drainage strategy embraces the new Sustainable Drainage Systems (SuDS) legislation, exploring means of disposal in hierarchical order. Surface water will be discharged to the sea at land Parcels E, F, G, H and I with overflow areas incorporated to allow flows during more infrequent events to discharge freely into Watercourse B, located within the site. Within Parcels B and C, surface water will be discharged to the existing lakes, where it will be stored before being discharged via an outfall to the sea.

All land parcels include sustainable surface SuDS features such as filters drains/bioretenion areas and associated planting and therefore offers significant betterment in terms of reducing flood risk in comparison to the existing scenario.

It is proposed that all foul drainage from the new development areas will be conveyed via totally separate networks of pipework by gravity and a system of pumping stations and pumped mains to connect into the existing private system.

## 2.6 Coastal defences (Parcel J)

The aims of the coastal defence element of the Proposed Development are to protect the Hafan y Môr Holiday Park and the coastal path from continued erosion and provide long-term stability for the site so that Haven Leisure Ltd can continue to provide and manage facilities into the future. In addition to addressing issues of coastal erosion, the defences are also designed to enhance the amenity value of the beach-front areas and improve both the safety of shoreline access for visitors and the level of visitor engagement with the adjacent intertidal landscape.

The amenity and safety benefits will arise because the design includes readily accessible 'beach' areas at the top of the foreshore. Overall, therefore, it is expected to enhance the extent to which visitors to the park can enjoy, and feel a part of, the adjacent shoreline area. In addition, it is also recognised that the coastal defence measures will help to stabilise the section of the Wales Coast footpath which runs through the Proposed Development area and is of significant public benefit (Lichfields, 2017; Appendix A).

The proposed defence work will be carried out along a 320 m section of the shoreline (see Figure 2 and Image 2) and will involve using a combination of 'fish-tail' shaped rock-armour breakwaters and intervening 'beach' areas. The spatial extent of these coastal defence works is shown in Figure 2. The habitats at the site of the proposed defences predominantly include sand, and shingle on the upper intertidal and semi-improved neutral grassland on the landside.

Over a 120 m of the 320 m section of the proposed defences there is already an existing linear rock revetment that was constructed in the 1990s (see Image 1). There is no official protection over the remaining 200 m of the coastal defence footprint (see Image 2). However, this section does comprise a stretch of upper-shore barren shingle and rock which includes quite a lot of unsightly demolition material. This demolition material was evidently placed within the shingle area in an '*ad hoc*' manner to provide a degree of erosion protection.



Figure 2. Outline of proposed coastal defences showing their extent relative to the position of the existing Mean High Water Spring elevation



**Image 2.** Upper foreshore where defences are proposed (with part of the existing revetment that will also be redesigned and realigned shown in foreground)

Along this section of the coast, the breakwaters will be aligned to create a stable coastline orientation and the beaches between them will be created by recharging with imported sand and gravel of a similar grade to the current beach. This approach will ensure that the new defence line is not 'fixed' and that there is then 'room' for sea level rise into the future. In other words, resilience and adaptability will be achieved because the materials used to form the coastal defences are all capable of moving to new configurations in place and elevation. The rock groynes can be dismantled, relocated and reshaped if required.

An approximately 10 m wide coastal strip has also been included to landward of the coastal defences where there will be no hard development (i.e. only removable infrastructure will be allowed). This will provide a flexible contingency zone for any storm events and to deal with the inherent uncertainty of natural future evolution of the shoreline in this area. It provides the facility to adaptively set the Proposed Development back further if rates of sea level rise exceed the present range limit forecasts. This undeveloped area will also form a wildlife corridor of wildflower grassland that links to surrounding habitats to achieve/maintain habitat connectivity as well as providing space for maintenance access. The realigned Wales Coast footpath will also be situated in this area as an unsurfaced, grassed path.

Although such rock-armour breakwaters and intervening beach recharge methods have successfully been used at many other locations<sup>14</sup>, the proposals for the Hafan y Môr Holiday Park are novel in that these features will not extend out into the intertidal for their full length (as is usual practice). Instead they will be placed in a way that will result in a net landward realignment of part of the coastal margin. These rock-armour breakwaters would be around 50 m in length and would be positioned around 30 m back from the existing MHWS elevation, extending only around 20 m into the intertidal below the existing MHWS height. This approach will provide shoreline stability within the upper beach and protect Hafan y Môr Holiday Park from coastal erosion but, crucially, will also allow these defence features to adjust in response to sea level rise in the future.

<sup>14</sup> For example, rock armour breakwaters have been used at many other coastal locations (including, for example, Tywyn (Gwynedd)) while 'fishtail' shaped structures have been used to protect a range of locations including the Bourne Leisure site at Hopton (Suffolk). Fishtail breakwaters combined with beach recharge (to enhance recreational value and provide protection) have also been used at sites such the Morecambe town frontage (Lancashire).

The proposed breakwaters and beach recharge will therefore straddle the MHWS elevation at the top of the foreshore. This minimises the extent to which the design footprint extends onto intertidal habitat. Ultimately, there will also be an effective landward realignment of the MHWS line in the section of existing linear revetment and no change to this alignment elsewhere. To achieve this maintenance or retreat of the MHWS elevation and to form a shallow beach profile, the existing landform will need to be excavated so that both the breakwaters (and the beach and gravel recharge areas between them) will be partially sunk into the ground. The set levels of the beach recharge will facilitate access between the hinterland and the beach to improve the enjoyment of the coastal path and the general amenity along the frontage. The socio-economic aims and benefits are discussed further in Section 3.1.

## 2.7 Construction phase methods

The full details of the construction methods (including quantities of materials for construction) will be finalised once the detailed design of the Proposed Development has been completed. At this time, the coastal defence works are expected to take place over 6 months (during winter months). All existing linear defences within the Proposed Development frontage will be removed.

The coastal defences will require the overall importation of around 18,000 m<sup>3</sup> of sand, gravel and rock armour (final quantities to be confirmed) by road from regional sources. The imported rock is likely to be granite that is derived from a local source at Minffordd quarry (near Porthmadog) and the gravel will probably come from the Cefn Graianog quarry (near Penygroes). The rock that was used for the existing formal revetment on the site (see Image 1) was also sourced from Minffordd quarry so the new materials will be compatible with those that are already present.

The new beaches (i.e. the recharge areas between the groynes) will be formed using appropriately/locally sourced materials of sand and shingle replacing the existing imported rock and demolition hardcore. The sand will be of marine origin and is proposed to be taken from the Hilbre Swash licensed dredge area at the mouth of the Dee Estuary. It will be screened at the extraction site and therefore there will be no risk of introducing invasive non-native species to the area.

The recent site investigation that was undertaken in September 2019 analysed the seabed sediments, including *in situ* sand, present within the intertidal area fronting the Proposed Development. The particle size analysis (PSA) results indicate that the particle size diameter (PSD) of the *in situ* sand is narrow band with a D50<sup>15</sup> of 200 µm. The grading curves of the *in situ* sand are the same as those for marine sand within the intertidal zone around the Wirral and in the Dee estuary approaches and therefore the Hilbre Swash licensed dredge area will provide imported sand with similar PSD characteristics to the *in situ* sand. Given that the imported sand is from the same geological source as the *in situ* sand such that the angularity, mineralogy and colour will also be the same. Furthermore, the sand from the Hilbre Swash licensed dredge area has been used in beach nourishment schemes in the approaches to the Conwy estuary and in Penrhyn Bay and is therefore considered acceptable for use in the Proposed Development.

As guided by NRW, any suitable sediment of marine origin within the footprint of the work that needs to be excavated during construction will be reused within the marine zone and not removed from the site. This suitable sediment will include coarser-grained sands and shingle which mainly lie at the surface of intertidal areas below the mean high-water spring (MHWS) tide level. It will also include comparable coarse sediment that is present, as discrete areas that can feasibly be separated out, in the excavations above the MHWS level (i.e. in the area where the defences are set back 30 m back from the existing MHWS). These coarser sediments will be relocated in front of the defences and to the east of the

<sup>15</sup> The D50 is the diameter of the particle that 50% of a sample's mass is smaller than and 50% of a sample's mass is larger than.

development footprint to build up the shingle at the top of the shore and feed into the prevailing easterly longshore drift of existing *in situ* sands in this area. A map of the key sediment relocation pathways is shown in Figure 3.

Any finer clays and silts that are excavated from the coastal defence footprint will be relocated into the hinterland for use in development landscaping and/or terrestrial habitat enhancement as appropriate. This is because relocating and re-using these finer sediments in the intertidal zone is likely to result in unnecessary ecological and water quality effects.

Across the development footprint, and in an area that extends around 150 m to the east, existing anthropogenic rubble material will also be removed from the site. As noted in Section 2.6, rubble has evidently been placed here historically to provide an informal coastal protection function. Its removal will further add to the ecological enhancements in the wider the area and act as mitigation/compensatory measures for habitat losses and changes within the development footprint.

The beaches will be set at levels facilitating access between the hinterland and the beach to improve the enjoyment of the coastal path and the general amenity along the frontage. A temporary ramp will be used during the holiday season to ensure access for all (including for disabled access) during summer periods. The socio-economic aims and benefits are discussed further in Section 3.1.1.

Rock, aggregate and plant machinery will be delivered to site via lorries from the relevant source quarries and Port Penrhyn at Bangor. Access to the work site will therefore be from the land (via road network) including along existing routes through the Haven Leisure Ltd. site and avoiding the Afon Wen. It is not envisaged that material will be delivered by sea during the construction work and therefore no vessels are expected to access the upper shore.

At the construction site, two tracked extraction vehicles (typically 35 tonne excavators) and dumper trucks will be used to cut back into the land to prepare the ground for installation of the rock revetment and breakwaters. The construction plant is expected to remain on site for the duration of the works. For the most part, vehicular movements will be largely above the MHWS area and a defined construction zone will be identified at the top of the shore. However, plant movement along the upper shore will be required on occasion both within and outside the construction footprint. The proposed plant access route for the large tracked vehicles during construction are shown on the masterplan (Revision R in Appendix A). The temporary coastal path diversion during construction is shown on the masterplan (Revision T in Appendix A). The previous STP site is likely to be used as the site compound for the construction of the coastal defences. It will also provide a storage area for construction materials (i.e. rock, sand and gravel). A construction management plan that provides a more detailed construction methodology will be prepared following the submission of the planning and marine licence application and once a preferred contractor has been appointed.

The details of the cut and fill requirements will also be finalised as part of the final design of the Proposed Development. However, approximately 15,000 to 20,000 m<sup>3</sup> of excavated sediment and soil is expected to be moved during the works in preparation for installing the breakwaters and rock revetment (to be confirmed in detailed design). As summarised above, the coarser sediments will be beneficially relocated within the intertidal area while other less suitable material (finer sediments) will be used as part of the on-site landscaping and will not be taken off site or to landfill.

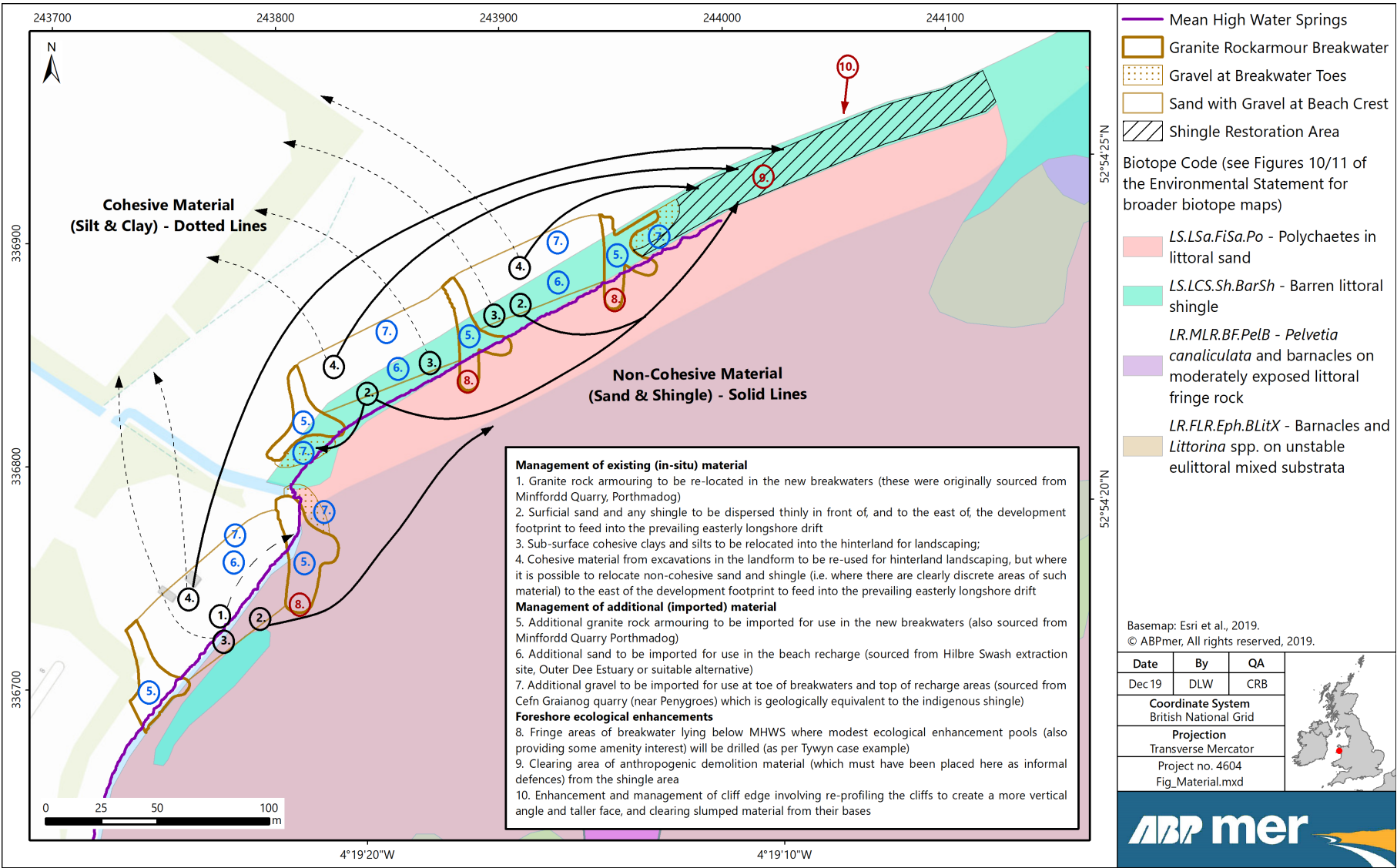


Figure 3 Marine origin sediment re-use plan and key shoreline ecological enhancement actions

It is envisaged that 10,000 tonnes of rock armour will be needed and that, to import this, there will need to be around 500 wagon return journeys to and from the selected local quarry at Porthmadog (around 19 km away) over 10 working days, over the construction phase of the coastal defence work. This is based on a worst-case assumption that 20 tonne wagons would be used whereas it is possible that 30 tonne vehicles could be employed. The source for sand and gravel (estimated as a total of 11,000 tonnes) has not yet been finalised but it is envisaged that a similar scale and duration of wagon movement is anticipated for the delivery of these beach materials. At this stage the number of vehicles and the number of their movements has not been finalised and it will be dependent on the final design. These details will be provided following contractor engagement, but they are not expected to be substantially different from the level estimated here.

## 2.8 Operational phase (site maintenance)

Following completion of the work, the temporary coastal path diversion during construction will revert to the 10 m corridor along coastal frontage and behind the new coastal defences. There will also be a need for on-going site monitoring and maintenance during the operational phase.

The sand recharge areas (which will only be infrequently inundated by tides and mainly at their lower elevations) are likely to require regular litter collection and surface management to deal with sediment consolidation, compaction or surface vegetation/algal growth. Some relocation of boulders within the structure and sand may also be needed on occasion (e.g. following a storm).

Plant access during these maintenance operations will be via the same proposed access route as during construction (see Section 2.7). There is also expected to be a loss of sand from the recharge zones and these areas will need to be topped up with imported sand from the consented Hilbre Swash extraction site. If a maximum import volume of 1,000 m<sup>3</sup> is assumed following an extreme storm event, then this can be imported by 50 wagon loads which at two deliveries per hour over 8 hour days of 20 tonnes per load would take three days to deliver. With an extra day to complete the spreading of the new material, the maintenance (rebuilding) work could be completed in a week. Storm events requiring management intervention, if they occur, are likely to be out of season, therefore, any maintenance work will avoid disruption to site operation during periods of high occupancy. The likely extent of such losses over time has been reviewed further within the physical and coastal processes assessment (Section 6.3).

The design life of these defences is 25 years. However, no formal scheduling of decommissioning is proposed (in 2045) as it is recognised that there will be an ongoing need to be adaptive in response to changing conditions and especially in response to the (as yet uncertain) effects of sea level rise and climate change. It is envisaged though, that there will be an ongoing process of monitoring to evaluate the performance of these defences. This monitoring will inform requirements for the ongoing management of these defences and will also be informed by any broader reviews of SMP policy which will also consider the wider shoreline management requirements. Around the end of the scheme service life there will be a performance review of the scheme over its service life which will include a reconciliation of: the needs of the park; the shoreline management approach with the SMP policy at that time; and recommend future shoreline management policy for the next 25 years.

## 2.9 Mitigation and enhancement measures

In advance of considering the potential impacts of the Proposed Development, it is important to summarise the measures that have already been identified to minimise and mitigate for adverse effects. A number of these measures have already been noted above with respect to the coastal defences work. A full list of the key mitigation measures that will be undertaken is presented below:

- Coastal defences have been designed to minimise both the direct effects on intertidal habitats and the indirect effects from changes in coastal processes;
- Coastal defence design will be adaptable and able to accommodate future sea level rise and hence avoid indirect impacts on intertidal habitats from coastal squeeze;
- Reuse of materials excavated for the coastal defence as part of the landscaping within the park extension in order to avoid impacts to areas (or landfill sites) outside the development footprint;
- Measures to avoid impacts to otter species including having an undisturbed green corridor along the watercourse within the site and ensuring that otters can gain access to it from the sea (between Parcels G and H), the creation of artificial lying-up site/holts, and the use of bridges rather than culverts for stream crossings;
- Measures to avoid impacts to bat species such as replacement roosting sites within any new or retained buildings, the installation of bat boxes and/or European Protected Species (EPS) licences for the removal of roosts where necessary;
- Measures to avoid impacts to reptile species including either a habitat management approach to facilitate the displacement of reptiles, or a trapping and translocation programme;
- Measures to avoid impacts to breeding birds including a careful programme of clearance works to ensure nests are not harmed during site clearance (in breeding season);
- Removing debris/'foreign material' from the top of the shore for reuse predominantly as a core to the rock groyne armour (all suitable sediment of marine origin will be retained within the existing intertidal environment);
- Reusing excavated material from the coastal set back area for hinterland landscaping and terrestrial mitigation habitat enhancement;
- Adoption of appropriate on-site construction measures to minimise the risk of accidents and spillages into the watercourse including the use of bunding and/or storage facilities to contain and prevent the release into the marine environment of fuels, oils etc.;
- Landscaping and planting measures at selected locations within the site and especially alongside the central drainage creek and the inclusion of a 10 m-wide buffer along the margins of this channel to avoid significant disturbance impacts on otter using this area;
- Timing of the construction works in winter to minimise effects on road traffic as well as on users of the park and the Wales Coast Path;
- Using local sources for construction materials such as rock armour and sand in order to minimise traffic increases (and associated effects) during construction; and
- Measures to mitigate for impacts on semi-improved meadow grassland and soft maritime cliff and to compensate/offset impacts to intertidal habitats;
- Inclusion of a wildflower grassland corridor within a buffer zone of at least 10 m along the coastal frontage and behind the coastal defences;
- Development of a terrestrial mitigation strategy, including terrestrial habitat creation in former car park north of A497, as well as the enhancement and management of existing areas of semi-improved meadow grassland and soft maritime cliff habitat east and west of the coastal works to enhance invertebrate interests, and especially bee and wasp fauna. In addition, the construction of extensive 'bee banks' within the former car park; and
- Provision for maintenance, monitoring and mitigation as appropriate to fulfil the design concept of continual adaptability. Management activities will include maintenance raking, cleaning and response (rebuilding) as required after major storms.

For the whole Proposed Development, an appropriate Construction Environmental Management Plan (CEMP) will be developed and implemented<sup>16</sup>. It will include all mitigation measures to address impacts identified during the assessment and appraisal phases of the planning application.

<sup>16</sup> The development of a CEMP is anticipated to be a condition of consent. It will be prepared once a contractor has been appointed and the final design and construction methodology agreed.

## 2.10 Environmental management best practice procedures

Environmental management best practice will be implemented by contractors during construction. This will involve adherence to a number of guidelines, including the following:

- British Standards (Various) (BSI, 2015)<sup>17</sup> and Eurocodes (2015)<sup>18</sup>;
- Construction, Design and Management (CDM) Regulations (2015)<sup>19</sup>;
- Construction Industry Research and Information Association: Environmental Good Practice on Site Guidelines (CIRIA, 2010);
- Office of Government Commerce: Construction Excellence Guidelines (OGC, 2011)<sup>20</sup>;
- All appropriate NRW guidelines, specifications and standard details;
- Guidance for Pollution Prevention (particularly GPP5 for works in or near water)<sup>21</sup>;
- CIRIA guidance C745 for engineering works in the coastal and marine environment (CIRIA, 2016);
- BS 5228 – noise and vibration from construction activities (BSI, 2009);
- SEPA Good Practice Guide on Engineering in the water environment (SEPA, n.d.); and
- Marine biosecurity planning guidance for England and Wales (2015)<sup>22</sup>.

Adherence to environmental management best practice will be controlled through the CEMP in accordance to guidance (IEMA, 2016). The CEMP will be provided to NRW and Gwynedd Council prior to works commencing following detailed design of the Proposed Development and will set out the mitigation measures needed to manage environmental effects (see Section 4.12). These would include measures for monitoring and for translocating protected species (reptiles) from the development footprint to a suitable receptor site. It could also include measures for replacing damaged or diseased plants/trees as part of the landscaping work. The CEMP will be a live document that will be updated as new information or details emerge of how mitigation will be achieved.

## 2.11 References

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CIRIA (2016). Coastal and marine environmental pocket book (second edition) (C745).

CIRIA (2010). Environmental good practice on site (third edition) [Online] Available at: [https://warwick.ac.uk/fac/sci/eng/eso/modules/year4/es94y/c692\\_environmental\\_good\\_practice\\_on\\_site\\_3rd\\_edition.pdf](https://warwick.ac.uk/fac/sci/eng/eso/modules/year4/es94y/c692_environmental_good_practice_on_site_3rd_edition.pdf) (accessed August 2019)

<sup>17</sup> <https://www.bsigroup.com/en-GB/standards/british-standards-online-database/>

<sup>18</sup> <https://eurocodes.jrc.ec.europa.eu/home.php#>

<sup>19</sup> <http://www.legislation.gov.uk/ukxi/2015/51/contents/made>

<sup>20</sup> [https://www.designingbuildings.co.uk/wiki/Achieving\\_Excellence](https://www.designingbuildings.co.uk/wiki/Achieving_Excellence)

<sup>21</sup> <http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppps-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

<sup>22</sup> [https://naturalresources.wales/media/684349/marine\\_biosecurity\\_planning\\_guidance\\_for\\_wales\\_and\\_england\\_november\\_2015.pdf](https://naturalresources.wales/media/684349/marine_biosecurity_planning_guidance_for_wales_and_england_november_2015.pdf)

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Lichfields, 2017. Hafan y Môr Vision. Bourne Leisure Ltd. Draft for discussion. November 2017.

Royal Haskoning. (2011). West of Wales Shoreline Management Plan 2 Section 4. Coastal Area D. Reference: 9T9001/RSection 4CADv4/303908/PBor.

SEPA (n.d.). Engineering guidance [Online] Available at: <https://www.sepa.org.uk/regulations/water/engineering/engineering-guidance/> (accessed August 2019)

## 3 Project Aims and Alternatives

### 3.1 Project aims

The principle aims of, and need for, the full Proposed Development are described in Haven Leisure Ltd.'s '2030 Vision' for Hafan y Môr Holiday Park (Appendix A). In summary, these are to:

- Provide long-term site-security in the context of coastal erosion and sea level rise;
- Extend the site and improve the overall quality of the visitor experience; and
- Enhance the amenity value of the site at its coastal margins by providing better and safer shoreline access and greater opportunities for coastal interaction by visitors.

These aims contribute to social and economic benefit, human health and public safety, and beneficial consequences of primary importance to the environment. Further details about the aims of the Proposed Development with reference to relevant national policies (including the Well-being of Future Generations (Wales) Act and the Welsh National Marine Plan (WNMP) as published on 12 November 2019<sup>23</sup>), are set out in the following sections, as well as in the 2030 vision (Appendix A) and in the Economic Statement (Appendix J). A Planning Statement has also been prepared by Lichfields in support of the planning application which assesses the Proposed Development against the relevant planning policies.

The coastal defence component of the Proposed Development specifically also has a combination of social, economic and public safety aims as summarised in Section 2.6 and in Section 2.3 of the Scoping Report. These defences are designed to protect the Hafan y Môr Holiday Park and coastal path from continued erosion and provide long-term stability for the site so that Haven Leisure Ltd can continue to offer and manage facilities into the future. They are also designed to enhance the accessibility and amenity value of the beach-front areas and improve both the safety of shoreline access for visitors and the level of visitor engagement with the adjacent intertidal landscape.

When considering the aims and benefits of this project and of the coastal defences specifically, it is recognised that this information may be needed to underpin assessment of whether the project qualifies as being undertaken for 'imperative reasons of overriding public interest' (IROPI) under the Habitat Directive/Regulations. Under Article 6(4) of the Habitats Directive, if a plan or project might have an effect on the integrity of an internationally designed site (or where such an effect cannot be excluded) the relevant competent authority must be able to identify that the project qualifies as being undertaken for IROPI (Defra, 2012). If the need to make an IROPI judgement applies in this case (see Appendix K for further details) this will necessitate consideration of different elements of the term IROPI alongside an understanding of the specific objectives and benefits of the Proposed Development (see Sections 2.4 to 2.6). In this case the Proposed Development site does not have the potential to affect any priority interest features<sup>24</sup> of the Pen Llyn a'r Sarnau SAC, and, therefore, the competent authority can consider IROPI issues that relate to social or economic benefit in addition to those of human health, public safety, or beneficial consequences of primary importance to the environment.

<sup>23</sup> <https://gov.wales/marine-planning>

<sup>24</sup> The only priority feature of the Pen Llyn a'r Sarnau SAC is coastal lagoons, specifically Morfa Gwylt lagoon, a small percolation lagoon that consists of a depression in a shingle bar across the mouth of the Afon Dysynni which is located more than 2 m from the Proposed Development site.

### 3.1.1 Social and economic benefit

The Welsh National Marine Plan (WNMP) has been developed by Welsh Government. It has been consulted upon and was issued on 12 November 2019. This Plan, which sets out the Welsh Government's policy for the next 20 years, will support sustainable decision-making; support a vision for clean, healthy, safe and biologically diverse seas; and integrate Welsh policy with the rest of the UK (aided by the UK Marine Policy Statement). High Level Marine Objective (HLMO) 2 is to 'Contribute to a thriving Welsh economy by encouraging economically productive activities and profitable and sustainable businesses that create long term employment at all skill levels.' This is in line with a key Planning Principle of Planning Policy Wales (PPW) which is to grow the economy in a sustainable manner.

As of August 2019, Hafan y Môr Holiday Park employs a total of 100 permanent staff all year round, all of which are full time, and approximately 400 seasonal staff, of which 280 are full-time and 120 part-time (see also Appendix J). The Proposed Development meets HLMO 2 and the key planning principle of the PPW as it will help to support economic prosperity throughout Gwynedd through investment and the provision of local jobs. It is also considered appropriate for the area in that it will provide a range of employment opportunities that will help to attract and retain working age people (Appendix J).

The key quantifiable economic impacts of the Proposed Development at construction stage are:

- Attracting £13.1 million of total private sector investment into the local economy in Gwynedd;
- Creating 190 full-time equivalent (FTE) person-years of temporary construction work, which is equivalent to 158 FTE jobs during the build period;
- Supporting an additional 119 indirect and induced FTE jobs during the build period in services and other businesses from supplier sourcing and the wage spending of construction workers; and
- Generating £9.75 million of direct Gross Value Added (GVA) and a further £13.8 million of indirect GVA from the construction phase of the scheme, equating to a total economic output of £23.5 million in GVA.

Once complete, the Proposed Development will support:

- 57.7 direct FTE jobs at the Hafan y Môr Holiday Park, plus 32.3 indirect/induced FTE jobs across Wales, of which 21.9 FTE jobs are likely to be located in Gwynedd; and
- £1.8 million in direct GVA and a further £1.0 million in indirect/induced GVA, equating to a total economic output of £2.8 million in GVA.

The value of tourism to the economy is recognised in Paragraph 5.5 of PPW which states that *"Tourism involves a wide range of activities, facilities and types of development and is vital to economic prosperity and job creation in many parts of Wales. Tourism can be a catalyst for regeneration, improvement of the built environment and environmental protection."* Paragraph 5.5.3 states that *"In rural areas, tourism-related development is an essential element in providing for a healthy and diverse economy. Here development should be sympathetic in nature and scale to the local environment."* In agreement, the Gwynedd Destination Management Plan 2013-2020 aims to enhance the natural, built and cultural environment, to improve the quality of the visitor experience, and to provide well paid, year-round quality jobs and skills development. The Welsh Government Strategy for Tourism 2013-2020 also states that an opportunity exists to promote higher quality and facility provision in caravan sectors.

The Anglesey and Gwynedd Joint Development Plan (JLDP) states that tourism provides an important source of income to several towns and rural communities in the form of visitor spending on accommodation, food, drink, leisure activities and shopping, and also to local business supply chains

and wholesalers. Tourism brings over £851 million into Gwynedd (including Snowdonia National Park) each year and supports nearly 16,000 local jobs. The JLDP further records that *"6.3.30 Gwynedd Council's key aim is to seek to ensure a geographical spread of employment opportunities. The rural economy has an important role in the area in terms of the agricultural sector, tourism and small rural businesses."*

The industry in the area is characterised by water-sports and recreational boat use and is dependent on the holiday and caravan parks along the coast. In this context, the Hafan y Môr Holiday Park plays a valuable role. The Proposed Development will help to ensure that Gwynedd continues to offer a range of high-quality holiday accommodation in order to attract expenditure from overnight visitors. The provision of new holiday accommodation at the Hafan y Môr Holiday Park will generate:

- Total direct and indirect/induced visitor expenditure of £2.25 million, which will support 42 FTE jobs in the local economy; and
- Additional maintenance expenditure of approximately £167,000 per annum.

In summary, the Proposed Development will provide jobs and support the tourism sector, thus reinforcing the site's contribution to the local economy in keeping with planning objectives.

### 3.1.2 Human health and public safety

HLMO 8 of the WNMP is to 'Improve understanding and enable action supporting climate change adaptation and mitigation'. The Proposed Development will provide protection against coastal erosion, sea level rise, and flooding which are predicted to increase due to climate change. This will reduce risks to human health and public safety. The impacts of climate change are uncertain both in timing and extent and this risk is accommodated in a sustainable manner because the Proposed Development will be resilient and fully adaptable to future change over its service life of 25 years (as outlined in Section 3.2).

The WNMP HLMO 7 is to 'Support enjoyment and stewardship of our coasts and seas and their resources by encouraging equitable and safe access to a resilient marine environment, whilst protecting and promoting valuable landscapes, seascapes and historic assets'. In addition, the Well-being of Future Generations (Wales) Act is concerned with improving the social, economic, environmental and cultural well-being of Wales. To help public bodies achieve this, the Act puts in place seven well-being goals. One of these goals is a Healthier Wales which aims for people's physical and mental well-being to be maximised and choices and behaviours that benefit future health are understood.

Currently, the only public access to the beach at Hafan y Môr Holiday Park is via a narrow unattractive and potentially treacherous slipway. Fronting part of the site is a steep rock revetment, which is also positioned at the southern part of the proposed coastal defence area. There is then a low elevation cliff (approximately 2 m high) to the north and east within the proposed coastal defence area. These factors make access to the beach difficult and unsafe and reduces the amenity benefits of the area.

The amenity and safety benefits from the Proposed Development will arise because the design includes readily accessible 'beach' areas at the top of the foreshore. This replaces a portion of the rock revetment as well as the cliff, with a lower elevation cliff face, facilitating access to the beach. The interface between the rock groynes and the cliff will be covered with imported natural shingle to facilitate safe public access between the hinterland and foreshore. Overall, therefore, it is expected to enhance the extent to which visitors to the Hafan y Môr Holiday Park can enjoy, and feel a part of, the adjacent shoreline area with associated contributory health benefits for visitors and the local community. A temporary ramp will be used during the holiday season to ensure access for all (including for disabled access) during summer periods.

In addition, it is also recognised that the coastal defence measures will help to stabilise the section of the Wales Coast footpath which runs through the Proposed Development area and is of significant public benefit. Improvements to Hafan y Môr Holiday Park itself will also include a lower density development and provide enhanced landscaping and some significant biodiversity improvements.

Overall, the Proposed Development is expected to enhance the enjoyment of, and safe access to, the shoreline area, whilst addressing coastal protection issues and climate change. This maximises the potential for human health and public safety benefits to be realised. It therefore aligns with the policies of the WNMP and Well-being of Future Generations (Wales) Act.

### 3.1.3 Beneficial consequences of primary importance to the environment

Another of the seven well-being goals under the Well-being of Future Generations (Wales) Act is 'A Resilient Wales' which aims for a nation which maintains and enhances a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change. In addition, the WNMP HLMO 10 is to 'Protect, conserve, restore and enhance marine biodiversity to halt and reverse its decline including supporting the development and functioning of a well-managed and ecologically coherent network of Marine Protected Areas (MPAs) and resilient populations of representative, rare and vulnerable species' and HLMO 11 is to 'Maintain and enhance the resilience of marine ecosystems and the benefits they provide in order to meet the needs of present and future generations'. The Sustainable Management of Natural Resources and the Environment (Wales) Act 2016 also aims to enable the environment in Wales to be managed in a more "proactive, sustainable and joined-up way" by "using natural resources in a way, and at a rate, that maintains and enhances the resilience of ecosystems and the benefits they provide".

As detailed in Section 3.2, it is considered that the Proposed Development provides an optimal solution which minimises impacts to the SAC and adjacent shoreline and has resilience and adaptability to climate change as a central tenet of its design. While the small-scale direct environmental effects of the Proposed Development cannot be avoided, the proposed approach is considered to be a valuable precedent for how such defence schemes can be designed to have social, economic and ecological objectives and consideration all built in.

## 3.2 Consideration of alternatives

### 3.2.1 Park extension

The masterplan for Hafan y Môr has evolved significantly as a range of alternatives have been considered and adjusted (Section 2.2). This process of review has been informed by extensive consultation with regulators and interested parties, numerous project team meetings, and the outcomes of the EIA work. Over this review process, adjustments to the proposed design have been made to take into account environmental issues, including ecological, cultural, landscape and visual impact, drainage, design and amenity considerations. In particular, care has been taken to maintain a green corridor along the drainage creek that runs through the site. Other sensitive landscaping and planning measures have been identified. Some of the key changes are presented in Section 2.2 Coastal Defences.

#### Options considered

When developing the design of the coastal defences early and detailed consideration was also given to the different alternatives with a view to optimising the design and minimising the potential environmental effects (especially on the SAC). Further details about the design considerations and the rationale for selecting the preferred options are set out in the Coastal Defences Technical Review that is included with a range of technical drawings in Appendix D.

The alternative approaches that were considered for this site were found to be inappropriate for this location because they would:

- Result in larger losses of, or changes to, intertidal areas within and surrounding development footprint;
- Fix in place larger sections of the fronting shoreline resulting in greater consequences for intertidal loss through sea level rise and 'coastal squeeze';
- Have a greater influence on coastal processes (e.g. sediment transport) with potentially larger effects beyond the location of the development itself;
- Not provide any amenity benefits or safety improvements for those visitors and the local community using the Hafan y Môr Holiday Park and the fronting shoreline which are also key objectives for the Proposed Development alongside coastal protection; and/or
- Not be as effective for retaining the proposed amenity beach features in place.

To consider these issues further and explain why specific alternatives were not considered to be appropriate, the following alternatives were rejected for the following reasons:

- **Extending and reinforcing the existing linear rock revetment:** Extending the existing revetment (as constructed in 1998) was considered but would be detrimental at this site and not achieve desired objectives. It would mean that the defence line would be 'held' which would be contrary to the SMP policy and would cause coastal squeeze effects. It would also not provide amenity beaches nor any improvements to beach access value with the only access to the beach being the unattractive and potentially unsafe slipways. It would also be visually the most obtrusive and unattractive (especially as the defence would be set to seaward in the existing beach and would thus need to have higher crest levels and remain more exposed than the proposed rock groynes which will be covered in natural gravel and become substantially buried over their inshore lengths);
- **Beach nourishment alone.** The use of beach nourishment on its own would achieve the scheme objectives but would be more costly to maintain and would increase the risk of sediment export from the site to adjacent sections of the shoreline. It would require topping up on a much more regular basis than the design which is proposed;
- **Using alternative cross-shore structure.** The alternative approach of using timber groynes or linear cross-shore rock-armour groynes (as found at Tywyn shoreline for example) would not be as effective. Traditional timber fence-type groynes in a macro-tidal environment would cause wave reflection and make it difficult to retain the sand recharge beaches. There are some deteriorating/redundant wooden groynes on site already which show this to some degree, although their design orientation is poor for the wave exposure;
- **Doing nothing/no intervention':** Carrying out no improvement works at all would result in the progressive erosion of the existing coastline which would increase over time in response with climate change and sea level rise. The unsightly and unnatural appearance of the 'ad hoc' demolition hardcore used to slow down erosion historically would remain. Over time, adopting this 'do nothing' alternative will diminish the viability of Hafan y Môr Holiday Park and coastal path with consequences for wider regional tourism and the employment opportunities provided by the site;
- **Increasing the scale of the existing design:** The very first option that was considered/designed for the site involved having two large breakwaters including slipways for enhanced recreational vessel access. This was developed to have a greater amenity value (including larger recreational beaches and slipways for multiple recreational activities) but was rejected in favour of the proposed design to minimise environmental effects; and

- Reducing the scale of the existing design.** As also noted above the proposed design is believed to be optimal for performing all the desired functions. The opportunity to reduce it further in scale was considered during the modelling work and Groyne 2 was removed to assess the sheltering function provided by this structure on the recharged beaches to either side. With its removal the wave and tidal currents were considered too severe in the centre of the larger embayment (at the location where Groyne 2 is proposed) increasing the risk of sand losses during more severe storm events. NRW also asked whether Groynes 2 and 3b could be removed to 'smooth' the hinterland behind and create pocket bays. This scenario was considered and discussed at the meeting on 2 May 2019. This had to be discounted because one of the main aims of the design is to keep the drainage outlet open from the inland watercourse. This is considered environmentally important and an access point for foraging otter (SAC interest feature) as well as being a valuable drainage outlet. The NRW suggestion would render this watercourse outlet to be more unstable without containment of the adjacent imported sand. The gravel beaches were included to mask the starker appearance of the rock armour and improve the interface between the intervention and the natural environment of the watercourse outlet. The standard aspect ratios for groyne fields (alongshore separation compared to on-offshore length) presented in text books would suggest that the spacing of the groynes in the proposed scheme could be increased. However, it is important to recognise the unusual hydrodynamic conditions applying at the site and the need to restrict the alongshore length of the works to minimise intrusions into the Marine SAC. The plan shape and orientation of the local coastline result in a significant alongshore current during south-westerly storms which is directed towards the shoreline to the north-east of the old STP frontage. This current is the reason for retention of the Groyne no. 2 from a coastal protection perspective to avoid higher losses of imported beach material during storms. The on-offshore length of the groynes is also determined to minimise beach losses during scheme service life. These considerations combine with the need to minimise alongshore scheme length to fix the aspect ratio of Groynes 1,2 and 3 as proposed.

As a result of the alternatives review process, an innovative variant of an established 'fishtail' breakwater design concept was ultimately proposed. This approach is considered optimal for achieving the Proposed Development objectives. This is because it will have the smallest effect on the shoreline (which is designated as SAC and SSSI) while also achieving the desired aims and being sustainable, resilient and adaptable to future change over its service life of 25 years. The innovative and adaptive nature of the project is described further below.

### Innovative and adaptive design

In developing the scheme design, the environmental effect was minimised by setting the coastal defences into the hinterland. The extent (distance) of this realignment into the landform also corresponds to the projected maximum potential extent of erosion for this shoreline i.e. as described in the SMP when considered over the service life of the Proposed Development. The scheme design also takes account of the latest sea level rise predictions provided in the latest UK Climate Projections 2018 (UKCP18). This approach, of setting the rock armour groyne defences back in this manner, is thought to be unique in the UK and has meant that the intrusion of the defences into the existing intertidal area is as small as possible, and that the risks of any alongshore physical or ecological impacts are minimised.

Fundamentally this defence is designed to be resilient and adaptable. This is achieved because the materials used to form the scheme can be moved to new configurations (in place and elevation). The rock groynes can be dismantled, relocated and reshaped if required. A 10 m corridor has also been included to landward of the scheme where there will be no hard development (i.e. only removable infrastructure will be allowed). This corridor is a contingency zone for any storm events and to deal with

the inherent uncertainty of natural future evolution of the shoreline in this area. It provides the facility to adaptively set the scheme back further if rates of sea level rise exceed the present range limit forecasts. Gwynedd Council has also advised that they would like to see the coastal habitat corridor retained to achieve/maintain habitat connectivity. The contingency zone will therefore be a wildflower grassland that links to surrounding habitats. The Wales Coast footpath will also be situated in this area as an unsurfaced, grassed path.

The costing of the scheme includes, over its service life, anticipated provision for maintenance, monitoring and mitigation as appropriate to fulfil the design concept of continual adaptability. Management activities will include maintenance raking, cleaning and response (rebuilding) as required after major storms.

### Confidence from past fishtail breakwater designs

Although the design that is proposed for this project is innovative (because it is set into the landform in a manner not previously adopted in the UK) it is noted that similarly-shaped 'fishtail' breakwaters with intervening beach recharge design have been implemented often over the last 40 years. This previous experience provides a lot of real-world evidence of the viability of the design that is proposed at Hafan y Môr when compared with other perhaps more 'traditional' alternatives. A short summary of the history of this design approach is therefore included in this section.

During the 1970s and 1980s it was recognised that there was a dearth of design information for traditional groyne systems in use around the UK and the Government supported research initiatives to provide design guidance on groyne systems to stabilise beach levels and thereby contribute to the design of coastal defences for the shoreline. The first offshore breakwater for coastal defence in the UK was built in the late 1970s and early 1980s and with the improved knowledge of wave and tide behaviour then available (from oil industry research for developments in the North Sea) it became clear that in UK waters there was the potential for a combination of the benefits from shore-normal (traditional fence-type groynes) and the newer concept of shore-parallel structures to intercept wave energy.

The fence-type groynes were well-known to cause a change in beach morphology with beach build-up on one side and beach erosion on the other and this provided problems of groyne stability and beach volatility. The fishtail shape was developed from the basic marine science of waves and tides and their interaction with the sea bed to provide a structure that used wave and tide energy to maintain higher beach levels on both sides of the structure. This new structure was possible due to the availability of larger machines and heavy-duty transport allowing construction in rock to a gravity design. This improved performance and adaptability (the latter becoming increasingly important with the recognition of climate change).

The first fishtail groyne was constructed on the Wirral in 1981. Offshore breakwaters constructed along the Wirral shoreline around the same time were converted into equivalent fishtail shapes over the 1980s and early 1990s because of the much-improved performance of the fishtail shape compared to alternatives. Similar schemes were undertaken at Morecambe, West Shore and Penrhyn Bay Llandudno, Llanelli, Clacton and Felixstowe during the 1990s with all schemes achieving performance objectives to date some of the schemes referred to above have been in service now for over 35 years.

### Design principles summary

During early consultations on the design NRW thought that the scheme might still be over-designed. The design approach and rationale were therefore further discussed in detail at a meeting with NRW on 2 May 2019. In this case thorough efforts have been made to minimise the scale of the defences as

described above and in Appendix D. As a summary of the design principles discussed at that meeting it was recorded that:

- The defences are relatively small in scale and they will be recessed into shoreline by 17 m on average;
- They will have a 25-year timeline (design life);
- They will be adaptable and adjustable over time (this is linked to the fact that this is a caravan park which also needs to be adaptable and respond to changing markets and customer needs into the future);
- The beach could be allowed to recess adaptively over time;
- They will intrude into the SAC boundary and specific efforts have been made to minimise this intrusion (including reducing project scale from initial design options and also innovatively recessing the defences into shoreline as noted above);
- They will result in a retreat of the MHWS line along the western part of the new defence frontage;
- The sand 'beach' areas between the rock armour groynes are expected to be stable under typical conditions with some losses under 1 in 35 year events;
- They are designed to provide amenity and access as well as defence functions;
- There is anticipated to be ongoing monitoring / maintenance and Haven Leisure Ltd has a track record of negotiating and complying with such conditions on marine schemes with other authorities.

To this list of design principles, it can also be added that they will help to keep the watercourse open where it discharges to the beach thus maintaining drainage and access for foraging otter.

### 3.3 References

Defra (2012). The Habitats and Wild Birds Directives in England and its seas. Core guidance for developers, regulators and land/marine managers. December 2012 (draft for public consultation). Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/82706/habitats-simplify-guide-draft-20121211.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/82706/habitats-simplify-guide-draft-20121211.pdf) (accessed August 2019).

## 4 Consents, Approvals and Policy Guidance

### 4.1 Introduction

The Proposed Development requires a range of consents and approvals under different legislative provisions, supported by detailed technical and environmental investigations. The principal consents/approvals and studies that are required are summarised in the following sections.

### 4.2 Marine Licence and Marine Planning

The current process of marine licencing under the Marine and Coastal Access Act 2009 came into force on 6 April 2011. This process requires anybody wishing to undertake works below MHWS in Welsh waters, including removals and deposits at sea, to obtain a marine licence from NRW. The Proposed Development will, therefore, require a marine licence to cover those works that impact upon the marine environment. It is anticipated that, in considering the marine licence application, NRW will take into account Government policy statements and guidance. In the context of the Proposed Development, the principles of sustainable development will also have to be taken into account, namely:

- Achieving a sustainable marine economy;
- Ensuring a strong, healthy and just society;
- Living within environmental limits;
- Promoting good governance; and
- Using sound science responsibly.

The UK Marine Policy Statement (Her Majesty's (HM) Government, 2011), which is now in force, contributes to the achievement of sustainable development in the UK marine area. Prepared under Section 44 of the Marine and Coastal Access Act 2009, it provides the framework for the preparation of Marine Plans and informing decisions affecting the marine environment. It ensures that marine resources are used in a sustainable way in line with marine objectives thereby:

- Promoting sustainable economic development;
- Enabling the UK's move towards a low-carbon economy, in order to mitigate the causes of climate change and ocean acidification and adapt to their effects;
- Ensuring a sustainable marine environment which promotes healthy, functioning marine ecosystems and protects marine habitats, species and our heritage assets; and
- Contributing to the societal benefits of the marine area, including the sustainable use of marine resources to address local social and economic issues.

The new Welsh National Marine Plan (WNMP) sets out the Welsh Government's policy for the next 20 years, will support sustainable decision-making; support a vision for clean, healthy, safe and biologically diverse seas; and integrate Welsh policy with the rest of the UK (aided by the UK Marine Policy Statement). For the planning application or marine licence of this Hafan y Môr proposal, decision makers will therefore be required to make authorising decisions in accordance with the marine plan policies unless relevant considerations indicate otherwise. The Proposed Development is expected to support the plan by:

- Contributing to a thriving Welsh economy by encouraging economically productive activities;
- Supporting enjoyment and stewardship of our coast and seas and their resources by encouraging equitable and safe access to the marine environment.

Further details about the how the Proposed Development complies with the new WNMP are provided in Section 3.1.

## 4.3 Environmental Impact Assessment

An EIA of the Proposed Development has been undertaken in compliance with the EIA Regulations. Table 1 summarises the requirements outlined in Schedule 4 of the Town and Country Planning (EIA) (Wales) Regulations 2017 (as amended) and Schedule 3 of the Marine Works (EIA) Regulations (Amendment) 2017. This table also signposts where the information can be found in this ES.

**Table 1. ES requirements according to the Town and Country Planning (EIA) (Wales) Regulations (Schedule 4) and Marine Works (EIA) Regulations (Schedule 3)**

| Schedule Reference | Requirements for ES                                                                                                                                                                                                                                                                                                                                                            | Section of the ES                    |
|--------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
| 1                  | A description of the project, including in particular:                                                                                                                                                                                                                                                                                                                         | Sections 1.1 and 2                   |
|                    | a) A description of the location of the development.                                                                                                                                                                                                                                                                                                                           | Section 1.1                          |
|                    | b) A description of the physical characteristics of the whole development, including, where relevant, requisite demolition works, and the land-use requirements during the construction and operational phases.                                                                                                                                                                | Section 2                            |
|                    | c) A description of the main characteristics of the operational phase of the development (in particular any production process), for instance, energy demand and energy used, nature and quantity of the materials and natural resources (including water, land, soil and biodiversity).                                                                                       | Section 2                            |
|                    | d) An estimate, by type and quantity, of expected residues and emissions such as water, air, soil and subsoil pollution, noise, vibration, light, heat, radiation and quantities and types of waste produced during the construction and operation phases.                                                                                                                     | Section 2                            |
| 2                  | A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the developer, which are relevant to the proposed project and its specific characteristics, and an indication of the main reasons for selecting the chosen option, including a comparison of the environmental effects.             | Section 3.2                          |
| 3                  | A description of the relevant aspects of the current state of the environment (baseline scenario) and an outline of the likely evolution thereof without implementation of the development as far as natural changes from the baseline scenario can be assessed with reasonable effort on the basis of the availability of environmental information and scientific knowledge. | Sections 6.2, 7.2, 8.2, 9.2 and 10.2 |
| 4                  | a) A description of the factors specified in regulation 4(2) (of the Town and Country Planning EIA Regulations) and 21A(2)(a) (of the Marine Works EIA Regulations) likely to be significantly affected by the development:                                                                                                                                                    | See below                            |
|                    | b) Population, human health;                                                                                                                                                                                                                                                                                                                                                   | Scoped out – Section 5.1             |
|                    | c) Biodiversity (for example fauna and flora);                                                                                                                                                                                                                                                                                                                                 | Sections 8 and 9                     |
|                    | d) Land (for example land take), soil (for example organic matter, erosion, compaction, sealing);                                                                                                                                                                                                                                                                              | Sections 6 and 7                     |
|                    | e) Water (for example hydromorphological changes, quantity and quality);                                                                                                                                                                                                                                                                                                       | Sections 6 and 7                     |

| Schedule Reference | Requirements for ES                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Section of the ES                             |
|--------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
|                    | f) Air, climate (for example greenhouse gas emissions, impacts relevant to adaptation);                                                                                                                                                                                                                                                                                                                                                                                                         | Scoped out – Section 5.1                      |
|                    | g) Material assets;                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Section 10                                    |
|                    | h) Cultural heritage, including architectural and archaeological aspects; and                                                                                                                                                                                                                                                                                                                                                                                                                   | Scoped out – Section 5.1                      |
|                    | i) Landscape.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Scoped out – Section 5.1 <sup>25</sup> .      |
| 5                  | A description of the likely significant effects of the development on the environment resulting from, inter alia:                                                                                                                                                                                                                                                                                                                                                                               | Sections 6-11                                 |
|                    | a) the construction and existence of the development, including, where relevant, demolition works;                                                                                                                                                                                                                                                                                                                                                                                              | Sections 6 to 10                              |
|                    | b) the use of natural resources, in particular land, soil, water and biodiversity, considering as far as possible the sustainable availability of these resources;                                                                                                                                                                                                                                                                                                                              | Sections 6 to 10                              |
|                    | c) the emission of pollutants, noise, vibration, light, heat and radiation, the creation of nuisances, and the disposal and recovery of waste;                                                                                                                                                                                                                                                                                                                                                  | Sections 7 to 9                               |
|                    | d) the risks to human health, cultural heritage or the environment (for example due to accidents or disasters);                                                                                                                                                                                                                                                                                                                                                                                 | Scoped out – Section 5.1                      |
|                    | e) the cumulation of effects with other existing and/or approved projects, taking into account any existing environmental problems relating to areas of particular environmental importance likely to be affected or the use of natural resources;                                                                                                                                                                                                                                              | Section 11                                    |
|                    | f) the impact of the project on climate (for example the nature and magnitude of greenhouse gas emissions) and the vulnerability of the project to climate change;                                                                                                                                                                                                                                                                                                                              | Scoped out – Section 5.1                      |
|                    | g) the technologies and the substances used.                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Sections 6 to 9                               |
| 5 and 6            | The description of the likely significant effects should cover the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development.                                                                                                                                                                                                                                     | Sections 6 to 11                              |
| 6 and 7            | A description of the forecasting methods or evidence, used to identify and assess the significant effects on the environment, including details of difficulties (for example technical deficiencies or lack of knowledge) encountered compiling the required information and the main uncertainties involved.                                                                                                                                                                                   | Section 5.2, and Sections 6 to 11             |
| 7 and 8            | A description of the measures envisaged to avoid, prevent, reduce or, if possible, offset any identified significant adverse effects on the environment and, where appropriate, of any proposed monitoring arrangements (for example the preparation of a post-project analysis). That description should explain the extent, to which significant adverse effects on the environment are avoided, prevented, reduced or offset, and should cover both the construction and operational phases. | Sections 0, 6.4, 7.4, 8.4, 9.5, 10.4, and 12. |

<sup>25</sup> Although the landscape/seascape topic does not require a formal assessment as part of the EIA, a standalone appraisal has been prepared and will be submitted in support of the planning application (Appendix H).

| Schedule Reference | Requirements for ES                                                                                                                                                                                                                          | Section of the ES             |
|--------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------|
| 8 and 9            | A description of the expected significant adverse effects of the development on the environment deriving from the vulnerability of the development to risks of major accidents and/or disasters which are relevant to the project concerned. | Section 10                    |
| 9 and 10           | A non-technical summary of the information provided under paragraphs 1 to 8/9.                                                                                                                                                               | Before contents page          |
| 10 and 11          | A reference list detailing the sources used for the descriptions and assessments included in the environmental statement.                                                                                                                    | Final section of each chapter |

## 4.4 Habitats Regulations Assessment

Where a development project, such as the Proposed Development, is located close to or within an area designated under the Birds and Habitats Directives (European Sites) and/or the Ramsar Convention, the requirements of Regulations 63 to 69 of the Conservation of Habitats and Species Regulations 2017 (the 'Habitats Regulations') apply. In essence, this requires the lead Competent Authority to determine whether the proposed works are likely to have a significant effect on a European Site and, if so, to undertake an Appropriate Assessment (AA) of the implications of the proposals in light of the site's conservation objectives.

In this case, the potential effects on the Pen Llŷn a'r Sarnau Special Area of Conservation (SAC), within which the Proposed Development and wider foreshore are located, trigger the need for a Habitats Regulations Assessment (HRA).

The legal process that needs to be followed for an HRA is very clearly laid out. In simple terms, it is pursued in two key stages. First, to determine whether the proposed works have a likely significant effect (LSE) on a European/Ramsar site and, if so, to undertake an Appropriate Assessment (AA) of the implications of the proposal in the light of the site's Conservation Objectives. The process for undertaking LSE screening and an AA are together referred to as the HRA.

The AA needs to take account of the in-combination effects of the proposal on the protected areas in association with other relevant projects and plans. Where it cannot be ascertained that a project will not have an adverse effect on site integrity, the project can only proceed if it can be demonstrated that there are no more suitable (less damaging) alternatives (see Section 3.2) and that there are IROPI sufficient to justify the project (see Section 3.1). In certain circumstances, the Secretary of State may be required to ensure that adequate compensation has been provided to protect the overall coherence of the Natura 2000 network.

In accordance with the latest available guidance for undertaking HRAs, information is provided to enable the competent authority to undertake an AA, assessing the effects of the development on the features for which the site is designated<sup>26</sup>. This information is provided in this ES, with a signposting document to highlight where the relevant information can be located (Appendix K).

<sup>26</sup> In this case there are two competent authorities, NRW is the lead authority under the marine licencing process and Gwynedd Council is the authority under the planning process

## 4.5 Water Framework Directive Compliance Assessment

The Water Framework Directive (WFD) (2000/60/EEC) establishes a framework for the management and protection of Europe's water resources. It is implemented in England and Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, known as the Water Framework Regulations. The overall objectives of the WFD as implemented by the Water Framework Regulations is to achieve "good ecological and good chemical status" in all inland and coastal waters by 2015 (now working towards revised objectives for 2021) unless alternative objectives are set or there are grounds for time limited derogation. For example, where pressures preclude the achievement of good status (e.g. navigation, coastal defence) in heavily modified water bodies (HMWBs), the WFD provides that an alternative objective of "good ecological potential" is set. Groundwater waterbodies are included in the WFD and are assessed on quantitative and chemical status. There is also a general "no deterioration" provision to prevent decline in status.

To support the planning and marine licence application, a WFD Compliance Assessment has been prepared to determine whether the Proposed Development complies with the objectives of the WFD. This was undertaken in two stages; firstly, the potential for the works to cause a 'deterioration' or failure of the water body to meet its WFD objectives was reviewed in a WFD screening and scoping exercise. It was considered that the works have the potential to cause a 'deterioration' or failure of the water body to meet its WFD objectives, and further detailed assessment was undertaken. This considered the potential implications of the Proposed Development on the achievement of 'good' status within adjacent WFD water bodies. This information is provided as a technical appendix to the ES (Appendix L) following the format specified in the latest 'Clearing the Waters for All' guidance by the Environment Agency, and NRW internal guidance "OGN72: Guidance for assessing activities and projects for compliance with the WFD".

## 4.6 Environmental Permit

Flood risk activities are now regulated under environmental permits (previously flood defence consents) under the Environmental Permitting (England and Wales) Regulations 2016. Flood risk activity permits are required for works in, over, under or near a main river or flood defence (including a sea defence), or within a flood plain. This is to ensure activities do not cause a risk of flooding, make existing flood risk worse, or interfere with flood risk management assets.

Exclusions for a flood risk activity permit include circumstances when an application has been made for a marine licence. NRW will provide comments on flood risk matters as part of the marine licence application and relevant conditions will be included in the marine licence where appropriate. The coast protection and flood defence assessment (Section 10) considers the potential changes to coastal protection as a result of the Proposed Development and provides the necessary information in support of an FCA.

## 4.7 Protected Species

Various species of animal are protected from being killed, injured or disturbed under provisions in the Habitats Regulations and Section 9(4) and Schedule 5 of the Wildlife and Countryside Act 1981 (as amended). These include cetaceans, turtles, basking sharks, otters and bats.

In particular, Regulation 43 of the Habitats Regulations makes it an offence to deliberately disturb wild animals of any such species (i.e. European Protected Species) in such a way as to be of likely significance:

- To impair their ability:
  - To survive, to breed or reproduce, or to rear or nurture their young; or
  - In the case of animals of a hibernating or migratory species, to hibernate or migrate; or
- To affect significantly the local distribution or abundance of the species to which they belong.

Section 9(4) of the Wildlife and Countryside Act (WCA) 1981 (as amended) makes it an offence to intentionally or recklessly disturb dolphins, whales or basking sharks subject to a defence that the act was the incidental result of a lawful operation and could not reasonably have been avoided. Natural England and Countryside Council for Wales (CCW, predecessor to NRW) produced detailed guidance on the application of these provisions in 2007.

The Environment Act (Wales) 2016 also requires<sup>27</sup> that Welsh Ministers publish, review and revise lists of living organisms and types of habitat in Wales, which they consider are of key significance to sustain and improve biodiversity in relation to Wales. This is known as the Section 7 list. This includes *Sabellaria alveolata* reefs (S7 habitat), Lowland Meadows (S7 habitat), Maritime Cliffs and Slopes (S7), Otter (S7 species), four species of reptile (all S7 species) and several species of bat (some S7) which have been recorded in the vicinity of the Proposed Development.

Under Section 6 Environment Act (Wales) 2016 a duty is also placed on public authorities to 'seek to maintain and enhance biodiversity' so far as it is consistent with the proper exercise of those functions. In so doing, public authorities must also seek to 'promote the resilience of ecosystems'.

At Hafan y Môr Holiday Park there are several species on site (otter, bat, reptiles and breeding birds) that are protected under EU and/or UK legislation, or for which Section 7 of the Environment (Wales) Act 2016 places a duty on Welsh ministers to enhance and maintain. Impacts to these species will need to be either avoided or mitigated satisfactorily. Further details about these species are presented in Sections 8 and 9.

## 4.8 Well-being and Future Generations (Wales) Act

The Well-being of Future Generations (Wales) Act became law in April 2015 and is concerned with improving the social, economic, environmental and cultural well-being of Wales. It requires public bodies to consider the long-term issues, work better with people and communities and each other, look to prevent problems, and take a more joined-up approach. To help public bodies achieve the same vision, the Act puts in place seven well-being goals. Linked to the goals, a set of National Indicators that was laid before the National Assembly for Wales as required under Section 10 of the Well-being of Future Generations Act (Wales) 2015, to help measure whether the goals are achieved.

The Resilient Wales goal of the Well-being of Future Generations (Wales) Act is "*to maintain and enhance a biodiverse natural environment with healthy functioning ecosystems that support social, economic and ecological resilience and the capacity to adapt to change*". The Proposed Development is expected to meet many aspects of this goals by combining environmental and ecological resilience with social, human health and economic gains (see Sections 2 and 3).

## 4.9 Land Ownership Permission

The Crown Estate own the seabed below MHWS out to 12 nautical miles. Therefore, permissions from The Crown Estate must also be obtained. The area comprising the landside works are owned by Haven Leisure Ltd.

<sup>27</sup> Replacing relevant duties in the Natural Environment and Rural Communities Act 2006 (NERC Act 2006)

## 4.10 Shoreline Management Plan

Shoreline Management Plans (SMPs) are non-statutory documents intended to both inform and be supported by the statutory planning process. They provide a large-scale assessment of the risks associated with coastal evolution and present a policy framework to address these risks to people and the developed, historic and natural environment in a sustainable manner. They assess the likely changes over the next 100 years, taking account of the condition of existing defences. The intention of an SMP is to develop a broad coast defence strategy that is technically, economically and environmentally sustainable.

Section 4. Coastal Area D of the east of Wales SMP covers the Proposed Development site (Royal Haskoning, 2011). The Hafan y Môr Holiday Park foreshore, and the railway frontage east of the Afon Wen, experience gradual but persistent erosion (Royal Haskoning, 2011). The SMP policy for the section of beach fronting the Hafan y Môr Holiday Park where the Proposed Development is located is 'no active intervention'<sup>28</sup> (NAI) over the next 100 years (see Figure 4).

In their Scoping Opinion, NRW raised concerns over whether the Proposed Development was in keeping with the SMP policy of NAI. This is summarised in Section 5.1.1. The Cardigan Bay Coastal Group and Welsh Coastal Groups Forum has subsequently confirmed that the proposed coastal development would be regarded as NAI for this section of coastline. This concurs with earlier advice received from Gwynedd Council and is in line with Haven Leisure Ltd.'s expectations because (as set out in the Scoping Report) the NAI policy does not preclude the maintenance of existing private defences along the site frontage subject to the usual consents being obtained.

In this case, such intervention is required to secure the long-term future for the Hafan y Môr Holiday Park, as well as achieve the benefits for site amenity and access safety (as described in Sections 2 and 3). The influence and relevance of the SMP policy is also reviewed further in the coastal defence technical review in Appendix D.

## 4.11 Relevant Local Plans

The Gwynedd Destination Management Plan 2013-2020 aims to enhance the natural, built and cultural environment, to improve the quality of the visitor experience, and to provide well paid, year-round quality jobs and skills development. The Proposed Development and enhancement of the Hafan y Môr Holiday Park will reinforce the site's contribution to the local economy by supporting the tourism sector and jobs (see Section 3.1.1).

The Anglesey and Gwynedd Joint Development Plan (JLDP) states that tourism provides an important source of income to several towns and rural communities in the form of visitor spending on accommodation, food, drink, leisure activities and shopping, and also to local business supply chains and wholesalers. Tourism brings over £851 million into Gwynedd (including Snowdonia National Park) each year and supports nearly 16,000 local jobs. The JLDP further records that "6.3.30 Gwynedd Council's key aim is to seek to ensure a geographical spread of employment opportunities. The rural economy has an important role in the area in terms of the agricultural sector, tourism and small rural businesses."

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<sup>28</sup> The SMP policy for the coastline to the east of the Afon Wen to the Afon Dwyfor is 'hold the existing defence line' (Environment Agency, 2018) for protection of the railway line becoming Managed Realignment at 50 years

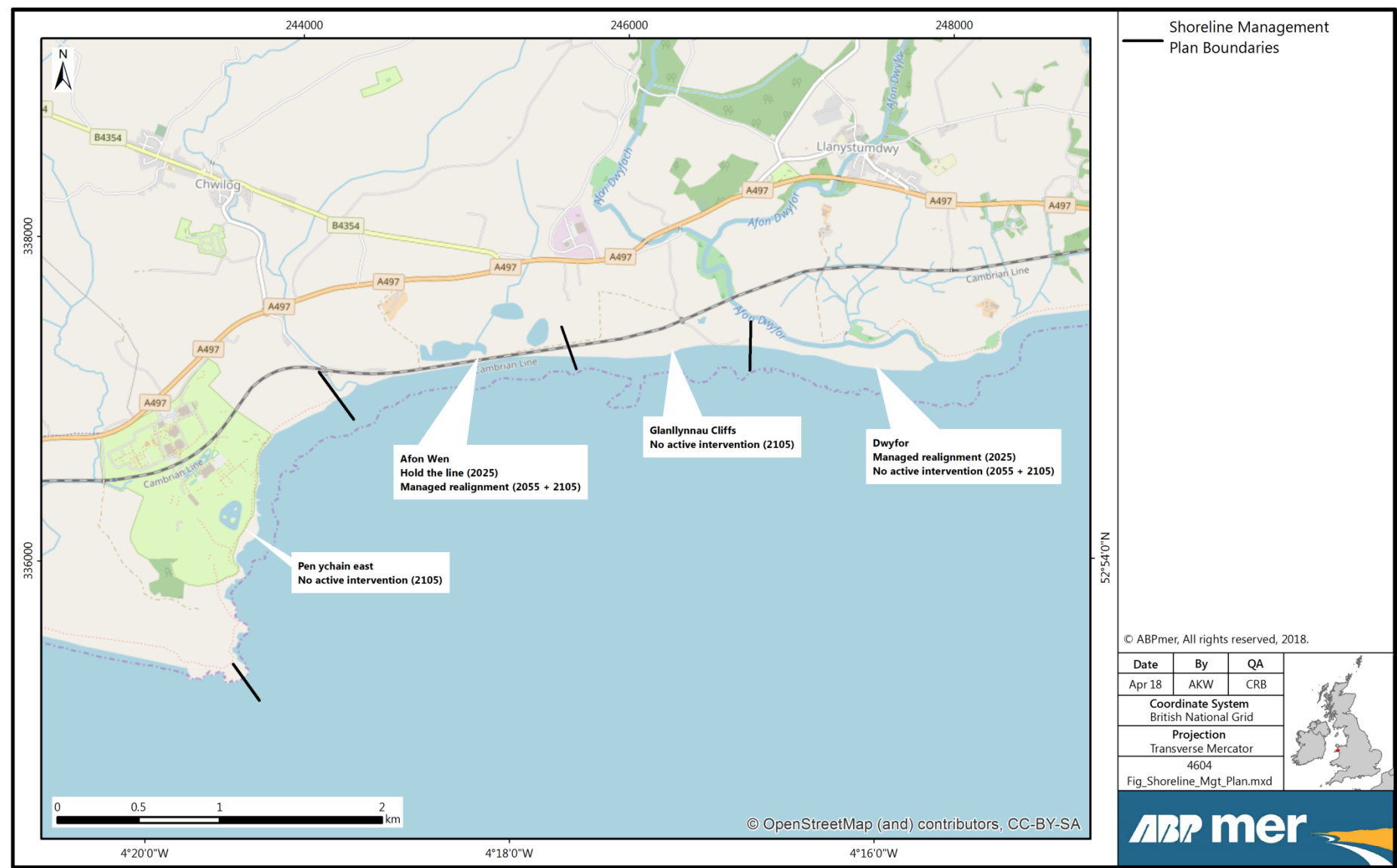


Figure 4. Shoreline management plan policies for Hafan y Môr Holiday Park and surrounding frontage areas

The industry in the area is characterised by water-sports and recreational boat use and is dependent on the holiday and caravan parks along the coast. In this context, the Hafan y Môr Holiday Park plays a valuable role (see Section 3.1.1).

The coastal defence work and the amenity value they will provide are expected to play a major role in improving the site and its attractiveness to visitors in keeping with local planning objectives.

## 4.12 Construction Environmental Management Plan

A CEMP will be provided to NRW and Gwynedd Council as a licence condition following the submission of the planning and marine licence application and prior to works commencing. This plan will present the final design of the Proposed Development and include a detailed construction methodology.

The potential impact of the Proposed Development on any sensitive receptors identified in this ES will be taken fully into account in the CEMP. Environmental management best practice (see Section 2.10) will be set out in accordance with all relevant guidance and any associated legislation, as well as any specific mitigation measures (see Section 0).

## 4.13 References

HM Government (2011). UK Marine Policy Statement [Online] Available at: [https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment\\_data/file/69322/pb3654-marine-policy-statement-110316.pdf](https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69322/pb3654-marine-policy-statement-110316.pdf) (accessed June 2018).

Royal Haskoning (2011). West of Wales Shoreline Management Plan 2 Section 4. Coastal Area D. Reference: 9T9001/RSection 4CADv4/303908/PBor.

## 5 Impact Assessment Approach

### 5.1 Impact assessment scope

#### 5.1.1 Scoping and consultation

The Scoping Opinions from Gwynedd Council and NRW, along with responses from various consultees, detailed the matters to be addressed and included in the ES. A summary of the comments received to date from statutory consultees is included in Table 2.

Following the Scoping Opinions, a meeting with NRW was held on 2 May 2019 to discuss the Proposed Development and particularly to review a number of key issues within their Scoping Opinion (see Appendix B), as well as NRW's advice underpinning Gwynedd Council's Scoping Opinion. The main focus for the discussions was the coastal defence component of the Proposed Development and, in summary, the topics reviewed were:

- Interpretation and implications of the existing SMP policy wording for the frontage;
- Identification of alternatives that satisfy the Proposed Development objectives;
- Consideration of the areas that lie within the Pen Llŷn a'r Sarnau SAC but are above the MHWS level or have a low quality 'rubble' composition;
- Initial examination of potential mitigation and compensation options available to comply with developments within the Pen Llŷn a'r Sarnau SAC (noting influence of recent HRA case law);
- Analytical work already completed to define Proposed Development effects on coastal processes and explore whether there are any specific presentations of study results that would assist the Regulators in their assessment of the proposal.

Following the 2 May 2019 meeting, and as agreed actions arose, further pre-application advice was sought from NRW regarding the HRA process and the details of the numerical modelling study that was undertaken to inform the design of the coastal defences and understand the implications for coastal processes (Appendix C). A summary of this further advice from NRW is included in Table 3.

In addition, formal advice was also obtained from NRW as part of the Pre-Application consultation process that was undertaken in November 2019. This letter and subsequent dialogue with NRW addressed some key topics which can be summarised as follows:

- **Compensation:** NRW identified (if required) intertidal habitat compensation measures in the form of shingle restoration to the east of the coastal defences. These measures have been included in this revised version of the EIA and HRA;
- **Marine Origin Sediment Re-use:** A plan for re-using marine origin sediment that is excavated within the footprint of the coastal defences was identified and discussed with NRW. This plan has been included in this revised version of the EIA and HRA. A map of this plan is now included as Figure 3 (**Requirement 1**);
- **Marine Ecology Reporting and early revision to the scheme design:** NRW asked whether the Appendix E report (marine baseline survey) could/should be updated as it contains old coastal defence design details. This issue is understood but no changes have been made as the report is already completed and it is also thought valuable to explain how early scheme design were considered and later rejected. However, text has been included in this EIA to clarify the changes made since this report was produced. Also, with the new defence design, the defences are 150 m away from *Sabellaria* spp. (whereas in the original/superseded design they were only 30 m away);

- **Request for further details to be included in a CEMP.** NRW set out a range of details that are to be included in the conditioned pre-development CEMP. These include more details about the sand, gravel and rock to be imported for use in the coastal defences. This information will be provided in the CEMP and will include details of the proposed monitoring programme and flood risk management scheme (**NRW Conditions 1 to 3**); and **Need for a wave overtopping assessment.** NRW identified that wave overtopping assessment was required and this has been completed and is included at the end of Appendix D (**NRW Requirement 2**).

Following this focussed consultation with NRW, the latest agreed position on a number of key issues are described in the following sub-sections.

### SMP policy

NRW stated it is important that projects are in keeping with the SMP policy, and that in doing so makes the approval process more straightforward. In the Scoping Opinion, it was suggested that the SMP policy for this section of coastline be changed from NAI to Hold the Line (HTL). However, following further consultation with both NRW and the Cardigan Bay Coastal Group, it was agreed that a policy of NAI is the preferred policy and allows Haven Leisure Ltd. to carry out necessary works which are anticipated to provide value to the local economy. The necessary evidence to support an alternatives review and outline IROPI case (that would ordinarily have been included in the SMP documents in the case of HTL) is provided in Section 3, as well Appendix K.

### Marine ecology and SAC

The coastal defences intrude into the Pen Llŷn a'r Sarnau SAC boundary and specific efforts have been made to minimise this intrusion (including reducing project scale from initial design options and also innovatively recessing the defences into the shoreline as explained above and confining it to the more depauperate habitat areas at the very top of the shoreline.

The boundary of the Pen Llŷn a'r Sarnau SAC was discussed and NRW noted that it followed the MHWS line to the west (toe of rock armour) and extended landward of the MHWS to the east (including low quality 'rubble'). The boundary to the east was selected to follow the 'hard mark' at the top of the shore in recognition of the fact that this shoreline was eroding. NRW consider the interest features of the Pen Llŷn a'r Sarnau SAC that have the potential to be affected are sandflats and inlets/bays. However, there was initial uncertainty from NRW about whether the footprint of the Pen Llŷn a'r Sarnau SAC was only the sandflat interest features or whether it was the whole area seaward of the SAC line which includes barren courses of sediment and rubble (as well as sandflat). It has since been confirmed with NRW that the direct footprint of the Proposed Development are those areas that lie on intertidal sandflat habitat. As such, any assessment of the effects under the Habitat Regulations will need to focus on the effects on this habitat specifically and the conservation objectives that have been developed for this habitat.

### Site integrity and scale of direct impact

During the meeting on 2 May, NRW discussed the subject of site integrity effects in the light of recent case law. In particular, NRW clarified its position which is to not adopt a "*de minimis* approach" for such judgements (which might allow some small-scale effects in some cases subject to evidence) but instead deem any effect however small to be an effect on the integrity of the designed sites. On this basis that a *de minimis* approach will not be applied there is expected to, inevitably, be a judgement from NRW that there is an effect on the integrity of the Pen Llŷn a'r Sarnau SAC will arise from the coastal defence

works. Based on the proposed design, the footprint of the works will cover 1,542 m<sup>2</sup> (0.15 ha) of this sandflat habitat<sup>29</sup>.

The extent of sand import, and the possibility of any further reduction in the footprint, was also assessed through a geotechnical field survey undertaken in September 2019. This survey has shown that the sub-surface sediment is mainly silty clay. This will therefore need to be excavated to create a stable beach area. Had there been a deeper layer of sand this excavation would not have been needed. This layer of silty clay will be excavated to a depth of 1.5 m and is proposed to be used within the hinterland landscaping.

The effects of the existing timber groynes on the adjacent foreshore is minor. This is due to their dilapidated condition, their location and their alignment.

### Compensation

Requirements to compensate for the loss of habitat as a result of the Proposed Development were discussed with NRW. It was noted that compensation should ideally be as close to the area of loss as possible and of a comparable habitat to that which would be lost. It was concluded that there were opportunities for compensation within the development footprint (recessed areas) as well as in an area at the top of the shore just to the east of the defences where enhancements could be introduced.

At the top of the shore, there is currently a surface layer of exposed shingle which includes imported rock and demolition hardcore. This introduced material provides a rudimentary coastal protection function. It has been agreed with NRW (following the PAC process) that compensation for the loss of SAC habitat beneath the footprint of the works would therefore involve removal of this rubble within the shingle to enhance the quality of this habitat (see NRW letter dated 3 December 2019 in Appendix B). This shingle restoration area will cover a 2,493 m<sup>2</sup> area of shingle to the east of the defences as shown in Figure 3.

In addition, and as also guided by NRW (and described in Section 2.7) any suitable material of marine origin within the footprint of the coastal defence work that needs to be excavated during construction will be reused within the marine zone and not removed from the site. This suitable sediment will include coarser-grained sands and shingle (see Section 2.7).

It had originally been thought that other measures might be needed and that there would be a requirement to relax and retreat the small soft maritime cliff edge feature in this location. However, given the scale of the anticipated effects such extra measures are not considered to be needed. It is also noted that bee and wasp fauna of County importance are associated with these soft-rock cliffs (no Nationally Scarce, Nationally Rare or Section 7 listed aculeate species were encountered during the survey). Reptile populations and semi-improved lowland meadow grassland (S7) was found along field edge above cliffs. Furthermore, the soft maritime cliff habitat itself is a priority habitat listed under Section 7 of Environment (Wales) Act 2016. For these reasons and, given that it is not likely to be necessary for delivering compensation, it is thought best not to substantially alter this cliff face (although the implementation of a management plan is proposed for soft maritime cliff and associated aculeate fauna).

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<sup>29</sup> Noting NRW's *de minimis* position (as recorded above) this is a small fraction of the 3,358 ha of this habitat across the SAC.

**Table 2. Summary of consultee comments and actions undertaken in ES**

| Consultee         | Topic                          | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Action/Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Section of the ES                             |
|-------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| NRW <sup>30</sup> | General                        | An NTS should be provided in the ES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | An NTS is provided with this ES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Before contents page.                         |
|                   |                                | The ES must include all the information set out in Schedule 3 and regulation 12 of the Marine Works (Environmental Impact Assessment) (Amendment) Regulations 2017.                                                                                                                                                                                                                                                                                                                                                             |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Section 4.3.                                  |
|                   |                                | A summary of those topics assessed, scoped in or scoped out must be included within the ES.                                                                                                                                                                                                                                                                                                                                                                                                                                     | A summary is provided of the issues scoped in and out of the EIA, along with responses to the Scoping Opinion provided by NRW and Gwynedd Council.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               | Section 5.1.2.                                |
|                   |                                | An HRA and WFD should be submitted separately with the application (with information to inform these assessments in the ES).                                                                                                                                                                                                                                                                                                                                                                                                    | These separate assessments have been undertaken and are included within the ES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Sections 4.4, 4.5, Appendix K and Appendix L. |
|                   | Legislative and policy context | In preparation for the adoption of the WNMP, it is recommended that any EIA undertaken reviews the contents of the draft WNMP, and the ES considers how the project complies with the draft Policies, or the final policies once the plan is adopted.                                                                                                                                                                                                                                                                           | A review of the final WNMP, and relevant policies is presented. A description on how the Proposed Development complies with these policies is provided.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Sections 3.1 and 4.2.                         |
|                   | Coastal processes              | The following should be considered in the EIA: littoral drift; coastal squeeze; morphological change of the foreshore; direct footprint impacts; beach recycling and recharge; hydrodynamic changes; sediment characteristics of imported material; removal of sediment from foreshore to be used in construction; impacts of ground preparation on underlying geology (and features of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI); climate change, sea level rise scenarios and the design lifetime of the project. | <p>Morphological change of the foreshore, beach recycling and recharge, hydrodynamic changes and littoral drift are considered within Impact Pathway 1.</p> <p>Sediment characteristics of imported material is detailed in the construction methodology.</p> <p>Coastal squeeze, climate change, sea level rise scenarios and the design lifetime of the Proposed Development are considered within Impact Pathway 2.</p> <p>direct footprint impacts, removal of sediment from foreshore to be used in construction and impacts of ground preparation on underlying geology (and features of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI) are considered within Impact Pathway 3.</p> | Sections 2.7 and 6.3.                         |

<sup>30</sup> In their scoping opinion, NRW permitting service consulted with various consultation bodies, including NRW Technical Experts, Maritime and Coastguard Agency (MCA), Royal Yachting Association (RYA), Trinity House Lighthouse Service (THLS), and Gwynedd Council (biodiversity).

| Consultee | Topic                      | Comment                                                                                                                                                                                                                                                                                       | Action/Response                                                                                                                                                            | Section of the ES           |
|-----------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|           |                            | Particular attention should be given to the infrastructure to the east of the project and any likely accelerated erosion of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI.                                                                                                             | This issue is considered further in Impact Pathways 1 and 11.                                                                                                              | Section 6.3 and 8.3.        |
|           |                            | NRW suggests the applicant considers applying to the Cardigan Bay Coastal Group for a change of SMP2 policy from 'No Active Intervention'(NAI) to 'Hold the Line' (HTL).                                                                                                                      | The Cardigan Bay Coastal Group and Welsh Coastal Groups Forum have confirmed that the proposed coastal development would be regarded as NAI for this section of coastline. | Sections 4.10 and 5.1.1.    |
|           |                            | An assessment of coastal squeeze is required, to support the 'set back' of the defence line, and to inform the project level HRA.                                                                                                                                                             | Coastal squeeze is assessed under Impact Pathway 2.                                                                                                                        | Section 6.3.                |
|           |                            | Regarding the footprint of works, sediments which are removed should remain within the marine system if they are of marine origin. Any potential for landward retreat should be assessed in relation to the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI in terms of direct habitat loss. | These issues are considered further under Impact Pathway 7 and Impact Pathway 11.                                                                                          | Section 8.3.                |
|           |                            | The ES must provide further information on the future recycling and management of sediments, noting that 18,000 m <sup>3</sup> of recharge seems to be relatively small given scale of works.                                                                                                 | The latest available information on this aspect is provided in the Project Description and Methodology section of the ES.                                                  | Sections 2.7 and 2.8.       |
|           |                            | The sufficiency of information to support the hydrodynamic model should be reviewed by NRW to confirm further field survey work is not required (bathymetry extent, sediment sample locations, wave data, tide data, ground investigation data).                                              | No action.                                                                                                                                                                 | N/A                         |
|           |                            | For the purposes of climate change data use clarification regarding whether the applicant intends to use UKCP18 for climate change scenarios is required.                                                                                                                                     | UKCP18 predictions have been used to inform the baseline description of the physical and coastal processes chapter.                                                        | Section 6.2.                |
|           |                            | Further detail is required on how it is intended to assess anticipated changes to hydrogeomorphology.                                                                                                                                                                                         | This is considered within Impact Pathway 1.                                                                                                                                | Section 6.3.                |
|           | Water and sediment quality | The WFD must consider all activities carried out, the zone of influence, short term effects (< 6 years) or non-temporary/permanent change, and relevant guidance particularly NRW OGN72.                                                                                                      | This has been taken account of within the water and sediment quality chapter and the WFD compliance assessment.                                                            | Section 7 and Appendix L.   |
|           |                            | Activities that may lead to modification of the Tremadog coastal water body should be assessed against the WFD's environmental objectives.                                                                                                                                                    | This has been considered within Impact Pathway 5 and the WFD compliance assessment.                                                                                        | Section 7.3 and Appendix L. |
|           |                            | The following impact pathways from the construction of the groynes should be considered in the WFD: sediment disturbance and potential release of contaminants; permanent loss of intertidal habitat and species; and                                                                         | This has been considered within the WFD compliance assessment.                                                                                                             | Appendix L.                 |

| Consultee | Topic                                  | Comment                                                                                                                                                                                                                                                                                           | Action/Response                                                                                                                                                                                                 | Section of the ES                    |
|-----------|----------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------|
|           |                                        | alteration to hydrodynamics and obstruction to natural sediment transport pathways should be considered in the WFD.                                                                                                                                                                               |                                                                                                                                                                                                                 |                                      |
|           |                                        | The applicant will need to consider measures and best practices that will need to be adopted to minimise the risk of pollution incidents – this may be presented in the proposed CEMP.                                                                                                            | This has been considered within Impact Pathway 3 and the WFD compliance assessment.                                                                                                                             | Section 7.3 and Appendix L.          |
|           | Ecology and nature conservation        | Any EIA produced will need to fully consider impacts to the habitat, species and geological features of Pen Llŷn a'r Sarnau / Llyn Peninsula and the Sarnau SAC and the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI.                                                                         | This has been considered within Impact Pathways 1, 6, 7, 8, 9 and 11 and the Appropriate Assessment Information Report.                                                                                         | Sections 6.3 and 8.3 and Appendix K. |
|           |                                        | Impacts listed under coastal and physical processes should be considered in the context of protected sites.                                                                                                                                                                                       | This has been considered within Impact Pathway 8 and the Appropriate Assessment Information Report.                                                                                                             | Section 8.3 and Appendix K.          |
|           |                                        | The impacts on coastal processes and specifically the impact of the groynes and recharge of beaches must be assessed due to potential effects on the <i>Sabellaria alveolata</i> reefs which occur to the East of the development.                                                                | This has been considered within Impact Pathway 8.                                                                                                                                                               | Section 8.3.                         |
|           |                                        | The ES must assess the potential impacts to all bird species that frequent the area (in addition to those described in Scoping Report), and mitigate if necessary.                                                                                                                                | This has been considered within Impact Pathways 10 and 21.                                                                                                                                                      | Sections 8.3 and 9.4.                |
|           |                                        | A biosecurity risk assessment to reduce the risk of introducing INNS should be undertaken and included within the CEMP.                                                                                                                                                                           | The potential risks of introducing non-native invasive species as a result of the Proposed Development are considered within Impact Pathway 22. A Biosecurity Plan will be prepared and included within a CEMP. | Sections 2.10, 4.12 and 9.4.         |
|           |                                        | Loss of part of the woodland in Parcel B should be assessed as part of the in-combination assessment with planning application C18/0618/40/LL.                                                                                                                                                    | An assessment of the loss of woodland has been undertaken. The current status of the extant 2011 consent is considered in the cumulative and in-combination assessment.                                         | Section 9.4 and 11.2.                |
|           | Fish and fisheries                     | NRW agree to scope out of further assessment, as per Scoping Report.                                                                                                                                                                                                                              | No action.                                                                                                                                                                                                      | N/A                                  |
|           | Commercial and recreational navigation | Any marking requirements, or changes to the existing markings must be confirmed with Trinity House on receipt of a Marine Licence application.                                                                                                                                                    | Any marking amendments will be confirmed with Trinity House as required.                                                                                                                                        | N/A                                  |
|           | Archaeology (cultural heritage)        | NRW did not receive comments from relevant archaeological bodies.                                                                                                                                                                                                                                 | No action.                                                                                                                                                                                                      | N/A                                  |
|           | Coast protection and flood defence     | Landward re-alignment of the foreshore and the installation of groynes can interfere with long shore drift. As such there could be an impact on erosion rates on adjacent areas of the coast. A Flood Consequences Assessment (FCA) must be undertaken to ensure the works do not have a negative | This has been considered within Impact Pathways 1 and 26.                                                                                                                                                       | Sections 6.3 and 10.3.               |

| Consultee       | Topic                                 | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Action/Response                                                                                                                                                                                                                                                                       | Section of the ES       |
|-----------------|---------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------|
|                 |                                       | impact on the existing flood regime or on the erosion rates of any adjacent areas.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |                                                                                                                                                                                                                                                                                       |                         |
|                 |                                       | The possibility of culverting over the watercourse to the south of the existing/proposed sewage treatment works (outside the consented boundary) to potentially gain 1 no. extra unit is against Gwynedd Council's Culverting Policy.                                                                                                                                                                                                                                                                                                                                      | This extra unit has been removed from the design in response to this advice.                                                                                                                                                                                                          | N/A                     |
|                 | Transport and access                  | NRW agree to scope out of further assessment, as per Scoping Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No action.                                                                                                                                                                                                                                                                            | N/A                     |
|                 | Airborne noise and vibration          | NRW agree to scope out of further assessment, as per Scoping Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No action.                                                                                                                                                                                                                                                                            | N/A                     |
|                 | Air quality                           | NRW agree to scope out of further assessment, as per Scoping Report.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | No action.                                                                                                                                                                                                                                                                            | N/A                     |
|                 | Infrastructure and other marine users | If any material for construction or deposit (i.e. aggregate) is to be transported by sea, the operation must consider potential impacts to navigation in the area. Pwllheli marina must be made aware of the works prior to commencement.                                                                                                                                                                                                                                                                                                                                  | No material will be brought to the Proposed Development site by sea. Therefore, this issue is not considered further in the ES.                                                                                                                                                       | N/A                     |
|                 |                                       | Safety risks to beachgoers such as swimmers, windsurfers, jet skis etc. should be considered. Whilst the works are taking place, suitable arrangements and controls should be considered to prevent possible hazards to them, including notification of HM Coastguard and local RNLI as this may impact beach access.                                                                                                                                                                                                                                                      | Any risks to the public during construction will be managed through adherence to good construction practice and measures outlined in the CEMP. The CEMP will be submitted to NRW and Gwynedd Council prior to works commencing following detailed design of the Proposed Development. | Sections 2.10 and 4.12. |
|                 | Accidents or natural disasters        | The vulnerability of the project to major accidents or natural disasters should be provided in the ES.                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | This topic is scoped in to the EIA and is considered in the context of coast protection and flood defence. This is because the effects on coastal protection is regarded as the only impact pathway that the Proposed Development relates to natural disasters.                       | Section 10.3.           |
| Gwynedd Council | General                               | <p>The essential planning issues are:</p> <ul style="list-style-type: none"> <li>Physical and coastal processes;</li> <li>Water and sediment quality;</li> <li>Ecology and nature conservation;</li> <li>Coast protection and flood defence;</li> <li>Landscape/seascape and visual impact;</li> <li>Transport and access; and</li> <li>Impact of development on public and residential amenity.</li> </ul> <p>However, the last three subjects do not have to form part of the EIA and can be submitted as standalone statements as part of the planning application.</p> | These topics are considered in the respective impact assessment chapters of the ES. The latter three topics are dealt with as standalone appraisals.                                                                                                                                  | Sections 6 to 9.        |

| Consultee                      | Topic                              | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                 | Action/Response                                                                                                                                                                                                                                                               | Section of the ES                                                            |
|--------------------------------|------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------|
|                                |                                    | Section 38(6) of the Planning and Compulsory Purchase Act 2004 and Planning Policy Wales emphasises that applications should be determined in accordance with the Development Plan, unless material planning considerations dictate otherwise. Material planning considerations include National Planning Policy and guidance and the relevant policies contained within the fully adopted Anglesey and Gwynedd Local Development Plan. | A review of relevant local plans, and relevant policies is presented. A description on how the Proposed Development complies with these policies is provided.                                                                                                                 | Sections 3.1 and 4.11, and in the Planning Statement prepared by Lichfields. |
|                                |                                    | Detailed technical information / assessments that support the topics covered should be included in the appendices rather than in the ES                                                                                                                                                                                                                                                                                                 | Detailed information in support of the assessment of topics is provided in appendices as appropriate                                                                                                                                                                          | Appendices                                                                   |
|                                | Physical and coastal processes     | As per NRW comments.                                                                                                                                                                                                                                                                                                                                                                                                                    | See above.                                                                                                                                                                                                                                                                    | See above.                                                                   |
|                                | Water and sediment quality         | As per NRW comments.                                                                                                                                                                                                                                                                                                                                                                                                                    | See above.                                                                                                                                                                                                                                                                    | See above.                                                                   |
|                                | Ecology and nature conservation    | As per NRW comments.                                                                                                                                                                                                                                                                                                                                                                                                                    | See above.                                                                                                                                                                                                                                                                    | See above.                                                                   |
|                                |                                    | There are several Candidate Wildlife Sites within or adjacent to the proposed project and the impact on these should be considered.                                                                                                                                                                                                                                                                                                     | This has been considered within Impact Pathway 12.                                                                                                                                                                                                                            | Section 9.4.                                                                 |
|                                | Coast protection and flood defence | As per NRW comments.                                                                                                                                                                                                                                                                                                                                                                                                                    | See above.                                                                                                                                                                                                                                                                    | See above.                                                                   |
| Gwynedd Council – biodiversity | Ecology and nature conservation    | The EIA should follow guidelines produced by CIEEM.                                                                                                                                                                                                                                                                                                                                                                                     | The assessment also follows the principles of relevant guidance, including IEMA guidelines, and the latest CIEEM guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (CIEEM, 2018). | See Section 5.2.                                                             |
|                                |                                    | Terrestrial and marine habitat surveys should be undertaken, with maps showing extent and coverage. Habitats listed under Section 7 of the Environment Act (Wales) should be identified and predicted area that would be lost or damaged permanently or temporarily.                                                                                                                                                                    | A number of terrestrial and marine habitat surveys have been undertaken to inform the baseline description for these respective topics.                                                                                                                                       | Sections 8.2 and 9.3.                                                        |
|                                |                                    | Protected species surveys should be undertaken at appropriate times of year. Consideration is required for otter associated with the Pen Llŷn a'r Sarnau SAC, and reptiles found at Hafan y Môr.                                                                                                                                                                                                                                        | A number of protected species surveys have been undertaken to inform the baseline description for the marine and terrestrial ecology topics.                                                                                                                                  | Sections 8.2 and 9.3.                                                        |
|                                |                                    | Species listed under Section 7 of the Environmental Act (Wales) 2016 should be included in the assessment.                                                                                                                                                                                                                                                                                                                              | Species listed under Section 7 of the Environmental Act (Wales) 2016 have been considered in Impact Pathways 13 and 15.                                                                                                                                                       | Section 9.4.                                                                 |
|                                |                                    | Several Wildlife Sites located within and adjacent to the project should be considered.                                                                                                                                                                                                                                                                                                                                                 | These have been considered within Impact Pathway 12.                                                                                                                                                                                                                          | Section 9.4.                                                                 |

| Consultee          | Topic                                            | Comment                                                                                                                                                                                                                                                                                                                                                                                | Action/Response                                                                                                                    | Section of the ES     |
|--------------------|--------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
|                    |                                                  | The EIA should include information to inform an HRA on the impacts to the Pen Llŷn a'r Sarnau SAC.                                                                                                                                                                                                                                                                                     | This has been provided in an Appropriate Assessment Information Report.                                                            | Appendix K.           |
|                    |                                                  | The proposal should incorporate measures to enhance biodiversity.                                                                                                                                                                                                                                                                                                                      | These have been considered as part of the terrestrial mitigation strategy for the Proposed Development.                            | Sections 0 and 9.5.   |
|                    |                                                  | Information should be provided to enable an assessment of ecosystem resilience in accordance with Section 6 of the Environment Act (Wales) 2016. This includes information on: diversity between and within ecosystems; connections between and within ecosystems; scale of ecosystems; condition of ecosystems (including structure and functioning); and adaptability of ecosystems. | This information is provided in the baseline description of the marine and terrestrial ecology topics.                             | Sections 8.2 and 9.3. |
| Network Rail       | Infrastructure and other marine users            | Section to be added to the ES to demonstrate that the railway infrastructure will not be compromised and be adequately protected.                                                                                                                                                                                                                                                      | This has been considered as part of the coast protection and flood defence assessment.                                             | Section 10.           |
| Interested parties | Archaeology                                      | There may be a future requirement for archaeological mitigation (e.g. in connection with the 'Old Stables' and coastal defence works).                                                                                                                                                                                                                                                 | The proposal to develop the Old Stables Area has been withdrawn from the plan to avoid cultural heritage and environmental damage. | N/A                   |
|                    | Infrastructure and other marine users (highways) | The development is not considered to have an adverse effect on any highway, or proposed highway.                                                                                                                                                                                                                                                                                       | No action.                                                                                                                         | N/A                   |
| Dwr Cymru          | Infrastructure and other marine users            | No comments.                                                                                                                                                                                                                                                                                                                                                                           | No action.                                                                                                                         | N/A                   |

**Table 3. Summary of NRW further comments and actions undertaken in ES<sup>31</sup>**

| Topic                     | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Action/Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Section of the ES           |
|---------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| Numerical modelling study | From an environmental perspective the smallest footprint into the marine environment possible is advised.                                                                                                                                                                                                                                                                                                                                                                          | It is a fundamental principle of the design to achieve the smallest marine environmental footprint while meeting the project objectives. The scale of the project from initial design options has been reduced and the innovative approach of recessing the defences into the shoreline has minimised the direct overlap with the Pen Llŷn a'r Sarnau SAC boundary and confined it to the poorer quality areas at the very top of the shoreline.                                                                                                                                                                                                                                                                                                                                                                                                                       | Section 2.6.                |
|                           | NRW consider the resolution of the models to be adequate for assessment.                                                                                                                                                                                                                                                                                                                                                                                                           | Noted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | N/A                         |
|                           | The model is currently an empirical evaluation where nearly all data are based on other models or predicted assessments; water level, flow (tide and wave), wave strength and direction, PSA (0.2 mm constant). Currently the only actual data to be inputted into the model is bathymetry. NRW has concerns over this approach. If the design is being based on the modelled data, the scheme could be over-engineered and not properly understood if a coarse approach is taken. | The modelling has been used to check and validate the design of the coastal defences but is not the basis for their design. The design is based upon practical experience of relevant schemes carried out and monitored in Wales and England over the last 40 years. Therefore, the design is not driven by the modelling work but reinforced by it.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Appendix C.                 |
|                           | NRW would expect a full spring-neap cycle model run of each scenario as a minimum standard.                                                                                                                                                                                                                                                                                                                                                                                        | A full spring-neap cycle has not been applied in this case (as is typically undertaken in other marine project) in part because the coastal defences lie above the mean high water neap (MHWN) tide elevation. But more importantly, the numerical modelling work has verified that the tide only influence on shoreline behaviour is minimal and that the shoreline only undergoes major change (i.e. major sediment transport movements) when subject to storm activity. The application of a spring / neap cycle of tides is therefore not considered necessary in this particular instance. The selection of an annual extreme event and an event with return period of 35 years is also considered to provide adequate data from which to derive likely sand losses from the Proposed Development and the determination of suitable maintenance during operation. | Section 6.2 and Appendix C. |
|                           | There is currently not enough detail about the PSA which was discovered in the ground investigation works or what is proposed to be placed on site to understand whether what the model is replicating will likely happen. NRW also recommends a sensitivity test is done of varying grain sizes of a similar fraction to understand how sensitive the model is to this parameter.                                                                                                 | PSA details are now available and will be matched to potential sources of imported sand. If there is a significant difference in the PSA results for the indigenous sand and the imported sand then further model runs would be appropriate but present evidence suggests that the PSAs are closely matched and that sensitivity tests will not be needed.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Section 2.7.                |
|                           | It is understood that for wave analysis 18 spectral bins between 90 and 270 degrees were applied, however the results presented simply state a SE and SW condition. NRW would like to understand more fully the wave rose hind cast results compared to the SE and SW forcing within the model. From a crude observation it appears that the dominant wave direction is                                                                                                            | This is a function of the data presentation in the report. To clarify, Figure 12 in Appendix C shows conditions at Site M1 but SSW seen in this case are due to SW events further offshore (e.g. Figure 18 in Appendix C refers to SW and SE and is based on conditions offshore). Even closer inshore SW waves are transformed into waves that approach the defences from the SE.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | N/A                         |

<sup>31</sup>

See also subsequent comments from NRW in their letter dated 3 December 2019 which was provided following the PAC process (see Appendix B)

| Topic | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                 | Action/Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Section of the ES           |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|       | more southerly (SSE and SSW) and clarity is required as to how that would change the modelled results.                                                                                                                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |                             |
|       | NRW understand the service life of the structure being applied for is 20 years and thus a 1:35 year return period has been selected based on guidance (MAFF 2000) as a suitable extreme event to analyse. Whilst NRW understand and agree with this approach, we would recommend a more extreme event to understand the robustness of the scheme (sand losses) and the sensitivity around the resilience given increased storminess we have observed over recent years. | The new recharged beaches will be subject to regular monitoring and additional monitoring after any extreme events following notification from the site manager. Extreme events at the site will be water depth-limited regarding wave height so the difference between a 1 in 35 year return period event and a 1 in 50 year return period event will be small. The duration of storms may vary due to climate change; however, they will also be constrained by the limited time of exposure of the scheme frontage during any tidal cycle. However, if any such events were to occur and cause greater loss of sand from the new beaches then this will be identified rapidly due to daily on-site attendance. If sand has been drawn down the beach, it can be pushed back to restore the beach design profile. If the sand has been dispersed away from the area then new sand can be readily imported from the approved source which is in daily operation all year round. If a maximum import of 1,000 m <sup>3</sup> is taken as an extreme then this can be imported by 50 wagon loads which at two deliveries per hour over 8 hour days of 20 tonnes per load would take three days to deliver. With an extra day to complete the spreading of the new material the work could be completed in a week. Such events, if they occur, are likely to be out of season thereby avoiding disruption to site operation during periods of high occupancy. | Appendix D.                 |
|       | It is apparent that no climate change scenarios have been applied, although the lifetime of the scheme is nominally 20 years, water levels and increased storminess into 2050 should be considered.                                                                                                                                                                                                                                                                     | The Proposed Development adopts a cautious approach to the uncertainties surrounding climate change and sea level rise. This issue is considered further under Impact Pathway 2.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Section 6.3 and Appendix D. |
|       | NRW would recommend a further step in calculating the sand losses. At present it is difficult to understand what is expected annually and then totalled over the course of 20 years; and therefore, how often it is expected (if at all) that recharge may be needed.                                                                                                                                                                                                   | Due to the nature of the scheme, high up on the foreshore, and the location of the site, significant sand transport is only expected to occur at the site under more extreme events that occur at very high tides. Under model typical annual conditions there would be no or very limited transport. Hence, it is not considered necessary to examine the potential losses under more benign conditions. This is considered further under Impact Pathway 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Section 6.3 and Appendix D. |
|       | NRW recommend a conceptual model is developed from the difference plots presented to understand what changes are expected and where would it be expected to see greater scour, accretion and erosion along the newly developed coastline. Points to note are changes in hydrodynamics and sediment transport to the east and the impact of less reflected energy on local habitats.                                                                                     | A conceptual coastal process plan has been prepared to assist NRW in its visualisation of the coastal process effects from the scheme. This is presented as part of the assessment of Impact Pathway 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | Section 6.3.                |
|       | NRW would like to understand the final scenario that was tested by taking out groyne 2. It would make sense from an environmental and aesthetic perspective if this could be achieved. The restricting factor is unclear to us                                                                                                                                                                                                                                          | The removal of groyne 2 was undertaken to assess the shelter provided by this structure to the imported beaches on either side. The incursion of wave-induced and tidal currents was considered to be too severe in the                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | N/A                         |

| Topic | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Action/Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Section of the ES |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|       | at present, is the sand loss too extreme to be viable? A quantitative understanding of the differences between scheme one and scheme two would aid evaluation, particularly the addition of a difference plot.                                                                                                                                                                                                                                                            | centre of the larger embayment (at the location of groyne 2), increasing the risk of sand losses during more severe storm events and affecting scheme performance against objectives. Any currents within the embayment during sea bed disturbance due to wave action will move sediments out of the embayment where they will be effectively 'lost' increasing maintenance commitments and reducing scheme service efficiency.                                                                                                                                                                  |                   |
|       | With regard to Figure 43, both scheme one (0.4 m/s) and scheme two (0.55 m/s) have reduced flows from baseline (0.75 m/s), the difference however between the two schemes is only 0.1 m/s. It is not clear what the expected impact of this is which makes the scheme unviable, particularly, when the roughness of the groynes has not been accounted for in the model, the model is not based on real data and as described will not be inundated for 98 % of the time. | See above response.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | N/A               |
|       | In relation to scheme layout, NRW would recommend from a geomorphology perspective that the step between Groyne 3a and 3b be removed and the coastline realigned in a more natural curvature. The bay will always try and reach an equilibrium point and an offset such as is proposed will create a strange dynamic.                                                                                                                                                     | The NRW proposed scheme revisions were considered but discounted because there was an overriding consideration of maintaining the outlet from the inland watercourse which was considered to be environmentally important. The NRW proposal would render this watercourse outlet to be unstable without containment of the adjacent imported sand. Prior to the scheme there was demolition rubble which the scheme substitutes as natural gravel beaches separated from the adjacent sand beaches by the groynes 3a and 3b thereby preserving the hydraulic characteristics of the watercourse. | N/A               |
|       | NRW's simplistic view would be to remove groyne 2 and 3b and smooth the hinterland behind to create pocket bays; has this scenario been considered in the alternatives stage?                                                                                                                                                                                                                                                                                             | See above response.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              | N/A               |
|       | NRW appreciate a lot of sediment will be excavated to set back the defences, NRW would expect any marine sediments to stay within the active marine zone, although a plan will need to be developed to incorporate this.                                                                                                                                                                                                                                                  | Noted. Further information on the changes in sediment processes are discussed under Impact Pathway 1.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Section 6.3.      |
| HRA   | This advice is provided by NRW's advisory service and is focused on nature conservation advice in relation to the test of alternatives and compensatory measures. It will be for the competent authority to advise you on the information provided relating to Imperative Reasons of Overriding Public Interest.                                                                                                                                                          | This position is fully understood and the role of the Competent Authorities (also Gwynedd Council) is described further in the HRA information 'signposting report' report which is included as Appendix K. This signposting report also highlights where further IROPI details can, if needed, be obtained. Unfortunately, while advice on IROPI considerations was requested from NRW (as lead competent authority under the marine licensing process to also provide) it is recognised, and understood, that this could not be provided because of time/resource constraints.                 | Appendix K.       |
|       | We note that the stated proposed compensatory measures (as indicated on Figure 1) involve removal of barren rubble to expose sandflat habitat beneath. It is also stated that, if necessary, these areas could be excavated                                                                                                                                                                                                                                               | One reason for selecting the upper shore for the compensation sites was so that it could match as closely as possible the small area of upper-shore habitat that will be lost by the coastal defences. Every effort has been                                                                                                                                                                                                                                                                                                                                                                     | Appendix K.       |

| Topic | Comment                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Action/Response                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Section of the ES |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------|
|       | sufficiently to ensure the area is below MHWS and provide intertidal habitat. NRW is concerned that the compensation area is within the upper shore and will not expose (and thus create) sandflat habitat. We also consider that any excavated area will revert to upper shore shingle habitat within the medium term as a result of coastal processes and will not therefore provide compensatory sandflat habitat that would satisfy the requirements of the Conservation of Habitats and Species Regulations 2017. | made to create like-for-like offsetting habitats (both the lost and created habitats will have a similar (i.e. very low species abundance) ecological composition. The habitats will revert to shingle but only as the cliffs retreat and release coarse single into the upper shore. The whole approach can also be adaptable over time to provide assurances as to the outcome.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |                   |
|       | We advise that the developer further considers possible compensation measures that would create long-term sandflat habitat. The developer may wish to consider if there is any rubble (artificial, not naturally placed rock) that could be removed from lower down in the intertidal area that could expose and create sandflat habitat.                                                                                                                                                                              | More consideration has been given to this issue but it has not been possible to identify a better compensation proposal. We did not see any similar lower quality unnatural habitats on the lower sections of the shore during the baseline intertidal habitat surveys ABPmer carried out. As with the previous point it would still seem the best approach to deliver like-for-like upper shore sandflat for upper-shore sandflat.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Appendix K.       |
|       | We can provide further advice once the above comments (2.2 – 2.3) have been considered and addressed. In the meantime, we have the additional comments below for your consideration.                                                                                                                                                                                                                                                                                                                                   | Noted.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | N/A               |
|       | The HRA note states the service life of the structure is for 25 years whilst the modelling details 20 years, clarification is sought as to which is correct.                                                                                                                                                                                                                                                                                                                                                           | The design life is 25 years. The modelling was appropriate for verifying the design of the scheme.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | N/A               |
|       | The test of alternatives is unclear. Within the modelling report an alternative to remove groyne 2 was developed. NRW would like to understand this scheme more (Scheme 2) as it indicates that there is still merit in this scenario (see comment 1.12 above). A possibly better alternative for consideration would be the one discussed in comment 1.13 and 1.14; we advise that the applicant considers this further.                                                                                              | This has been discussed further as part of the consideration of alternatives.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            | Section 3.2.      |
|       | The erosion rates are only a coarse prediction and caution would be advised that by setting back the defence and opening up a new active area, further erosion is likely to occur – even by rainfall and slumping rather than coastal inundation.                                                                                                                                                                                                                                                                      | The defences will protect the section of cliff that will be cut back so no acceleration of this section is anticipated. No effects on the cliff to the south-west of the defences is expected based on the hydrodynamic functionality. The north-east side of the defences includes a gravel beach deliberately to address the risk of localised erosion acceleration here. Equivalent localised erosion was seen following the introduction of the existing rock armour in 1998 and therefore this lesson has been learned for this design. Further to the east in the area, where the compensation site is proposed, there will be an acceleration of the existing erosion because the fronting protective shingle and debris strip will be removed. This erosion is being encouraged as a demonstrable 'natural' coastal adaptation strategy and as a way of keeping vegetation down on the cliff edge because that, in turn will improve the value of the cliff face for bees and wasps (aculeates). | Section 6.3.      |

| Topic      | Comment                                                                                                                                                                                                                                                                                                                 | Action/Response                                                                                                                                                                  | Section of the ES           |
|------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
|            | It would be prudent to understand what annual monitoring, mitigation and adaptation is expected and proposed over the lifetime of the scheme as indicated in the provision provided.                                                                                                                                    | Maintenance, monitoring and mitigation measures that are proposed have been considered.                                                                                          | Sections 2.9 and 12.        |
|            | NRW are pleased to note the source of the sediments (sand, shingle and rock) to be used within the scheme, grading curves and more specifics, such as; amount, mineralogy, colour and angularity should be provided within the application.                                                                             | Further details of the sediment characteristics are provided in the construction methodology.                                                                                    | Section 2.7.                |
|            | NRW are also pleased to note that all marine sediment excavated will be re-used within the scheme and kept in the active marine zone, further detail such as quantities of excavated marine sediment will help understand the scale of this operation.                                                                  | This has been considered further as part of the construction and operational methodology.                                                                                        | Section 2.7 and 2.8.        |
|            | We note the intention to remove the imported rock and demolition hardcore from the adjacent area to the scheme. NRW would recommend that all possible foreign material be removed and not just what was calculated as a straightforward quid pro quo.                                                                   | As described above the compensation plan can be adapted and therefore the specifics of how this is achieved and over what are can be discussed in further details with NRW       | add                         |
|            | We request clarification as to what is presented by the polygon with white dots, which does not seem to have an associated legend.                                                                                                                                                                                      |                                                                                                                                                                                  |                             |
| Flood risk | The lowering of land is likely to change the designation of the said area from a zone A to C2 as per the Development Advice Maps accompanying TAN15: Development and Flood Risk.                                                                                                                                        | Noted and this is considered further as part of the coastal protection and flood defence section of the ES.                                                                      | Section 10.                 |
|            | Works requiring planning permission in zone C should be supported by a Flood Consequence Assessment which is proportionate to the size and scale of the development and the flood risks.                                                                                                                                | Noted and the information required to support an FCA is included as part of the coastal protection and flood defence section of the ES.                                          | Section 10.                 |
|            | Ideally the Extreme Sea Levels should be considered for current day events and future projections associated with climate change allowances. The recently released updated levels, Coastal Flood Boundaries Dataset should be used which can be obtained from the <a href="https://data.gov.uk">data.gov.uk</a> portal. | The Proposed Development adopts a cautious approach to the uncertainties surrounding climate change and sea level rise. This issue is considered further under Impact Pathway 2. | Section 6.3 and Appendix D. |
|            | The Shoreline Management Plan for this coastal cell should be considered and addressed.                                                                                                                                                                                                                                 | The SMP for this coastal cell has been considered as part of the coastal protection and flood defence assessment.                                                                | Section 10.                 |
|            | There should be no impact elsewhere as part of the scheme i.e. no acceleration in erosion to third party owners (e.g. private landowners, Network Rail).                                                                                                                                                                | The potential impact on third party owners has been considered as part of the coastal protection and flood defence assessment.                                                   | Section 10.                 |

### 5.1.2 Final ES scope

The following main receptor groups are assessed in this ES (presented in Sections 6 to 10):

- Physical and coastal processes;
- Water and sediment quality;
- Marine ecology and nature conservation;
- Terrestrial ecology and nature conservation; and
- Coast protection and flood defence.

Further details of the full scope of the further assessment work that has been undertaken for each topic are provided at the beginning of each specific topic section.

The Transboundary Regulation 17 of the Marine Works (EIA) (Amendment) Regulations 2017, and Regulation 58 of the Town and Country Planning (EIA) Regulations 2017, has not been considered in the impact assessment due to the predicted localised effects of the Proposed Development and the large distance between the study area and the next nearest member state.

A number of topics have not been specifically assessed in this ES. The rationale for not undertaking further assessment is presented in detail in the Screening and Scoping Report and summarised in Table 4. This is also in accordance with the Scoping Opinions of Gwynedd Council and NRW.

**Table 4. Topics that have not been assessed in this Environmental Appraisal**

| Receptor                               | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|----------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Fish and fisheries                     | Given the location, nature and scale of the Proposed Development, no significant interaction and impact with fish species is expected (e.g. from underwater noise, sediment dispersion or hindrance of migration). Also, no significant indirect effects on the Afon Wen River (around 300 m to the east of the Proposed Development area) are expected. Therefore, any impacts to fish have been scoped out of the further assessment process for the Proposed Development. In addition, because the development is largely around and above the MHWS level, with a limited footprint within the upper intertidal zone, the effects to commercial and recreational fishing from the Proposed Development are expected to be insignificant. Therefore, it has been concluded that there is no impact pathway for fisheries to be affected by the Proposed Development and this topic has been scoped out of any further assessment. |
| Commercial and recreational navigation | For this Proposed Development, there will be no requirements for marine plant or vessel access and any changes that may occur along the foreshore will not affect any recreational navigation, other marine users or commercial fishing activities (e.g. there are no berths in the zones of physical influence). The Proposed Development is also not designed to include navigation access ramp points that might change or benefit navigation access in the area. For these reasons, this issue has been scoped out of the further assessment.                                                                                                                                                                                                                                                                                                                                                                                   |
| Archaeology (cultural heritage)        | At this site, intrusive groundworks and excavations will be localised and relatively small in scale. On the basis of existing evidence, it is considered unlikely that there will be significant cultural heritage impacts. The scale of any indirect changes on the foreshore will also be localised and too small to have any effects on archaeological features at a distance. Furthermore,                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

| Receptor                                       | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                | there are no above ground heritage assets within or in close proximity to the development site and the site is not in a conservation area (Lichfields, 2017). For these reasons, this topic has been scoped out of the further assessment, although a standalone Desk Based Archaeological Assessment will be submitted to accompany the planning application.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
| Landscape/seascape and visual                  | The Proposed Development parcels are predominantly self-contained within the main body of the holiday park and, with careful site planning, sensitive material choices and appropriate infrastructure landscaping, can be fully integrated with their immediate environs with little or no impact on the wider landscape. Furthermore, any changes to distant views (e.g. from the railway, public beach and sea) will be seen against the backdrop of the existing mass of the holiday park. Therefore, it is concluded there will be no significant adverse effects on the principal characteristics of the existing landscape or seascape character or visual amenity of the site (Lichfields, 2017). As such, there is no requirement for this topic to be assessed within any further assessment, although a standalone Landscape and Visual Impact appraisal will accompany the planning application.                                         |
| Transport and access                           | The operational change in park extent (accommodation units) is just under 10% and that is expected to have an imperceptible effect on the highway network bearing in mind the relevant IEMA guidelines (Lichfields, 2017). Also, any additional construction traffic is expected to have a negligible effect on the adjacent road network and any sensitive receptors. This view takes account of the nature and tolerances of the main A497 access route and its junctions (Lichfields, 2017). The coastal path will need to be managed during construction and repositioned during operation. Generally, the Proposed Development will maintain and encourage access to the beach. In conclusion, no significant traffic/transport/access issues are anticipated that will require further formal assessment, though a Design and Access Statement and a standalone Transport Statement will be submitted in support of the planning application. |
| Airborne noise and vibration                   | There are limited sources of noise associated with the Proposed Development. During construction, the effects on traffic will not be significant, and the majority of the activities (especially the noisiest material delivery and placement work associated with the coastal defence rock armouring work) will occur during the winter months when the park is closed to visitors. Furthermore, there are limited receptors for airborne noise and vibration effects. Therefore, no significant effects are anticipated for noise and vibration and this topic has therefore been scoped out of any further assessment.                                                                                                                                                                                                                                                                                                                           |
| Air quality and greenhouse gas (GHG) emissions | Due to the rural and coastal location of the Proposed Development area, the air quality around the Proposed Development area is likely to be very good. It is not anticipated that the vehicle operations associated with the Proposed Development work will significantly affect air quality at the site. Due to the scale and nature of the Proposed Development, GHG emissions will be of a small magnitude. Furthermore, there are few alternatives to construction materials as they are required to have a high durability to withstand conditions in the marine environment, and other buildability restrictions. Therefore, this has been scoped out of any further assessment.                                                                                                                                                                                                                                                             |

| Receptor                              | Rationale                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Infrastructure and other marine users | There do not appear to be any disposal sites, active subsea cables, utility installations waste water outfalls (current or planned) within proximity to the Proposed Development area. Therefore, it has been concluded that there is no impact pathway for infrastructure and other marine users to be affected by the Proposed Development and this topic has been scoped out of any further assessment.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Human health                          | The Proposed Development will extend and improve the quality of the park and will help to maintain Hafan y Môr Holiday Park as a holiday destination and improve public access to recreational activities. The proposed coastal defences will include beach recharge areas that are expected to be used by visitors for recreation and relaxation and will enhance engagement with the coast. The defences will also help to maintain the coastal path. Therefore, there are expected to be inherent benefits for human health from the Proposed Development. No adverse effects for human health are envisaged (air quality, airborne noise etc. have been scoped out). Therefore, it has been concluded that there is no adverse impact pathway for human health and this topic has been scoped out of any further assessment. However, further details about the recreational benefits and uses of the development will be included as part of the Proposed Development rationale description within the ES (see Section 3.1). |

## 5.2 Impact assessment methodology

To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology has been applied. This framework, which is presented in the following sections, has been developed from a range of sources, including the Town and Country Planning (EIA) Regulations 2017 (as amended), Marine Works (EIA) Regulations 2007 (as amended), the new EIA Directive (2014/52/EU), statutory guidance, consultations and ABPmer's previous (extensive) EIA project experience. The assessment also follows the principles of relevant guidance, including IEMA guidelines, and the latest CIEEM guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (CIEEM, 2018).

This impact assessment methodology is designed to incorporate the key criteria and considerations without being overly prescriptive. This allows alternative topic-specific guidance for impact assessment to be applied, following best practice. Where possible, these methodologies have been broadly aligned with the standard assessment methodology described in this section in order to maintain consistency throughout the ES (e.g. use of same terminology). A description of any alternative topic-specific methodologies for impact assessment is provided in the corresponding assessment chapters (e.g. Section 9.2).

The EIA considers the impacts from the entire Proposed Development, covering the whole scope of the landside park and coastal defence works. The environmental issues are divided into distinct 'receiving environments' or 'receptors'. The effect of the proposed activity on each of these is assessed by describing in turn: the baseline environmental conditions of each receiving environment; the 'impact pathways' by which the receptors could be affected; the significance of the impacts occurring; and the measures to mitigate for significant adverse impacts where these are predicted.

### 5.2.1 Stage 1 – Identify receptors and changes

The first stage identifies the potential environmental changes resulting from the proposed activity and the features of interest (receptors) that are likely to be affected (which are together referred to as the impact pathway). The impact pathways which are considered relevant to this EIA are set out at the beginning of each topic-specific assessment chapter (Section 6 to 10). This aspect of the assessment has been developed in consultation with key statutory and non-statutory authorities.

### 5.2.2 Stage 2 – Understand change, sensitivity and importance

The second stage involves understanding the nature of the environmental changes to provide a benchmark against which the changes and levels of exposure can be compared. The scale of the impacts via the impact pathways depends upon a range of factors, including the following:

- Magnitude (local/strategic):
  - Spatial extent (small/large scale);
  - Duration (temporary/short/intermediate/long-term);
  - Frequency (routine/intermittent/occasional/rare);
  - Reversibility;
- Probability of occurrence;
- The margins by which set values are exceeded (e.g. water quality standards);
- The baseline conditions of the system;
- Existing long-term trends and natural variability;
- The sensitivity of the receptor (resistance/adaptability/recoverability);
- The importance of the receptor (e.g. designated habitats and protected species or local features); and
- Confidence, or certainty, in the impact prediction.

### 5.2.3 Stage 3 – Impact assessment

To assess the significance of effects, the magnitude of the impact pathway and the probability of it occurring is evaluated to understand the exposure to change, and this is assessed against the sensitivity of a receptor/feature to understand its vulnerability. Finally, this is compared against the importance of a receptor/feature to generate a level of significance for effects resulting from each impact pathway. This is summarised in the following sections.

The key significance levels for either beneficial or adverse impacts are described as follows:

1. Insignificant: Insignificant change not having a discernible effect;
2. Minor: Effects tending to be discernible but tolerable;
3. Moderate: Where these changes are adverse, they may require mitigation; and
4. Major: Effects are highest in magnitude and reflect the high vulnerability and importance of a receptor (e.g. to nature conservation). Where these changes are adverse, they will require mitigation.

To ensure transparency in the impact assessment, it is important to make clear the evidence-based or value-based judgments used at each stage of the assessment, and how they have been attributed to a level of significance. This is presented in the impact assessment for each impact pathway.

## Impact assessment guidance tables

The matrices in Table 5 to Table 7 have been used to help assess significance (see below).

Table 5 was used as a means of generating an estimate of exposure. Magnitude of change needs to be considered in spatial and temporal terms (including duration, frequency and seasonality), and against the background environmental conditions in a study area. Once a magnitude has been assessed, this should be combined with the probability of occurrence to arrive at an exposure score which can then be used for the next step of the assessment, which is detailed in Table 6. For example, an impact pathway with a medium magnitude of change and a high probability of occurrence would result in a medium exposure to change.

**Table 5. Exposure to change, combining magnitude and probability of change**

| Probability of Occurrence | Magnitude of Change |                 |                 |            |
|---------------------------|---------------------|-----------------|-----------------|------------|
|                           | Large               | Medium          | Small           | Negligible |
| High                      | High                | Medium          | Low             | Negligible |
| Medium                    | Medium              | Medium/Low      | Low /Negligible | Negligible |
| Low                       | Low                 | Low /Negligible | Negligible      | Negligible |
| Negligible                | Negligible          | Negligible      | Negligible      | Negligible |

Table 6 was then used to score the vulnerability of the features/receptors of interest based on the sensitivity of those features and their exposure to a given change. Where the exposure and sensitivity characteristics overlap then vulnerability exists, and an adverse effect may occur. For example, if the impact pathway previously assessed with a medium exposure to change acted on a receptor which had a high sensitivity, this would result in an assessment of high vulnerability. Sensitivity can be described as the intolerance of a habitat, community or individual of a species to an environmental change and essentially considers the response characteristic of the feature. Thus, if a single or combination of environmental changes is likely to elicit a response then the feature under assessment can be considered to be sensitive. Where an exposure or change occurs for which the receptor is not sensitive, then no vulnerability can occur. Similarly, vulnerability will always be 'none' no matter how sensitive the feature is, if the exposure to change had been assessed as 'negligible'.

**Table 6. Estimation of vulnerability based on sensitivity and exposure to change**

| Sensitivity of Feature | Exposure to Change |          |          |            |
|------------------------|--------------------|----------|----------|------------|
|                        | High               | Medium   | Low      | Negligible |
| High                   | High               | High     | Moderate | None       |
| Moderate               | High               | Moderate | Low      | None       |
| Low                    | Moderate           | Low      | Low      | None       |
| None                   | None               | None     | None     | None       |

The vulnerability was then combined with the importance of the feature of interest using Table 7 to generate an initial level of significance. The importance of a feature is based on its value and rarity (e.g. to either ecosystem or economy), such as the levels of protection, whilst recognising that importance should be determined having regard to geographic context (i.e. international/European, national, regional, and local). For an example of estimating significance, if a high vulnerability was previously given to a feature of low importance, an initial level of significance of minor would be given.

Table 7. Estimation of significance based on vulnerability and importance

| Importance of Feature | Vulnerability of Feature to Impact |                     |                     |               |
|-----------------------|------------------------------------|---------------------|---------------------|---------------|
|                       | High                               | Moderate            | Low                 | None          |
| High                  | Major                              | Moderate            | Minor               | Insignificant |
| Moderate              | Moderate                           | Moderate/Minor      | Minor/Insignificant | Insignificant |
| Low                   | Minor                              | Minor/Insignificant | Insignificant       | Insignificant |
| None                  | Insignificant                      | Insignificant       | Insignificant       | Insignificant |

## 5.2.4 Stage 4 – Impact management

The final stage is to identify any impacts that are found to be moderate and/or major adverse significant and require mitigation measures to reduce residual impacts, as far as possible, to environmentally acceptable levels. Within the assessment procedure the use of mitigation measures will alter the risk of exposure and, hence, will require significance to be re-assessed and thus the residual impact (i.e. with mitigation) identified. Mitigation measures can take three forms (IEMA, 2016):

- **Primary (inherent)** – modifications to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken;
- **Secondary (foreseeable)** – actions that will require further activity in order to achieve the anticipated outcome (may be imposed as part of the planning consent or through the inclusion in assessment); and
- **Tertiary (inexorable)** – actions that would occur with or without input from an environmental impact assessment process, including actions that will be undertaken to meet other existing legislative requirements, or actions considered to be standard practices to manage commonly occurring environmental effects.
- In addition, it is appropriate to adopt a mitigation hierarchy which, from the CIEEM (2018) guidance<sup>32</sup> on ecological impact assessment specifically, can be summarised as follows:
  - Seek to adopt options that **avoid** harm in the first instance;
  - Identify ways to **minimise** adverse effects that cannot be completely avoided;
  - Undertake **compensation** where there are significant residual adverse effects despite the mitigation proposed; and
  - Provide **net benefits** (for biodiversity) above requirements for avoidance, mitigation or compensation.

In instances, a decision may need to be taken despite residual uncertainty about the effects. In such cases, adaptive management, linked to a bespoke monitoring programme, is a well-established and recommended way of ensuring that any negative impacts or effects are addressed in the course of the development and during the subsequent operational phase.

## 5.2.5 Confidence assessment

Following the significance assessment, a confidence assessment was undertaken which recognises the degree of interpretation and expert judgement applied. This is presented in the summary table contained within the conclusions section of each impact assessment section. Confidence was assessed on a scale incorporating three values: low, medium and high.

<sup>32</sup> Adapted from Royal Town Planning Institute (RTPI) (2000) *Planning for Biodiversity* (out of print) as used in the emerging CIEEM guidance

### 5.2.6 Cumulative impact and In-Combination assessment

Under the Marine Works (EIA) Regulations (Amendment) 2017 and Town and Country Planning (EIA) Regulations 2017 (as amended) it is necessary to assess the potential cumulative impacts of a proposed activity on all environmental receptors together with other known developments in the area. Under the Habitats Regulations, it is also necessary to consider the in-combination effects of a development proposal specifically on the designated features of European Sites. The EIA cumulative impact and Habitats Regulations in-combination assessments are presented in Section 11.

## 5.3 Study area

The 'study area' is defined as the area over which the potential direct and indirect impacts of the Proposed Development are predicted to occur. In other words, the study area covers the impacts arising from whole scope of the landside park and coastal defence works. Areas outside the range of any potential impacts from the Proposed Development are representative of the wider natural environment and form part of the wider study area.

## 5.4 References

Chartered Institute of Ecology and Environmental Management (CIEEM) (2018). Guidelines for Ecological Impact Assessment in the UK and Ireland (Terrestrial, Freshwater, Coastal and Marine). Available at: <https://www.cieem.net/data/files/ECIA%20Guidelines.pdf> (accessed August 2019).

IEMA (2016). Environmental Impact Assessment Guide to: Delivering Quality Development. Available at: <https://www.iema.net/assets/newbuild/documents/Delivering%20Quality%20Development.pdf> (accessed August 2019).

Lichfields (2017). Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 - Request for a formal EIA Screening Opinion. Letter to Gwynedd Council dated 14 July 2017.

## 6 Physical and Coastal Processes

This section considers how the Proposed Development, and specifically the coastal defence element of it, will influence physical and coastal processes along the shoreline fronting Hafan y Môr Holiday Park. This physical and coastal processes review will then be used to understand, and assess, the implications for key environmental features such as marine ecology and coastal protection and flood defence. For this review, Section 6.1 initially details the data that was sourced and consultation work which has taken place with regard to this topic, and Section 6.2 then describes the baseline conditions at and around the proposed coastal defences. This review needs to be read alongside the supporting coastal defences technical review which is included as Appendix D.

An impact assessment describing changes to the existing physical and coastal processes is then presented in Section 6.3 and mitigation measures and residual effects are reviewed in Section 6.4. Section 6.5 provides a summary and conclusions. The methods adopted for this assessment of the physical and coastal processes changes are slightly different to those adopted for other EIA topics. This is because the Proposed Development has the potential to result in changes to hydrodynamic and sedimentary processes but, in themselves, these processes are not recognised as EIA features/receptors and therefore do not equate to 'impacts'. The impacts will instead be the consequence of these changes on other environmental features. For example, 'changes' in the transport and deposition of sediment may 'impact' on the structure and function of marine habitats and their associated species.

This topic, therefore, focuses on the potential 'exposure to change' resulting from the impact pathways that have been scoped into the assessment and not the significance of any effects. The significance of any effects is assessed in relation to specific environmental features/receptors under other EIA topic chapters (e.g. Water and Sediment Quality).

### 6.1 Data sources and consultation

#### 6.1.1 Data sources

The principal data sources that have informed this assessment are as follows:

- A range of bathymetric datasets which describe the shoreline morphology, including:
  - Project specific survey data;
  - Available NRW Light Detection and Ranging (LiDAR) data;
  - MMO survey data of Tremadog Bay;
  - Merged bathymetry data from EMODnet;
- Project specific topographic survey data which describe the intertidal morphology;
- Project specific Particle Size Analysis (PSA) survey data;
- Water level and flow data near Hafan y Môr from 'Totaltide';
- Water levels from gauge at Barmouth (National Tidal and Sea Level Facility (NTSLF) site);
- ABPmer SEASTATES model (ABPmer, 2017) for wave, tide and surge modelling;
- Wave parameters from ABPmer's SEASTATES hindcast model (ABPmer, 2013);
- Scheme design information (Digital Terrain Model (DTM)) provided by the client;
- Hydrodynamic and sediment modelling (Appendix C);
- Coastal processes review (Appendix D);
- A small-scale geotechnical investigation undertaken September 2019;
- Shoreline Management Plan 2 (SMP-2) (Royal Haskoning, 2011);
- Marine Nature Conservation Review (Mills, 1998); and
- UK Climate Projections 2018 (UKCP18).

Most of these data sources were also used to underpin a numerical modelling study that was carried out for this project (ABPmer, 2018a). For this work, a series of bespoke modelling tools were developed to simulate tidal variations and the wave climate in the study area, as well as the alongshore and cross-shore sediment transport associated with a number of typical as well as extreme tide and wave events.

As recorded in Section 1.3, this modelling work was carried out to inform and validate the design of the proposed defences and to further describe the baseline conditions along the shoreline (see Section 6.2). It has also been used to inform this assessment, the effects of these defences on hydrodynamic and sediment transport conditions. A copy of this modelling report is presented as Appendix C. The results of the modelling have informed the specialist coastal process review by Dr Barber (SMP 2019) that is included in Appendix D. The text in this chapter draws upon the information provided in these main documents as well as other supporting reviews such as the SMP-2 review (Royal Haskoning, 2011).

### 6.1.2 Consultation and scope

Based on the Scoping Report (ABPmer, 2018), and the subsequent advice provided by NRW, Gwynedd Council, and statutory consultees (see Section 5.1), Table 8 presents the physical and coastal processes impact pathways and further assessment work that has been carried out to inform the marine licence application.

**Table 8. Impact pathways and summary of further work for physical and coastal processes**

| Receptor                                                                                                                                                                                                                                                                             | Impact Pathway                                                    | Requires Further Assessment?    | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Summary of Further Work                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Changes in physical and coastal processes are not considered features and/or receptors in themselves. The potential for these changes to result in significant effects is assessed in relation to environmental receptors under other EIA topic chapters (see Sections 7, 8, and 10) | Changes to sediment transport/supply                              | Yes ( <b>Impact Pathway 1</b> ) | Changes to hydrodynamics and consequently sediment transport/supply along and across the beach may occur due to the morphological changes brought about by the physical (obstructive) presence of the new rock armour structures, the removal of beach sediment to 'set-back' the coastal defences, and beach recharge. This, in turn, could have implications for environmental features including intertidal habitat functioning or changing erosion rates along adjacent areas of the coast. | This impact pathway has been assessed. A suite of modelling tools has been developed to simulate tidal variations and the wave climate in the study area, as well as the alongshore and cross-shore sediment transport (Appendix C). In addition, a separate coastal processes review has been undertaken to inform the assessment (Appendix D). Particular attention is given to the infrastructure to the east and any likely accelerated erosion of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI, as per Scoping Opinions. |
|                                                                                                                                                                                                                                                                                      | Potential for coastal squeeze due to the presence of new defences | Yes ( <b>Impact Pathway 2</b> ) | The Proposed Development is designed to be able to accommodate future sea level rise through the 'set back' of defences. This will help avoid indirect impacts on intertidal habitats from coastal squeeze. Nevertheless, to support this 'set back', the potential for coastal squeeze should be understood (as per NRW Scoping Opinion).                                                                                                                                                      | An assessment of the potential for coastal squeeze in the context of climate change, specifically sea level rise, has been undertaken under this impact pathway. This assessment has been informed by a separate coastal processes review (Appendix D).                                                                                                                                                                                                                                                                               |

## 6.2 Review of baseline understanding

### 6.2.1 Geomorphology

The coastline around the Hafan y Môr frontage is influenced by the hard geology of the Aberystwyth cliffs and the rock headlands at Pen-y-chain and Criccieth. The effects of glaciation have provided a large amount of sediment to the region which, with the oblique wave action across the coastline, has led to the formation of crenulate shaped bays along the south coast of the Llyn peninsular. At Borth Fawr, Pwllheli and east of Criccieth, barrier beaches have been created adding natural protection to low lying land behind.

The upper foreshore gradient at the Proposed Development site is around 1 in 10 flattening to around 1 in 50 across the lower beach (Figure 5 and Appendix C). The land behind the existing beaches is generally flat with some lower areas moving back from the existing shoreline. This is denoted by a low steep cliff to the north-east of the watercourse outlet and by the linear rock armour to the south-west.

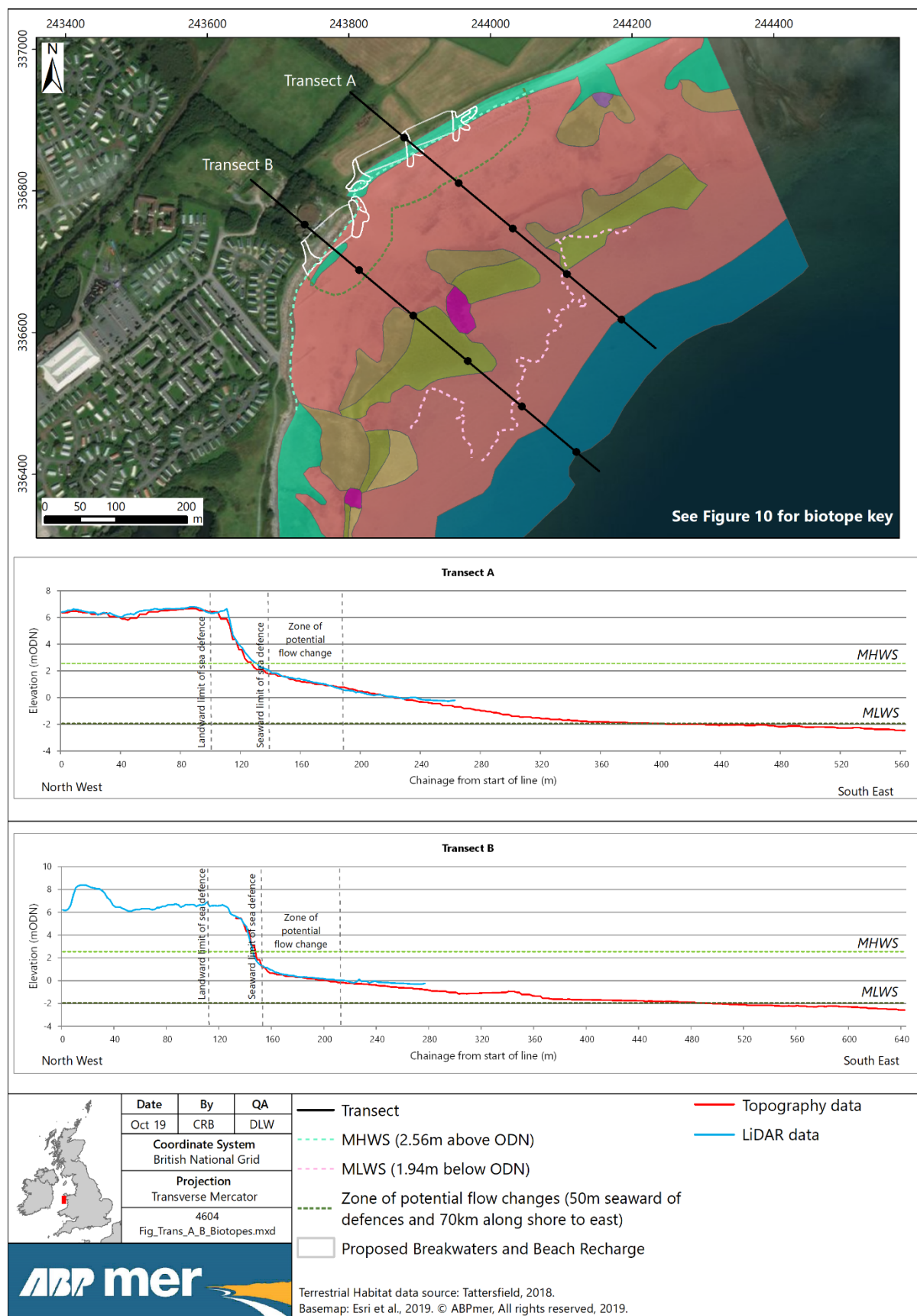


Figure 5. Baseline elevation transects across two areas of the Proposed Development site

## 6.2.2 Hydrodynamics

The tides within Tremadog Bay have a relatively large tidal range of around 4.5 m on mean spring tides and 1.5 m on neap tides. The levels on mean spring and mean neap tides are given at Pwllheli and Criccieth in Table 9. Levels for Highest Astronomical Tide (HAT) are also provided.

**Table 9. Tidal levels at Pwllheli and Criccieth**

| Tidal Level               | Level at Pwllheli (m ODN) | Level at Criccieth (m ODN) |
|---------------------------|---------------------------|----------------------------|
| Mean Low Water Spring     | -1.94                     | -2.04                      |
| Mean Low Water Neap       | -0.54                     | -0.64                      |
| Mean High Water Neap      | 0.96                      | 0.96                       |
| Mean High Water Spring    | 2.56                      | 2.56                       |
| Highest Astronomical Tide | 3.36                      | 3.36                       |

Despite the large tidal range, tidal flows in Tremadog Bay are relatively weak. A tidal diamond located offshore of Pwllheli in depths of approximately 13 m Ordnance Datum Newlyn (ODN) indicates peak flows of approximately 0.25 m/s on the flood and ebb of a mean spring tide.

The predominant wave direction offshore is from the southwest, where waves from the Atlantic can pass up through the Irish Sea as they propagate to the site. However, as these waves approach the Hafan y Môr frontage they undergo significant refraction, and ultimately approach the defences from the south-southeast. Waves from the south-east can also be generated locally from south-easterly winds. Ultimately waves approach the coast from a relatively narrow band, predominantly driving eastward flows along the coast in the study area (particularly in the western section of the frontage).

Modelled baseline wave heights at the site of the proposed coastal defences during an extreme wave event (1 in 35 year return period) are similar for waves derived from the south-west and from the south-east, with a significant wave height of around 2 m, a distance of around 100 m from the frontage (Appendix C). However, the wave period associated with waves originating from the southwest are typically much longer than those associated with waves from the south-east. The longer period waves from the southwest lead to increased energy and hence induce slightly faster flows than the shorter period waves from the south-east. These combined tide and wave driven flows are significantly faster (typically peaking at 0.6-0.7 m/s, 100 m offshore of the frontage) than any tide only driven flows and thus the wave driven flow is dominant (Appendix D).

These 1 in 35 year wave conditions are rare and modelled waves and flow conditions were also examined for a 1 in 1 year conditions from both the southwest and south-east. These events typically resulted in wave heights and current speeds, 100 m off the frontage, that were around 10% lower than those predicted for more extreme 1 in 35 year events. However, events of this magnitude or near magnitude would be expected more commonly, typically once or more a year. For both return periods, wave and flow conditions were examined for the Highest Astronomical Tide (HAT) event, as the defence is to be developed in the upper tidal zone. This peak high water level achieved during this event can be expected to occur around once a year.

Compared to waves from the southwest, waves from the south-east drive a more complex flow pattern along the adjacent coastline with areas of convergence and divergence. Convergence occurs offshore from the mouth of the Afon Wen which is possibly due to river interaction. Areas where the south-east waves drive a westward flow in the model reduce the net eastward transport of sediment.

Despite variations in flow directions, significant waves from both the southwest and from the south-east drive a predominantly north-eastward flow along the foreshore at Hafan y Môr. This north-eastward flow is prevalent throughout most of the tide, with only a short duration (around 1 hour for south-easterly waves and around 0.5 hours for south-westerly waves) of much weaker south-westward flows. These periods of south-westward flows coincide with periods of shallow water. The peak flows occur over the main wave breaking zone which varies with the tide, with flow in the upper intertidal zone only occur over periods around high spring tide.

### 6.2.3 Sediments

The mobile surface sediments of the foreshore comprise glacial material, mainly clay, silt and sand (Appendix D). These mobile finer surface sediments are intermixed across the intertidal zone with areas of harder substrata, including rock, boulders and cobbles. Beach sampling was undertaken as part of a site investigation carried out in August and September 2017. From the sediment samples collected, the foreshore in front of the development site is characterised by fine sands (with a median grain size of around 0.2 mm) on the lower foreshore (below approximately Mean Sea Level (MSL)) and coarser sediments (fine to medium gravels with a median grain size of between 4 mm and 23 mm) on the upper foreshore (at Mean High Water Spring (MHWS)).

In addition to this net reduction in sediment grain sizes in an offshore direction (i.e. with greater distances seaward away from the top of the shore), based on the data collected at the sample locations, there appears to be a slight alongshore sediment grain size reduction in a west to east direction (i.e. with coarser sediment at Mean High Water Neap at the western edge of the survey area than at the eastern edge of the survey data).

### 6.2.4 Sediment transport

Sediment transport drift rates (i.e. the amount of sediment being moved along the shoreline) across the shoreline fronting the Hafan y Môr site are influenced by the presence of hard headlands and the shape of the resultant bays. The subsequent sediment transport between the bays is generally considered to be low, with the exception of the southern tip of each frontage (Royal Haskoning 2011; Mills 1998). Sediment supply between Penychain and Criccieth is limited by the harder, higher foreshore and the influence of the Dwyfor River.

As the baseline hydrodynamic modelling indicates that tidal flows in the study area are weak, they are unlikely to contribute directly to sediment transport (Appendix C). Instead wave-driven flows are the main mechanisms for transporting sand material in suspension. The highest sediment transport occurs for extreme wave events from the southwest, consistent with the higher energy associated with waves from this direction (Section 6.2.2). Sediment transport during an extreme wave event (1 in 35-year return period) is generally directed parallel to the coast in an eastward direction, with a slight offshore tendency in the shallowest water around elevations of MHWS (Appendix C). The location of the transport across the foreshore varies with the tide. At low tide the transport is restricted to the lower intertidal and subtidal zone. Through the flooding and ebbing tide, sediment transport is mainly restricted to the mid to lower intertidal region. Sediment transport is then only predicted to occur in the upper foreshore over high tide periods when there are significant wave conditions. At high water under extreme wave conditions, a narrow band of eastwards focused transport is predicted along the upper foreshore. This is because the upper foreshore is steeper, and waves break in a narrower more focused section of the beach. This differs to the mid and lower foreshore, where the seabed has a shallower slope and therefore transport is predicted to occur over a wider region.

In the modelling study, a uniform sand grading of 0.2 mm is used across the model domain to examine potential transport rates across the foreshore. However, in reality, the beach material is much coarser along the upper foreshore (Section 6.2.3) due to natural sorting (which imposed by more active conditions and steeper beach). Therefore, for the short duration, where more focused transport is predicted along the upper foreshore, this transport is being overestimated, in relative terms, as the material in this region is much coarser.

Overall, the amount of potential sediment transport across the upper foreshore region over high tides is very small compared to the transport that occurs across the whole of the foreshore region (extending 1.5 km from the coast) throughout the whole tide.

Sediment transport is lower for 1 in 1-year wave conditions but with a similar pattern for waves from the southwest. For waves from the south-east, the sediment transport exhibits a less coherent pattern for the 1 in 1-year wave event (as per the wave driven flows), with areas of converging transport at relatively low rates.

The existing linear rock protection (or armour) fronting Hafan y Môr was constructed in 1998 and followed the natural shoreline alignment at that time. The presence of the rock protection has resulted in some local erosion in the north-east around the entrance to the small watercourse (which lies immediately to the east of the armouring) over an alongshore length of around 50 m (Appendix D).

As for the wider shoreline, the current SMP estimates the average annual erosion in this area to be 0.3 m/year along the unprotected sections of the coastline between Pen y Chain and the Afon Wen based on monitoring and historical data (Royal Haskoning, 2011). This suggests a 6.0 m potential recession in these unprotected sections between 1998 and 2018. The use of demolition materials along the shoreline at Hafan y Môr by previous site operators, however, has reduced the natural erosion rate so that actual erosion is only around half of that forecast under natural exposure by the SMP. The local shoreline erosion caused by the presence of the rock armour is therefore estimated to be around a 3.0 m. This erosion occurred quite quickly after the rock protection scheme was completed in 1998 and once established the shoreline resorted to the average annual erosion rate referred to above.

### 6.2.5 Future baseline

Sea level rise (SLR) will be a significant factor in the future development of the shoreline. Very slow erosion of the main hard headlands at Pen-y-chain and Criccieth will still control the overall shape of the coast and they would be largely unaffected. Where there are softer cliffs or shorelines suffering erosion, the rate of erosion is likely to increase with SLR. This might be by a factor of 1.7 to 2.5 times the existing base erosion rate over the 100 years (Royal Haskoning, 2011). Where there are more stable features, such as fully developed storm beaches there would be a natural roll back of the beach potentially in the order of 10 m to 40 m, depending on the nature of beach and the coast behind.

UKCP18 SLR projections at Cardiff by 2100 relative to 1981-2000 for a low emission scenario range from 27 to 69 cm and for a high emission scenario range from 51 to 113 cm. At Belfast, the SLR projections for a low emission scenario range from 11 to 52 cm and for a high emission scenario range from 33 to 94 cm. Sea levels will continue to rise beyond 2100, however the uncertainty also increases further into the future. The risk of coastal flooding from storm surges and high tides will increase as sea levels rise.

## 6.2.6 Conceptual overview

To provide a conceptual summary of these baseline conditions, Figure 6 illustrates the key hydrodynamic features and sediment transport pathways. This plot includes the predominant south-west wave direction and the mean west to east longshore drift direction within the embayment. This plot also shows the potential sediment transport zone extending 1.5 km from the coast

Figure 6 also describes the zone (which was identified by the modelling work) where reductions in flow of more than 0.1 m/s are expected to occur as a result of the Proposed Development. This potential zone of physical influence extends approximately 50 m offshore from the breakwaters and also 70 m along the shore to the east. This zone of potential influence is described further under the impact assessment section (Section 6.3).

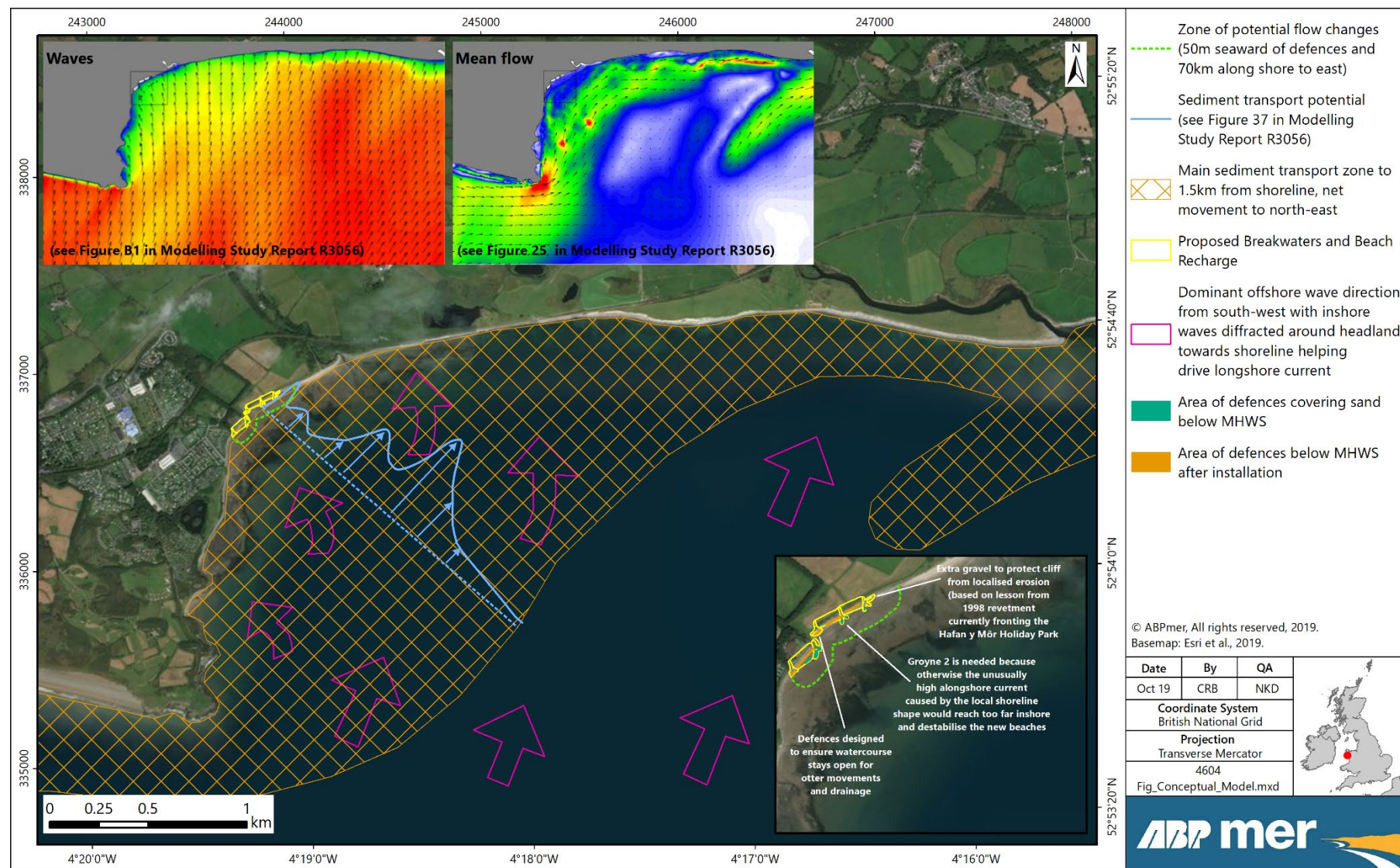


Figure 6. Conceptual overview showing the main hydrodynamic and sediment transport features

## 6.3 Impact assessment

### 6.3.1 Impact Pathway 1: Changes to sediment transport/supply

#### Changes to existing sediment volume and patterns

One potential effect of the proposed defences would be to alter the pattern and rate of sediment as it moves (in a net eastward direction predominantly during storm events). The design of the scheme is a crucial consideration when considering this issue. The proposed coastal defence scheme will result in a minor landward realignment of the MHWS tidal line in the section of the existing linear rock revetment but will not result in any change to this alignment elsewhere within the development footprint. The proposed rock-armour breakwaters will be around 50 m in length but will be positioned around 30 m landward of the existing MHWS tidal elevation. They will therefore extend only around 20 m into the intertidal area below existing MHWS alignment

The proposed breakwaters and the beach recharge will therefore straddle the MHWS elevation at the top of the foreshore. This innovative design approach was developed to minimise the morphological change of the foreshore and the extent to which the design footprint will extend into the intertidal area. It will also provide shelter and shoreline stability within the upper beach and minimise changes to alongshore transport.

As the defence intrudes only 20 m into the shoreline it has only a small effect on the sediment fluxes along the shoreline. The modelling shows that even for the extreme conditions when the main sediment fluxes occur, the effects of the proposed coastal defences on flows (combined wave and tide) are highly localised. Under such conditions the reductions in flow of more than 0.1 m/s constrained to within approximately 50 m of the breakwaters in an offshore direction, 70 m in a north-eastern direction and no detectable changes to the south-west. As sediment transport occurs up to 1.5 km offshore over the whole tide, the scheme only influences transport across a very small proportion of the foreshore, the top 50 m (3-4 %) of the shore profile. On a temporal scale the influence is further reduced because the water, waves, and tides will only reach the defences for short periods of time. Across the whole shore profile, the difference in the potential longshore transport rate is 2 % or less under the proposed scheme. This difference was derived by assuming a uniform sediment grading across the beach profile, however, the existing bed material is also coarser in the upper foreshore where the differences with the scheme are observed, therefore the actual differences will be less than this.

The proposed coastal defences will be located high up on the beach and high in the tidal frame (above the mean high water neap elevation), the breakwater and beach structures will only be inundated on some of the high tides and for only limited periods over high water. Therefore, any changes in coastal processes are limited and can only occur during these short immersion periods.

The modelling shows no discernible difference in the flow regime and transport regime across the foreshore at Afon Wen. The defences that are proposed to the east of the existing rock revetment will, however, halt some of the shoreline erosion that has occurred along the frontage. To the east of the existing revetment, the shoreline has been reportedly eroded at a rate of around 0.3 m/year (approximately 7.5 m over a 25-year design life). As these low cliffs presently erode it provided material into the marine environment. However, the cliff height in this location is low (1-2 m) and the material within it is made up of a mix of sand and clay in varying composition. Over the design life it is estimated that 2,500 m<sup>3</sup> (7.5 x 220 x 1.5) of material would be released into the environment over the section to be protected, with much of the finer material being rapidly removed from the frontage when it enters the marine environment. This volume of material is relatively small and will be compensated for by loss

of sand from the nourished beaches (see sub-section below), which will be subject to recharge over their design life. Hence, the overall supply of sediment to the frontage will remain similar.

Furthermore, the scale of change will not overlap with any other infrastructure to the east.

### Export/loss of beach recharge material to the foreshore

The other potential way in which the coastal defences could affect the local sediment transport pathways is through the introduction of the beach recharge material and from any loss/export of these sediments from the development footprint. The extent of any such 'drawdown' of the introduced beach material following a number of storm conditions has been quantified. This analysis indicates that the drawdown effect during individual storm events is relatively small compared to the amount of beach recharge material available between the groyne structures (Appendix C). The anticipated export volumes are outlined below. In the first instance though it is noted that the breakwaters are designed to reduce any such losses (and any ongoing maintenance costs associated with beach maintenance). The scheme locally reduces shore parallel flows which will allow any material that is drawn down the beach to an area beyond the rock groyne seaward limits to then be returned to the beach when suitable wave conditions allow.

Although there are not anticipated to be any major losses of the imported gravel from the recharged beaches over the 25-year service life of the Proposed Development, there is the potential for some losses of sand. The initial beach recharge volume is around 7,500 m<sup>3</sup> of marine sand and 4,000 m<sup>3</sup> of natural gravel/shingle and allowances have been made for up to three re-nourishment campaigns as part of ongoing maintenance works during operation with a maximum total re-nourishment volume of 3,250 m<sup>3</sup> of marine sand (Appendix D). Any sand that is lost from the scheme frontage will tend to progress alongshore to the north-east but become rapidly spread over the intertidal area within around 100 m of the shoreline. These changes are expected to be undetectable against natural fluctuations in this area. The supply of material from the recharged beach (and from the re-use of excavated marine origin sands) will also compensate for the loss of supply of material to the environment from the erosion of the shoreline that is to be protected, which is estimated to be of a similar volume.

Overall, the probability of a change in hydrodynamic and sediment transport processes occurring as a result of the Proposed Development is considered to be High and the magnitude is considered to be Negligible in adjacent areas. The exposure to change is therefore considered to be **Negligible**.

## 6.3.2 Impact Pathway 2: Potential for coastal squeeze due to new defences

In the developing the coastal defences, consideration was given to the ensuring that they will be sustainable and flexible in order to avoid any potential effects on coastal squeeze. The proposed breakwaters will be aligned to create a stable coastline orientation with the beaches between them being created by recharging with imported sand and gravel of a similar grade to the current beach. This approach will ensure that the new defence line is not 'fixed' and that there is then 'room' for sea level rise into the future (Appendix D). In other words, resilience and adaptability will be achieved because the materials used to form the coastal defences are all capable of moving to new configurations in place and elevation. The rock groynes can be dismantled, relocated and reshaped if required.

Furthermore, the proposed defences will be positioned landward or 'set back' to beyond the maximum forecast shoreline recession (including sea level rise) over the 25-year service life of the scheme based on the rates provided in the SMP. In addition, an approximately 10 m wide coastal strip has also been included landward of the coastal defences where there will be no hard development (i.e. only removable infrastructure will be allowed). This will provide a flexible contingency zone for any storm events and to deal with the inherent uncertainty of the natural future evolution of the shoreline in this area. In

other words, it provides the facility to adaptively set the Proposed Development back further if rates of sea level rise exceed the present range limit forecasts.

- The Proposed Development will therefore be designed to be adaptable and to accommodate future sea level rise. This will avoid the potential for coastal squeeze. Overall, the probability of coastal squeeze occurring as a result of the Proposed Development is considered to be Negligible and the magnitude is considered to be Negligible. The exposure to change is therefore considered to be **Negligible**.

## 6.4 Mitigation measures and residual effects

None of the impact pathways identified for physical and coastal processes are expected to give rise to a measurable exposure to change. The following measures have been identified as part of the design work for the coastal defences work to minimise and/or avoid the potential for effects:

- 'Set back' coastal defence design minimises the indirect effects from changes in coastal processes;
- Coastal defence design is adaptable and able to accommodate future sea level rise, thus avoiding indirect impacts from coastal squeeze; and
- All sediment of marine origin will be retained within the existing intertidal environment e.g. the debris/ 'foreign material' removed from the top of the shore will be reused predominantly as a core to the rock groyne armour.

## 6.5 Summary and conclusions

A summary of the impact pathways that have been assessed for physical and coastal processes is presented in Table 10. It is considered that the proposed coastal defence design and construction methodology will minimise and/or avoid the potential for any significant adverse effects.

Table 10. Summary of potential exposure to change for physical and coastal processes

| Impact Pathway                                                      | Exposure to Change | Confidence |
|---------------------------------------------------------------------|--------------------|------------|
| Changes to sediment transport/supply (or 'littoral drift pathways') | Negligible         | Medium     |
| Potential for coastal squeeze due to the presence of new defences   | Negligible         | Medium     |

## 6.6 References

CCW (Countryside Council for Wales) (2001). Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI Citation. Available at: [https://naturalresources.wales/media/640528/SSSI\\_0326\\_Citation\\_EN001b53d.pdf](https://naturalresources.wales/media/640528/SSSI_0326_Citation_EN001b53d.pdf) (accessed September 2019).

ABPmer (2013). SEASTATES Wave Hindcast Model: Calibration and Validation Report. ABP Marine Environmental Research Ltd, Report No. R.2145.

ABPmer (2017). SEASTATES North West European Continental Shelf Tide and Surge Hindcast Database Model Validation Report. ABPmer, Report No. R.2784.

ABPmer, (2018). Hafan y Môr Holiday Park '2030 Vision' Masterplan, Scoping Report for Environmental Impact Assessment with Screening for Habitats Regulations Appraisal, ABPmer Report No. R.2958. A report produced by ABPmer for Bourne Leisure Ltd., October 2018.

## 7 Water and Sediment Quality

This section of the ES considers how the Proposed Development will affect water and sediment quality receptors. The first two sub-sections (Sections 7.1 and 7.2) cover the data sources and consultation which has taken place with regard to this topic, as well as the baseline information. The impact assessment relating to water and sediment quality is presented in Section 7.3, mitigation measures and residual effects in Section 7.4, and Section 7.5 provides a summary and conclusions.

### 7.1 Data sources and consultation

#### 7.1.1 Data sources

A range of data sources have been used to characterise the water and sediment quality baseline in the vicinity of the Proposed Development, including the following:

- NRW 'Water Watch Wales' website;
- NRW 'Find a bathing water' website;
- NRW WFD Protected Area Register and Information;
- Lle Nitrate Vulnerable Zones (NVZ) map browser;
- List of Shellfish Water Protected Areas in Wales as required under 'The Water Environment (Water Framework Directive) (England and Wales) (Amendment) Regulations 2016';
- Surface sediment samples collected in 2016 and 2017 from the intertidal adjacent to the Hafan y Môr Holiday Park, including the direct footprint of the proposed coastal defence works, which have been analysed for particle size distribution; and
- Borehole samples collected from the proposed beach recharge areas in 2019.

It should be noted that supplementary water and sediment quality surveys have not been conducted as part of this project as they were not considered necessary (given available information and the nature of the Proposed Development). Instead this assessment is underpinned by a desk-based review of available data.

#### 7.1.2 Consultation and scope

Based on the Scoping Report, and the subsequent Scoping Opinion provided by NRW, Gwynedd Council, and statutory consultees (see Section 5.1), Table 11 presents the water and sediment quality receptors, impact pathways, and further work that has been carried out to inform the planning and marine licence application.

**Table 11. Impact pathways and summary of further work for water and sediment quality**

| Receptor                   | Impact Pathway                                                                                                                                                | Requires Further Assessment?    | Justification                                                                                                                                                                                                                                            | Summary of Further Work                                                                                                                                                                                                                                               |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Water and sediment quality | Potential changes to the levels of contaminants in watercourses as a result of accidental plant spillages (e.g. fuel releases) during the construction phases | Yes ( <b>Impact Pathway 3</b> ) | Plant and machinery used during the construction of the Proposed Development has the potential to result in accidental spillages (e.g. fuel, hydraulic fluid etc.) and the release of contaminants to the environment.                                   | An assessment of potential contamination of the water environment as a result of accidental spillages from plant and machinery has been undertaken. In addition, a WFD Compliance Assessment has been prepared following the latest available guidance (Appendix L).  |
|                            | Potential changes to levels of contaminants in water from introduction of the construction materials and disturbance of sediment                              | Yes ( <b>Impact Pathway 4</b> ) | Rock armour, sand and gravel that will be introduced have the potential to affect the level of contaminants in coastal waters. Consideration of the release of sediment-bound contaminants during construction has been included in this impact pathway. | An assessment of potential contamination of the water environment as a result of material introduction and sediment disturbance has been undertaken. In addition, a WFD Compliance Assessment has been prepared following the latest available guidance (Appendix L). |
|                            | Changes in status of nearby WFD water bodies                                                                                                                  | Yes ( <b>Impact Pathway 5</b> ) | There is potential for nearby water bodies to be affected, primarily associated with the presence of the coastal defences and potential impacts to hydro-geomorphological processes and effects to intertidal habitat function and erosion.              | A WFD Compliance Assessment has been prepared following the latest available guidance (Appendix L).                                                                                                                                                                   |

## 7.2 Review of baseline understanding

### 7.2.1 Water quality

Water quality standards are regulated at EU level through the WFD (2000/60/EC), the Priority Substances Directive (2008/105/EC, 2013/39/EU), the revised Bathing Water Directive (2006/113/EC) and the Marine Strategy Framework Directive (MSFD; 2008/56/EC). The WFD integrates and requires protection of bathing waters (through the Bathing Water Directive), Shellfish Water Protected Areas (through the WFD), nature conservation designated sites (through the Habitats and Birds Directives; 92/43/EEC and 2009/147/EC), nitrate vulnerable zones (NVZs) (through the Nitrates Directive; 91/676/EEC) and areas sensitive to eutrophication (through the Urban Wastewater Treatment Directive; 91/271/EEC).

#### Water Framework Directive

The WFD provides for holistic management of all water bodies including rivers, estuaries, groundwater, lakes and coastal waters to 1 nautical mile from the low water mark<sup>33</sup>. River Basin Management Plans (RBMPs) are a requirement of the WFD, setting out measures for each river basin district to maintain and improve quality in surface and groundwater water bodies where necessary. In 2009, the Environment Agency published the first cycle (2009 to 2015) of RBMPs for England and Wales, reporting the status and objectives of each individual water body. NRW subsequently published updated RBMPs for Wales as part of the second cycle (2015 to 2021), as well as providing water body classification results from 2015 and Cycle 2 interim classifications via the Water Watch Wales website. The Proposed Development lies within the Western Wales River Basin District, specifically within the Llŷn and Eryri management catchment, which is reported in the Western Wales RBMP (NRW, 2015).

The following three surface and groundwater water bodies are located in the vicinity of the Proposed Development at Hafan y Môr (see Figure 7):

- Tremadog Bay coastal water body (ID: GB651009350000);
- Erch – lower river water body (ID: GB110065053570); and
- Llŷn and Eryri groundwater water body (ID: GB41002G204600).

In the centre of the Hafan y Môr Holiday Park is the boating lake, which provides leisure activities. The boating lake forms part of the existing surface water drainage system and has two overflow outfalls at the western and eastern edge of the waterbody. The two outfalls form two watercourses flowing through the site, referred to as Watercourse A and Watercourse B for the purposes of this assessment (see Image 3; Weetwood, 2019). These two watercourses are not classified as water bodies under the WFD.

Watercourse A is predominately culverted through the site and outfalls into the Erch – lower river water body to the west of the Proposed Development and the Afon Ddu offsite (which is classified as a main river; Weetwood, 2019). The catchment of the Erch – lower river water body covers a large section of the Hafan y Môr Holiday Park. It should be noted that the Erch – lower river water body itself (i.e. the river channel) does not overlap the Proposed Development and thus potential effects to this water body would be indirect through changes to the drainage of Watercourse A. Watercourse B, which drains east from the boating lake, is predominately open channel and outfalls directly into the sea, and thus the Tremadog Bay coastal water body. There is also a fishing lake situated in the southern section of the Hafan y Môr Holiday Park, which has reservoir style overflow, which outfalls directly to the Tremadog Bay coastal water body (Weetwood, 2019). Furthermore, the coastal defence works of the Proposed Development directly overlap the Tremadog Bay coastal water body. The Llŷn and Eryri groundwater

<sup>33</sup> Surface waters includes territorial water out to 12 nm in respect of chemical status.

water body covers the entire Llŷn and Eryri management catchment and, therefore, all landside works directly overlap this groundwater.

The Tremadog Bay coastal water body currently (2018) has an overall good status, based on good ecological status and good chemical status. The overall, ecological and chemical status is determined by the "one-out, all-out" principle, whereby the poorest individual parameter classification defines the assessment level. Therefore, if any parameter is assessed as less than good (e.g. moderate), then the status for that water body is reported at that level. An overall good status confirms that each individual parameter measured within the Tremadog Bay coastal water body is currently achieving (at least) the standard required to report good status. Alien species are reported as the driving ecological quality element for this water body which, despite being at good ecological status, suggests potential for the introduction or spread of invasive non-native species (INNS) should be a key consideration.

The Erch – lower river water body currently (2018) has an overall moderate status, based on moderate ecological status and good chemical status (not assessed). Moderate ecological status is due to the biological quality elements 'Macrophytes' and 'Phytobenthos', summarised through the driving ecological quality element as 'Macrophytes and Phytobenthos Combined'. The Llŷn and Eryri groundwater water body currently (2015) has an overall poor status, based on good quantitative status and poor chemical (groundwater) status.

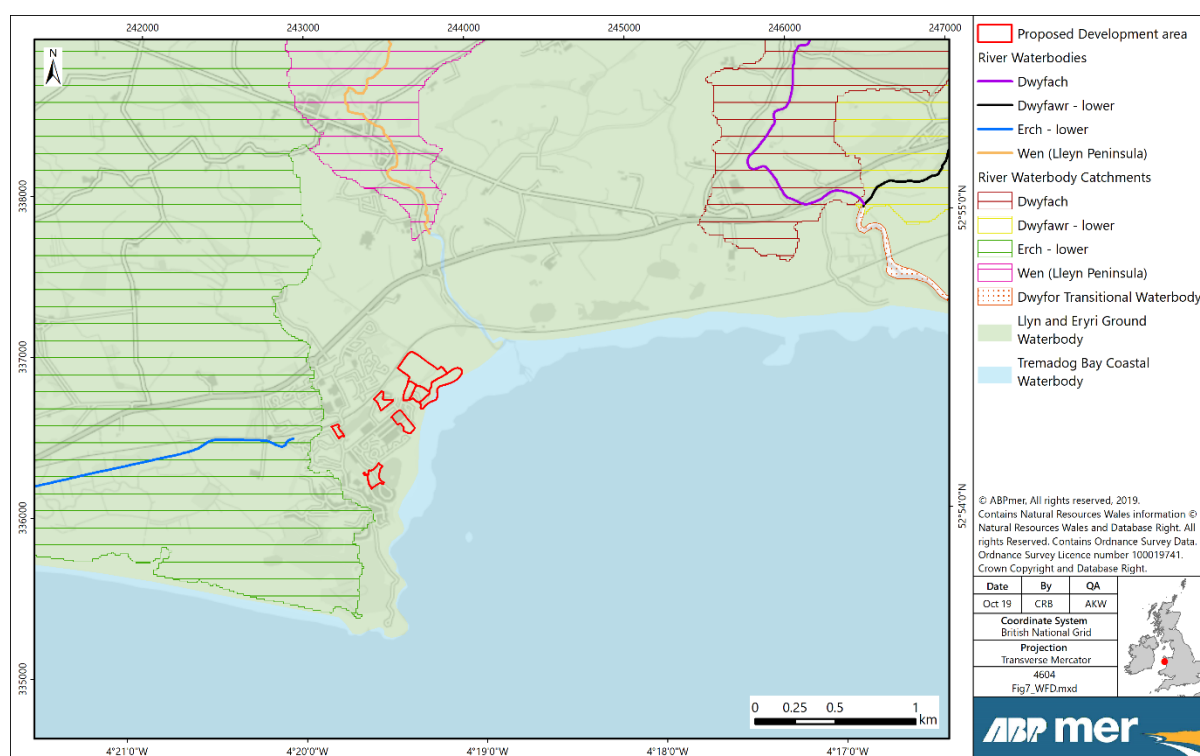
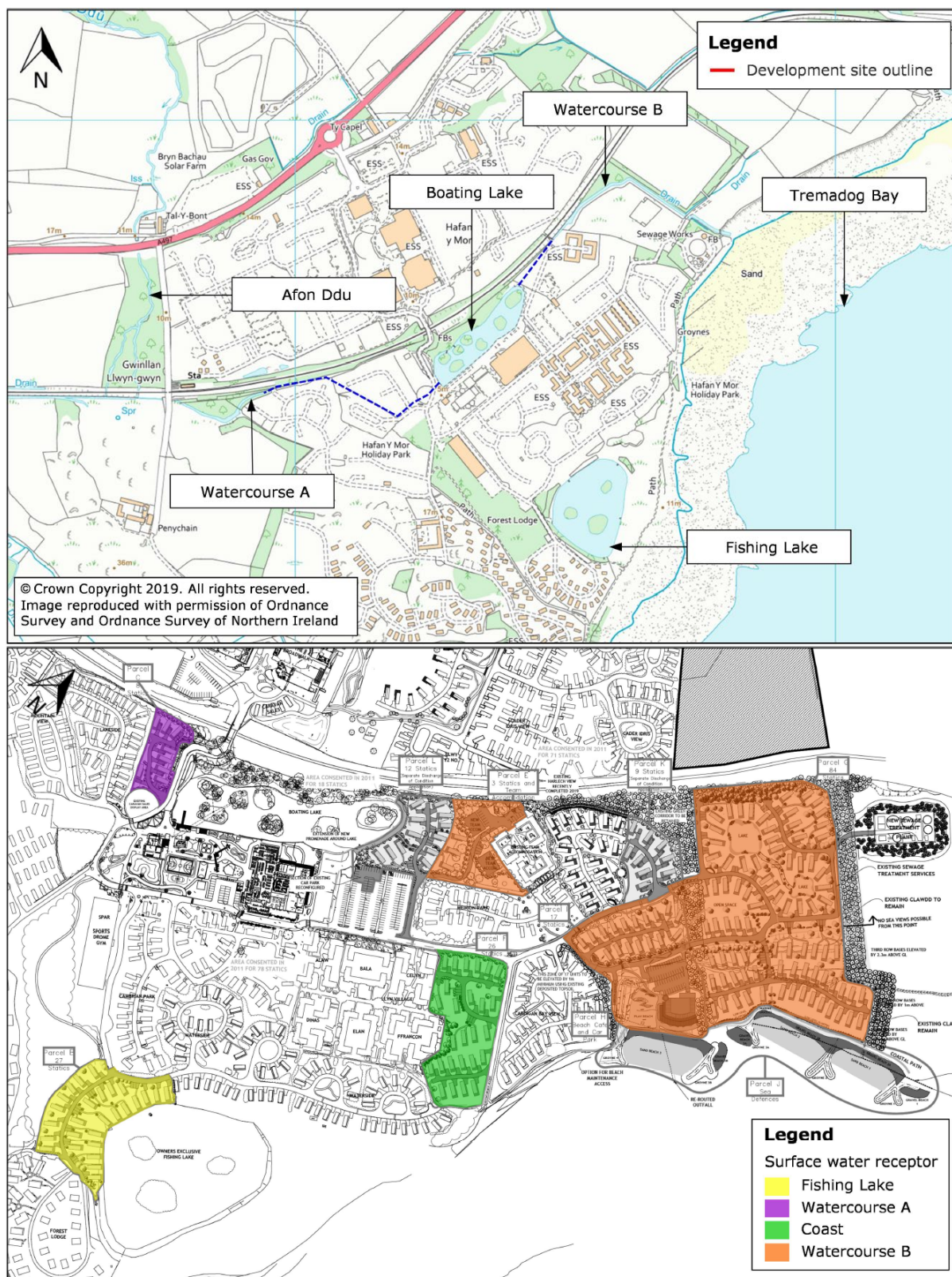


Figure 7. Water bodies in the vicinity of the Proposed Development at Hafan y Môr



Source: Weetwood, 2019

**Image 3.** Watercourses, drainage catchments and surface water receptors within the Proposed Development at Hafan y Môr

## Bathing Waters

The revised Bathing Water Directive (2006/7/EC) was adopted in 2006, updating the microbiological and physico-chemical standards set by the original Bathing Water Directive (76/160/EEC) and the process used to measure/monitor water quality at identified bathing waters. The revised Bathing Water Directive focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the original Bathing Water Directive. Bathing waters under the revised Bathing Water Directive are classified as excellent, good, sufficient or poor according to the levels of certain types of bacteria (intestinal enterococci and *Escherichia coli*) in samples obtained during the bathing season (May to September).

The original Bathing Water Directive was repealed at the end of 2014 and monitoring of bathing water quality has been reported against revised Bathing Water Directive indicators since 2015. The new classification system considers all samples obtained during the previous four years and, therefore, data has been collected for revised Bathing Water Directive indicators since 2012. The UK Government's target is to achieve 'sufficient' for all bathing waters by 2015, as described under the Bathing Water Regulations 2013 which transposes the revised Bathing Water Directive into UK law.

The nearest bathing water is Glan Don Beach (newly designated in 2017), located approximately 5.5 km to the west of the Proposed Development and currently classified as achieving excellent water quality (Figure 8). There are several other bathing waters within 15 km of the Proposed Development (Table 12), all classified as achieving excellent water quality over the last four years.

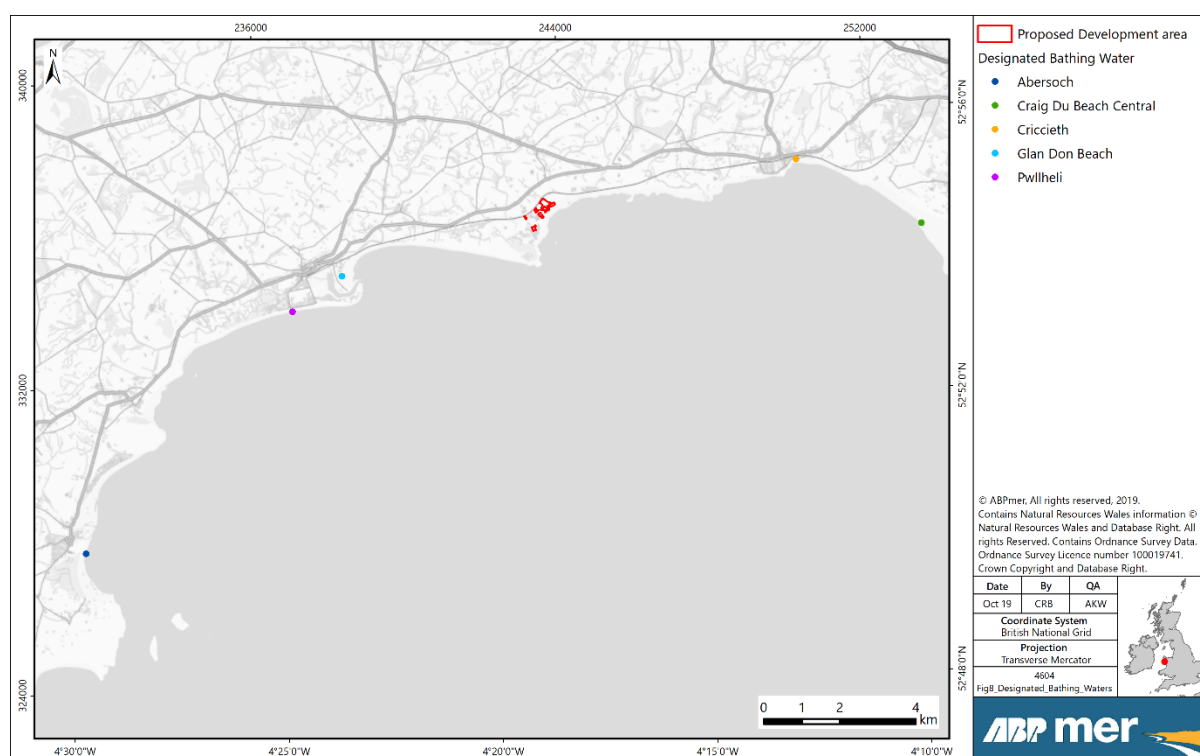


Figure 8. Bathing water in the vicinity of the Hafan y Môr Proposed Development

**Table 12. Bathing waters in the vicinity of the Proposed Development and water quality classifications over the last four years**

| Bathing Water          | Distance* / Direction | 2015      | 2016      | 2017      | 2018      |
|------------------------|-----------------------|-----------|-----------|-----------|-----------|
| Glan Don Beach         | 5.5 km / west         | Excellent | Excellent | N/A       | N/A       |
| Criccieth              | 6.5 km / east         | Excellent | Excellent | Excellent | Excellent |
| Pwllheli               | 7.0 km / west         | Excellent | Excellent | Excellent | Excellent |
| Craig Du Beach Central | 9.5 km / east         | Excellent | Excellent | Excellent | Excellent |
| Abersoch               | 14 km / southwest     | Excellent | Excellent | Excellent | Excellent |
| Harlech                | 14 km / southeast     | Excellent | Excellent | Excellent | Excellent |

\* Approximate distance from the proposed coastal defence works.

### Shellfish Water Protected Areas

The Shellfish Waters Directive (2006/113/EC) was repealed in December 2013 and subsumed within the WFD. However, the Shellfish Water Protected Areas (England and Wales) Directions 2016 require NRW (in Wales) to endeavour to observe a microbial standard in all 'Shellfish Water Protected Areas'. The microbial standard is 300 or fewer colony forming units of *E. coli* per 100 ml of shellfish flesh and intravalvular liquid. The Directions also requires NRW to assess compliance against this standard to monitor microbial pollution (75 % of samples taken within any period of 12 months below the microbial standard and sampling/analysis in accordance with the Directions).

The nearest Shellfish Water Protected Area is Mawddach, located approximately 25 km to the southeast; however, there are currently no classification zones for bivalve mollusc harvesting at this location.

### Nitrate Vulnerable Zones

The Nitrates Directive (91/676/EEC) is designed to protect waters against nitrate pollution from agricultural sources. It requires European member states who do not opt for a whole territory approach to identify waters which are, or could become, polluted by nitrates. The member states are also required to designate as NVZs all land that drains to those waters and which contributes, as a result, to nitrate pollution.

The nearest NVZ is approximately 30 km to the north on Anglesey/Ynys Môn (NVZ ID: 206)<sup>34</sup>.

### Waste Water Treatment

The Urban Waste Water Treatment Directive (91/271/EEC) aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. In general, the Urban Waste Water Treatment Directive requires that collected waste water is treated to at least secondary treatment standards for significant discharges. Secondary treatment is a biological treatment process where bacteria are used to break down the biodegradable matter (already much reduced by primary treatment) in waste water. Sensitive areas under the Urban Waste Water Treatment Directive are water bodies affected by eutrophication of elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

There are no "Sensitive Areas" as under the Urban Waste Water Treatment Directive in the vicinity of the Proposed Development at Hafan y Môr, with the surrounding land considered a 'normal area'<sup>35</sup>.

<sup>34</sup> <https://lle.gov.wales/catalogue/item/NitrateVulnerableZonesNVZ/?lang=en> (Accessed October 2019).

<sup>35</sup> <https://www.eea.europa.eu/themes/water/european-waters/water-use-and-environmental-pressures/uwwtd/interactive-maps/urban-waste-water-treatment-maps> (Accessed October 2019).

All the foul drainage from the existing Hafan y Môr Holiday Park was previously conveyed by pumped systems to a sewage treatment plant (STP) that was located on a section of coastline protected by a rock armour revetment. This STP had consent from NRW for the discharge of treated effluent from the plant via a long sea outfall into the sea. This STP has been replaced with a new STP that has been constructed and installed to the north east of the Proposed Development, immediately to the south of the railway (Gwynedd Council Application No. C17/0739/40/LL). The treated effluent from the new STP continues to be discharged to the sea via the same long sea outfall (Bratherton Park Design Consultants, 2019).

### 7.2.2 Sediment quality

Five surface sediment samples were collected in the vicinity of the proposed coastal defence works in 2016, with a further 16 surface samples collected in 2017. Each sample was analysed for particle size distribution, with results presented in Table 13. Surface sediments near Hafan y Môr typically comprise a significant sand fraction (<2 mm to >63 µm; mean = 75.8 %), with samples in the upper foreshore including greater proportions of gravel (i.e. >2 mm) and samples further down the shore including increased silt levels (i.e. <63 µm). Thirteen boreholes were collected from the proposed beach recharge areas in 2019, sampling to 1.5 m as the proposed depth to be excavated. The borehole results indicate that surficial sediments, which include relatively coarse material (i.e. sand and gravel), present a thin veneer (approximately 15 cm) above a layer of dense/firm clays beneath.

**Table 13. Particle size distribution of surface sediment samples collected in the vicinity of the proposed coastal defence works at Hafan y Môr**

| Surface Sediment Sample | Particle Size Distribution (%) |                       |               |
|-------------------------|--------------------------------|-----------------------|---------------|
|                         | Gravel (>2 mm)                 | Sand (<2 mm - >63 µm) | Silt (<63 µm) |
| B1                      | 0.0                            | 100.0                 | 0.0           |
| B2                      | 1.9                            | 97.9                  | 0.2           |
| B3                      | 0.0                            | 100.0                 | 0.0           |
| B4                      | 38.1                           | 58.4                  | 3.6           |
| B5                      | 28.3                           | 71.4                  | 0.3           |
| BS02                    | 65                             | 34                    | 1             |
| BS04                    | 2                              | 96                    | 2             |
| BS06                    | 81                             | 18                    | 1             |
| BS07                    | 4                              | 94                    | 2             |
| BS08                    | 0                              | 7                     | 93            |
| BS09                    | 0                              | 89                    | 11            |
| BS10                    | 0                              | 97                    | 3             |
| BS11                    | 41                             | 57                    | 2             |
| BS12                    | 4                              | 95                    | 1             |
| BS13                    | 0                              | 98                    | 2             |
| BS14                    | 1                              | 71                    | 28            |
| BS15                    | 1                              | 96                    | 3             |
| BS16                    | 64                             | 35                    | 1             |
| BS17                    | 0                              | 99                    | 1             |
| BS18                    | 0                              | 89                    | 11            |
| BS19                    | 0                              | 89                    | 11            |

## 7.3 Impact assessment

### 7.3.1 Impact Pathway 3: Accidental plant spillages during construction

There is some risk from accidents and spillages/leaks in any construction operation (e.g. oil, fuel and lubricants from machinery) which could result in the contamination of the adjacent sediments and water. Should pollution occur from runoff, stored material or accidental spillages, the adverse effect on water resources and their associated ecology could be significant, the scale of which will depend on the nature and magnitude of the pollution incident. The implications of a pollution incident are highly dependent on both the nature of the substance released and the species that would be affected. However, this risk will be minimised by ensuring that the construction methods, Proposed Development design and the contractual arrangements are pursued in an appropriate way (see Section 2.10).

In order to reduce the risk of accidental spillages and/or leaks from construction plant, the following guidance will be adopted:

- Pollution Prevention Guidance (PPG), or Guidance for Pollution Prevention (GPP)<sup>36</sup>:
  - Understanding Your Environmental Responsibilities – Good Environmental Practices (PPG1);
  - Works and maintenance in or near water (GPP5);
  - Working at construction and demolition sites (PPG6); and
  - Safe storage and disposal of used oils (GPP8);
- Regulatory guidance available from GOV.UK<sup>37</sup>
- The Oil Care Code; and
- CIRIA's Environmental Good Practice on Site (CIRIA, 2010).

In adhering to this guidance, a number of best practice measures will be followed. All wastes generated on site will be removed in a timely manner and any materials and containers giving rise to possible spills or contamination of the surrounding environment will be taken from site to be processed at a licensed facility. In the event of a pollution incident then measures to report, manage and minimise any impacts will be pursued.

Plant will also be maintained regularly, will use biodegradable hydraulic oils and will carry spill kits in the event of an accident. Refuelling will be in designated sites away from the water to limit the potential for spillages. Fuel will be stored in the site compound overnight, limiting the potential for fuel theft and vandalism which could cause pollution. Should any pollution incidents occur, they will be reported immediately to NRW via the hotline number (03000 653000). The workforce will be trained in preventing and dealing with pollution incidents.

Given the resultant very low risk (due to the appropriate mitigation measures included in Proposed Development methodology), the probability of occurrence is considered to be Low and the magnitude of change will be Small/Negligible. This results in a Negligible exposure to change on surface or groundwater receptors. Therefore, despite the High sensitivity of the Tremadog Bay coastal water body to such events, based on the current (2018) overall good status of the water body, and High importance due to the presence of protected areas (see Section 8), the potential impact of spillages on water quality is assessed as **Insignificant** on the basis that there will be mitigation through adherence to good workings practices and guidance.

<sup>36</sup> <http://www.netregs.org.uk/environmental-topics/pollution-prevention-guidelines-ppgs-and-replacement-series/guidance-for-pollution-prevention-gpps-full-list/>

<sup>37</sup> <https://www.gov.uk/government/collections/pollution-prevention-guidance-ppg>

### 7.3.2 Impact Pathway 4: Construction materials and disturbance of sediment

The potential for changes in water quality to occur arise primarily where sediment is released into the water column as a result of physical disturbance to the seabed or introduction of new materials to the marine environment. This is particularly the case for fine sediments (<63 µm) which can become suspended more easily. Dependent on the scale of change and the sensitivity of species, an increase in suspended sediment concentrations can cause a wide range of environmental impacts, including clogging of gills (e.g. essential feeding apparatus for filter-feeders) and smothering of sedentary organisms. Elevated levels of suspended sediment (increased turbidity) can cause a reduction in light penetration through the water column (Newell *et al.*, 1998), restricting the light availability for photosynthesis in important primary producers such as phytoplankton and macrophytes. Such primary producers are important sources of food and oxygen and a reduction in their productivity can reduce water quality. High levels of suspended sediment may also increase chemical oxygen demand (COD) and encourage the oxidation of organic matter by bacteria (Biological Oxygen Demand or BOD), depressing dissolved oxygen content.

Larger disturbed particles are generally quickly deposited on the seabed, while finer sediments remain suspended for longer durations and, coupled with a highly dispersive environment, can be transported over greater distances. The potential to impact the marine environment as a result of any sediment-bound contaminants arises primarily when the sediment that is released into the water column disperses and deposits elsewhere. The proposed construction works will not input any additional contaminants into the system through the introduction of contaminated sediment (i.e. material used for beach recharge will be clean), but it could potentially redistribute any contaminants already present in the sediments.

The resuspension of sediment can lead to the release and mobilisation of sediment-bound contaminants into the water column. These include both toxic contaminants, such as heavy metals, pesticides and hydrocarbons, and non-toxic contaminants, such as nutrients. The occurrence of contaminated sediment is most likely to occur where the sediments are finer (with more surface area for absorption of contaminants) and where toxic material has previously settled onto the seabed. The chemical contaminants associated with sediments can be removed or disturbed during construction and may be dispersed, redistributed and deposited elsewhere in the marine environment where they may become available for uptake by marine organisms. As sediment is disturbed and re-distributed into the water column, sediment-bound contaminants may be partitioned from the solid phase (i.e. bound to sediments or suspended matter), to the dissolved or aqueous phase (i.e. dissolved in pore water or overlying water) (Luoma, 1983).

The construction of the groynes, as well as beach recharge, will be undertaken in a dry working environment (i.e. around low tide). The majority of the proposed works are located above mean high water springs and thus resuspension of unconsolidated sediments will be minimal on subsequent flooding tides above these levels. Sediment samples collected in 2016 and 2017 indicate that surface sediments predominantly comprise sands and gravels in the upper foreshore (Table 13). The potential for these surficial sediments to be resuspended and dispersed in the wider marine environment is limited. While material below these relatively coarse surface sediment includes dense/firm clay material, it is considered unlikely that large quantities of fine sediments will be redistributed in the wider area. This is because, fine sediments will only be disturbed and become unconsolidated by the proposed works in the dry and will therefore not be immediately re-suspended into the water column. Once inundated by the tide during construction, small amounts of unconsolidated fine materials may be re-suspended, but only for a limited period in shallow water close to the proposed works. Therefore, any sediment disturbance that results in increases in suspended sediment concentrations during construction is likely to be small in scale, highly localised and short-term.

The coarse surface material situated in the vicinity of the Proposed Development is likely to have low concentrations of organic matter and be uncontaminated. This is because coarser sediments have a lower surface area for adsorption of particles. Therefore, the resuspension of these sediments is not expected to result in a significant redistribution of contaminants or reductions in dissolved oxygen. While high contaminant concentrations are typically associated with finer material, it is considered unlikely that the clay material present below the coarse surface layer will be contaminated (no known historic contamination events in the area). Material used for beach recharge will be clean and will also be of a similar grain size to that found naturally on the local foreshore. Therefore, this is unlikely to result in significant changes in suspended sediment concentrations, nor introduce contaminants to the marine environment.

The probability of sediment resuspension in the marine environment is considered to be Low given that excavation and placement of material will be undertaken in the dry. The magnitude of change is considered to be Small due to the potential changes being confined to the immediate spatial extent over a short/temporary timescale. The exposure to change is therefore considered to be Negligible. Despite the High sensitivity of the Tremadog Bay coastal water body, based on a current overall good status of the water body, and High importance due to the presence of protected areas (see Section 8), the overall effects of excavations for the groynes and beach recharge on suspended sediment levels and water quality conditions is assessed as **Insignificant**.

### 7.3.3 Impact Pathway 5: Changes in status of nearby WFD water bodies

A WFD compliance assessment has been prepared to consider potential impacts of the Proposed Development on nearby WFD water bodies, presented in Appendix L. This follows the Environment Agency's 'Clearing the Waters for All' guidance and NRW's internal guidance for assessing activities and projects for compliance with the WFD, referred to as Operational Guidance Note 72 (OGN 72; NRW, 2018).

The WFD compliance assessment concludes that the Proposed Development at Hafan y Môr is not likely to have a permanent (i.e. non-temporary) effect on the status of WFD parameters that are significant at water body level. Therefore, deterioration to the current status of the Tremadog Bay coastal water body, Erch – lower river water body or Llyn and Eryri groundwater water body is not predicted, nor a prevention of these water bodies achieving future WFD status objectives.

## 7.4 Mitigation measures and residual effects

No impact pathways are expected to give rise to significant adverse effects. Nevertheless, good practice measures, such as those described in 'Guidance for Pollution Prevention: Works and maintenance in or near water (GPP5)', will be used to prevent/reduce the potential for accidental spillages during construction. Such measures will be included in the CEMP (see Section 4.12).

## 7.5 Summary and conclusions

This section reports the assessment of potential impacts on water and sediment quality receptors as a result of the Proposed Development. With the adoption of appropriate mitigation, it is considered that significant impacts can be avoided and/or minimised. A summary of the impact pathways that have been assessed and the identified residual impacts following the application of mitigation measures is presented in Table 14.

**Table 14. Summary of potential impact, mitigation measures and residual impacts for water and sediment quality**

| Receptor                   | Impact Pathway                                     | Impact Significance                               | Mitigation Measures/Monitoring                                                                 | Residual Impact | Confidence |
|----------------------------|----------------------------------------------------|---------------------------------------------------|------------------------------------------------------------------------------------------------|-----------------|------------|
| Water and sediment quality | Accidental plant spillages during construction     | Insignificant                                     | Guidance and best practice measures to be incorporated in CEMP and adopted during construction | Insignificant   | High       |
|                            | Construction materials and disturbance of sediment | Insignificant                                     | N/A                                                                                            | Insignificant   | Medium     |
|                            | Changes in status of nearby WFD water bodies       | N/A (see WFD Compliance Assessment in Appendix L) | N/A                                                                                            | N/A             | High       |

## 7.6 References

Bratherton Park Design Consultants (2019). Hafan y Môr Holiday Park, Pwllheli LL53 5RJ. Planning Application for Proposed Park Expansion and Infill Development. Drainage Strategy Report. October 2019.

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Natural Resources Wales (NRW) (2015). Western Wales River Basin Management Plan 2015 – 2021. Summary. December 2015. Available online at: <https://naturalresources.wales/evidence-and-data/research-and-reports/water-reports/river-basin-management-plans/river-basin-management-plans-published/?lang=en> (Accessed October 2019).

Natural Resources Wales (NRW). Water Watch Wales website: <https://waterwatchwales.naturalresourceswales.gov.uk/> (Accessed October 2019).

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Newell, R.C., Seiderer, L.J. and Hitchcock, D.R. (1998). The impact of dredging works in coastal waters: a review of the sensitivity to disturbance and subsequent recovery of biological resources on the sea bed. *Oceanography and Marine Biology: An Annual Review* 36: 127-178.

Weetwood (2019) Flood Consequences And Surface Water Drainage Assessment. Draft Report v1.0. October 2019

## 8 Marine Ecology and Nature Conservation

This section of the ES considers how the Proposed Development will affect marine ecology receptors. The first two sub-sections (Sections 8.1 and 8.2) cover the data sources and consultation which has taken place with regard to this topic, as well as the baseline information. The impact assessment relating to marine ecology is presented in Section 8.3, mitigation measures and residual effects in Section 8.4, and Section 8.5 provides a summary and conclusions.

### 8.1 Data sources and consultation

#### 8.1.1 Data sources

The following data sources were used to understand the baseline environment:

- MAGIC (Multi-Agency Geographic Information for the Countryside) Interactive Map (<http://www.magic.gov.uk>) provides the location of all designated conservation sites in the area;
- Joint Nature Conservation Committee (JNCC) website (<http://jncc.defra.gov.uk/page-4>) which provides definitions of designated sites and their respective features;
- Natura 2000 standard data forms/information sheets for each designation, as well as related Geographic Information System (GIS) shapefiles;
- Countryside Council for Wales (CCW) (now NRW) biotope data (Brazier *et al.*, 2007);
- British Trust for Ornithology (BTO) Non-Estuarine Waterbird Survey (NEWS) undertaken in 2015/16; and
- Marine Evidence based Sensitivity Assessment (MarESA) based on the Marine Life information Network (MarLIN) website.

#### 8.1.2 Consultation and scope

Based on the Scoping Report, and the subsequent Scoping Opinion provided by NRW, Gwynedd Council, and statutory consultees (see Section 5.1), Table 15 presents the marine ecology receptors, impact pathways, and further work that has been carried out to inform the planning and marine licence application.

**Table 15. Impact pathways and summary of further work for ecology and nature conservation**

| Receptor | Impact Pathway                                                                                     | Requires Further Assessment?    | Justification                                                                                                                                                                                                                                                                                                                                               | Summary of Further Work                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|----------|----------------------------------------------------------------------------------------------------|---------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Habitats | Physical disturbance of intertidal habitats during construction                                    | Yes ( <b>Impact Pathway 6</b> ) | There is the potential for impacts to intertidal habitats and species as a result of physical disturbance during construction of the proposed coastal defences.                                                                                                                                                                                             | This impact pathway has been assessed. It has also been assessed in the context of the Habitat Regulations (see Section 4.4, and Appendix K). It focusses on disturbance to the upper shore during the demolition of existing linear defences, cut back of the landform, and importation of materials and sediment recharge to from the new coastal defences. Increases in suspended sediment concentrations and smothering due to sediment disturbance is considered unlikely as construction works will be undertaken in a dry working environment and will therefore not be considered further. |
|          | Direct loss of intertidal habitat (feature of SAC) under the development footprint                 | Yes ( <b>Impact Pathway 7</b> ) | Sandflat habitat will be lost as a result of the proposed coastal defences. This is a feature of the Pen Llŷn a'r Sarnau SAC.                                                                                                                                                                                                                               | This impact pathway has been assessed. It has also been assessed in the context of the Habitat Regulations (see Section 4.4, and Appendix K).                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Changes to intertidal habitat along the beach from hydro-morphology and sediment transport changes | Yes ( <b>Impact Pathway 8</b> ) | There is potential for changes to sediment transport and hydro-morphology to effect intertidal habitat. The implications for coastal squeeze should also be considered as well as the resilience of ecosystems in accordance with Section 6 of the Environment Act (Wales) 2016 as per Gwynedd Council's scoping opinion advice.                            | This impact pathway has been assessed. It has also been assessed in the context of the Habitat Regulations (see Section 4.4, and Appendix K).                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Physical disturbance of intertidal habitats during operational phase maintenance work              | Yes ( <b>Impact Pathway 9</b> ) | There is the potential for impacts to intertidal habitats and species as a result of physical disturbance during operational phase maintenance of the proposed coastal defences.                                                                                                                                                                            | This impact pathway has been assessed. It has also been assessed in the context of the Habitat Regulations (see Section 4.4, and Appendix K).                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|          | Changes in water quality during construction                                                       | No                              | The expected negligible, highly localised and temporary changes in suspended sediment levels (and related changes in sediment bound contaminants and dissolved oxygen) associated with sediment disturbance during construction works or changes in sediment transport during operation (outlined in Section 7.3) is considered unlikely to produce adverse | No further assessment work has been undertaken for this impact pathway.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |

| Receptor                | Impact Pathway                                             | Requires Further Assessment?    | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Summary of Further Work                                                                          |
|-------------------------|------------------------------------------------------------|---------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|
|                         |                                                            |                                 | effects in any species. The potential for accidental spillages will also be negligible during construction through following established industry guidance and protocols.                                                                                                                                                                                                                                                                                                                                                                                                      |                                                                                                  |
| Waterbirds              | Waterbird disturbance during construction                  | Yes ( <b>Impact Pathway 9</b> ) | NRWs scoping opinion advised to assess potential impacts to all bird species that frequent the area.                                                                                                                                                                                                                                                                                                                                                                                                                                                                           | This impact pathway has been scoped in for further assessment and assessed within Section 8.3.5. |
|                         | Direct loss of and changes to intertidal waterbird habitat | No                              | Physical disturbance to, direct loss of, and changes to, intertidal habitat is assessed in Impact Pathways 6 to 9. Whilst some birds may forage on the strandline of the barren shingle and on the sandflat that will be lost within the footprint of the proposed coastal defences, this is not considered a particularly valuable food resource due partly to the recreational use of the foreshore. The potential bird habitat lost is also a small fraction of the available similar habitat nearby and is not expected to significantly effect birds using the foreshore. | No further assessment work has been undertaken for this impact pathway.                          |
|                         | Waterbird disturbance during operation                     | No                              | Recreational pressure may increase on the foreshore during operation of the Proposed Development. However, birds using the foreshore on Hafan y Môr beach are already likely habituated to the presence of people and dogwalkers. Therefore, significant effects to birds are not expected due to increases in recreational pressure.                                                                                                                                                                                                                                          | No further assessment work has been undertaken for this impact pathway.                          |
| Marine mammals and fish | Underwater noise and vibration during construction         | No                              | No piling is proposed as part of the construction methodologies for the coastal defences. Furthermore, construction of the coastal defences will be undertaken in a dry working environment (i.e. around low tide). Therefore, significant increases in underwater noise and vibration are unlikely.                                                                                                                                                                                                                                                                           | No further assessment work has been undertaken for this impact pathway.                          |

| Receptor           | Impact Pathway                                         | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Summary of Further Work                                                                                                                                                                                        |
|--------------------|--------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Non-native species | Introduction of non-native species during construction | No                               | It is not envisaged that material will be delivered by sea during the construction work and therefore no vessels are expected to access the upper shore. Vehicular movements will be largely above the MHWS area and a defined construction zone will be identified at the top of the shore. Construction of the coastal defences will be undertaken in a dry working environment (i.e. around low tide). Furthermore, the sand used for recharge will be of marine origin and will almost certainly be taken from the consented Hilbre Swash extraction site at the mouth of the Dee Estuary. It will be screened at the extraction site and therefore there will be no risk of introducing invasive non-native species to the area. | No further assessment work has been undertaken for this impact pathway. However, a Biosecurity Plan will be prepared and included within a CEMP, as per comment from NRW in the Scoping Opinion (see Table 2). |
|                    | Introduction of non-native species during operation    | No                               | The new coastal defences will introduce a new substrate into the marine environment that has the potential to be colonised by invasive non-native species. However, given the small and localised scale of the works the exposure to change is likely to be low.                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | No further assessment work has been undertaken for this impact pathway. However, a Biosecurity Plan will be prepared and included within a CEMP, as per comment from NRW in the Scoping Opinion (see Table 2). |
| Geology            | Direct physical interaction with geology               | Yes ( <b>Impact Pathway 10</b> ) | The coastal works will involve the removal of sediment from the foreshore. This together with any changes in coastal processes have the potential to affect underlying geology and features of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Potential effects on underlying geology and the SSSI have been assessed within this impact pathway.                                                                                                            |

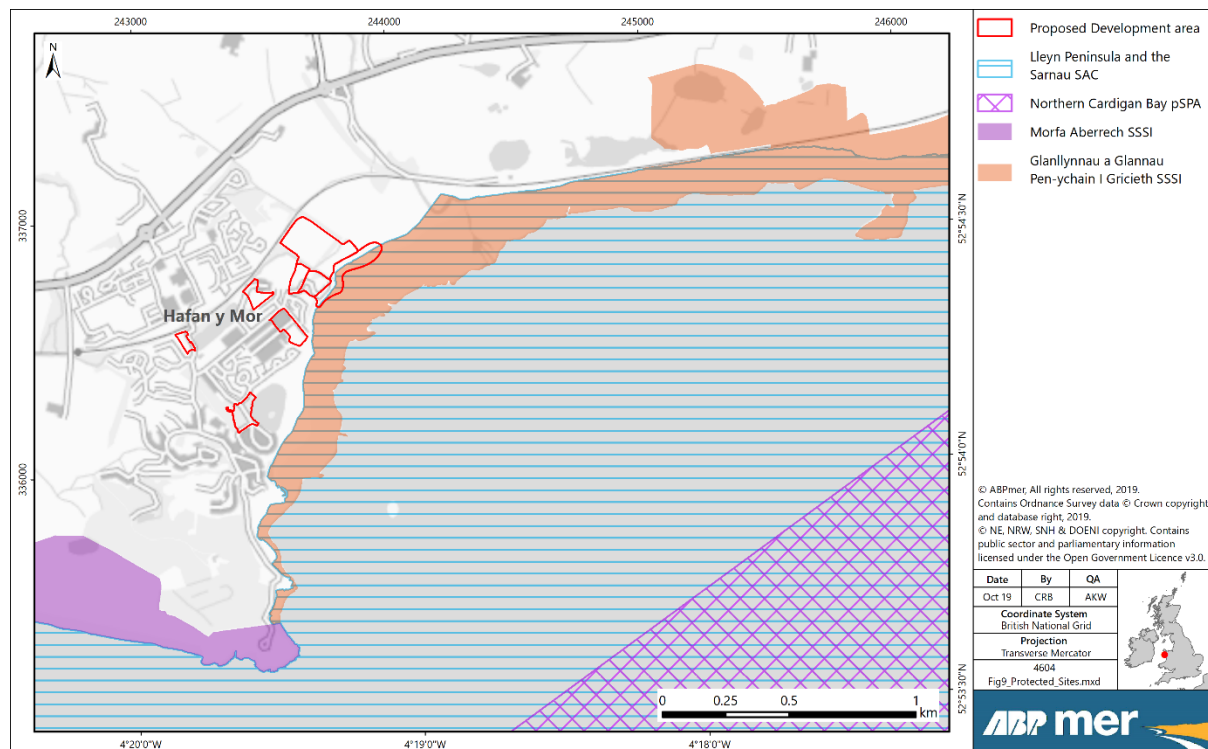
## 8.2 Review of baseline understanding

### 8.2.1 Designated nature conservation sites

A summary of marine and coastal designated sites for nature conservation is provided in Table 16 and shown in Figure 9.

**Table 16. Summary of designated sites for marine and coastal nature conservation within 2 km of the Proposed Development**

| Designated Sites                                 | Feature of Conservation Interest                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          |
|--------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Internationally Designated</b>                |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Pen Llŷn a'r Sarnau SAC                          | <p><b>Annex I habitats that are a primary reason for selection of this site:</b></p> <ul style="list-style-type: none"> <li>1110 Sandbanks which are slightly covered by sea water all the time</li> <li>1130 Estuaries</li> <li>1150 Coastal lagoons</li> <li>1160 Large shallow inlets and bays</li> <li>1170 Reefs</li> </ul> <p><b>Annex I habitats that are present as a qualifying feature, but not a primary reason for selection of this site:</b></p> <ul style="list-style-type: none"> <li>1140 Mudflats and sandflats not covered by seawater at low tide</li> <li>1310 Salicornia and other annuals colonizing mud and sand</li> <li>1330 Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)</li> <li>8330 Submerged or partially submerged sea caves</li> </ul> <p><b>Annex II species that are present as a qualifying feature, but not a primary reason for site selection:</b></p> <ul style="list-style-type: none"> <li>Bottlenose dolphin <i>Tursiops truncatus</i></li> <li>Otter <i>Lutra lutra</i></li> <li>Grey seal <i>Halichoerus grypus</i></li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Northern Cardigan Bay SPA                        | <p><b>Article 4.1 qualifying species (79/409/EEC)</b></p> <p>Over winter:</p> <ul style="list-style-type: none"> <li>Red-throated diver <i>Gavia stellata</i>, 1,186 individuals representing 7 % of the wintering population in Great Britain (2001/02 –2003/04)</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                              |
| <b>Nationally Designated</b>                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI | <p>An 8 km length of shoreline with nationally and regionally important intertidal communities between the headlands at Pen-y-chain and Criccieth Castle.</p> <p><b>Geology</b></p> <p>Glanllynau is one of the most important sites for studies of the late Devensian in Wales. A low coastal cliff reveals a sequence of glacial deposits. Recent work has shown that the geological sequence can be explained in terms of a single glaciation during the late Devensian. This site may therefore provide a valuable model for reinterpreting other multiple till sequences in Wales. Radiocarbon analysis and studies of pollen and Coleoptera in the late-glacial sediments further enhance the significance of the site for environmental reconstructions. Glanllynau has yielded the earliest radiocarbon date (14,468 ± 300 Before Present) for deglaciation in Wales. It is also the only site in Wales where Coleoptera have been studied to produce a detailed palaeo temperature reconstruction.</p> <p><b>Marine biology</b></p> <p>The shoreline is the largest extent of moderately exposed mixed rock and sediment shore in the Bardsey Island to St David's Head Area of Search, and is the most typical, and has the best variety of biotopes (seashore and seabed habitats and their associated communities) expected to occur on this type of coastline. The nationally important <i>Sabellaria alveolata</i> (marine worm) reef biotope, is found in extensive reaches with outcrops of the nationally important 'clay with Piddocks' (mollusc) biotope also present. Areas of sand on this shore are well zoned. At the rear of the shore is a narrow strandline with the sand hopper <i>Talorchestia deshayesii</i> above a narrow band of barren sand. A relatively wide expanse of upper to mid shore sediment is dominated by lugworm <i>Arenicola marina</i>, catworm <i>Nephtys</i> species and amphipods.</p> |
| Morfa Abererch SSSI                              | <p>Morfa Abererch is located on the south coast of the Llyn Peninsula between Pwllheli and Criccieth. This site is of special interest for its lowland heath, vegetated shingle and floodplain fen. The site supports a significant area of lowland heathland including dune heath, dry heath, maritime heath, wet heath and scrub.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |



**Figure 9. Marine designated sites for nature conservation surrounding Proposed Development**

### International designated sites

The Proposed Development coastal defences overlap with the Pen Llŷn a'r Sarnau SAC.

No other international nature conservation designations (i.e. SACs, Special Protection Area (SPAs), and Ramsar sites) overlap with the Proposed Development site.

The next nearest European site is the Northern Cardigan Bay SPA, located approximately 1.5 km offshore from the Proposed Development coastal defences. This is designated for its wintering population of Red-throated Diver *Gavia stellata*.

### National designated sites

The Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI overlaps with the Proposed Development coastal defences. The defences comprise approximately 0.3 km of the 8 km shoreline included in the SSSI. It is designated for glacial deposits exposed along the coastal cliffs at Glanllynau and the associated glacial landforms found inland. It is also nationally important for the variety of seashore and seabed biotopes including a complete community zonation that includes small beds of eelgrass, rock pools, mixed substrata, and sand influenced biogenic reef honeycomb worms *Sabellaria alveolata*.

Morfa Abererch SSSI, located approximately 0.6 km south of the Proposed Development, is designated for lowland heath, vegetated shingle and floodplain fen. There is also a dune system comprising a narrow section of foredune backed by a large area of dune heath vegetation (e.g. heather *Calluna vulgaris* and sand sedge *Carex arenaria*).

There are no other national designated sites for marine features (e.g. Marine Conservation Zone (MCZ)) within 2 km of the Proposed Development.

## Local designated sites

There are no locally designated sites within the marine environment. There are a number of Candidate Wildlife Sites located within the Proposed Development site (see Section 9).

### 8.2.2 Intertidal habitats

The intertidal habitat and associated notable features are summarised below following an intertidal habitat survey (ABPmer, 2017b), with a full description of each biotope provided in Appendix E. The locations of intertidal biotopes are presented in Figure 10 and Figure 11.

#### Upper shore habitats

The intertidal area at Hafan y Môr is a sheltered crenulated shaped beach consisting of rock and shingle at either end of the bay, within which is a zoned beach of sand and shingle. Part of the area fronting Hafan y Môr Holiday Park consists of a boulder seawall or large cobbles, boulders and shingle including a collection of broken concrete and general debris. This foreign material will be removed and used in the hinterland landscaping.

The upper shore, near where the Proposed Development coastal defences will be placed, mainly consisted of barren shingle, pebbles and cobbles (MNCR Biotope Code LS.LCS.Sh.BarSh: Barren littoral shingle). These habitats are generally impoverished and have a low biodiversity. Within this zone, there were several strandline areas characterised by sand hoppers (Talitrid amphipods) on decomposing seaweed (LS.LSa.St.Tal: Talitrids on the upper shore and strandline). Clean sand with frequent lugworm *Arenicola* sp. casts was present below this zone (LS.LSa.FiSa.Po: Polychaetes in littoral fine sand). The only species recorded in infaunal samples collected from this area was the polychaete *Nephtys cirrosa* (3 individuals).

#### Mid-shore habitats

Lower down the foreshore (away from the Proposed Development site), the habitats change with alteration to tidal elevation, sediment type and the level of consolidation. The middle shore fronting the Proposed Development coastal defences is characterised predominantly by fine sand with occasional lugworm *Arenicola* spp. casts. The infaunal sample revealed four species (the errant polychaete *Nephtys cirrosa*, mobile crustaceans *Bodotria pulchella* and *Bathyporeia pilosa* and the bivalve *Fabulina fabula*) typical of clean sand beach habitat, characterised by low species diversity and organism abundance. Large boulder and cobble fields were also present in the mid-eulittoral shore, with bladder wrack *Fucus vesiculosus* and spiral wrack *F. spiralis* recorded occasionally in the upper sections. Barnacles were abundant, the periwinkle *Littorina littorea* was frequently recorded, and gammarids were present underneath the pebbles and cobbles (LR.FLR.Eph.BLitX: Barnacles and *Littorina* spp. on unstable eulittoral mixed substrata). The lower sections of the boulder fields were characterised by abundant bladder wrack *F. vesiculosus* (LR.LLR.F.Fves.X: *Fucus vesiculosus* on mid eulittoral mixed substrata). The area was rich in gastropod species including the netted dog whelk *Nassarius reticulatus*, flat periwinkle *Littorina obtusata*, dog whelk *Nucella lapillus*, common periwinkle *L. littorea*, the common limpet *Patella vulgata* and top shells (*Osilinus lineatus*, *Gibbula cineraria* and *G. umbilicalis*). The beadlet anemone *Actinia equina* was also occasionally recorded.

The honeycomb worm *Sabellaria alveolata* was commonly recorded encrusting the boulders in the mid-shore area fronting the Hafan y Môr Holiday Park. The *S. alveolata* structures generally consisted of flat (sheet) crusts or patchy mounds, though several patches were recorded where more notable biogenic growth had occurred (LS.LBR.Sab.Salv: *Sabellaria alveolata* reefs on sand-abraded eulittoral rock). Honeycomb worm *S. alveolata* reef is a BAP Priority Habitat (UK Biodiversity Action Plan, 2008a) and also listed as a Habitat of Principal Importance under Section 7 of the Environment Act (Wales)

2016. The habitat is included in the OSPAR List of Threatened and/or Declining Habitats and Species (OSPAR, 2008). Gravelly sand habitat between the *S. alveolata* reef consisted of a sparse assemblage with only the polychaete *Polyophthalmus pictus* (three individuals) and isopod *Sphaeromatidae* spp. recorded in the infaunal samples collected from this area.

### Lower shore habitats

The shallow sublittoral zone (lower shore) consisted of a mixture of sand, gravel, cobbles and small boulders characterised by red seaweeds (particularly carrageen moss *Chondrus crispus* and calcareous algae *Corallina officinalis*). The sugar kelp *Saccharina latissima* (*Laminaria saccharina*) was also frequently recorded (IR.HIR.KSed.LsacChoR: *Laminaria saccharina*, *Chorda filum* and dense red seaweeds on shallow unstable infralittoral boulders or cobbles). Epifaunal species recorded in this habitat included the marine hermit crab *Pagurus bernhardus*, the tube building polychaete *Pomatoceros* spp., the sea spider *Anoplodactylus pygmaeus*, the brittle starfish *Amphiura chiajei*, calcareous sponge *Sycon ciliatum*, sea squirt *Ascidella aspersa*, the juvenile common starfish *Asteria rubens* and the snakelocks anemone *Anemonia viridis*. A benthic sample from this area was characterised by a diverse number of taxa and a moderate abundance of individuals. This included polychaetes (particularly *Nereis zonata* and *Polyophthalmus pictus*), bivalves *Rissoa* spp. and gammarid shrimps (such as *Dexamine spinosa*). Higher up the shoreline, the lower shore consisted of clean sand habitat with evidence of occasional sand mason worms *Lanice conchilega* and lugworm (*Arenicola* spp.) casts (LS.LSa.FiSa.Po: Polychaetes in littoral fine sand). A benthic sample from this area was characterised by an impoverished community with only three *Nephtys cirrosa* and a single bivalve *Donax vittatus* recorded in the sample.

On the lower shore in the southern section of the area fronting Hafan y Môr Holiday Park, large and medium sized boulders overlying sand and gravel were recorded. The boulders were covered in carrageen moss *C. crispus* and serrated wrack *Fucus serratus* (as well as other macroalgae). The under-boulder community recorded was rich with a range of mobile epifaunal species including broad-clawed porcelain crab *Porcellana platycheles*, long clawed porcelain crab *Pisidia longicornis*, sea spider *Nymphon* spp., juvenile common starfish *A. rubens* and chitons commonly observed. Other mobile crustacean species recorded more infrequently in this under boulder habitat included juvenile edible crabs *Cancer pagurus*, Risso's Crab *Xantho pilipes* and toad crab *Hyas coarctatus*. As well as this, common prawn *Palaemon serratus* and chameleon prawn *Hippolyte varians* were present in shallow pools, along with several fish species including the greater pipefish *Syngnathus acus*, worm pipefish *Nerophis lumbriciformis*, shore clingfish *Lepadogaster lepadogasta* and butterflyfish *Pholis gunnellus*. Sessile species such as sponges, sea squirts and bryozoans were also common under the boulders. The habitat is considered to be a combination of LR.MLR.BF.Fser.Bo (*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders) and LR.HLR.FR.Mas (*Mastocarpus stellatus* and *Chondrus crispus* on very exposed to moderately exposed lower eulittoral rock). The habitat recorded under the boulders in this area is characteristic of the UK Biodiversity Action Plan (BAP) Priority Habitat 'Intertidal Under-boulder Communities' (UK Biodiversity Action Plan, 2008b). This habitat is also listed as a Habitat of Principal Importance in Wales under Section 7 of the Environment Act (Wales) 2016. Several sandy hummocks with eelgrass (SS.SMp.SSgr.Zmar: *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand) were recorded within the wider LR.MLR.BF.Fser.Bo/LR.HLR.FR.Mas habitat (*Fucus serratus* and under-boulder fauna on exposed to moderately exposed lower eulittoral boulders/*Mastocarpus stellatus* and *Chondrus crispus* on very exposed to moderately exposed lower eulittoral rock).

### North east of coastal defences

To the north east of the Proposed Development coastal defences, habitats were generally similar to the those within and surrounding the location of the proposed coastal defences. The top of the upper foreshore below the high water mark consists of barren shingle, pebbles and cobble. Within this zone there were several strandline areas characterised by sand hoppers (talitrid amphipods) on decomposing

seaweed. Sand habitat was present below this area that extended into the middle shore. Situated on the upper shore was one area of large boulders characterised by channelled wrack *Pelvetia canaliculata* (LR.MLR.BF.PelB: *Pelvetia canaliculata* and barnacles on moderately exposed littoral fringe rock).

### South west of coastal defences

To the south west of the Proposed Development at Porth Fechan Beach, lichen zonation was observed on the rocky headlands (LR.FLR.Lic.YG: Yellow and grey lichens on supralittoral rock and LR.FLR.Lic.Ver.Ver: *Verrucaria maura* on very exposed to very sheltered upper littoral fringe rock). Below this was a zone of *P. canaliculata* and barnacles on moderately exposed littoral fringe rock (LR.MLR.BF.PelB).

The mid-shore habitat on the rocky headlands was characterised by a zone of spiral wrack *Fucus spiralis* (LR.LLR.F.Fspi: *Fucus spiralis* on sheltered upper eulittoral rock) with clumps of knotted wrack *Ascophyllum nodosum*. The beach itself again consists of barren shingle in the upper sections, and fine clean sand with evidence of polychaetes in the mid-sections.

The lower shore on Porth Fechan beach consisted of fine sand habitat. Razorshell *Ensis* spp. and sea potato *Echinocardium cordatum* were recorded. This habitat is most appropriately assigned to SS.SSa.IMuSa.EcorEns (*Echinocardium cordatum* and *Ensis* spp. in lower shore and shallow sublittoral slightly muddy fine sand). The habitat around Cerrig y Barcdy Island consisted of gravel, boulders and cobbles with dense red seaweeds (particularly carrageen moss *C. crispus* and the calcareous red seaweed *C. officinalis*). This mixed substratum sediment extended into the shallow sublittoral around Cerrig y Barcdy Island, where the biotope recorded in this zone was IR.HIR.KSed.LsacChoR (*Laminaria saccharina*, *Chorda filum* and dense red seaweeds on shallow unstable infralittoral boulders or cobbles).

Several large patches of eelgrass *Zostera marina* bed (SS.SMp.SSgr.Zmar *Zostera marina/angustifolia* beds on lower shore or infralittoral clean or muddy sand) were also present on the lower shore on Porth Fechan Beach with small patches also recorded around Cerrig y Barcdy Island. As well as being an interest feature of the Pen Llŷn a'r Sarnau SAC, this habitat is a UK BAP Priority Habitat (UK Biodiversity Action Plan, 2008c) and it also listed as a Habitat of Principal Importance under Section 7 of the Environment Act (Wales) 2016. Eelgrass beds are also included in the OSPAR List of Threatened and/or Declining Habitats and Species (OSPAR, 2008).

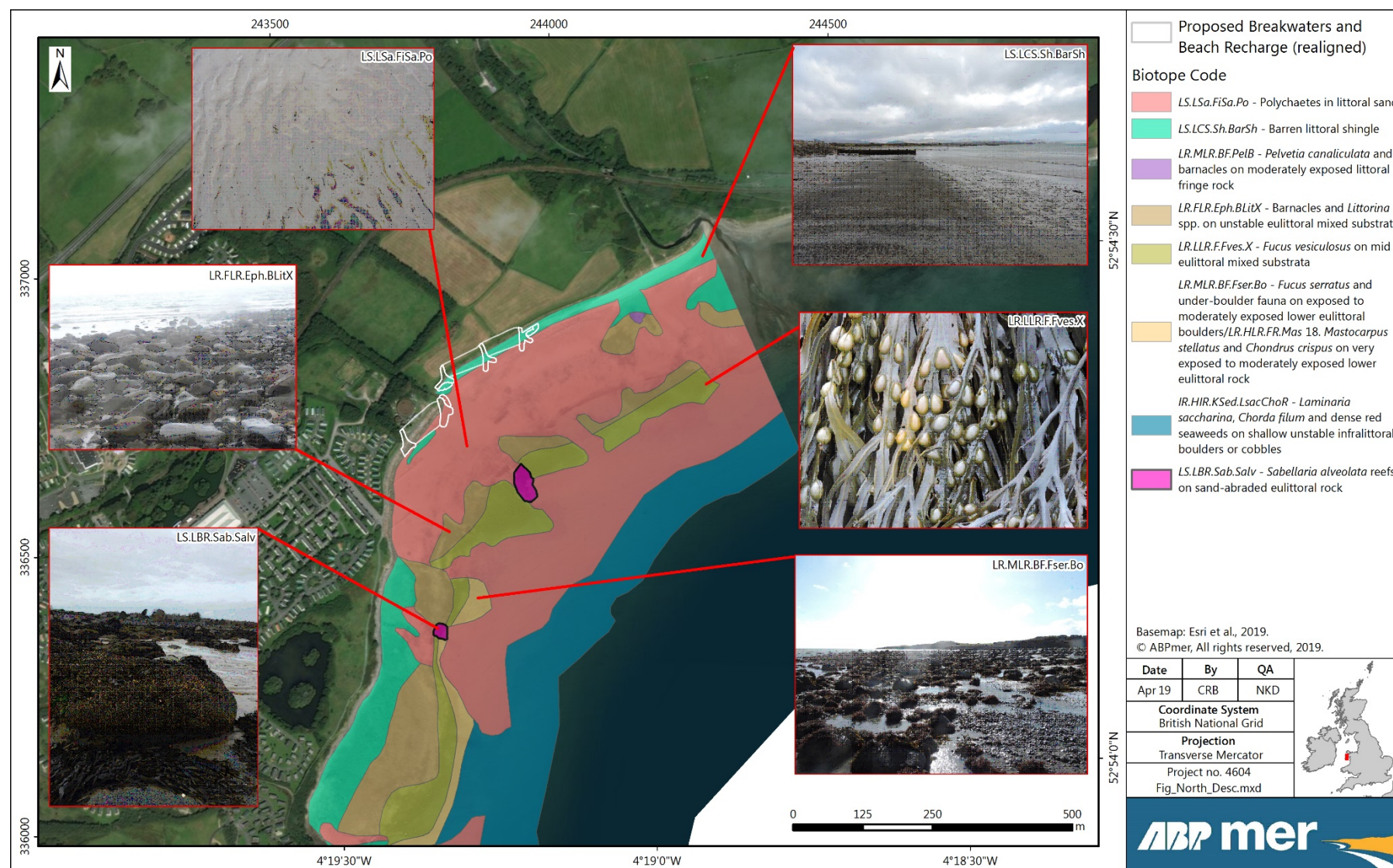


Figure 10. Intertidal biotopes at Hafan y Môr during the March and September 2016 surveys (holiday park to Afon Wen river mouth)

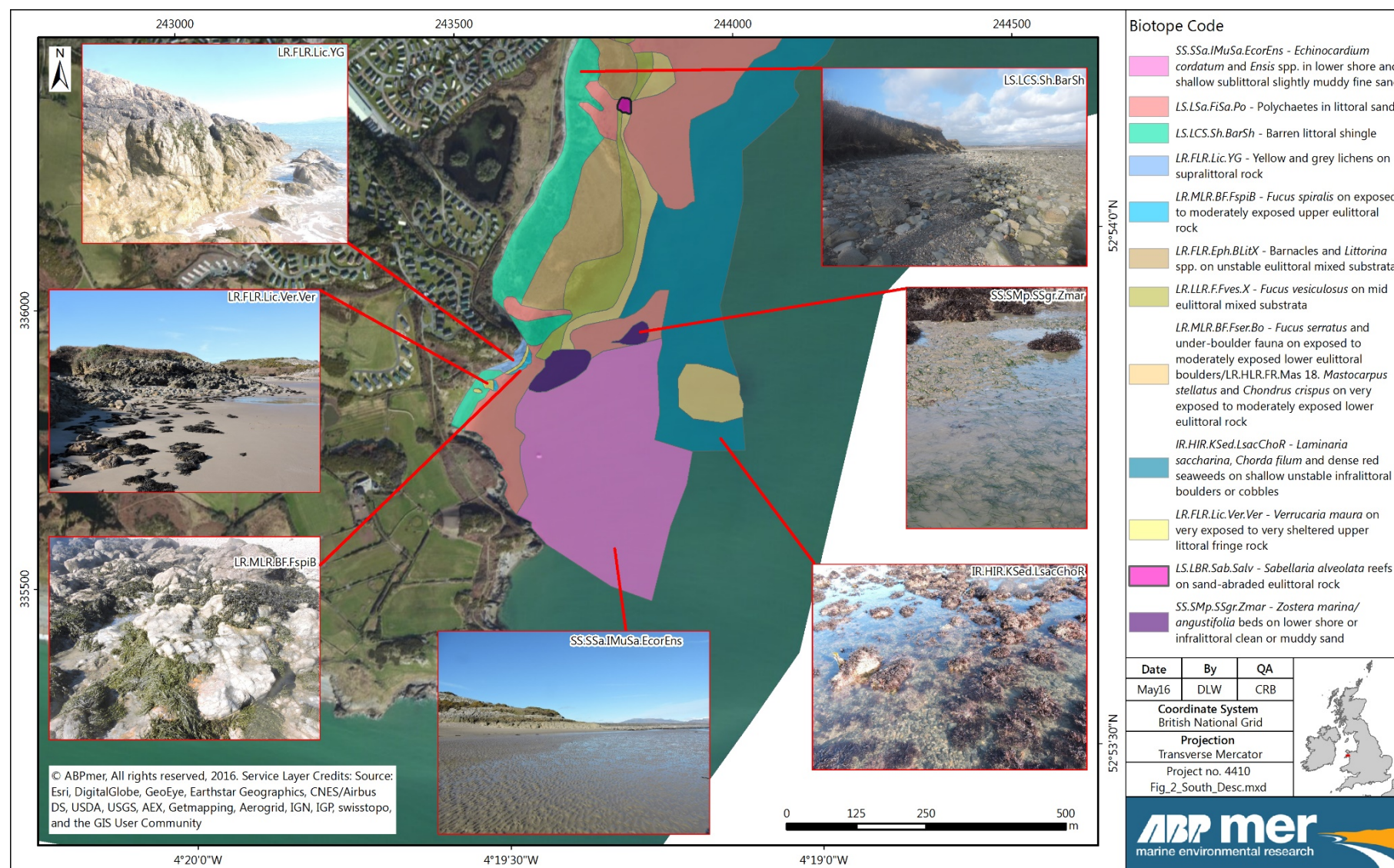


Figure 11. Intertidal biotopes at Hafan y Môr during the March and September 2016 surveys (Porth Fechan beach to holiday park)

### 8.2.3 Waterbirds

Approximately 1.8 km offshore from the Proposed Development area is the Northern Cardigan Bay SPA which is designated for overwintering Annex I Species Red-throated Diver (see Table 16). It is also noted that habitats within the Pen Llyn a'r Sarnau SAC support resident and migratory birds and marine species.

During the intertidal ecology surveys undertaken by ABPmer in 2016 (ABPmer, 2017) observations were made of a range of other species. This included several individual Little Egret *Egretta garzetta* and Grey Heron *Ardea cinerea*. These piscivorous (fish eating) waterbirds were recorded foraging around rockpools. Wading birds foraging on the shoreline (primarily in rocky areas) included several small flocks of Oystercatcher *Haematopus ostralegus* and Turnstone *Arenaria interpres*.

European herring gull *Larus argentatus* were recorded both on the shore and also further offshore on a times lapse video (ABPmer, 2017). Several flocks of auks (Razorbills *Alca torda* and Guillemot *Uria aalge*) were also recorded foraging offshore.

Similar species were also found on the foreshore at Hafan y Môr during the most recent British Trust for Ornithology (BTO) Non-Estuarine Waterbird Survey (NEWS) undertaken in 2015/16. These surveys focus on coastline not covered by the Wetland Bird Surveys (WeBS) scheme. Species recorded in the area included small flocks of waders which are commonly recorded on shingle and gravel beaches (such as Oystercatcher *H. ostralegus*, Turnstone *A. interpres* and Ringed Plover *Charadrius hiaticula*). In addition, individuals of Heron *A. cinerea* and Little Egret *E. garzetta* were recorded on the foreshore as well as gulls (such as Black-headed Gull *Chroicocephalus ridibundus*, Herring Gull *L. argentatus* and Great Black-backed Gull *Larus marinus*). Low numbers of diving birds such as Shag *Phalacrocorax aristotelis*, Cormorant *Phalacrocorax carbo*, Common Scoter *Melanitta nigra* and Red-throated Diver *Gavia stellata* were also recorded off the shoreline.

### 8.2.4 Geology

The bedrock geology on the southern coast of Llŷn is Ordovician in age including sedimentary rocks and igneous intrusions. Surrounding Llŷn, the offshore bedrock largely reflects the coastal geology. The Proposed Development overlaps with Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI which is one of the most important sites for studies of the late Devensian in Wales and is nationally important for geological features, namely a low coastal cliff revealing a sequence of glacial deposits (CCW, 2001). The SSSI citation states that these geological features are located at Glanllynau approximately 1.7 km east of the Proposed Development.

## 8.3 Impact assessment

### 8.3.1 Impact Pathway 6: Physical disturbance of intertidal habitats during construction

There is the potential for physical disturbance of upper shore intertidal habitat by heavy machinery (such as tracked excavators and wheeled dump trucks) during construction. This would occur during the demolition of existing linear defences, cut back of the landform, and importation of materials to from the new coastal defences. It is not envisaged that material will be delivered by sea during the construction work and therefore no vessels are expected to access the upper shore.

Potential physical disturbance from all sources are anticipated to be highly localised to the direct vicinity of the works. The upper shore habitat in the vicinity of the Proposed Development consists predominantly of barren shingle, pebbles and cobbles (LS.LCS.Sh.BarSh: Barren littoral shingle). This area also includes a collection of broken concrete and general debris. Clean sand with frequent lugworm *Arenicola* sp. casts is present below this zone (LS.LSa.FiSa.Po: Polychaetes in littoral fine sand). These habitats tend to support very limited macrofauna in their very mobile and freely draining substratum. The few individuals that may be found are those washed into the habitat by the ebbing tide, including the occasional amphipod or small polychaete. On this basis the area at the top of the shore is not considered to support marine habitats which are considered to be rare or of particularly high ecological importance (e.g. as a key prey resource for foraging birds). However, the sandflat habitat is an interest feature of the Pen Llŷn a'r Sarnau SAC (see Table 16). Habitats with higher biodiversity and value are located further down the shore, away from the proposed coastal defences. *S. alveolata* reef is located approximately 150 m away, *F. vesiculosus* on mid eulittoral mixed substrata is located approximately 135 m away, and Barnacles and *Littorina* spp. on unstable eulittoral mixed substrata is located approximately 95 m away (please note distances presented in Appendix E are based on a previous coastal defence design and should be ignored). Therefore, impacts to these habitats and species are not expected.

In addition, any effects from disturbance are expected to be temporary with recoverability of benthic assemblages expected over a relatively short timescale. The species poor, macrofaunal community present towards the top of the shore consists of species typical of tide swept sandflat habitat such as the polychaete *Nephtys* spp. and mobile crustaceans *B. pulchella* and *B. pilosa*. These species are well adapted to living in a dynamic and disturbed tide swept environment. These disturbance-tolerant species also are considered to have high recoverability rates and are capable of rapidly recolonising disturbed habitat (Budd, 2005; Tillin, 2016a). Furthermore, following any period of sustained disturbance, if conditions are favourable, the recovery of shingle habitat follows a typical series of successional colonisations. Therefore, following completion of the works, it is considered likely that the higher areas of new gravel beach will support vegetation as the scheme becomes established.

Based on the evidence provided above, the magnitude of change is assessed as Small and the probability of occurrence is High, resulting in an exposure to change of Low. The sensitivity of the receptor is assessed as Low, resulting in a vulnerability of Low. The importance of the habitat is considered High, despite the generally impoverished nature and low biodiversity value of the habitat due to very mobile and freely draining substratum, as it resides within the Pen Llŷn a'r Sarnau SAC. Therefore, the overall this impact pathway is assessed to result in a **Minor Adverse** effect.

### 8.3.2 Impact Pathway 7: Direct loss of intertidal habitat under the development footprint

Intertidal habitats are vulnerable to physical loss at locations where new structures are introduced onto the seabed. In this case, the impact of direct loss of intertidal habitat relates to the permanent physical replacement of intertidal habitat with the proposed coastal defences (i.e. under the 'footprint' of the coastal defences).

The footprint of the proposed coastal defences is 1.04 ha, or 10,400 m<sup>2</sup> as it is shown in Figure 2 (also Parcel J in the masterplan in Appendix A). However, the defences will be set-back in the landform resulting in a net landward realignment of part of the coastal margin. The rock-armour breakwaters will be positioned around 30 m back from the existing MHWS elevation, extending only around 20 m into the intertidal area below the existing MHWS height. Therefore, the majority of the footprint of the proposed coastal defences is not intertidal habitat (the impacts on terrestrial habitat is considered in Section 9).

In the location of the proposed coastal defences, and as noted above, habitat mainly consisted of barren shingle, pebbles, cobbles and foreign debris. These habitats are generally impoverished and have a low biodiversity. The footprint of the proposed coastal defences will cover approximately 0.37 ha (3,674 m<sup>2</sup>) of this barren littoral shingle and debris. Clean sand habitat is present below this zone and is an interest feature of the Pen Llŷn a'r Sarnau SAC (see Table 16). Approximately 0.15 ha (1,542 m<sup>2</sup>) of sandflat habitat is beneath the footprint of the proposed coastal defences. This is a small fraction of the 3,358 ha of this habitat across the SAC<sup>38</sup>. Of this area of loss around two thirds will underly the introduced rock armour and the remaining one third (some 458 m<sup>2</sup>) will be part of the easternmost sandy beach recharge area.

Where intertidal habitat loss occurs, rock armour groynes will provide some alternative hard substratum where recolonisation by upper shore species at the lower margins of the rock may occur following construction of the coastal defences. Hard defences such as this offer more habitat complexity (compared with sediment) due to crevices between blocks and large rough surfaces for attachment (Davis *et al.*, 2002; Chapman and Underwood, 2013). There is an opportunity to undertake small-scale enhancements to the rock armour such as drill-cored rock pools. This is described by Evans *et al.* (2016) and artificial rock pools created by these means were found to support greater species richness than adjacent granite rock surfaces on the breakwater (see Image 4). Opportunities to achieve this will be discussed with NRW.



Source: <https://www.celtest.com/aberystwyth-university-rock-pool>

**Image 4. Examples of core-drilled granite for biodiversity enhancement by Aberystwyth University**

The probability of intertidal habitat loss occurring is High, and the magnitude of change is Small given the limited spatial extent of intertidal habitat loss. The exposure to change is therefore considered Low. Based on this and a High sensitivity of the receptor to habitat loss, the vulnerability is considered Moderate. The importance of the receptor is High as the sandflat within the intertidal area that will be lost is an interest feature of the Pen Llŷn a'r Sarnau SAC and within the SSSI, despite the generally impoverished and low biodiversity value of the habitat due to very mobile and freely draining substratum. Therefore, overall this impact pathway is considered to have a **Moderate Adverse** effect.

<sup>38</sup> This is considered within the context of the Habitat Regulations in Appendix K, which recognises NRW's position to not adopt a *de minimis* approach but instead deem any effect however small to be an effect on the integrity of the designed sites.

### 8.3.3 Impact Pathway 8: Changes to intertidal habitat as a result of hydro-morphology and sediment transport

This impact pathway considers the effects of potential changes to physical and coastal processes (described in Section 6) on intertidal habitat and associated species.

The exposure to change caused by changes to sediment transport and supply as a result of the proposed coastal defences is considered to be Negligible (Section 6.3.1). This is because the defence intrudes 20 m below MHWS and is above MHWN and as such only has a small effect on the sediment fluxes along the shoreline. Losses of material from beach nourishment is expected to be undetectable against natural fluctuations in the area. In any case, the habitats and species on the foreshore in the vicinity of the Proposed Development are not considered sensitive to changes in concentrations of suspended sediment or smothering. This includes polychaetes in littoral fine sand (Ashley, 2016); barren littoral shingle (Tillin, 2016b), *S. alveolata* (Jackson, 2008), *Nephtys* spp. (Budd and Hughes, 2005), and *A. marina* (Tyler-Walters, 2008). For example, *S. alveolata* reefs are considered 'not sensitive' to light smothering and indeed there needs to be an adequate supply of suspended coarse sand grains in order for *S. alveolata* to be able to build their tubes (Tillin and Jackson, 2018). *Zostera marina* beds on lower shore or infralittoral clean or muddy sand are considered to have a 'high' sensitivity to increases in suspended sediment, and a 'medium' sensitivity to light smothering (D'Avack *et al.*, 2019). However, this biotope is located approximately 0.5 km south of the proposed coastal defences, and as such is unlikely to be impacted by any changes in sediment transport.

The exposure to change associated with coastal squeeze is considered Negligible (Section 6.3.2). This is because specific consideration was given to ensuring the proposed coastal defences will avoid any potential effects on coastal squeeze. They have been designed to be set-back in the landform, and flexible and adaptable to accommodate future sea level rise. In this way, the proposed coastal defences allow the intertidal habitat fronting the defences to adapt and 'roll-back' into the newly created space (i.e. not suffer coastal squeeze).

Given that the exposure to change resulting from hydromorphological and sediment transport changes is Negligible, the vulnerability is considered to be None, and the significance of any effects are expected to be **Insignificant**.

### 8.3.4 Impact Pathway 9: Physical disturbance of intertidal habitat during operational phase maintenance work

This impact pathway considers the potential for physical disturbance of upper shore intertidal habitat by heavy machinery working within and immediately adjacent to the development footprint, during the operational phase of the work. The coastal defences will be monitored and maintained over their service life as appropriate to fulfil the design concept of continual adaptability. Management activities will include maintenance raking, cleaning and response (rebuilding) as required after major storms. This may involve landside plant to replenish and if needed re-shape the beach or adjust the rock armouring.

As with the disturbance from the land-based plant during construction (see Section 8.3.1) these effects will be localised to the direct vicinity of the works (within 50 m) and will be temporary. Recovery of the habitat expected to occur over a relatively short timescale (days/weeks).

The magnitude of change is assessed as Small and the probability of occurrence is High, resulting in an exposure to change of Low. The sensitivity of the receptor is assessed as Low, resulting in a vulnerability of Low. The importance of the habitat is considered High, despite the generally impoverished nature and low biodiversity value of the habitat due to very mobile and freely draining substratum, as it resides

within the Pen Llŷn a'r Sarnau SAC. Therefore, the overall this impact pathway is assessed to result in a **Minor Adverse** effect.

### 8.3.5 Impact Pathway 10: Waterbird disturbance during construction

This pathway considers the effects of disturbance on coastal waterbird populations as a result of the construction activities. Noise and visual disturbance stimuli may also occur as a result of construction machinery, vehicles (such as excavators and dump trucks) and construction workers throughout the six month construction period (which is planned for winter 2020/21).

Evidence suggests that waterbirds generally show a flight response to construction activities and a presence of people on the foreshore at distances of between 20 m and 100 m. However, distances over 200 m have been recorded for some sensitive species (IECS, 2009). Within the construction site, the level of disturbance stimuli is dependent on the type of activity being undertaken. In general, human presence on the foreshore (e.g. walking) is considered to cause greater disturbance than vehicles and waterbirds are more easily disturbed by irregular movements than the regular and defined presence of machinery and other vehicles (IECS, 1997; ABPmer, 2013; McLeod, *et al.*, 2013; Guay *et al.*, 2014; Glover *et al.*, 2015). Other research has also indicated that in general, birds appear to habituate to continual noises (such as engine noise) as long as there is no large amplitude 'startling' component (Hockin *et al.*, 1992; IECS, 2009).

The results of the project specific bird surveys suggest that foreshore nearby to the proposed coastal defences are used by a range of species including flocks of waders such as Turnstone, Curlew, Oystercatcher and Ringed Plover. In addition, gulls and low numbers of Grey Heron and Little Egret have also been recorded on the foreshore with diving birds (such as Cormorants, Red-throated Diver and Common Scoter) recorded off the beach (Section 8.2.3).

Based on the above information, construction activity could potentially cause infrequent, mild behavioural responses in a localised area in the vicinity of the works. The responses observed are likely to range from increased vigilance, avoidance walking and short flights with birds rapidly resettling and resuming feeding or roosting near their original location. Nevertheless, localised avoidance and larger disturbance events (causing birds to flush and temporarily disperse from the vicinity of the construction zone) could also occur. Rather than evacuating the area completely, birds would be expected to redistribute to another nearby adjacent foreshore in Tremadog Bay. Should this occur, the effect would only likely be short term with birds expected to return following completion of the construction works. It should also be noted, however, that waterbirds present in the area are expected to already be reasonably habituated to anthropogenic activities due to recreational pressure (such as dog walkers and holiday makers using the beach), and the birds are also expected to become further habituated to the ground works and other construction activities.

The probability of occurrence is considered High with a Small magnitude of change given the temporary and localised nature of the impact, with no permanent displacement of birds from the area predicted. Therefore, a Low exposure to change is expected. The vulnerability is assessed as Low, based on a Low exposure to change (above) and a Low to Moderate sensitivity of the feature. The latter is attributed to the infrequent, mild behavioural responses expected from coastal birds as a result of construction works and likely established habituation of coastal birds in the area (with variations depending upon the species).

The importance of the feature is scored as High because of the protection afforded to overwintering birds. Therefore, the impact of temporary disturbance during construction has been assessed as **Minor Adverse**.

### 8.3.6 Impact Pathway 11: Direct physical interaction with geology

The proposed coastal defence scheme relocates the shoreline approximately 20 m inland from its existing location. The 'set back' of the shoreline is achieved by projecting existing beach gradients (around 1 in 10) to landward and excavating the existing hinterland to provide a formation level on which to construct the new defences and beaches. In this way, the coastal works will involve the removal of any existing imported rock and demolition hardcore/debris material from the top of the shore for reuse predominantly as a core to the rock groyne armour. Any existing beach material at the beach recharge locations (where it contains clay) will also be removed to a depth of 1.5 m and replaced with marine sand of similar characteristics to the natural sand occurring on the beach and seabed of Cardigan Bay. Where new sections of beach are to be created between the rock groynes, these will be formed using imported marine sand of the same characteristics. As advised by NRW, any sediment (e.g. upper-shore sand) of marine origin within the footprint of the work that needs to be excavated during construction will be reused within the marine zone and not removed from the site. The new gravel beaches along the 'set back' shoreline will be set to similar gradients but locally steepened to 1 in 5 around the roots of the new rock groynes to facilitate public access from the hinterland to the foreshore.

The landward 'set back' of the defences and changes to coastal processes (see Section 6.3.1) will not overlap with any of the geological features of the Glanllynau a Glannau Pen-Y-Chain I Gricieth SSSI which are located over 1 km from the Hafan y Môr frontage. There will therefore be **no impact** on these SSSI geological features.

The soft cliffs backing the proposed defences will be impacted as the landform will be excavated to realign the shoreline and accommodate the groynes and new beaches between them. The extent of this realignment reflects the projected maximum potential erosion rate that would naturally occur over the service life of the Proposed Development. Following the works, these cliffs will continue to be eroded by existing natural wave/storm processes. The Proposed Development will allow a degree of natural retreat and evolution in keeping with the sustainable and adaptive approach that has been adopted for the coastal defences and site management (see Sections 2.6 and 6.3.2). Overall, the probability of the Proposed Development interacting with underlying geology is considered to be High and the magnitude is considered to be Small. The exposure to change is therefore considered to be Low. The sensitivity to direct physical interaction of the soft cliffs is considered to be Moderate as although the cliffs will be excavated and set-back, the extent aligns with predicted erosion rates and as such reflects the adaptation of the shoreline that would occur naturally. As the soft cliffs backing the proposed defences do not contain geological sequences of glacial deposits that are included in the SSSI designation, their importance is considered to be Low. The potential impact of the Proposed Development on geology is therefore considered to be **Insignificant**.

## 8.4 Mitigation measures and residual effects

In order to avoid and/or minimise significant adverse impacts (i.e. those that are Moderate or Major Adverse, see Section 5.2), a number of mitigation measures are proposed. These are set out below together with the assessment of residual effects following the application of mitigation measures.

### 8.4.1 Impact Pathway 7: Direct loss of intertidal habitat

Under the Habitat Regulations, there is a need to carry out compensation measures if it is deemed that the loss of sandflat interest features beneath the footprint of the works result in an adverse effect on the integrity of the Pen Llŷn a'r Sarnau SAC. As NRW do not adopt a "*de minimis* approach" for such judgements (which might allow some small-scale effects in some cases subject to evidence) compensatory measures have been considered (see Appendix K).

It is proposed that this will involve removal of barren rubble from the top of the intertidal area as close as possible to the area of loss to expose sandflat habitat beneath. There is an ideal area to the north east of the Proposed Development and west of the Afon Wen. If necessary, these areas could be excavated sufficiently to ensure they lower the shoreline elevation to below the MHWS mark, thus providing intertidal habitat.

NRW has raised concerns that excavation could result in more damage to the SAC (and SSSI), and that any excavated area will revert to upper shore shingle habitat within the medium term as a result of coastal processes. Therefore, this approach is considered by NRW unlikely to provide compensatory sandflat habitat that would normally satisfy the requirements of the Conservation of Habitats and Species Regulations 2017 (see Table 3).

As an alternative (and as suggested by NRW), the potential to remove rubble (artificial, not naturally placed rock) from lower down in the intertidal area to expose and create sandflat habitat has been considered. However, there is limited rubble present lower down in the intertidal area and would not provide sufficient habitat compared with the area of loss. Furthermore, habitats further down the shore are more valuable and biodiverse and disturbing these areas should be avoided (as achieved with the design of the coastal defences).

Following further consultation with NRW, it is suggested that the removal of rubble and anthropogenic material from the shingle habitat (2,493 m<sup>2</sup> area identified) to the north east of the Proposed Development would be effective at restoring shingle habitat, which forms part of the 'Large shallow inlets and bays' feature of the SAC. Although compensation is normally expected to compensate for the habitat being lost (i.e. as a 'like for like'), given that the creation of sandflat habitat in this location is likely to be complex these shingle restoration measures are welcomed by NRW and are considered to conserve that status of a SAC feature at this locality. There is an ample area (at least 2,493 m<sup>2</sup> – see Figure 3) of barren shingle, pebble and cobble habitat with rubble to the north east of the Proposed Development to provide extra compensatory habitat as needed. These measures also align with the mitigation proposed for the loss of maritime soft cliff and aculeate Hymenoptera (see Section 9.5).

An illustration of the direct footprint of the proposed coastal defences, and proposed compensation area, is provided in Figure 3, Figure 12 and Appendix K.

The above proposed compensatory measures are likely to reduce the significance of the impact of direct loss of intertidal habitat under the development footprint. Therefore, the significance of the residual effects for this impact pathway is assessed as **Minor Adverse**.

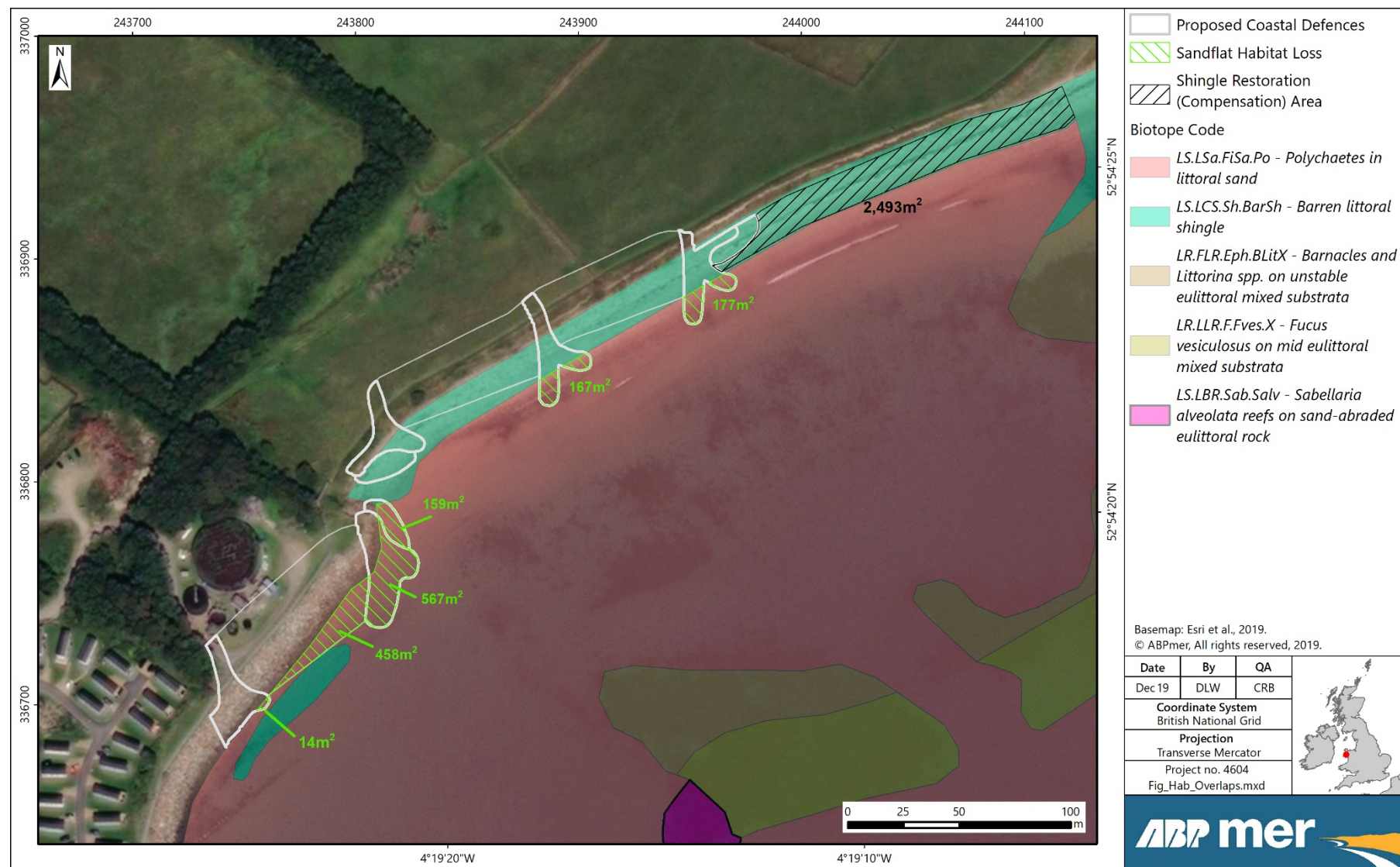


Figure 12. Sandflat habitat loss beneath footprint of proposed coastal defences and associated compensation area

## 8.5 Summary and Conclusions

This section reports the assessment of potential impacts on marine ecology receptors as a result of the Proposed Development. With the adoption of appropriate mitigation and offsetting measures, it is considered that significant impacts can be avoided and/or minimised. A summary of the impact pathways that have been assessed and the identified residual impacts following the application of mitigation measures is presented in Table 17.

**Table 17. Summary of potential impact, mitigation measures and residual impacts for marine ecology**

| Receptor                                | Impact Pathway                                                                     | Impact Significance | Mitigation Measures/<br>Monitoring                                                                                                 | Residual Impact | Confidence |
|-----------------------------------------|------------------------------------------------------------------------------------|---------------------|------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| Intertidal habitats and benthic species | Physical disturbance to intertidal habitats during construction                    | Minor Adverse       | N/A                                                                                                                                | Minor Adverse   | High       |
|                                         | Direct loss of intertidal habitat                                                  | Moderate Adverse    | Compensatory habitat provided through the removal of rubble in shingle the north east of the Proposed Development coastal defences | Minor Adverse   | High       |
|                                         | Hydro-morphology and sediment transport changes                                    | Insignificant       | N/A                                                                                                                                | Insignificant   | Medium     |
|                                         | Physical disturbance of sandflat habitat during operational phase maintenance work | Minor Adverse       | N/A                                                                                                                                | Minor Adverse   | High       |
| Waterbirds                              | Waterbird disturbance during construction                                          | Minor Adverse       | N/A                                                                                                                                | Minor Adverse   | High       |
| Geology                                 | Potential impact on geology                                                        | Insignificant       | N/A                                                                                                                                | Insignificant   | Medium     |

## 8.6 References

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Tillin, H.M & Jackson, A., 2018. *Sabellaria alveolata* reefs on sand-abraded eulittoral rock. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom. [Online] Available from: <https://www.marlin.ac.uk/habitat/detail/351> (accessed 5 December 2019)

Tyler-Walters, H. (2008). *Arenicola marina* Blow lug. In Tyler-Walters H. and Hiscock K. (eds) Marine Life Information Network: Biology and Sensitivity Key Information Reviews, Plymouth: Marine Biological Association of the United Kingdom [Online] Available from: <https://www.marlin.ac.uk/species/detail/1402> (accessed 2 October 2019).

UK Biodiversity Action Plan, (2008a). Priority Habitat Descriptions: *Sabellaria Alveolata* Reefs.

UK Biodiversity Action Plan, (2008b). Priority Habitat Descriptions: Intertidal Underboulder Communities.

UK Biodiversity Action Plan, (2008c). Priority Habitat Descriptions: Seagrass bed.

## 9 Terrestrial Ecology and Nature Conservation

This section of the ES considers how the Proposed Development will affect terrestrial ecology receptors. This EIA topic has been informed by the supporting Terrestrial Ecology Technical Report which is provided in Appendix F and should be read alongside this section of the ES. The first sub-section (Section 9.1) covers the data sources used to inform the assessment and the consultation that has taken place with regard to this topic. Section 9.2 presents the impact assessment methodology that has been applied. The baseline information is included in Section 9.3 and the impact assessment relating to terrestrial ecology is presented in Section 9.4. Mitigation measures and residual effects are discussed in Section 9.5, and Section 9.6 provides a brief summary and conclusions.

### 9.1 Data sources and consultation

#### 9.1.1 Data sources

The following data sources were used to understand the baseline environment:

- Cofnod (the North Wales Environmental Information Service) data request;
- Surveys undertaken previously at Hafan y Môr Holiday Park in connection with other development proposals;
- Information from Gwynedd Council biodiversity officer;
- NRW information (including web based sources), especially relating to statutory sites;
- Miscellaneous information from various web-based and local sources, for example, the National Biodiversity Network (NBN) Atlas; and
- Site specific surveys (as outlined in Section 9.3).

#### 9.1.2 Consultation and scope

Based on the Scoping Report, and the subsequent Scoping Opinion and further consultation with Gwynedd Council biodiversity officers, (see Section 5.1), Table 18 presents the terrestrial ecology receptors, impact pathways, and further work that has been carried out to inform the planning and marine licence application.

**Table 18. Impact pathways and summary of further work for terrestrial ecology and nature conservation**

| Receptor | Impact Pathway                                                                                                                                                                           | Requires Further Assessment?      | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      | Summary of Further Work                                                                                                        |
|----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------|
| Habitats | Damage or disturbance to landside habitats adjacent to development parcels during construction work                                                                                      | Yes ( <b>Impact Pathway 12</b> )  | Detailed surveys resulted in the identification of potential disturbance of important habitats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Important habitats were identified following surveys as outlined within Section 9.3 and this impact pathway has been assessed. |
|          | Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works                                         | Yes ( <b>Impact Pathway 13</b> ). | Detailed surveys resulted in the identification of potential disturbance of important habitats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Important habitats were identified following surveys as outlined within Section 9.3 and this impact pathway has been assessed. |
|          | Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations | Yes ( <b>Impact Pathway 14</b> ). | Detailed surveys resulted in the identification of potential disturbance of important habitats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Important habitats were identified following surveys as outlined within Section 9.3 and this impact pathway has been assessed. |
|          | Loss of soft maritime cliff (Section 7 priority habitat) as a result of coastline defence/realignment works                                                                              | Yes ( <b>Impact Pathway 15</b> ). | Detailed surveys resulted in the identification of potential disturbance of important habitats.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    | Important habitats were identified following surveys as outlined within Section 9.3 and this impact pathway has been assessed. |
|          | Potential impacts on plantation woodland in Parcel B                                                                                                                                     | No                                | <p>Gwynedd Council's scoping opinion advised that effects on the woodland in Parcel B should be assessed in the ES. This seems to have been raised by NRW (5/2/19) who commented:</p> <p><i>"For information, we do have concerns regarding the loss of part of the woodland at Parcel B. This area was assessed and approved as part of planning application C18/0618/40/LL. However, no tree loss was identified as part of the submitted ecology report at the time, and therefore, the mitigation proposed was approved based on this information. This area will now need to be reassessed as part of the in-combination assessment."</i></p> | No further assessment work has been undertaken for this impact pathway.                                                        |

| Receptor | Impact Pathway                                                                                                                                                                                                                | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | Summary of Further Work                                                                                 |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------|
|          |                                                                                                                                                                                                                               |                                  | <p>C18/0618/40/LL refers to a separate development proposal which includes the extension of a sports building that lies about 75 m to the north-west of Parcel B. An ecology report was submitted with the application but no impacts on this woodland (or mitigation requirements) were identified. NRW's consultation response to application C18/0618/40/LL does not raise any issues relating to trees or woodland, and Gwynedd Council's Senior Biodiversity Officer commented that <i>"Adjacent to the sports hall is a wooded area, this will not be affected by this development proposal"</i>.</p> <p>Since C18/0618/40/LL does not have biodiversity impacts on woodland it is considered appropriate to assess potential biodiversity impacts associated with the New Masterplan proposals in isolation, rather than in combination with this planning consent.</p> |                                                                                                         |
|          | Effects on designated sites                                                                                                                                                                                                   | No                               | <p>With the exception of otters, potential effects on internationally designated sites specifically the Pen Llŷn a'r Sarnau SAC are not considered because they are marine related and covered within Section 8.</p> <p>Effects on nationally designated sites specifically the Lanllynnau a Glannau Pen ychain I Gricieth SSSI, are also considered marine related and also covered within Section 8.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                     | No further assessment work has been undertaken for this impact pathway.                                 |
| Otter    | Habitat loss and disturbance of otters (qualifying feature of SAC and European Protected Species), during construction work (including potential for sediment run-off and contamination of watercourses used by this species) | Yes ( <b>Impact Pathway 16</b> ) | Detailed surveys resulted in the identification of potential effects on otters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Otter surveys were undertaken as outlined within Section 9.3 and this impact pathway has been assessed. |
|          | Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes                                                     | Yes ( <b>Impact Pathway 17</b> ) | Detailed surveys resulted in the identification of potential effects on otters.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | Otter surveys were undertaken as outlined within Section 9.3 and this impact pathway has been assessed. |

| Receptor                                           | Impact Pathway                                                                                                                                                                                                              | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                | Summary of Further Work                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |
|----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Bats                                               | Loss of bat roosts and potential for harm to bats (European Protected Species) caused by demolition of chalet blocks                                                                                                        | Yes ( <b>Impact Pathway 18</b> ) | Detailed surveys resulted in the identification of potential effects on bats.                                                                                                                                                                                                                | Bat surveys were undertaken as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                                                                                                                                                                                                                                                 |
|                                                    | Disturbance of bat dispersal routes and/or foraging areas                                                                                                                                                                   | Yes ( <b>Impact Pathway 19</b> ) | Detailed surveys resulted in the identification of potential effects on bats.                                                                                                                                                                                                                | Bat surveys were undertaken as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                                                                                                                                                                                                                                                 |
| Reptiles                                           | Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J) | Yes ( <b>Impact Pathway 20</b> ) | Detailed surveys resulted in the identification of potential effects on reptiles.                                                                                                                                                                                                            | Reptile surveys were undertaken as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                                                                                                                                                                                                                                             |
| Terrestrial breeding birds                         | Direct impacts on nesting birds (all species protected from harm while nesting) during construction (e.g. site clearance)                                                                                                   | Yes ( <b>Impact Pathway 21</b> ) | This assessment was driven by Gwynedd Council's request for breeding grassland bird survey to be undertaken. NRW's scoping opinion advised to assess potential impacts to all bird species that frequent the area. Therefore, this impact pathway has been scoped in for further assessment. | This impact pathway has been scoped in for further assessment.<br><br>Development proposals in a former stable block (referred to as Parcel A) were removed from the Masterplan, thus avoiding potential impacts on bats and barn owl. It was subsequently agreed with the Gwynedd Council's Biodiversity Officer that a detailed barn owl assessment could be 'scoped out' because the scheme has subsequently been modified to avoid potential effects on potential roosting and foraging habitats. |
| Non- native and potentially invasive plant species | Potential for increase in abundance or/and distribution of invasive non-native plant species                                                                                                                                | Yes ( <b>Impact Pathway 22</b> ) | The Proposed Development has the potential to cause invasive species to increase and spread.                                                                                                                                                                                                 | Non-native species were recorded during surveys as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                                                                                                                                                                                                                             |
| Aculeate Hymenoptera (bees and wasps)              | Potential effects on bee and wasp fauna associated with the removal of soft maritime cliff and grassland habitats                                                                                                           | Yes ( <b>Impact Pathway 23</b> ) | Habitat types in Parcel J have been identified as potentially suitable habitat for these species.                                                                                                                                                                                            | Species of aculeate Hymenoptera were recorded during surveys as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                                                                                                                                                                                                                |

| Receptor         | Impact Pathway                                                                                                  | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             | Summary of Further Work                                                                                                                                                                                                                                                                                    |
|------------------|-----------------------------------------------------------------------------------------------------------------|----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Black oil beetle | Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats | Yes ( <b>Impact Pathway 24</b> ) | Habitat types in Parcel J have been identified as potentially suitable habitat for these species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                         | Species of aculeate Hymenoptera were recorded during surveys as outlined within Section 9.3 and this impact pathway has been assessed.                                                                                                                                                                     |
| Water vole       | Disturbance to Water vole                                                                                       | No                               | No evidence of water vole was recorded during surveys despite the presence of suitable habitat. Throughout 2018 and 2019 there were reports of mink around the northern lake, and the presence of this predator is likely to be the primary reason for an absence of water voles within the assessment area. Additionally, there were no desktop records of water voles from any of the development parcels, and the only historical record was to the west of the holiday park, dating from 1999. Based on this evidence it is considered most likely that the water vole is absent from the Proposed Development site.  | No further assessment work has been undertaken for this impact pathway.                                                                                                                                                                                                                                    |
| Badgers          | Effects on badgers                                                                                              | No                               | Badger surveys covered the proposed development parcels and adjacent areas and adopted standard field methods (Harris <i>et al.</i> , 1989; Cresswell <i>et al.</i> , 1990). No setts were identified, but badger footprints were found in Parcels G and H, and a badger was recorded on a trail camera set up to monitor otters along the watercourse between Parcels G and I. The desk based study returned several badger records.<br><br>These observations confirm that badgers use parts of Hafan y Môr for dispersal and probably foraging, but there is no evidence that they reside on the Proposed Development. | No further assessment work has been undertaken for this impact pathway. However, a number of precautionary measures are proposed to be adopted for badgers (see Section 9.5.3). By adopting these precautionary measures, it is considered that any potential adverse effects on badgers could be avoided. |
| Eels             | Effects on Eels                                                                                                 | No                               | No structures are proposed that would interfere with any eel migration or dispersal (in respect of the Eels (England and Wales) Regulations 2009).                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | No further assessment work has been undertaken for this impact pathway.                                                                                                                                                                                                                                    |
| Hedgehogs        | Effects on hedgehogs                                                                                            | No                               | The scoping exercise concluded that it is reasonably likely that hedgehogs occur in suitable habitats on some of the development parcels. Apart from Parcels F and I, potential hedgehog habitat occurs on all parcels; these are especially the plantation woodlands, stands of bramble and ruderal tall herb                                                                                                                                                                                                                                                                                                            | No further assessment work has been undertaken for this impact pathway. However, precautionary measures are proposed during construction. These would comprise: covering any excavation holes at the end of each working day, or providing safe escape ramps, and control                                  |

| Receptor             | Impact Pathway                                                                             | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Summary of Further Work                                                                                                                             |
|----------------------|--------------------------------------------------------------------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------|
|                      |                                                                                            |                                  | <p>and unmanaged grasslands. Estimated total areas of the main hedgehog habitats, across all parcels are:</p> <ul style="list-style-type: none"> <li>Plantation woodland and scrub 1.1 ha, mainly on Parcels E, G, and H;</li> <li>Bramble and ruderal tall herb: 0.8 ha, mainly on Parcels B, E, G and I; and</li> <li>Unmanaged grassland: 0.17 ha, mainly on Parcel J.</li> </ul> <p>These habitats occupy a relatively small area in total and their removal is unlikely to significantly affect any local hedgehog population</p> | of hazardous materials (see Section 9.5.3). These measures would be included in the CEMP.                                                           |
| General              | Other disturbance effects caused by operation of the developments, on species and habitats | Yes ( <b>Impact Pathway 25</b> ) | Surveys identified the potential disturbance of habitats and species.                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | An outline of surveys undertaken has been identified in Section 9.3 and this impact pathway has been assessed.                                      |
| Lower value habitats | Impact on lower value features                                                             | Yes ( <b>Impact Pathway 26</b> ) | Although features of less than Medium value are not assessed in detail <sup>39</sup> , it is recognised that many widespread species rely on lower value habitats. These habitats also provide networks and 'stepping stones', thus maintaining habitat connections across the wider landscape.                                                                                                                                                                                                                                        | Consideration has been given to impacts on the less important habitat features that have wider relevance and this impact pathway has been assessed. |

<sup>39</sup> Because effects on them are unlikely to materially influence the planning decision

## 9.2 Impact assessment methodology

The impact assessment methodology for terrestrial ecology and nature conservation follows an alternative methodology to the general impact assessment methodology (Section 5.2). This section explains the methodology applied when assessing the effects of the Proposed Development on terrestrial ecological resources, and the approach taken to the determination of the level of significance of those effects. This process is referred to as Ecological Impact Assessment (EclA).

### 9.2.1 Relevant guidance

A number of relevant guidance documents were drawn upon throughout the EclA process. The overall approach was guided by the Chartered Institute of Ecology and Environmental Management's (CIEEM) publication 'Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal' (CIEEM 2018). However, a 'matrix' approach, as recommended under WebTAG (2019)<sup>40</sup>, has been adopted to present the formal impact assessment. This method provides a reasonably simple and heuristic approach to the assessment of effects on terrestrial ecology receptors.

The CIEEM (2018) guidelines are intended to promote good practice in EclA relating to terrestrial, freshwater and coastal environments within the UK. The recommended approach broadly comprises the following steps:

- Scoping - to determine what issues to cover within the EclA (this is an ongoing process that continues throughout the assessment). In this case a formal scoping opinion has also been provided by Gwynedd Council;
- Establishing the baseline - collecting information and describing the ecological conditions in the absence of the proposed project, to inform the assessment of impacts;
- Identifying important ecological features (e.g. habitats, species and ecosystems) that may be affected;
- Impact assessment - assessing whether important ecological features will be subject to impacts, and characterisation of these impacts and their effects. Assessment of the significance of the residual effects of the project (those remaining after mitigation), including cumulative effects;
- Mitigation, compensation and enhancement - incorporating measures to avoid, reduce and compensate for negative ecological impacts and their effects, and the provision of ecological enhancements. Monitoring impacts and their effects. Evaluation of the success of proposed mitigation, compensation and enhancement measures; and
- Implication for decision making - consideration of the policy and legal framework throughout the EclA process.

### 9.2.2 Evaluation of ecological features

The CIEEM (2018) guidelines identify a range of characteristics that contribute to the importance of ecological features:

- Naturalness;
- Animal or plant species, subspecies or varieties that are rare or uncommon, either internationally, nationally or more locally, including those that may be seasonally transient;
- Ecosystems and their component parts, which provide the habitats required by the above species, populations and/or assemblages;
- Endemic species or locally distinct sub-populations of a species;

<sup>40</sup> See TAG UNIT A3 Environmental Impact Appraisal. May 2019. Department for Transport. <https://www.gov.uk/government/publications/tag-unit-a3-environmental-impact-appraisal>.

- Habitats that are rare or uncommon;
- Habitats that are effectively irreplaceable;
- Habitat diversity;
- Size of habitat or species population;
- Habitat connectivity and/or synergistic associations;
- Habitats and species in decline;
- Rich assemblages of plants and animals;
- Large populations of species or concentrations of species considered uncommon or threatened in a wider context;
- Plant communities (and their associated animals) that are considered to be typical of valued natural/semi-natural vegetation types, including examples of naturally species-poor communities; and
- Species on the edge of their range, particularly where their distribution is changing as a result of global trends and climate change.

Where appropriate, features can also be assessed in terms of their statutory or policy designation, or their protected or conservation status. Thus, for example, sites may be designated under various EU or UK legislation, or identified as local Wildlife Sites under using published criteria. Species may be protected by legislation (EU or UK), or their conservation status recognised via classification as priority species (for example, under Section 7 of the Environment (Wales) Act 2016), or recognised under Biodiversity Action Plans, or in lists of uncommon and declining species (e.g. Red Lists, such as Dines (2008), Eaton *et al.* (2015)).

### 9.2.3 Evaluation frameworks

As recommended in CIEEM (2018), the importance of an ecological feature (e.g. habitat, species) may be considered within a defined geographical context:

- International and European;
- National;
- Regional;
- Metropolitan, County, vice county or other local authority-wide area; and
- Local.

The Terrestrial Ecology Technical Report (Appendix F) that supports this assessment evaluates the ecological features in relation to the above geographical framework, with the addition of a further 'Negligible' category.

For the purposes of the formal impact assessment, the above geographical evaluation categories have been aligned (Table 19) to the evaluation criteria set out in WebTAG (2019).

**Table 19. Alignment of CIEEM geographical evaluation framework with WebTAG value categories**

| CIEEM                                                                  | WebTAG     |
|------------------------------------------------------------------------|------------|
| International and European                                             | Very High  |
| National                                                               | High       |
| Regional, Metropolitan, County, vice county, other authority wide area | Medium     |
| Local                                                                  | Low        |
| Negligible                                                             | Negligible |

The resulting evaluation categories are Very High, High, Medium, Low and Negligible. To achieve a direct comparison with WebTAG, the Regional, County and District categories have been combined and are assigned to 'Medium' value. Where an ecological feature falls into more than one category of scale (e.g. a site designated at both the International and National level) then the highest category is always selected for evaluation purposes.

#### 9.2.4 Definition of important ecological features

CIEEM (2018) advises that 'one of the key challenges of EcIA is to decide which ecological features are important and should be subject to detailed assessment'. It explains that *"it is not necessary to carry out detailed assessment of features that are sufficiently widespread, unthreatened and resilient to project impacts and will remain viable and sustainable"*.

Thus, for the purposes of this assessment, potential impacts affecting features rated as holding Medium, High or Very High value, plus those protected by law, are defined as 'important' and are assessed in detail. Those features holding Low or Negligible value are either scoped out from the further consideration, or considered in less detail or collectively.

#### 9.2.5 Assessing the magnitude of the impact

The criteria adopted under WebTAG (2019) guidance have been used to categorise impacts on the important ecological features that have been identified (Table 20). Five impact categories ranging from Positive to Major Negative are defined. When assessing impact magnitude, the consequences on the 'integrity' of the feature being assessed is a key consideration.

Ecological impacts and effects may be characterised (CIEEM 2018) by reference to whether they are positive or negative, their extent, magnitude, duration, reversibility and their timing and frequency, although as recommended in CIEEM (2018), only impacts that are likely to be significant are considered in detail.

**Table 20. Criteria for determining Magnitude of the Impact (WebTAG, 2019)**

| Magnitude             | Criteria                                                                                                                                                                                                                                                                                                                                                             |
|-----------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Major Negative        | The proposal (either on its own or with other proposals) may adversely affect the integrity of the key environmental resource, in terms of the coherence of its ecological structure and function across its whole area, that enables it to sustain the habitat, complex of habitats and or population levels of species of interest                                 |
| Intermediate negative | The key environmental resource's integrity will not be adversely affected, but the effect on the resource is likely to be significant in terms of its ecological objectives. If, in the light of full information it cannot be clearly demonstrated that the proposal will not have an adverse effect on integrity then the impact should be assessed major negative |
| Minor negative        | Neither of the above apply, but some minor negative is evident                                                                                                                                                                                                                                                                                                       |
| Neutral               | No observable impact is evident either direction                                                                                                                                                                                                                                                                                                                     |
| Positive              | Impacts which provide a net gain for wildlife overall                                                                                                                                                                                                                                                                                                                |

### 9.2.6 Significance criteria

The assessment of impact significance considers both the likely magnitude of the impact and the importance of the ecological feature. The approach adopted in this EclA follows WebTAG guidance where it is referred to as the 'Overall Assessment Score'. Effects may be either beneficial, neutral or adverse, and vary from Slight to Very Large significance (Table 21).

Table 21. Determination of the significance of ecological effects (WebTAG, 2019)

| Magnitude of Impact          | Biodiversity and Earth Heritage Value |                     |                     |                   |            |
|------------------------------|---------------------------------------|---------------------|---------------------|-------------------|------------|
|                              | Very high                             | High                | Medium              | Lower             | Negligible |
| <b>Major negative</b>        | Very large adverse                    | Very large adverse  | Moderate adverse    | Slight adverse    | Neutral    |
| <b>Intermediate negative</b> | Large adverse                         | Large adverse       | Moderate adverse    | Slight adverse    | Neutral    |
| <b>Minor negative</b>        | Slight adverse                        | Slight adverse      | Slight adverse      | Slight adverse    | Neutral    |
| <b>Neutral</b>               | Neutral                               | Neutral             | Neutral             | Neutral           | Neutral    |
| <b>Positive</b>              | Moderate beneficial                   | Moderate beneficial | Moderate beneficial | Slight beneficial | Neutral    |

WebTAG (2019) advises that proposals resulting in impacts of Very Large Adverse significance are likely to be unacceptable on nature conservation grounds alone (even with compensation). There is likely to be a strong presumption against schemes that result in impacts of Large Adverse significance. Schemes in the Moderate Adverse category should include compensation - at least 1:1 is recommended and with no net loss within the Natural Area if the development is allowed.

Beneficial impacts should be considered to be of lower value if the gains are clearly evident but not significant in terms of the conservation objectives of the Natural Area. Beneficial impacts should be classed as medium value if they deliver significant gains to the Biodiversity Action Plan objectives in the Natural Area, and as major value if they deliver positive gains of national or international importance.

## 9.3 Review of baseline understanding

This section provides a summary of the desk based review of designated sites followed by a summary of the field surveys. Further detail is provided within the Terrestrial Ecology Technical Report (Appendix F), including a review of the constraints identified during the course of the surveys. None of the constraints or limitations encountered were of such significance that the survey results could not be relied on to provide an accurate assessment of the feature being assessed. Table 22 provides a summary of the evaluation of habitats and other terrestrial ecological receptors, in each of the development parcels.

Table 22. Evaluation of ecological features within each development parcel

|                                                                                         | Development Parcel |            |            |            |            |     |     |            | Comments                                                               |
|-----------------------------------------------------------------------------------------|--------------------|------------|------------|------------|------------|-----|-----|------------|------------------------------------------------------------------------|
|                                                                                         | B                  | C          | E          | F          | G          | H   | I   | J          |                                                                        |
| Designated sites                                                                        |                    |            |            |            |            |     |     |            |                                                                        |
| Pen Llyn a'r Sarnau SAC                                                                 | -                  | -          | -          | -          | -          | -   | -   | Very High  | Considered in marine ecology assessment (Section 8), apart from otter. |
| Glanllynau a Glannau Pen-y-chain I Gricieth SSSI                                        | -                  | -          | -          | -          | -          | -   | -   | High       | Considered in marine ecology assessment (Section 8).                   |
| Butlins 1' Candidate Wildlife Site                                                      | Medium             | -          | -          | -          | -          | -   | -   | -          |                                                                        |
| Habitats                                                                                |                    |            |            |            |            |     |     |            |                                                                        |
| Semi-improved neutral grassland (including acidic, marshy and inundation grassland)     | -                  | -          | -          | -          | Medium     | -   | -   | Medium     | Section 7 priority habitat (Lowland Meadow).                           |
| Soft maritime cliff                                                                     | -                  | -          | -          | -          | -          | -   | -   | Medium     | Section 7 priority habitat (Coastal Cliffs and Slopes).                |
| Semi-improved grassland, non-agricultural                                               | -                  | -          | Low        | -          | -          | Low | -   | -          |                                                                        |
| Unmanaged grassland (species pool, mainly National Vegetation Classification (NVC) MG1) | -                  | -          | -          | -          | -          | Low | Low | Low        |                                                                        |
| Flowing watercourse                                                                     | -                  | -          | -          | -          | Low        | -   | -   | Low        |                                                                        |
| Broad-leaved plantation/native trees (included coppiced)                                | Low                | -          | -          | -          | Low        | -   | -   | Low        |                                                                        |
| Broad-leaved plantation/non-indigenous trees                                            | -                  | Low        | -          | -          | Low        | Low | Low | -          |                                                                        |
| Coniferous plantation and trees                                                         | Low                | -          | Low        | -          | -          | Low | -   | -          |                                                                        |
| Scrub – mainly grey willow                                                              | Low                | -          | Low        | -          | Low        | Low | Low | Low        |                                                                        |
| Bramble                                                                                 | -                  | -          | Low        | -          | Low        | Low | Low | Low        |                                                                        |
| Tall ruderal herb                                                                       | Low                | -          | -          | -          | Low        | Low | Low | Low        |                                                                        |
| Cloddiau                                                                                | -                  | -          | -          | -          | Low        | Low | -   | Low        |                                                                        |
| Ornamental planting – shrubs/trees                                                      | Negligible         | Negligible | Negligible | Negligible | -          | -   | -   | -          |                                                                        |
| Amenity grassland/lawn                                                                  | Negligible         | -          | -          | Negligible | -          | -   | -   | -          |                                                                        |
| Sea wall                                                                                | -                  | -          | -          | -          | -          | -   | -   | Negligible |                                                                        |
| Building/cabin                                                                          | -                  | -          | -          | Negliaible | Negliaible | -   | -   | -          |                                                                        |

|                                                   | Development Parcel |        |        |            |            |                 |                 |        | Comments                                                                                  |
|---------------------------------------------------|--------------------|--------|--------|------------|------------|-----------------|-----------------|--------|-------------------------------------------------------------------------------------------|
|                                                   | B                  | C      | E      | F          | G          | H               | I               | J      |                                                                                           |
| Bare/semi-bare/compacted ground/hardstanding/road | -                  | -      | -      | Negligible | Negligible | -               | -               | -      |                                                                                           |
| <b>Species</b>                                    |                    |        |        |            |            |                 |                 |        |                                                                                           |
| Reptiles                                          | -                  | -      | Low    | -          | Medium     | -               | -               | Medium | Statutory implications.                                                                   |
| Birds (including grassland birds)                 | -                  | -      | -      | -          | Low        | -               | -               | Low    | Statutory implications.                                                                   |
| Bats                                              | Medium             | Medium | Medium | Medium     | Medium     | Medium          | Medium          | Medium | Statutory implications. Roosts on Parcel F; activity by up to 7 species on other parcels. |
| Otter                                             | Medium             | -      | -      | -          | Medium     | Medium          | Medium          | Medium | Statutory implications. Use of watercourse WC1 and South lake                             |
| Badger                                            | Low                | Low    | Low    | Low        | Low        | Low             | Low             | Low    | No setts. Likely foraging and dispersal across the whole site; statutory implications.    |
| Aculeate Hymenoptera (bees and wasps)             | -                  | -      | -      | -          | -          | -               | -               | Medium |                                                                                           |
| Black oil beetle ( <i>Meloe proscarabaeus</i> )   | -                  | -      | -      | -          | -          | -               | -               | Medium | Section 7 priority species.                                                               |
| Invasive non-native plant species                 | Negative Medium    | -      | -      | -          | -          | Negative Medium | Negative Medium | -      | Wildlife and Countryside Act Schedule 9 species.                                          |

### 9.3.1 Designated nature conservation sites

#### International designated sites

The Pen Llŷn a'r Sarnau SAC (see Figure 1a in Appendix G) is designated as a statutory European Site (Very High value) for the following:

- Annex I habitats that are a primary reason for selection of this site: Sandbanks which are slightly covered by seawater all the time; Estuaries; Coastal Lagoons; Large Shallow inlets and bays; Reefs;
- Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: Mudflats and sandflats not covered by sea water at low tide; Salicornia and other annuals colonizing mud and sand; Atlantic Salt meadows (*Glaucopuccinellietalia maritima*); Submerged or partially submerged sea caves; and
- Annex II species present as a qualifying feature, but not a primary reason for site selection: Bottlenose dolphin (*Tursiops truncatus*); Otter (*Lutra lutra*); Grey seal (*Halichoerus grypus*)

#### National designated sites

The Glanllynau a Glannau Pen-y-chain I Gricieth SSSI (see Figure 1b in Appendix G) is a nationally important (High value) statutory site that is designated for geological and marine biological features including: glacial deposits and the variety of seashore and seabed biotopes (habitats) including a complete community zonation that includes small beds of eelgrass; rock pools; mixed substrata; sand influenced biogenic reef honeycomb worms (*Sabellaria alveolata*). The terrestrial habitats within the footprint are not designated.

Morfa Abererch SSSI, which is situated about 700 m to the south of Parcel B at its closest point, would not be affected and is not considered further in the terrestrial ecology impact assessment.

#### Local/non-statutory designated sites

Parcel B contains coniferous plantation that is within the 'Butlins 2' Candidate Wildlife Site (cWS), and it is also adjacent to the South/fishing lake that is also within this cWS. According to Cofnod information, this non-statutory site consists of three areas within Hafan y Môr Holiday Park; it totals 5.4 ha and contains areas of open water plus broadleaved and coniferous woodland habitats. Parcels C and E are situated close to 'Butlins 2' Candidate Wildlife Site, although no high value habitats or species would be affected.

Parcel G is close to 'Butlins 1' Candidate Wildlife Site but it is separated by an active railway line and would not be affected in any way by the proposals. Cofnod information describes Butlins 1 cWS as 2.9 ha and containing 'acid grassland and semi-improved neutral grassland'.

The other 13 Wildlife Sites are too distant and remote from the Proposed Development to be of relevance.

#### Section 7 species

Forty-one Section 7 species were identified in the desk based study although many of these may be confidently scoped out from this terrestrial ecology assessment because they are either associated with marine or intertidal habitats (covered in Section 8), or with terrestrial habitats that do not occur in any of the development parcels. These excluded species include, for example, two fish species (plaice and mackerel), eight sea or shoreline birds (including several waders) and two plants with very restricted habitat requirements.

The eel has been scoped out from further consideration because there are no proposals that would interfere with eel movement or migration, so no risk of infringement of the Eel Regulations.

Three of the species, the grayling and small pearl-bordered fritillary butterflies and Peus' long-back spider, has also been scoped out because the areas of potentially suitable habitat present are so small and poorly represented that these species are very unlikely to be present.

The birds, reptiles, bats, otter and water vole have been subject to specific field surveys so their status and potential impacts can be directly assessed in the following sections.

Three Section 7 species remain for more detailed consideration, for which at least one of the development parcels contains potentially suitable habitat. These are hedgehog, cinnabar moth and the small heath butterfly.

With respect of the small heath butterfly and cinnabar moth, the grassland habitats in Parcels G and J could provide suitable habitat. Both species are reasonably widespread in North Wales, but no records were made during any of the surveys, including the aculeate Hymenoptera survey which was conducted under good weather conditions and during the flight periods of both species. The Cofnod desk study records for both species were from the Morfa Abererch SSSI. Based on this, it seems unlikely that these species are present, so they are not evaluated or considered further in this assessment.

Hedgehogs are likely to be quite widespread in the area and may utilise a range of habitats including plantation woodlands, bramble thicket and areas of unmanaged grassland. These habitats occupy a relatively small area in total and their removal is unlikely to significantly affect any local hedgehog population. On this basis, the potential impacts on hedgehogs has been scoped out of further assessment (Table 18), although precautionary measures during construction are proposed to avoid direct impacts on individual hedgehogs.

### 9.3.2 Terrestrial habitats and vascular plants

#### Methods

Habitats and vascular plants were surveyed between 2017 and 2019 using Phase 1 Habitat Survey (JNCC, 2010) methods adapted to suit local conditions as necessary.

The eight development parcels plus three potential ecological mitigation areas (a former car park north of the A497, grasslands to the east of the South/fishing lake and the 'Afon Wen fields', see Section 9.5) were surveyed (see Figure 2 in Appendix G). Habitat maps of each development parcel were produced (see Figure 3 in Appendix G) and plant species were recorded. The locations of non-native and potentially invasive species were recorded, especially those listed on Schedule 9 of the Wildlife and Countryside Act 1981.

#### Habitats recorded

The following habitats were identified across the eight development parcels. Habitat maps are provided in Figure 3 in Appendix G:

- Semi-improved neutral grassland;
- Grassland unmanaged (strong affinity with NVC MG1, and typically dominated by false-oat grass or cock's-foot);
- Marshy grassland - rush (*Juncus*) dominated;
- Acidic grassland;
- Amenity grassland/lawn;

- Inundation vegetation/grassland - within areas of semi-improved neutral grassland and typically dominated by silverweed;
- Broad-leaved plantation - mainly native trees (including coppiced areas);
- Broad-leaved plantation - mainly non-indigenous trees;
- Coniferous plantation;
- Ornamental planting - typically shrubs;
- Scrub - typically grey willow, but also hawthorn, blackthorn and other species;
- Bramble - dense continuous thicket;
- Tall ruderal herb – e.g. common nettle, rosebay willowherb etc.;
- Soft maritime cliff;
- Flowing watercourse;
- Open water (north/boating and south/fishing lakes);
- Bare and semi-bare/compacted ground - typically supporting very sparse flora of ephemeral/short ruderal species;
- Cloddiau;
- Hardstanding/road;
- Sea wall;
- Building; and
- Habitat surveys were also undertaken on potential ecological mitigation areas at Hafan y Môr, and these are described further in Appendix F.

#### Parcel B: Lakeside west - South (Fishing) Lake

The surveys included Parcel B itself, plus a wider area around and to the east of the fishing lake including the candidate Wildlife Site and areas of grassland (see Figure 3a in Appendix G).

Parcel B contains broad-leaved plantation woodlands of mainly native species, coniferous plantation, ruderal tall herb and the grey willow dominated scrub around the riparian margins; these habitats hold **Low** value.

The wider area outside Parcel B contains areas of moderately diverse unimproved neutral grassland, blocks of scrub and open water and riparian habitats associated with the lake. These habitats are in Butlins 2 candidate Wildlife site and hold **Medium** value.

#### Parcel C: Secondary sales area

Parcel C is an area of hard standing (**Negligible** value) surrounded by belts of planted sycamore woodland (**Low** value) and ornamental shrubs (**Negligible** value) (see Figure 3b in Appendix G).

#### Parcel F: The Beachside Site - Llyn Village Apartments and area to South East

This parcel contains four lines of holiday apartments separated by species poor amenity grassland and a few scattered, mainly ornamental, trees and shrubs (see Figure 3c in Appendix G). All habitats are assessed to hold **Negligible** value (bat interests are examined in Section 9.3.4).

#### Parcel E: Area west of existing staff accommodation

Habitats present in Parcel E include areas of rather disturbed and species-poor semi-improved grassland, amenity grassland, belts of planted trees and/or shrubs (plantation woodland, including both coniferous and broad-leaved) and bramble thicket (see Figure 3d in Appendix G). All of these habitats hold **Low** value.

### Parcel G: Coastal grasslands

Parcel G consists of two agricultural fields ('North' and 'South' fields) that are separated by a belt of plantation woodland that has recently been coppiced/pollarded (see Figure 3g in Appendix G). Part of the South field also falls into Parcel J.

Both fields contain semi-improved neutral grassland. There is considerable local variation in the sward, and the North field has also been subject to recent (and ongoing) disturbance and damage (further details in Appendix F). Both fields contain small areas of marshy grassland, and there is a very small area of acidic grassland and inundation grassland (silverweed dominated) communities in the South field. The semi-improved neutral, acidic, marshy and inundation grassland communities in both fields are collectively evaluated as holding **Medium** value. These grasslands are assessed to be Lowland Meadow priority habitat under Section 7 of the Environment Wales Act 2016.

Following discussion with Gwynedd Council Biodiversity officers, the Medium evaluation category has also been applied to the damaged areas of grassland in the North field. These areas were formerly semi-improved neutral grassland of comparable value to the intact grassland areas, and measures could be taken to restore them.

Other habitats within Parcel G comprise belts of mainly native, broad-leaved plantation (**Low** value), stands of ruderal tall herb and cloddiau (all **Low** value) and bare and semi-bare ground (although becoming colonised by vegetation).

### Parcel H: Former Sewage Treatment Plant (STP)

The former sewage plant has been decommissioned and demolished and all infrastructure has been removed. As at June 2019, most of the site consisted of bare and *sparingly* vegetated ground, although recolonisation by ruderal species is taking place (see Figure 3f in Appendix G). Remaining habitats within the parcel consist of broad-leaved plantation dominated by either sycamore or comprising mixtures of mainly native trees, and a fragment of coniferous plantation. There is a flowing watercourse along the north-east boundary, a stone faced clawdd and small patches of bramble, tall ruderal herb, scrub and unmanaged grassland (although within the former STP fence some of these minor habitats lie within Parcel J). All remaining habitats are assessed to hold **Low** value.

### Parcel I: Land to north west of former sewage treatment plant

Figure 3e in Appendix G shows the habitats on Parcel I as at June 2019. However, much of the remaining habitat will be removed before November 2019 under provisions made in planning permission C10D/0141/40/LL, and as explained below.

At the time of the survey most of this parcel contained bare and semi-bare/compacted ground and stands of ruderal tall herb. Other habitats present were unmanaged grassland, plantation woodland and scrub.

With the exception of a small area of plantation at the south end, Parcel I is included in what is referred to as Parcel D3 under the 2011 planning permission C10D/0141/40/LL for static caravan development. Haven Leisure Ltd. proposes to continue development under the 2011 consent in winter 2019/20. During the 2019 works, the residual area will be cleared and compacted, and thereafter maintained in a vegetation free condition, under the provisions of the approved reptile mitigation scheme (Discharge of condition reference C19/0718/40/AC).

Thus, for the purposes of this ecological impact assessment (EclIA) it is assumed that all habitats and species within Parcel I, with the exception of the plantation at the south end (which has **Low** value), will have been removed and thus have **Negligible** value.

## Parcel J: Coastal defences

Parcel J includes both terrestrial and intertidal habitats; the latter are assessed in Section 8.3.

In terms of terrestrial habitats, this parcel contains soft maritime cliff (**Medium** value), and part of the semi-improved neutral grassland (**Medium** value) in the South field (see Parcel G and Figure 3h in Appendix G). Both are Section 7 priority habitat types - see para. 4.3.2 for further evaluation of these habitats. Other minor habitats comprise a short section of flowing watercourse, a clawdd, fragments of plantation woodland, bramble thicket and a strip of unmanaged grassland along the top of the soft cliff. Parcel J also extends into the former sewage works site which contains bare/semi-bare ground and species-poor grassland. All these habitats hold **Low** value.

### Further assessment of medium value habitats within Development Parcels G and J

Two habitat types within the development parcels hold Medium value:

- Semi-improved neutral grassland in Parcels G and J41; and
- Soft maritime cliff in Parcel J.

These may be further evaluated as described in the following sub-sections.

#### Semi-improved neutral grassland

The semi-improved neutral grassland within the North and South fields of Parcels G and J totals 3.5 ha (approx.). It forms part of a larger block of fields of this grassland habitat that extends north-east towards the Afon Wen watercourse, and the relatively large extent of this block increases its value. Outside Parcels G and J, there is a further 5.1 ha (approx.) of semi-improved neutral grassland in fields towards the Afon Wen, so the total grassland area is about 8.6 ha. These semi-improved grasslands are considered to be Section 7 Lowland Meadow priority habitat.

Both fields suffer from ongoing disturbance and the North field has been damaged quite extensively (details in Appendix F). This limits the current value of these grasslands, but the remaining sward contains species indicative of unimproved conditions such as eyebright, yellow rattle, common cat's-ear, bird's-foot trefoils, heath grass and tormentil. The presence of these species, and also the small areas of marshy and acidic grassland, indicate that agricultural management has not been intensive.

Such grassland habitats have diminished greatly across the country<sup>42</sup> and are recognised as holding conservation value. The 2016 State of Natural Resources Report (SoNaRR) (NRW, 2016) estimates a total of 78,000 ha priority (Section 7) grassland habitat remaining in Wales, of which an estimated 42,900 ha falls in the Lowland Meadow category. Within Gwynedd, Jones *et al.* (2003) estimate a total of 30 ha of Lowland Meadow habitat<sup>43</sup>. Because of these declines and the scarcity of this grassland type in both Gwynedd and Wales, these grasslands are assessed to hold County/Medium importance, or **Medium** value using the WebTAG framework.

#### Soft maritime cliff

The soft maritime cliff (c. 200 m) in Parcel J is assessed to be Section 7 Maritime cliff and slopes priority habitat. As such it is assessed to hold County/Medium importance, and thus **Medium** value using WebTAG. Jones *et al.* (2003) estimated that there is about 40.5 km of this habitat type in Gwynedd.

<sup>41</sup> The small areas of acidic, inundation and marshy grassland are included within this category for the purposes of evaluation.

<sup>42</sup> There is an estimated 97 % decline in semi-natural grasslands across Wales between 1930-84 (NRW, 2016).

<sup>43</sup> This comprises grasslands assigned to NVC communities MG4, MG5 or MG8.

### Coastal ecological corridor function

Semi-natural habitats running along the coast within Parcel J provide an ecological corridor function over and above their significance as separate habitat types. The wide zone of grassland and soft maritime cliff in the northern half of Parcel J (to the south-east of Parcel G) provides a strong corridor that is considered to hold **Medium** value, whereas the corridor in the south half of Parcel J, in front of the former sewage treatment works (Parcel H), is very narrow and relatively weak and has **Low** value. Beyond the former sewage treatment works the corridor continues as a very weak and narrow belt due to the existence of Cardigan Bay View.

#### 9.3.3 Otter

Otter surveys (see Figures 7a-b in Appendix G) of the site and wider area were undertaken between September 2017 and July 2019. This included surveys for otter field signs as well as camera trap monitoring, and encompassed: the unnamed watercourse WC1, the North and South lakes, the coastline and an area of dense scrub to the north of the railway line.

Otter field signs were found to be common along WC1 and the southern lake where feeding remains, spraint and lying up sites were found but no otter signs were found along the coast. Camera trap monitoring of resting sites along WC1 recorded otters on three separate occasions but there was no evidence that otters are using identified resting sites for long periods and it is likely that otters are mainly spraint marking along this watercourse with only occasional use of the resting sites for short periods.

No evidence of breeding was recorded during the survey period and it is considered unlikely that otters use any of the habitats within the site for this purpose. However, WC1 provides connectivity between the sea and a large area of relatively undisturbed scrub to the north of the railway line. This area is considered to provide suitable breeding habitat for female otters as it is close to a good supply of food but sufficiently far enough from areas likely to be frequented by adult male otters that can predate otter cubs.

These observations indicate that otters use parts of Hafan y Môr for foraging, resting and commuting but there is no evidence that they breed within the site. The otter is listed as a qualifying feature in the citation for the Pen Llŷn a'r Sarnau SAC, although it is not a primary reason for the SAC's designation. Additionally, otters are a UK and European protected species as well as a Section 7 priority species under the Environment (Wales) Act 2016. In summary, the site is assigned to the **Medium** ecological value category.

#### 9.3.4 Bats

Numerous bat surveys (see Figures 6a-e in Appendix G) of the site were carried out between 2017 and 2019 including daytime inspection surveys, nocturnal roost surveys and activity transect surveys (augmented by static detector monitoring). The surveys identified the presence of common and soprano pipistrelle day roost sites comprising low numbers of non-breeding bats in two holiday apartments (B1 and B2). All bats and their roosts are afforded full legal protection under the Habitat Regulations 2017 and Wildlife and Countryside Act 1981 (as amended) but non-breeding roost sites comprising low numbers of common bat species are of limited ecological importance.

Seven species of bat (including five Section 7 species) were recorded using the habitats within the site during the field surveys including common pipistrelle, soprano pipistrelle, noctule, brown long-eared, whiskered/Brandt's, Daubenton's and lesser horseshoe (Annex II species). Bat activity was encountered across most of the survey area although it was notably higher around aquatic habitats (North and South lakes) where group foraging by several species was recorded, notably Daubenton's and pipistrelle spp.

Sheltered woodland edge habitats such as those in Parcel G were also favoured foraging areas, such habitats being likely to support higher densities of insects than other habitats within the site. Bats were also recorded commuting across the site, although no particularly well used routes or features were identified.

Based on the above information the site is assessed as being of **Medium** value to bats.

### 9.3.5 Reptiles

A reptile survey was undertaken across potentially suitable habitats in Parcels E, G and J in June 2019, using methods recommended in Froglife (1999) and Gent and Gibson (1998). A total of 164 artificial reptile refugia were distributed across these parcels (Appendix F). The refugia were checked for reptiles on 11 occasions over seven days under suitable weather conditions. Reptile surveys were not undertaken in the other parcels because they do not contain significant areas of potential reptile habitat.

No reptiles were detected in Parcel E, but six slow worms records were made on adjacent land (see Figure 4a in Appendix G) so it is reasonably likely that small numbers of slow worms may also utilise suitable habitats within the parcel.

In contrast, 459 reptile records (see Figures 4b-e in Appendix G) were made on Parcels G and J, comprising one adder, two common lizard, four grass snake and 452 slow worm records. These records indicate that reptiles, and in particular slow worms, are likely to occur in any suitable habitat in these two parcels.

The small slow worm population on Parcel E is assessed to hold **Low** value, whereas the larger populations of four species in Parcels G and J have **Medium** value.

### 9.3.6 Terrestrial breeding birds

The main objective of the bird survey was to establish the status of grassland bird species such as skylark, meadow pipit etc in the fields in Parcels G and J (see Figure 5 in Appendix G). However, the survey also identifies other bird species, including Section 7 terrestrial species which are reported in more detail in Appendix F.

The survey involved three visits that were undertaken in good conditions in April, May and June 2019. This number and spread of surveys is considered appropriate to meet the general objective defined above. Surveys were undertaken in the morning and at least one hour after sunrise and under good weather conditions. Records were made along predetermined route at a slow walking pace, with longer periods of observation being made at strategic points. Sightings were registered on a base map using standard BTO species codes.

Nineteen bird species were recorded, although five of these (carrion crow, kingfisher, magpie, sand martin and swallow) were solely recorded flying over the site, and Canada geese were only passing through and/or feeding in the North field. Excluding these species, the total is therefore 13 species of which three (common whitethroat, meadow pipit and dunnoek) are Amber listed Birds of Conservation Concern (Eaton *et al.*, 2015), and the dunnoek is also on the Section 7 list of species of principal importance in Wales. Meadow pipit, which is a grassland nesting bird species, were probably nesting in the South field. Apart from meadow pipit, no other grassland nesting birds were recorded during the survey. The breeding bird fauna in Parcels G and J is assessed to hold **Low** value.

The desk based study identified ten Section 7 bird species meriting further consideration. However, apart from dunnock, which is discussed above, none of these species were recorded during the breeding bird survey or other site surveys. These species are therefore not evaluated and are not considered further in the assessment.

### 9.3.7 Non-native and potentially invasive plant species

Several non-native species, some of which may be potentially invasive under some circumstances, were recorded during the habitat and other surveys (Table 23).

Table 23. Non native and potentially invasive species recorded

| Parcel | Non-Native Species                                                             | Notes                           |
|--------|--------------------------------------------------------------------------------|---------------------------------|
| B      | <i>Montbretia Crocosmia × crocosmiiflora</i>                                   | Listed on Schedule 9 of the WCA |
| G      | <i>Fuchsia magellanica</i> and various exotic herbs from horticultural tipping |                                 |
| H      | <i>Montbretia Crocosmia × crocosmiiflora</i>                                   | Listed on Schedule 9 of the WCA |
|        | False Virginia creeper, probably <i>Parthenocissus inserta</i>                 | Listed on Schedule 9 of the WCA |
|        | Sea buckthorn <i>Hippophae rhamnoides</i>                                      |                                 |
|        | A bridewort, probably <i>Spiraea × pseudosalicifolia</i>                       |                                 |
| I      | <i>Himalayan balsam Impatiens glandulifera</i>                                 | Listed on Schedule 9 of the WCA |
|        | False Virginia creeper, probably <i>Parthenocissus inserta</i>                 | Listed on Schedule 9 of the WCA |
|        | <i>Tutsan Hypericum androsaemum</i>                                            |                                 |
| J      | Broad-leaved everlasting pea <i>Lathyrus latifolius</i>                        |                                 |

Schedule 9 species are regarded as holding **Negative Medium** value for the purposes of the assessment.

### 9.3.8 Large mason bee and other aculeate Hymenoptera

Although formerly relatively widespread, the Large Mason Bee (*Osmia xanthomelana*) is now seemingly restricted to just two UK sites, both on the Llŷn Peninsula. The bee is typically associated with soft cliff exposures and the sections of this habitat type in Parcel J have been identified as potentially suitable habitat for this species and other solitary mining bee species. A specialist survey for the Large Mason Bee and other aculeate Hymenoptera (bees and wasps) associated with this soft maritime cliff habitat has therefore been undertaken and is reported in further detail in Appendix F.

The Large Mason Bee was not recorded during the survey and it is concluded that the species is unlikely be present. No Section 7 bees or wasps were recorded.

In total, 37 species of aculeate Hymenoptera were recorded during the survey, including 13 species of conservation interest, all categorised as nationally Local<sup>44</sup>. The overall bee and wasp fauna associated with the cliffs was found to be quite diverse and is assessed to hold **Medium** value.

<sup>44</sup> **Local** = Species which, whilst fairly common, are evidently less widespread than truly common species, but also not qualifying as Nationally Notable having been recorded from over one hundred, but less than three hundred, ten-kilometre squares of the UK National Grid.

### 9.3.9 Black oil beetle

The black oil beetle (*Meloe proscarabaeus*) was recorded during the aculeate Hymenoptera survey from soft coastal cliffs and grassland habitats in Parcel J and further along the coast north eastwards towards the Afon Wen watercourse (Appendix F). This beetle is found in lowland areas throughout Britain but has undergone a severe decline and is considered a priority species for conservation in Wales as a Section 7 priority species, and across the UK<sup>45</sup>. In Wales, it is largely coastal with core populations found on the Gower Peninsular, Llŷn Peninsula and Pembrokeshire coast. Its larvae are parasitic on solitary bees of various genera including *Andrena*, *Melitta* and *Panurgus* – it is therefore reliant on healthy populations of its solitary bee hosts. In view of this species' conservation status (especially Section 7), this species is assessed to hold **Medium** value.

### 9.3.10 Badger

The badger survey covered the proposed development parcels and adjacent areas and adopted standard field methods (Harris *et al.*, 1989; Cresswell *et al.*, 1990). No setts were identified, but badger footprints were found in Parcels G and H, and a badger was recorded on a trail camera set up to monitor otters along the watercourse between Parcels G and I. The desk based study returned several badger records.

These observations confirm that badgers use parts of Hafan y Môr for dispersal and probably foraging, but there is no evidence that they reside on the site. The badger and badger setts are protected under the Protection of Badgers Act 1992, although the species is widespread and relatively common in Wales. For the purposes of the impact assessment the badger is assigned to the **Low** value category.

### 9.3.11 Future baseline

It is important to consider the potential ecological changes that may take place on the site in the event of the Proposed Development not proceeding. Some of the development parcels (Parcels C, E and F) are currently intensively managed as part of the existing holiday park and this is likely to continue so there are not likely to be any significant changes.

In terms of the other parcels the following future changes are anticipated in the absence of the Proposed Development:

- Parcel B - the plantation woodlands will continue to mature, and scrub is likely to expand in the area of damaged coniferous plantation;
- Parcel G and J - the disturbed bare/semi-bare ground habitats in the North field would continue to become colonised by ruderal plant species and, unless managed, would probably develop into scrub. However, the east half of the North field benefits from an existing planning permission (2011) so it may be assumed that it would be developed. The North and South fields are also included in mitigation measures for the recently developed new sewage treatment works, and also partly for caravan development consented in 2011. In the event of the Proposed Development not proceeding it is therefore assumed that they would be maintained under a management agreement to conserve and enhance their biodiversity value (apart from the east half of the North field which would presumably be developed, see above). In the absence of the proposed coastal defence element of the Proposed Development, the soft maritime cliff habitats and their associated aculeate, reptile and faunas are unlikely to change significantly;

<sup>45</sup> [http://jncc.defra.gov.uk/\\_speciespages/2421.pdf](http://jncc.defra.gov.uk/_speciespages/2421.pdf) (accessed October 2019).

- Parcel H - the plantation woodlands would continue to mature. The large areas of bare ground would become colonised by ruderal plant species, and eventually develop into grassland, and/or scrub communities; and
- Parcel I - this area benefits from an existing planning permission (2011) so it may be assumed that it would be developed.

## 9.4 Impact assessment

### 9.4.1 Impact Pathway 12: Damage or disturbance to landside habitats adjacent to development parcels during construction work

The following habitats on land adjacent to the development parcels are identified as potentially sensitive to construction disturbance:

- Parcel B - Butlins 2 cWS - potentially affecting riparian and open water habitats (Medium value) adjacent to Parcel B. Potential impacts could comprise the run-off of contaminated (e.g. sediment laden) surface water into the lake and damage to riparian vegetation/lake edges caused by accidental trespassing by contractors;
- Parcel G - adjacent areas of Lowland Meadow and soft maritime cliff priority habitat (both Medium value) are vulnerable. Construction activities in the North field is well contained by the existing plantation belts so accidental damage and/or disturbance to adjacent grassland habitats is considered unlikely. Although its north-east boundary is defined by a clawdd and recent planting, the interface between the South field and adjacent areas of semi-improved grassland is less well defined, so there is a greater risk of accidental damage by contractors; and
- Parcel J - adjacent areas of Lowland Meadow and soft maritime cliff priority habitats (both Medium value) could be accidentally damaged during the coastline defence/realignment works.

The above risks could be managed by installing temporary fencing to restrict working/storage areas during construction, and by adopting appropriate pollution prevention guidelines. It is likely that such potential effects would be short terms and reversible in nature, and Minor Negative in magnitude, so overall their significance is assessed to be **Slight Adverse**.

### 9.4.2 Impact Pathway 13: Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works

The construction of the static caravan development in Parcel G would require the permanent removal of 3.1 ha of Medium value semi-improved neutral grassland that is Lowland Meadow priority habitat (Section 7). Jones *et al.* (2003) estimated that Gwynedd contains 30 ha of this grassland type, so this loss could represent up to 10.3 % of the county's resource of this grassland type. This permanent loss is considered to be of Major negative magnitude and of Moderate Adverse significance.

The coastline defence/realignment works in Parcel J would result in the permanent loss of 0.4 ha of this grassland type, which could represent up to 1.3 % of the county's resource of this grassland type. This permanent loss is considered to be of Major negative magnitude and Moderate Adverse significance.

In total, the Parcel G and J developments would result in the permanent loss of 3.5 ha of semi-improved Lowland Meadow priority habitat, which is estimated to represent up to 11.7 % of this habitat type in Gwynedd. This is considered to represent an effect of Major negative magnitude and **Moderate Adverse** significance.

#### 9.4.3 Impact Pathway 14: Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations

This pathway is especially relevant to Parcel J, but also has implications for the realigned coast within Parcels G and H.

The coastline defence/realignment works would remove semi-improved grassland, unmanaged grassland, soft maritime cliff and other habitats that currently form a strong coastal ecological corridor in the north part of Parcel J (Medium value). Following realignment of the coast in this area, the static caravan development in Parcel G would remove further habitats (mainly semi-improved grassland) from the ecological corridor along about 200 m of coastline. This impact would be permanent and is assessed to have Intermediate negative magnitude, and overall significance of **Moderate Adverse**.

These effects would be likely to have indirect negative effects on various animal species, preventing or hindering movement and thus potentially fragmenting populations. Of particular relevance is the potential effect on the dispersal opportunities of reptiles and aculeate Hymenoptera, which have been shown to have Medium value populations in the area.

In contrast, the section of coast within Parcel J that lies to the south-east of Parcel H is currently not well endowed with a coastal corridor (Low value), the only habitat of relevance in the area being a narrow strip (*circa* 1-2 m wide) of grassland. The construction of the proposed beach cafe would, therefore not have a major impact on habitat connectivity in this area, and the overall effect in this area is assessed to be permanent, but of Minor negative magnitude and **Slight Adverse** significance.

#### 9.4.4 Impact pathway 15: Loss of soft maritime cliff (Section 7 priority habitat) as a result of coastline defence/realignment works

The coastline defence/realignment works in Parcel J would result in the permanent loss of 200 m of soft maritime cliff, which is a Section 7 priority habitat (maritime cliff and slope). According to Jones *et al.* (2003), there are 40.5 km of this habitat type in Gwynedd, so this loss would represent up to 0.5 % of the county resource. Although this is a relatively small proportion, this loss is considered to represent an effect of Intermediate negative, and of **Moderate Adverse** significance. It should be noted that the loss of this habitat would also have adverse effects on the coastal ecological corridor, reptiles, aculeate Hymenoptera (bees and wasps) and black oil beetle.

#### 9.4.5 Impact Pathway 16: Habitat loss and disturbance of otters (qualifying feature of SAC and European Protected Species) during construction work (including potential for sediment run-off and contamination of watercourses used by this species)

Lying up sites H3 and H4 along WC1 are likely to be lost during construction of a new access road over the watercourse while four other lying-up sites along this watercourse (H1, H2, H5 and H6) will be subject to short term disturbance during the construction phase. However, these lying up sites are not thought to be used regularly by otters and there are no signs that they are used by female otters for breeding/rearing cubs. Additionally, otters typically have c.30 lying up sites within their home range meaning the loss and disturbance of these resting sites is assessed as having an effect of Minor negative magnitude, and of **Slight Adverse** significance.

It should also be noted that otters are nocturnal and as such, construction activities during the daytime should not perturb otters from utilising WC1 as a commuting route, as long as the watercourse remains

free of obstructions. Otters are however inquisitive animals and may investigate construction areas meaning there is the potential for otters to become trapped in steep sided excavations although the risk of this occurring is considered low.

#### 9.4.6 Impact Pathway 17: Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes

The operational phase of the Proposed Development has the potential to hinder otter movements along WC1 if new road crossings are not designed sensitively with safe passage for otters beneath e.g. box culverts with integral mammal ledges. This may result in otters avoiding WC1 or result in otter road traffic accidents as otters are forced to leave the watercourse channel during periods of high flow and cross over access roads with increased traffic volumes, albeit low numbers of vehicles travelling at relatively slow speeds. Inappropriate modification, or the introduction of obstructions, at the exit of watercourse WC1 at the coast could also interfere with otter movement.

Additionally, there will be increased levels of direct human disturbance due to the proximity of new static caravans in Parcels H and G which may further deter use of this watercourse by otters both for commuting and lying-up. This would result in an impact of Intermediate negative magnitude and **Moderate Adverse** significance given that the watercourse links the coast to potential breeding habitat to the north of the site.

New static caravans on the north west shore of the South lake in Parcel B are unlikely to have a direct or indirect negative impact on otters. The magnitude of this impact, and its significance are therefore assessed as **Neutral**. It is not considered that the sea defence proposals in Parcel J would have any adverse impacts on otters or their fish/mollusc prey; the exit of watercourse WCI has been designed to avoid any interruption in otter movement.

#### 9.4.7 Impact Pathway 18: Loss of bat roosts and potential for harm to bats (European Protected Species) caused by demolition of chalet blocks

Individual or small numbers of pipistrelle spp. bats could be disturbed and/or possibly injured or killed during demolition of the chalet blocks (B1 and B2). This action could, therefore, result in an offence under the legislation that protects bats and their roosts. However, since only low numbers of common species are present in these buildings, the magnitude of this impact is assessed as Minor negative and **Slight Adverse** significance.

#### 9.4.8 Impact Pathway 19: Loss of and/or disturbance of bat dispersal routes and/or foraging areas

The scheme has the potential to result in disturbance of key foraging areas such as the southern fishing lake adjacent to Parcel B and plantation belts around Parcel G through increased lighting levels. No information is currently available on the layout of the lighting scheme, so it is not possible to accurately assess such impacts at this stage. However, it is understood, that low level Light Emitting Diode (LED) bollard lighting will be used, which are likely to result in minimal light spill, although the potential to disturb light sensitive species such as lesser horseshoe, brown long-eared and *Myotis* spp. bats remains should lighting levels exceed 3 lux in key areas. The use of LED lighting will help to make lighting columns less attractive to flying insects therefore avoiding surrounding habitats being denuded of insects' prey.

In the absence of such measures to control lighting, the proposals have the potential to cause Minor negative impacts with **Slight Adverse** significance on bat foraging habitats and commuting routes.

New landscaping proposals should result in positive impacts for bats as they will provide additional habitat for foraging and commuting. For instance, new landscape planting in Parcel G will connect two blocks of woodland while new water features (including their associated swales) will provide new foraging habitat for species such as Daubenton's bats.

#### 9.4.9 Impact Pathway 20: Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J)

No reptiles were detected in Parcel E but a small population of slow worms was recorded in adjacent habitats. There are no obstacles to reptile movement in the area, so it is quite likely that a small number of slow worms may colonise Parcel E in the future. In this event, site clearance for the caravan development would result in the harm/killing of slow worms. Mitigation measures would be required because slow worms are protected under the Wildlife and Countryside Act. Such an effect is assessed to be Minor negative in magnitude, and of **Slight Adverse** significance.

Reptile habitats are interconnected in Parcels G and J so these two Parcels are assessed together. The removal of these reptile habitats during the coastline defence/realignment (Parcel J) and caravan development (Parcel G) would result in a Major negative impact on these Medium value reptile populations. This impact would be exacerbated by habitat fragmentation effects caused by the weakening of the coastal ecological corridor, which would reduce reptile dispersal opportunities. Overall the significance of these effects is assessed to be **Moderate Adverse**. Further, mitigation measures would be needed to avoid possible infringement of the Wildlife and Countryside Act.

#### 9.4.10 Impact Pathway 21: Direct impacts on nesting birds (all species protected from harm while nesting) during construction (e.g. site clearance)

All breeding birds (Low value) are protected under the Wildlife and Countryside Act and the clearance of bird nesting habitats has the potential to cause harm. Mitigation measures will be needed, consisting of either the programming of clearance outside the main nesting period (typically February to August inclusive) and/or undertaking checks for nests by a suitably qualified ecologist. The adoption of these measures would be expected to remove the risk of harm, but in their absence the overall impact magnitude is assessed to be Minor negative and of **Slight Adverse** significance.

#### 9.4.11 Impact Pathway 22: Potential for increase in abundance or/and distribution of invasive non-native plant species

Without adequate precautionary control measures, site clearance, earthworks and construction activities have the potential to cause invasive species to increase and spread on the Proposed Development. This could have negative effects for other plant communities and species that hold biodiversity value, and could also introduce additional maintenance requirements. Overall such effects are assessed to have potentially Intermediate negative magnitude, which could be of **Moderate Adverse** significance.

#### 9.4.12 Impact Pathway 23: Potential effects on bee and wasp fauna associated with the removal of soft maritime cliff and grassland habitats

The coastal works will result in the removal of about 200 m of soft maritime cliff that supports a Medium value aculeate fauna. This is assessed to represent an impact of Intermediate negative magnitude, which would have **Moderate Adverse** significance.

#### 9.4.13 Impact Pathway 24: Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats

The coastal works will result in the removal of black oil beetle (Medium value) populations and habitat (soft maritime cliff and grassland) along about 200 m of coast in Parcel J. These effects are assessed to represent an impact of Intermediate negative magnitude, which would have **Moderate Adverse** significance.

#### 9.4.14 Impact Pathway 25: Other disturbance effects caused by operation of the developments on species and habitats

During the operational stages of the Proposed Development there are likely to be a small number of additional disturbance effects on retained habitats and species (including those on adjacent land). The semi-improved grassland in the Afon Wen fields to the north-east of Parcel G and retained reptile populations are identified as sensitive features. Potential disturbance issues relate to increased use of retained areas for informal recreation (including dog walking) and habitat fragmentation (Table 24).

There could be very minor effects on other species and habitats, although these are likely to be insignificant so are not considered in detail.

**Table 24. Potential disturbance effects during operation**

| Receptor and Value                        | Predicted Effect                                 | Potential Impact | Confidence, Duration and Reversibility | Magnitude of Significance |
|-------------------------------------------|--------------------------------------------------|------------------|----------------------------------------|---------------------------|
| Retained semi-improved grassland (Medium) | Habitat disturbance                              | Minor negative   | Possible, long term, permanent         | Slight adverse            |
| Retained reptile populations (Medium)     | Habitat and recreational (e.g. dogs) disturbance | Minor negative   | Possible, long term, permanent         | Slight adverse            |

#### 9.4.15 Impact Pathway 26: Impact on lower value features

Consideration has been in this section given to impacts on the less important habitat features that have wider relevance. These are cloddiau<sup>46</sup> (which hold cultural interest) and two further linear habitat features that also provide a wildlife corridor function.

##### Cloddiau

These stone faced traditional earth banks are features of local value that also have cultural interest. They provide linear boundary features and sometimes support habitats that contrast and complement those in the surrounding area. Cloddiau are present in Parcels G, H and J.

<sup>46</sup> Single – "clawdd".

Impacts on cloddiau would be caused by the coastal works (Parcel J), which would result in the loss of about 20 linear metres of a clawdd that currently forms a field boundary. Construction of two roads/pavements plus two further pedestrian access routes through the clawdd that runs the length of the plantation belt along the south-west boundary of Parcel G. This clawdd would be fragmented, with an estimated total loss of about 30 linear metres. With the exception of this section, the remaining sections of clawdd would be retained within the development layouts.

### **Belt of unmanaged grasslands (Parcel J)**

About 0.12 ha of unmanaged grassland along the cliff top in the north section of Parcel J would be removed as a result of the coastal works. Whilst this grassland community is generally widespread and common, the removal of this linear grassland strip would have the effect of reducing the strength of coastal ecological corridor and is encompassed within impact pathway 13.

### **Habitat corridor between Parcels G, H and I**

The belt of plantation woodland and the watercourse (WC1) between Parcels G, H and I provide a habitat corridor that is used for wildlife dispersal, including otters. This corridor function has been identified throughout the design process, and the Illustrative Masterplan recognises it by retaining the existing broad belt of plantation woodland between the railway line and the coast.

The construction of two roads/pavements and two pedestrian links, to provide access to Parcel G, will require the crossing of the watercourse and removal of small sections of plantation. However, the removal of plantation has been minimised, and it is understood that bridges (rather than culverts) will be used for these four crossings, thus ensuring that an open and continuous watercourse channel is maintained. By adopting these design measures, it is considered unlikely that there will be any significant effects on the corridor function of this plantation belt and watercourse.

## **9.5 Mitigation measures and residual effects**

Mitigation is the stage in the EclA process when measures are identified to avoid or minimise potential impacts, and if this is not possible then to compensate for expected losses. A range of measures have been incorporated into the scheme and they are now integral (see Section 0). These measures and the level to which they reduce or remove impacts are described in this section.

Key post scoping scheme changes are described in Section 2.2. Changes of ecological relevance were the removal of development proposals from an area of unimproved grassland within Parcel B, and the omission of proposed houseboats on the South/fishing lake also in Parcel B. Both of these habitats hold Medium value and lie within Butlins 2 candidate Wildlife Site. Development proposals in a former stable block (referred to as Parcel A) were also removed from the Masterplan, thus avoiding potential impacts on bats and barn owl. These changes in scheme design significantly reduce potential adverse effects on biodiversity.

Sections 9.5.1 to 9.5.4 describe the mitigation measures that are required during construction. Section 9.5.5 presents the habitat creation and enhancement measures that are proposed to further mitigate habitat losses that cannot be adequately avoided or reduced. Sections 9.5.6 to 9.5.19 explain the specific mitigation measures that have been incorporated to address the effects associated with the identified impact pathways. Where applicable during the construction phase, these measures will need to be incorporated into the CEMPs for each of the development parcels.

### 9.5.1 Construction Environmental Management Plan (CEMP)

A CEMP would be produced for each development parcel, although the document, where logical could cover more than one parcel. This would bring together a coherent approach to avoiding impacts on ecological receptors where possible, and/or minimising risk of harm where avoidance cannot be secured.

For some development parcels, depending on the time that has passed, an updated ecological baseline survey of affected and relevant ecological features will be needed prior to the preparation of the detailed CEMP, to ensure that decisions are based on up-to-date information. This is needed to account for natural change in habitat distributions and species use of the site.

Advice in BS42020:2013 would be followed when preparing CEMPs. This British Standard (BS) states that CEMPs should be proportionate and tailored to the specific needs of the development. The biodiversity elements should all have a common structure, and be based on the following considerations, as appropriate:

- a) Risk assessment of potentially damaging construction-type activities;
- b) Identification of "biodiversity protection zones" and areas where invasive species have been identified. These areas include:
  - important habitats, species and/or other biodiversity features, and related resources (e.g. soils) and existing hazards (e.g. areas of identified invasive species) that are to be retained and protected during construction or implementation of the development;
  - areas that are to be restricted for some or all construction-type activities for the whole or part of the construction/implementation process;
  - areas where protective measures (e.g. fencing) are to be installed and maintained; and
  - approved layout and areas for construction-type activities necessary to implement the proposed development.
- c) Inclusion of or reference to details for implementation of method statements required to achieve specific biodiversity outcomes, and particularly mitigation measures;
- d) Identification of practical measures, both physical measures and sensitive working practices to avoid impacts during development, for protecting biodiversity through the control or regulation of construction-type activities;
- e) The location and timing of sensitive works to avoid harm to biodiversity features;
- f) The times during construction or development implementation when particular specialists need to be present on site to oversee works;
- g) Responsible persons and lines of communication;
- h) Defining and communicating the role and responsibilities on site of an ecological clerk of works (ECoW), or appointed ecologist(s) responsible for managing biodiversity issues on site, and times and activities during construction or development implementation when they need to be present to oversee works; and
- i) Use of exclusion fences, protective barriers and warning signs.

Reference would be made to the detailed advice in BS:42020 when detailing specific CEMPs for each Parcel.

### 9.5.2 General mitigation measures to avoid or reduce impacts during construction

The CEMP should set out all necessary practical measures to ensure that biodiversity features are protected during construction or development implementation, including some or all of the following,

as appropriate to the nature of the development and construction operations on the parcel concerned and the risks to biodiversity:

- Siting and timing of all construction-type activities to avoid harm to important nature conservation features;
- Erection of fences to protect sensitive biodiversity features specifying type, location and means of installation;
- Erection of information or warning signs for site workers specifying location, type and means of installation;
- Erection of wildlife exclusion barriers to prevent, where necessary, particular species (e.g. reptiles) from moving from one area or feature to another;
- Direction of security/construction lighting away from protection zones, tree canopies and watercourses;
- Regular inspection and maintenance of wildlife exclusion barriers and protective fences to ensure they remain fit for purpose;
- Monitoring and provision of advice by an ecologist (or other competent person) of specified destructive activities, e.g. vegetation clearance, hedgerow removal, tree felling or surgery, soil stripping, full or partial demolition of buildings and structures, roof stripping and removal;
- Species rescue and translocation;
- Provision of temporary shelters during construction/implementation for vulnerable species e.g. barn owl boxes and bat roosts;
- Containment, control and removal of invasive non-native species (e.g. Himalayan balsam);
- Biosecurity protocol or method statement to prevent the introduction and spread of invasive non-native species and pathogens between sites i.e. biosecurity risk assessment and method statement;
- Measures and inspections to ensure that wildlife does not become trapped in pipes, excavations or machinery;
- Training and awareness: provision of information to all site workers explaining the importance of sensitive features and any associated protection measures;
- Protection against vandalism, e.g. security fencing around equipment/materials that could cause pollution;
- Procedures to avoid pollution incidents, e.g. from fuel spills or site run-off, based on an understanding of the wildlife interest at risk;
- Contingency/emergency measures for accidents and unexpected events, for example:
  - pollution incidents, e.g. use of spill kits with machinery;
  - dealing with previously unrecorded protected species found during construction/implementation;
  - unexpected bad weather;
  - other unforeseen causes of delay; and
  - repair of damaged areas and features.
- Temporary management of existing wildlife features during construction/implementation;
- Regular review of mitigation measures throughout the construction/implementation process to monitor their effectiveness and compliance with legal, planning and/or contractual requirements; and
- Maintenance of records and regular review of environmental procedures to identify and report issues to site managers and project team, identifying remedial action where necessary.

### 9.5.3 Precautionary measures for hedgehogs, badgers and other mammals during construction

Precautionary measures would be adopted during construction for mammal species, including hedgehogs and badgers. These would be incorporated into the CEMP. For badgers, there is a small

risk that new setts could be established so a pre-works badger survey of the development parcel concerned would be undertaken by a qualified ecologist, to check for any new setts and update current findings. If a sett was located then the likely effects on it would need to be reviewed and consideration given to licensing requirements.

For all mammal species, measures to maintain safe dispersal routes across site during construction would be taken. These would include covering any excavation holes at the end of each working day, or providing safe escape ramps, and control of hazardous materials. By adopting these precautionary measures, it is assessed that any adverse effects on individual badgers and other mammals could be avoided, and there would be no risk of statutory infringement. The overall level of significance would therefore be reduced to **Neutral**.

#### 9.5.4 Advance ecological mitigation works

The seasonal constraints around some of the ecological mitigation measures will require a programme of advance ecological site clearance works. This will ensure sensitive ecological receptors (habitats or species) are suitably protected or removed safely to an undisturbed area of the site prior to the main works beginning. This will include:

- Protection of all trees to be retained on site using standard tree protection measures;
- Protection of any retained habitats on site using suitable fencing; and
- Delineation and protection of suitable retained habitats to receive any animals cleared from site during advance ecological site clearance works – especially reptiles. Areas receiving translocated animals will be secured with suitable temporary fencing to prevent re-colonisation of the construction site. As explained below, it is proposed to translocate reptile populations to the existing reptile receptor site that has been previously established at Hafan y Môr.

#### 9.5.5 Habitat creation and enhancement measures to offset impacts

Where habitat losses cannot be adequately avoided or reduced, off-site habitat creation and enhancement measures are proposed to further mitigate impacts. Habitat creation, including new landscape plantings, should, wherever possible, consist of appropriate native species, ideally of local provenance. Also, green corridors and 'stepping stones' should be considered to facilitate species' movement through the site and to maintain ecological links with the wider landscape.

Four off-site habitat creation and enhancement measures are proposed (see Figure 2 in Appendix G and Figure 13):

- 1) Habitat creation within a former car park at Hafan y Môr, to the north of the A497 - to help offset impacts on semi-grassland grassland (Impact Pathway 12) and soft cliff habitats (Impact Pathway 14);
- 2) Grassland diversification in Afon Wen fields, to the north-east of Parcel G, - to help offset impacts on semi-grassland grassland (Impact Pathway 12), and coastal ecological corridor (Impact Pathway 13);
- 3) Management plan for the South lake neutral grassland - to help offset impacts on semi-grassland grassland (Impact Pathway 12); and
- 4) Management plan for retained soft maritime cliffs, to mitigate loss of cliff habitats (Impact Pathway 14), and impacts on aculeate Hymenoptera (Impact Pathway 21) and black oil beetle (Impact Pathway 22).

Further details are given below and under the relevant impact pathways.

### Habitat creation proposals in Former Car Park

A former car park site, to the north of the A497 (see Figure 2 in Appendix G and Figure 13) is proposed as an off-site habitat creation area. This area extends for about 0.75 ha and it will be used to help offset effects caused by the loss of soft maritime cliff and semi-improved grassland habitats, and those on aculeate Hymenoptera (bees and wasps), caused by development in Parcels G and J (Impact pathways 12, 14 and 21).

The main habitats on the car park (see Figure 3i in Appendix G) site comprise:

- Bare ground, composed mainly of crushed slate and granite, and,
- Open mosaic habitats on previously developed land (OMHPDL), including mixtures of semi-vegetated bare ground, grassland and scrub communities

Habitat creation and management measures on this site would need to be confirmed and agreed via planning condition and a detailed Ecological Management and Enhancement Plan (EMEP). However, it is proposed that new habitats would include wildflower grassland and specific bee habitats including 'bee banks'. It is envisaged that about 100 m of bee bank could be constructed. Subject to further detailed consideration other habitats may also be appropriate, such as dwarf shrub heath and possibly wetlands (e.g. marsh/pond).

OMHPDL holds existing biodiversity value and this area is potentially Section 7 priority habitat. Therefore, any habitat creation measures on this site would need to avoid damage existing OMHPDL by restricting it to the central areas of bare ground where there is little biodiversity value. A management plan would also be produced to maintain the existing and new habitats.

### Afon Wen fields - grassland diversification proposals

The Afon Wen fields (Figure 13) lie to the north east of Parcel G and contain semi-improved grassland; they are identified as fields G8-G10 on Figure 3j in Appendix G. A management plan to maintain their biodiversity interest is currently being prepared, as required under planning condition 6 for the new sewage treatment plant (C17/0739/40/LL).

The current mitigation proposals, for this New Masterplan scheme, would extend the conservation value of these fields by including species diversification measures. Details would need to be confirmed via planning condition and an EMEP, but briefly they would comprise the introduction of additional species by spreading seed-bearing 'green' hay or other arisings taken from species-rich grasslands elsewhere in North Wales. This method is currently being used to create new wildflower grasslands on the golf course at Hafan y Môr.

### South lake neutral grassland

These grasslands (see Figure 3a in Appendix G and Figure 13) are currently unmanaged and, as a result, may be declining in diversity and biodiversity value. It is proposed to implement a management plan for these grasslands, which is likely to comprise annual mowing (with arisings removed). It is proposed that this management plan would be detailed and delivered via a planning condition, presumably via an EMEP. This area was previously identified as a grassland mitigation area under the 2011 planning consent (C10D/0141/40/LL), although it has not been required yet because the development that would have triggered its use has not commenced.

### Management plan for retained soft maritime cliffs

Approximately 650 m of retained soft maritime cliff (Figure 13), to the north-east and south of the proposed coastal works in Parcel J will be managed to enhance and maintain their biodiversity value, including aculeate Hymenoptera.

Further details are provided in Section 9.5.8. It is proposed that this management plan would be detailed and delivered via a planning condition, presumably via an EMEP.

### 9.5.6 Impact Pathway 12: Damage or disturbance to landside habitats adjacent to development parcels during construction work

These impacts would be controlled via the adoption of the CEMP (Section 9.5.1) and other generic mitigation measures as outlined in Section 9.5.2. If satisfactorily implemented, these measures should eliminate or greatly reduce the risk of most accidental damage and disturbance effects during construction. The assessed residual impact and level of significance is therefore reduced to **Neutral**.

### 9.5.7 Impact Pathway 13: Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works

A grassland mitigation plan has been developed to reduce and offset the effects caused by the loss of this Lowland Meadow priority habitat (see Section 9.5.4 and Figure 13).



Figure 13. Mitigation proposals for loss of semi-improved grassland (Lowland Meadow) and soft maritime cliff habitats (measurements are approximate)

In summary they comprise:

- Management and enhancement plan for grasslands G8-10;
- Management plan for South Lake grasslands, which are unimproved grassland G1A and G1B (approximately 1.36 ha);
- Grassland creation within the former car park site; and
- Grassland creation within development parcels (details for Parcels G and H are shown on ADP drawings W2345 SK05A and W2240 SK06 in Appendix H).

Although these measures would reduce the overall impact on Lowland Meadow habitat, there would still be a net loss of at least 2.75 ha<sup>47</sup> of this Section 7 habitat type. This is assessed to represent an Intermediate Negative impact of **Moderate Adverse** significance.

### 9.5.8 Impact Pathway 14: Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations

Mitigation proposed includes incorporating a belt of wildflower grassland along the realigned coastal frontage across the new coastal boundaries of Parcels G and H. The grassland would be situated in a coastal buffer zone of minimum width 10 m. These measures would create an ecological corridor across Parcel H, where there is currently only a very weak belt of vegetation. It would also partially reinstate the wildlife corridor function across the realigned coast in Parcel G. Details are shown on landscape drawings W2345 SK05A and W2240 SK06 in Appendix H.

In Parcel G, the new corridor would be narrower than the existing one, and it would not contain the soft maritime cliff habitat. The impact in this area is assessed to be reduced to Minor Negative, with **Slight Adverse** significance.

Parcel H does not currently contain a viable corridor, so these measures would strengthen the ecological link across this area. The magnitude of the impact would therefore be Positive, and its significance can be regarded as **Moderate Beneficial**.

### 9.5.9 Impact pathway 15: Loss of soft maritime cliff (Section 7 priority habitat) as a result of coastline defence/realignment works

The impact of the loss of this habitat would be mitigated by implementing a management plan for about 650 linear metres of existing soft maritime cliff (Figure 13), plus the creation of 'bee banks' within the former car park ecological mitigation area and the inclusion of 'bee hotels' in other development parcels where possible.

It is envisaged that the cliff enhancement plan would be agreed via a planning condition and that it would enhance the cliffs for aculeate Hymenoptera (bees and wasps), sand martins and other cliff dependent wildlife. Two sections of cliff are proposed to be enhanced (Figure 13):

1. About 200 m of cliff to the north east of the proposed coastal defence works (Parcel J), where significant enhancement could be achieved by re-profiling the cliffs to create a more vertical angle and taller face, and clearing slumped material from their bases. This section of cliff is currently partially vegetated (Appendix F) and has significant accumulations of vegetated

<sup>47</sup> 2.75 ha assumes that all 0.75 ha of the former car park would be converted to meadow grassland. This is not likely because of constraints, and also because other habitats are required. The net loss of Section 7 grassland is therefore likely to be higher and probably closer to the total loss of 3.5 ha.

material at its base. Measures to compensate for the loss of intertidal habitats caused by the coastal works would involve clearing accumulated artificial debris from the shingle habitat at the top of the shore (see the HRA in Appendix K) as well as the relocation within the intertidal of marine origin sediment excavated for the coastal defence works (see Section 2.7). This beach lowering would also increase the cliff's exposure to the natural erosive processes of the sea, thus clearing slumped material from its base and helping to maintain a more vertical, taller and un-vegetated profile. These changes would therefore further enhance the cliff's value to aculeates and other cliff dependent species; and

2. The other section to be enhanced is about 390 m, to the east of the South/fishing lake. This section of coast currently contains largely vegetated soft cliff faces (Appendix F). It would be enhanced by selective clearance of vegetation and localised small scale works to expose clean cliff faces. Works in this section would be necessarily small scale because it is a sensitive area (the Wales Coast Path runs close to the cliff edge) and it is already subject to retreat. The appropriate measures would be specified via a planning condition and set out in an Ecological Management and Enhancement Plan (EMEP) and Ecological and Landscape Management Plan (ELMP) documents.

These mitigation proposals would provide new habitats for aculeate Hymenoptera, and significantly increase the biodiversity value of the enhanced/managed cliffs for these insects and other cliff-dwelling animals. Overall, these measures would reduce the assessed overall impact and significance of the loss of cliff to **Neutral**.

#### 9.5.10 Impact Pathway 16: Habitat loss and disturbance of otters (qualifying feature of SAC and European Protected Species), during construction work (including potential for sediment run-off and contamination of watercourses used by this species)

Pollution prevention control guidelines outlined within a CEMP should ensure that pollution of aquatic habitats does not occur during construction and that disturbance of habitats used by otters is also minimal e.g. through the employment of sensitive working measures and implementing no works buffer zones. Lying-up sites H3 and H4 will need to be removed under licence from NRW. As these lying-up sites are relatively superficial features (i.e. shallow undercut banks with no tunnel and chamber systems) they can be inspected using torches and endoscopes prior to removal and there is unlikely to be a requirement to exclude otters beforehand through the use of one way gates and fencing. The loss of these features should be compensated for through the provision of two artificial pipe and chamber holts at a suitable location within the bank of WC1 watercourse. Adopting these measures would result in a **Neutral** impact and significance.

#### 9.5.11 Impact Pathway 17: Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes

The two new road crossings and the pedestrian links over WC1 will be designed to allow safe passage for otters underneath. It is proposed to adopt bridge designs for these crossings, and this will allow otters to remain in the watercourse during high flows. An alternative design, that could also be used for the pedestrian links, would consist of box culverts with integral mammal ledges to allow otters to remain in the watercourse during high flows. A new fence along the bank top of WC1 will help ensure that the stream corridor is protected from direct human disturbance. Assuming the above measures are implemented the overall significance of this impact can be reduced to **Slight Adverse**.

### 9.5.12 Impact Pathway 18: Loss of bat roosts and potential for harm to bats (European Protected Species) caused by demolition of chalet blocks

Buildings B1 and B2 within Parcel F will need to be removed under an NRW mitigation licence. This will principally involve the careful removal of timber panelling under the supervision of a licensed ecologist. In the event of bats being encountered during the supervised works, the licensed ecologist will capture the bat(s) and place them in a pre-installed bat box. If a bat is discovered at other, unsupervised times, work will cease immediately and the licensed ecologist will be called for advice. This advice will include leaving the bat to disperse of its own accord, or waiting for the licensed ecologist to arrive and move the bat. Builders and contractors are prohibited from handling bats. It is proposed that eight woodcrete bat boxes are installed on nearby trees to compensate for the loss of roosting habitat.

Implementation of the above measures will ensure that impacts are reduced to **Neutral** significance.

### 9.5.13 Impact Pathway 19: Loss of and/or disturbance to bat dispersal routes and/or foraging areas

Key bat foraging areas such as aquatic habitats adjacent to Parcel B and the plantation woodlands along the north east and south west edges of Parcel G (see T6A on Figure 3g in Appendix G) will be retained as part of the Proposed Development. New woodland planting is also proposed along the northern edge of Parcel G (parallel with the railway line), and across the parcel, and this will provide better connectivity between these two belts of plantation in the process. Detailed landscape proposals are shown on ADP drawing W2345 SK05 A in Appendix H.

New lighting should be kept to an absolute minimum with the aim of achieving no more than 3 lux light spill in key foraging areas. This will be achieved through the use of low level LED bollard lighting with motion sensors.

Implementation of the above measures will ensure that impacts are reduced to **Neutral** significance.

### 9.5.14 Impact Pathway 20: Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J)

Reptile mitigation schemes would be undertaken prior to site clearance to avoid direct harm. Such mitigation schemes have been used successfully on several previous occasions at Hafan y Môr (e.g. Parcel D3 associated with the 2011 planning permission).

Where populations are small (as in Parcel E), this would be achieved by using habitat management techniques to displace resident populations. For the larger and more important populations on Parcels J and G, reptiles would be trapped and translocated to a prepared receptor site. It is proposed to use the existing reptile receptor site at Hafan y Môr, although it would be further enhanced by constructing additional reptile habitats.

The habitats in Parcels J and G are in a dynamic state and as a result the status and distribution of reptile populations is likely to change and probably expand in the future. Unless translocation works were undertaken in Spring 2020, the precise details of the mitigation scheme would need to be confirmed following update reptile surveys.

If designed and implemented satisfactorily, these reptile mitigation schemes should avoid possible infringement of the law, and also maintain local reptile populations. However, the Proposed Development would inevitably result in the loss of a small area of reptile habitat so there would be a Minor negative impact, with **Slight Adverse** significance.

#### 9.5.15 Impact Pathway 21: Direct impacts on nesting birds (all species protected from harm while nesting) during construction (e.g. site clearance)

All wild birds, their nests and eggs are protected under the Wildlife and Countryside Act 1981, with additional protection from disturbance for Schedule 1 species. It is therefore important that potential breeding bird habitats within the Proposed Development, including trees, scrub and dense vegetation (e.g. bramble, ruderal tall herb stands), are removed outside the main breeding season which is generally considered to run from March to August inclusive.

If this is not possible then a suitably experienced ecologist should check the vegetation no more than 48 hours prior to site clearance, to ensure no active nests are present. If nesting birds are confirmed to be present then works would be postponed until young have fledged and/or nesting has been completed. It may be necessary to cordon off the nest and monitor it until it is completed.

This approach should be included in any CEMP and will avoid the risk of destroying active nests and infringing wildlife legislation. Adopting this approach should satisfactorily avoid these potential impacts, which are therefore assessed to be **Neutral** magnitude and significance.

#### 9.5.16 Impact Pathway 22: Potential for increase in abundance or/and distribution of invasive non-native plant species

Mitigation measures would adopt best practice advice and would be incorporated into the CEMP. These would essentially form a biosecurity risk assessment and method statement. They would include, for example, the prior eradication of problem species, and/or specific control measures for the transport and stockpiling of soils during clearance/stripping works. If implemented satisfactorily these measures should avoid greatly reduce risks associated with the spread of invasive species and reduce the overall impact and significance to **Neutral**.

#### 9.5.17 Impact Pathway 23: Potential effects on bee and wasp fauna associated with the removal of soft maritime cliff and grassland habitats

Mitigation proposals for the loss of soft cliff habitats and for impacts on the bee/wasp populations are essentially the same, and they have been presented in detail under impact pathway 14. However, in summary, they comprise:

- Enhancement and management plan for about 650 m of retained cliff, to the north east and south of the coastal works;
- Construction of about 100 m of new 'bee bank' habitat in the former car park mitigation area; and
- Installation of 'bee hotels' within new development.

The proposed wildflower grassland creation, enhancement and management measures (impact pathway 12) will also benefit the bee and other pollinator fauna. Overall, these measures are assessed to reduce the magnitude and significance of effects on the aculeate fauna to **Neutral**.

### 9.5.18 Impact Pathway 24: Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats

This beetle's requirements are strongly linked to the presence of strong solitary bee colonies, so the mitigation measures proposed under impact pathway 23 will also assist in reducing impacts on this Section 7 species.

The main mitigation proposals for the black oil beetle would be concentrated along the retained cliff section to the north east of the coastal works (see also mitigation for impact pathway 13), and by creating flower-rich habitat as forage for solitary bees, and bare ground habitat (such as bee banks) for nesting. The management plan proposed for the Afon Wen fields would encourage a more diverse and flower-rich sward that would prove beneficial, as would the proposed habitat creation measures (i.e. bee banks, flower rich grassland, bare ground) in the ecological mitigation area on the former car park.

Is likely that the proposals for the retained cliffs and adjacent Afon Wen fields will bolster existing populations of the beetle. However, success of the habitat creation measures in the former car park are less certain because the specific requirements and autecology of the oil beetle species are not fully known.

Overall this mitigation scheme is assessed to reduce the overall negative effects on this species to Minor negative, and its significance as **Slight Adverse**.

### 9.5.19 Impact Pathway 25: Other disturbance effects caused by operation of the developments, on species and habitats

Potential impacts on retained semi-improved grasslands and reptile populations, caused by changes in the level and patterns of recreational use, would be mitigated via a management plan. The plan would seek to steer recreational use away from particularly sensitive features, and also include environmental information measures informing users about their importance and sensitivity. This approach is considered likely to largely remove such effects, and reduce their significance to **Neutral**.

### 9.5.20 Biodiversity enhancement opportunities

Biodiversity enhancement options have also been considered which, while not strictly required to mitigate or compensate for predicted losses, would nevertheless provide valuable additional benefits for biodiversity.

Enhancement opportunities could include:

- Installation of bat and bird boxes on trees, buildings and/or structures to provide additional habitat (over and above the measures required to mitigate for the loss of the small bat roosts in Parcel F);
- Inclusion of integrated artificial invertebrate habitat features into the developments and areas of open space at Hafan y Môr;
- Use of successional planting within the landscape design to provide nectar-rich flowers over as much of the year as possible, thereby supporting local populations of butterflies, moths, bees and other insects;
- Management of existing and retained plantation woodlands on the site (i.e. both within and outside development parcels) to improve structure and increase diversity. For example, some plantations would benefit from selective coppicing or thinning, and some have large quantities of ash that could be replaced with alternative species - the ash is likely to succumb to ash

dieback disease (*Hymenoscyphus fraxineus*) in the future so its replacement would improve the resilience of these locally important plantations;

- Inclusion of native wildflowers within new landscape woodland planting, and/or introduction into existing retained plantations. Such measures require careful planning because appropriate woodland herbs require very specific conditions to establish, including a well-established canopy; and
- Biodiversity benefits, especially for pollinators, can also be provided by careful design of any formal landscape planting within developments. This would include the use of native and 'pollinator friendly' plants wherever possible. For tree planting or hedgerow creation, spring blossoming scrubs such as willows, blackthorn and hawthorn are beneficial as these are particularly important for emerging bumblebee queens and a variety of spring-flying solitary bees.

## 9.6 Summary and Conclusions

This section reports the assessment of potential impacts on terrestrial ecology receptors as a result of the Proposed Development. With the adoption of appropriate mitigation, it is considered that significant impacts can be avoided and/or minimised. A summary of the impact pathways that have been assessed and the identified residual impacts following the application of mitigation measures is presented in Table 25.

It is also recognised that the Proposed Development also has the potential to generate beneficial biodiversity effects. For instance, the creation of a belt of wildflower grassland across the coastal frontage of Parcel H would strengthen the currently weak coastal habitat corridor. And the incorporation of the biodiversity enhancement measures cited in Section 9.5.20 would also add biodiversity benefits.

**Table 25. Summary of potential impact, mitigation measures and residual impacts for terrestrial ecology**

| Receptor | Impact Pathway                                                                                                                                                                                                                | Impact Significance        | Mitigation Measures/Monitoring                                                                                                                                                                                                                                                                 | Residual Impact                       | Confidence |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------|------------|
| Habitats | Damage or disturbance to landside habitats adjacent to development parcels during construction work                                                                                                                           | Slight Adverse             | CEMP                                                                                                                                                                                                                                                                                           | Neutral                               | Medium     |
|          | Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works                                                                              | Moderate Adverse           | <ul style="list-style-type: none"> <li>• Management and enhancement plan for grasslands G8-10;</li> <li>• Management plan for South Lake grasslands, which are unimproved grassland G1A and G1B (about 1.36 ha); and</li> <li>• Grassland creation within the former car park site.</li> </ul> | Moderate                              | Medium     |
|          | Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations                                      | Slight to Moderate Adverse | Includes incorporating a belt of wildflower grassland along the realigned coastal frontage across the new coastal boundaries of Parcels G and H.                                                                                                                                               | Slight Adverse to Moderate Beneficial | Low        |
|          | Loss of soft maritime cliff (Section 7 priority habitat) as a result of coastline defence/realignment works                                                                                                                   | Moderate Adverse           | Cliff enhancement plan.                                                                                                                                                                                                                                                                        | Neutral                               | Medium     |
| Otter    | Habitat loss and disturbance of otters (qualifying feature of SAC and European Protected Species), during construction work (including potential for sediment run-off and contamination of watercourses used by this species) | Slight Adverse             | NRW mitigation licence, CEMP, artificial holt provision.                                                                                                                                                                                                                                       | Neutral                               | High       |
|          | Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes                                                     | Moderate Adverse           | Design amendments - road crossings designed to permit safe otter passage along watercourse; fencing to restrict human access to watercourse corridor.                                                                                                                                          | Slight Adverse                        | Medium     |
| Bats     | Loss of bat roosts and potential for harm to bats (European Protected Species) caused by demolition of chalet blocks                                                                                                          | Slight Adverse             | NRW mitigation licence                                                                                                                                                                                                                                                                         | Neutral                               | High       |
|          | Loss and/or disturbance of bat dispersal routes and/or foraging areas                                                                                                                                                         | Slight Adverse             | Retaining key bat foraging areas, planting new woodland and keeping new lighting to a minimum.                                                                                                                                                                                                 | Neutral                               | Medium     |

| Receptor                              | Impact Pathway                                                                                                                                                                                                              | Impact Significance        | Mitigation Measures/Monitoring                                                                                                                                                                                                                                                    | Residual Impact | Confidence |
|---------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|------------|
| Reptiles                              | Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J) | Slight to Moderate Adverse | Reptile mitigation scheme                                                                                                                                                                                                                                                         | Slight Adverse  | Medium     |
| Birds                                 | Direct impacts on nesting birds (all species protected from harm while nesting) during construction (e.g. site clearance)                                                                                                   | Slight Adverse             | Measures to be incorporated within a CEMP such as Bird habitats removed outside main breeding season (March to August inclusive) where possible                                                                                                                                   | Neutral         | High       |
| Non- native species                   | Potential for increase in abundance or/and distribution of invasive non-native plant species                                                                                                                                | Moderate Adverse           | Measures within a CEMP/ biodiversity risk assessment                                                                                                                                                                                                                              | Neutral         | High       |
| Aculeate Hymenoptera (bees and wasps) | Potential effects on bee and wasp fauna associated with the removal of soft maritime cliff and grassland habitats                                                                                                           | Moderate Adverse           | Enhancement and management plan for about 650 m of retained cliff, to the north east and south of the coastal works;<br>Construction of about 100 m of new 'bee bank' habitat in the former car park mitigation area; and<br>Installation of 'bee hotels' within new development. | Neutral         | Medium     |
| Black oil beetle                      | Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats                                                                                                             | Moderate Adverse           | Habitat creation measures                                                                                                                                                                                                                                                         | Slight Adverse  | Low-Medium |
| General                               | Other disturbance effects caused by operation of the developments, on species and habitats                                                                                                                                  | Slight Adverse             | Habitat creation measures                                                                                                                                                                                                                                                         | Neutral         | Medium     |
| Lower value habitat features          | Impact on lower value features                                                                                                                                                                                              | Neutral                    | N/A                                                                                                                                                                                                                                                                               | Neutral         | High       |

## 9.7 References

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## 10 Coast Protection and Flood Defence

This section of the ES considers how the Proposed Development will affect coastal protection and flood defence. The first two sub-sections (Sections 10.1 and 10.2) cover the data sources and consultation which has taken place with regard to this topic, as well as the baseline information. The impact assessment relating to coast protection and flood defence is presented in Section 10.3, mitigation measures and residual effects in Section 10.4, and Section 10.5 provides a summary and conclusions.

NRW has advised that the excavation/lowering of the land (in the coastal defence area) as a result of the Proposed Development is likely to change the designation of that area from a Zone A (little or no risk of fluvial/tidal flooding) to C2 (a floodplain without significant flood defence infrastructure) as per the Development Advice Maps accompanying TAN15: Development and Flood Risk (NRW, 2019). The element of the Proposed Development that involves some lowering of the land are the proposed coastal defences in Parcel J (see Figure 2 and Section 2.6). The proposed coastal defences will result in a landward realignment of the MHWS tidal line in the section of the coastline with an existing linear rock revetment. This lowered area of land is considered likely to require a change in designation from Zone A to C2.

It is understood that any works requiring planning permission in Zone C should be supported by a Flood Consequence Assessment (FCA) which is proportionate to the size and scale of the development and the flood risks. Given the small scale and nature of the proposed coastal defences, this section of the ES assesses the potential changes to coastal protection as a result of this element of the Proposed Development and provides information in support of an FCA. The details of the flood risk are also set out in the separate FCA report (Weetwood, 2019) and a wave overtopping assessment is also included at the end of Appendix D.

### 10.1 Data sources and consultation

#### 10.1.1 Data sources

The principal data sources that have informed this assessment are as follows:

- Scheme design information (DTM) provided by the client;
- Hydrodynamic and sediment modelling (Appendix C);
- Coastal processes review (Appendix D);
- Shoreline Management Plan 2 (Royal Haskoning, 2011);
- Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management (2011);
- Long Term Flood Risk Maps (c); and
- UK Climate Projections 2018 (UKCP18).

#### 10.1.2 Consultation and scope

Based on the Scoping Report (ABPmer, 2018), and the subsequent advice provided by NRW, Gwynedd Council, and statutory consultees (see Section 5.1), Table 26 presents the coastal protection and flood defence impact pathways and further assessment work that has been carried out to inform the marine licence application.

**Table 26. Impact pathways and summary of further work for coast protection and flood defence**

| Receptor         | Impact Pathway                | Requires Further Assessment?     | Justification                                                                                                                                                                                                                                                                                                                                                                          | Summary of Further Work                                                                                                                                                                                                                                                                                                                                                                                                                  |
|------------------|-------------------------------|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Coast protection | Changes to coastal protection | Yes ( <b>Impact Pathway 26</b> ) | The Proposed Development is designed to offer long-term coastal protection to the hinterland where the defences are proposed. Any changes to the hydrodynamic regime and sediment transport pathways as a result of the proposed coastal defences could result in changes in coastal erosion along adjacent undefended areas of the shoreline with implications to coastal protection. | An assessment of the effects of the Proposed Development on coastal protection both in the areas where defences are proposed and also in adjacent coastal areas has been undertaken in the context of the SMP for this coastal cell. Following advice from NRW, the potential impacts of any changes in coastal protection to third party owners (e.g. private landowners, Network Rail) have been considered as part of the assessment. |
| Flood regime     | Changes to flood regime       | Yes ( <b>Impact Pathway 27</b> ) | The coastal defences element of the Proposed Development have the potential to change the existing tidal flood regime through changes in waves and tidal water levels. The Proposed Development also has the potential to change the surface water flood risk at Hafan y Môr Holiday Park depending on the drainage system that is installed to support the new development parcels.   | An assessment of the effects of the Proposed Development on tidal and surface water flood regime has been undertaken.                                                                                                                                                                                                                                                                                                                    |

## 10.2 Review of baseline understanding

### 10.2.1 Policy context

The Welsh Government's National Strategy for Flood and Coastal Erosion Risk Management (2011) sets the following four overarching objectives for the management of flood and coastal erosion risk in Wales:

- Reduce the consequences for individuals, communities, businesses and the environment from flooding and coastal erosion;
- Raise awareness of and engaging people in the response to flood and coastal erosion risk;
- Provide an effective and sustained response to flood and coastal erosion events; and
- Prioritise investment in the most at-risk communities.

The new Draft National Strategy for Flood and Coastal Erosion Risk Management in Wales (2019) sets two new additional objectives on:

- Improving our understanding of risk: emphasising the importance of accurate information to help decision-making and inform the public. This highlights the importance of research, monitoring and investigations, modelling and mapping, and sharing this information effectively so that others can also make informed decisions; and
- Preventing exposure to risk: recognising the importance of using flood data and aligning with planning policy to inform better development and infrastructure decisions, not locating people into high risk areas and avoiding the build-up of future problems which will require difficult and expensive solutions to resolve.

Technical Advice Note 15: Development and Flood Risk (TAN15) (Welsh Government, 2004) provides guidance which supplements the policy set out in Planning Policy Wales (Welsh Government, 2018) in relation to development and flooding. A precautionary framework is set out which advises caution in respect of new development in areas at high risk of flooding. This is used as a guide for planning decisions. The overall aim of the precautionary framework is to direct new development away from those areas that have a high risk of flooding; and development will only be justified in these areas if it meets the criteria and tests specified in this guidance.

The operation of the precautionary framework is governed by Development Advice Maps (DAMs) made up of three zones (Table 27) which are used to trigger the appropriate planning test and definitions of vulnerable developments. The DAMs are based on the best available information considered adequate to determine when flood risk needs to be taken into consideration with future development.

**Table 27. Flood Zone designations, their associated flood risk definition and use**

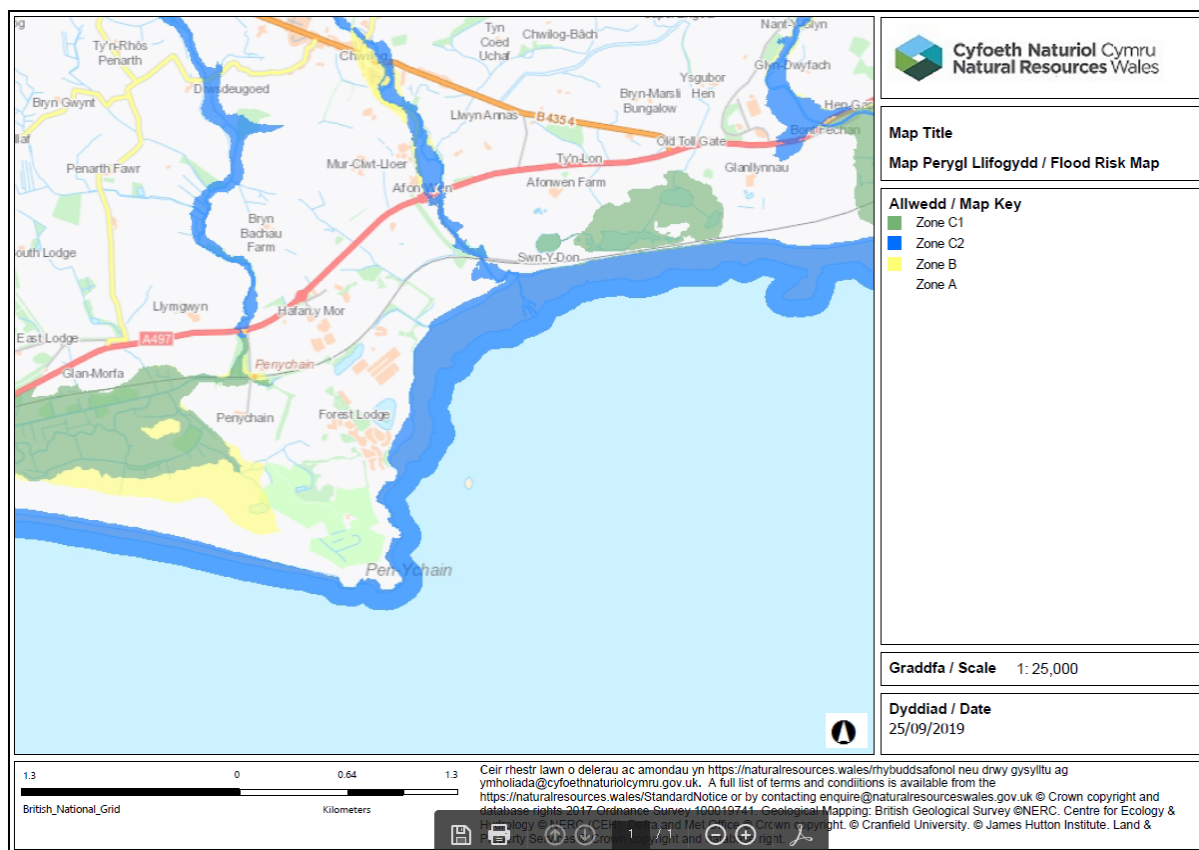
| Flood Zone | Definition                                                                   | Use Within the Precautionary Framework                                                                                                                                                                                                           |
|------------|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| A          | Little or no risk of fluvial/ tidal flooding                                 | Justification test is not applied and do not need to consider further                                                                                                                                                                            |
| B          | Areas known to have flooded historically evidenced by sedimentary deposits   | Used as part of the precautionary approach to indicate where site levels should be checked against the extreme (0.1 % annual probability) flood. No need to consider flood risks further if site levels are greater than the extreme flood level |
| C          | Based on Environment Agency extreme flood outline (0.1 % annual probability) | Indicates that flooding issues should be considered as an integral part of the decision making by the application of the justification test, including FCA                                                                                       |

| Flood Zone | Definition                                                                                             | Use Within the Precautionary Framework                                                                                                                                                                                                                |
|------------|--------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| C1         | Areas of Zone C which are developed and served by significant infrastructure, including flood defences | Indicates that development can take place subject to the application of the justification test, including acceptability of consequences                                                                                                               |
| C2         | Areas of Zone C without significant flood defence infrastructure                                       | Indicates that only 'less vulnerable' development should be considered, subject to the application of the justification test, including acceptability of consequences. Emergency services and highly vulnerable development should not be considered. |

Source: TAN15

DAMs enable planning authorities to take a strategic approach to flood risk and consider the catchment as a whole by providing a preliminary representation of flood risks, which inform decisions on the location of new development and the requirements necessary to support any applications which may be proposed.

The coastal defence element of the Proposed Development overlaps with Zone C2 (Figure 14).



Source: NRW, 2019

**Figure 14. NRW Development Advice Map**

As discussed above, the landward realignment of the MHSW tidal line in the section of existing linear rock revetment, will also result in an area of lowered area of land that is likely to require a change in designation from Zones A to C2.

In Zone C, there are a number of tests that need to be applied for certain types of development.

Due to the nature of the Proposed Development, it is essential that the proposed coastal defence structures are built within Zone C2. The Proposed Development is therefore considered to fall under the 'other' category which comprises uses that should be considered to be exceptions to the general rule, because they are required in fluvial, tidal or coastal locations by virtue of their nature (see Section 1.5 of TAN15). In accordance with TAN15, these developments are not be subject to the first part of the justification test but are subject to the acceptability of consequences part of the test (part iv) which states:

- iv. *"The potential consequences of a flooding event for the particular type of development have been considered, and in terms of the criteria contained in Sections 5 and 7 and Appendix 1 (of TAN15) found to be acceptable".*

The aims and objectives of the Proposed Development include providing long-term site-security and helping to maintain the coastal path in the context of coastal erosion and sea level rise, as well enhancing the amenity value of the park by providing better and safer shoreline access (Section 2.4). A further benefit of this enhancement of the Hafan y Môr Holiday Park, is that it will reinforce the park's contribution to the local economy by supporting the tourism sector and jobs (Section 3.1.1). PPW acknowledges that tourism is vital to economic prosperity and job creation in many parts of Wales. The Proposed Development directly accords with PPW and LDP strategic policy PS14 which sets out Gwynedd Council's commitment to support the development of a year-round local tourism industry by managing and enhancing the provision of high quality accommodation, including existing static caravan sites.

It has been agreed with Gwynedd Council and the chair of the coastal group, that the Proposed Development is keeping with the SMP policy of 'no active intervention'<sup>48</sup> (NAI) over the next 100 years for the section of beach fronting the Hafan y Môr Holiday Park (Section 4.10). This is because the NAI policy does not preclude the maintenance of existing private defences along the site frontage subject to the usual consents being obtained. In this case, such intervention is required to secure the long-term future for the Hafan y Môr Holiday Park, as well as achieve the benefits for site amenity and access safety.

In line with part iv of the justification test (see above), for the Proposed Development to be accepted an assessment must be carried out that covers the consequences of flooding on the development, the consequences of the development on flood risk elsewhere, and appropriate mitigation measures that can be incorporated into the design. Due to the nature of the proposed development that overlaps with Zone C2 (i.e. the coastal defences), it is essential that these are built within zone C2 and it is possible for the development to flood without causing any harm. The consequences of the Proposed Development on coastal erosion and flood risk elsewhere have been considered in Section 10.3.

### 10.2.2 Coastal erosion

The coastline along the south Llyn Peninsular and at Hafan y Môr is slowly eroding due to the nature of the cliffs. St Tudwal's head and subsequent hard rock headlands at Pen-y-chain and Criccieth provide some shelter against the dominant wave direction from the southwest. Along this coastline the undefended areas have a tendency to roll back at around 0.3 m per year in many areas (Royal Haskoning, 2011).

The Shoreline Management Plan (SMP2) management policy for the beach fronting Hafan y Môr is 'no active intervention' (NAI) and therefore the responsibility falls to the private land owner to defend their

<sup>48</sup> The SMP policy for the coastline to the east of the Afon Wen to the Afon Dwyfor is 'hold the existing defence line' (Environment Agency, 2018) for protection of the railway line becoming Managed Realignment at 50 years

property from coastal erosion at their own expense<sup>49</sup>. In this context, the SMP notes that the existing Haven Leisure Ltd. defences will protect the main park frontage '*possibly through to the end of epoch 2*' (which is 20 to 50 years after the SMP) and that failure of these would result in erosion and losses of holiday park areas over epoch 3 (which is 50 to 100 years after the SMP).

### 10.2.3 Flooding

TAN15 requires the consideration of all potential flood sources that could be affected by a scheme. The Proposed Development has the potential to affect or be affected by river, tidal and/or surface water sources of flooding. Other sources will remain unaffected, namely rainfall on the ground surface (overland flow), rising groundwater, surcharged sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

Approximately 300 m to the east of the Proposed Development, the Afon Wen flows in to Cardigan Bay and marks the eastern boundary of the land owned by Haven Leisure Ltd. The river is classified as a main river and falls under the jurisdiction of NRW/Welsh Ministers (NRW, 2019). The long-term flood risk map for this area (NRW, 2019) indicates there is a high risk of flooding from the rivers and/or the sea to land surrounding the Afon Wen channel. This is illustrated in Figure 15 and shows the extent of the following fluvial and tidal flood risk zones:

- Flood Zone 3: NRW's best estimate of the areas of land with a 100 to 1 (or greater) chance of flooding each year from rivers or with a 200 to 1 chance (of greater) of flooding each year from the sea.
- Flood Zone 2: NRW's best estimate of the areas of land between Zone 3 and the extent of the flood from rivers or the sea with a 1000 to 1 chance of flooding in any year.



Figure 15. Flood Zones 2 and 3 covering intertidal area and mouth of the Afon Wen (accessed September 2019)<sup>50</sup>

<sup>49</sup> See also The Anglesey and Gwynedd Joint Local Development Plan (JLDP) (31 July, 2017) <http://www.anglesey.gov.uk/Journals/I/g/e/8-Joint-LDP---Appendices.pdf> <sup>50</sup> <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en> (accessed September 2019).

<sup>50</sup> <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en> (accessed September 2019).

These flood risk zones are largely confined to the flood plain at the river mouth, which is around 150 m to the east of the Proposed Development. The coastal defences associated with the Proposed Development are located within the flood zone 3 (Figure 15).

The existing Hafan y Môr Holiday Park and the landward area comprising the Proposed Development lie outside a flood risk zone. According to the SMP (Royal Haskoning, 2011) the park *"would only be at risk of flooding under extreme conditions under a 2 m sea level rise scenario"*.

Further baseline information on the principal contributing factors to tidal flood risk (i.e. tidal water levels and waves) is presented in the physical and coastal processes chapter (Section 6.2). The effects of climate change and sea level rise based on the latest UKCP18 projections are discussed in Section 10.2.4.

Overland flow from surface water flooding results from the accumulation of rainfall that does not infiltrate into the ground or flow into drainage systems. Such runoff flows across the ground surface and ponds in low lying areas. This is exacerbated by impermeable surfaces, low permeability geology or drainage systems with inadequate capacity. The existing infrastructure at Hafan y Môr Holiday Park provides a separate drainage system that discharges surface water to adjacent water courses and to the sea.

The NRW Risk of Flooding from Surface Water mapping indicates that there is no current risk of flooding from surface water at the location of the proposed coastal defences and the majority of the Hafan y Môr Holiday Park. There are some low to medium risk areas associated with the central drainage creek that runs through the site (Figure 16).

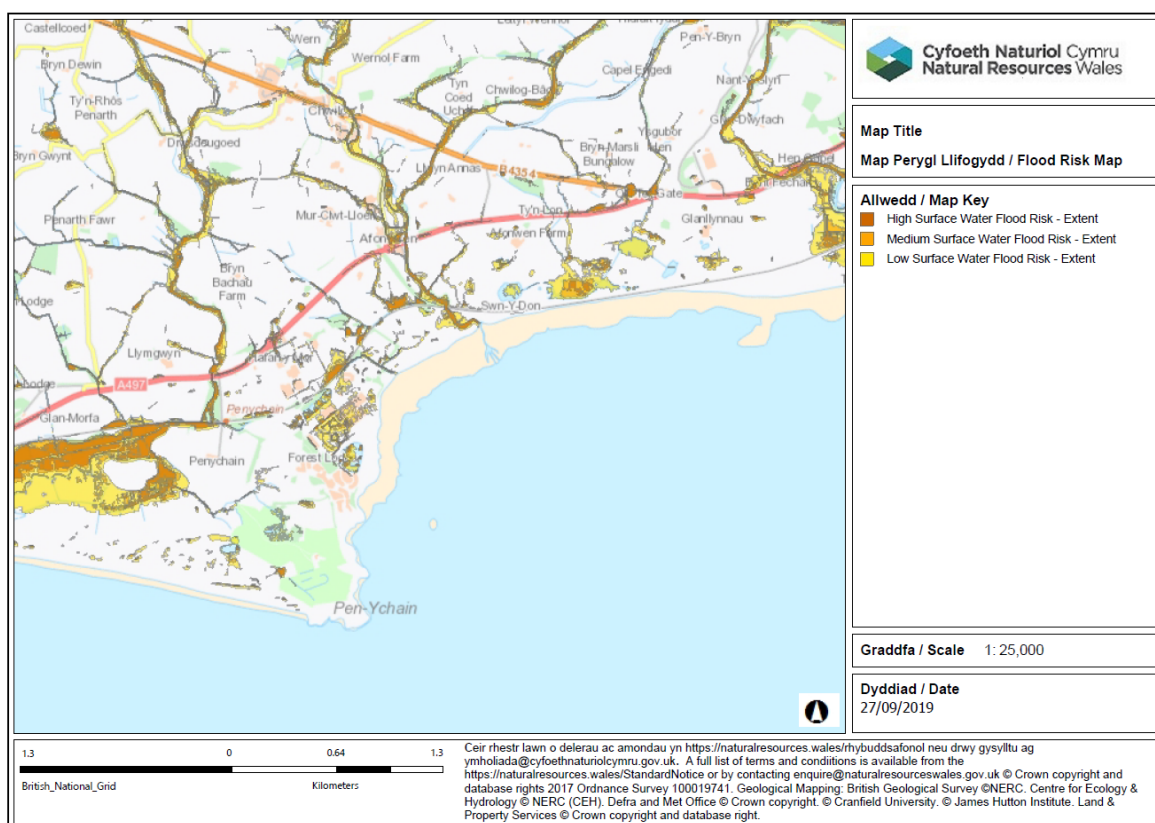


Figure 16. Risk of Flooding from Surface Water (accessed September 2019)<sup>51</sup>

<sup>51</sup> <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en> (accessed September 2019).

## 10.2.4 Future baseline

Sea level rise (SLR) will be a significant factor in the future development of the coastline along the south Llyn Peninsular and at Hafan y Môr. Where there are unprotected softer cliffs or shorelines suffering erosion, the rate of erosion is likely to increase with SLR. This might be by a factor of 1.7 to 2.5 times the existing base erosion rate over the next 100 years (Royal Haskoning, 2011). In other words, the roll-back of these undefended areas is likely to increase to 0.5 to 0.75 m per year in the future (Royal Haskoning 2011). Further information regarding the future development of the coastline and the implications of the latest sea level rise projections (UKCP18) are considered in Section 6.2.5.

## 10.3 Impact assessment

### 10.3.1 Impact Pathway 26: Changes to coastal protection

The Proposed Development has the potential to result in effects on coastal protection both in areas where the defences are proposed and in areas to the east and west where there could be changes to the hydromorphology, sediment supply and transport. The standard of coastal protection has been examined in the context of the coastal processes modelling (Appendix C), the coastal processes review (Appendix D) and the physical and coastal processes assessment (see Section 6.3).

The Proposed Development is designed to offer long-term coastal protection to the hinterland. The proposed coastal defence work involves using a combination of 'fish-tail' shaped rock-armour breakwaters aligned to create a stable coastline orientation and intervening 'beach' areas using imported sand and gravel of a similar grade to the current beach (Section 2.6). This approach will ensure that the new defence line is not 'fixed' as the materials used to form the coastal defences can be relocated if required and that there is 'room' for sea level rise into the future. In other words, the proposed design of the coastal defences will allow for resilience and adaptability to be achieved. An approximately 10 m wide coastal strip has also been included landward of the coastal defences to provide a flexible contingency zone for any storm events and to deal with the inherent uncertainty of natural future evolution of the shoreline in this area.

The proposed coastal defences are novel because they will be set back around 30 m from the existing MHWs elevation and involve the landward realignment of part of the coastline. This approach will provide shelter and shoreline stability within the upper beach, minimise changes to alongshore transport and protect Hafan y Môr Holiday Park from coastal erosion. It will also allow these defence features to adjust in response to sea level rise in the future.

Changes to the hydrodynamic regime brought about by the coastal defences are predicted to be highly localised and given the high elevation of the defence structures in the tidal frame, will only occur on some tides and for limited periods (over high water). Alongshore sediment transport (or littoral drift) is predicted to be reduced within 50 m down shore (i.e. north-east) of the groynes. This may result in the increased potential for coastal erosion in this adjacent section of undefended coastline which is backed by fields owned by Haven Leisure Ltd. Any change in coastal erosion will be highly localised and will not overlap with other third party infrastructure (e.g. private landowners or Network Rail).

Overall, the exposure of a change in coastal protection occurring as a result of the Proposed Development is considered to be high at the location of the defences and negligible in the adjacent area to the north-east of the groynes. The sensitivity of human features and/or infrastructure to a change in coastal protection is considered to be high along the entire coastline and hinterland. The importance of human features and/or infrastructure at the location of the Hafan y Môr Holiday Park is considered high. The adjacent short section of undefended area to the north-east of the groynes which

backs onto fields owned by Haven Leisure Ltd. is not considered of importance to human features and/or infrastructure. The overall impact of a change to coastal protection is therefore considered **major beneficial** at the location of the Hafan y Môr Holiday Park and **insignificant** in adjacent coastal areas.

### 10.3.2 Impact Pathway 27: Changes to existing flood regime

The Proposed Development has the potential to result in changes to the existing tidal and surface water flood regime. These are assessed separately below.

#### Tidal flood regime

The physical and coastal processes assessment (see Section 6.3) concluded that the changes in flows (combined wave and tide) brought about by the proposed coastal defences are highly localised, with reductions in flow constrained to within approximately 50 m of the breakwaters in an offshore direction, 70 m in a north-eastern direction and no detectable changes to the south-west. Given the high elevation of the proposed coastal defences in the tidal frame, the breakwater structures are only inundated on some tides and for limited periods (over high water) and therefore any changes in hydrodynamics and associated tidal flooding regime are limited and can only occur during these short immersion periods.

Overall, the exposure to change in factors influencing tidal flood risk (i.e. water levels and waves) is considered to be negligible. The sensitivity of human features and/or infrastructure to a change in tidal flood risk is considered to be high along the entire coastline. The importance of human features and/or infrastructure at the location of the Hafan y Môr Holiday Park is considered high. The adjacent short section of undefended area to the north-east of the groynes is not considered of importance to human features and/or infrastructure. The overall impact of a change to tidal flood regime is therefore considered **insignificant**.

#### Surface water flood regime

The Proposed Development will incorporate sustainable drainage system (SuDS) features designed to meet Sustainable Drainage Approving Body (SAB) standards within the development parcels. This drainage system will discharge surface water to adjacent water courses and to the sea.

Despite the high sensitivity and importance of human features and/or infrastructure to a change in surface water flood risk at Hafan y Môr Holiday Park, the exposure to change is considered to be negligible. The overall impact of a change to surface water flood regime is therefore considered **insignificant**.

## 10.4 Mitigation measures and residual effects

None of the impact pathways identified for coastal protection and flood defence are expected to give rise to significant adverse effects. The following measures have been identified as part of the design work for the Proposed Development to minimise and/or avoid the potential for effects:

- 'Set back' coastal defence design minimises the indirect effects from changes in coastal erosion;
- Coastal defence design is adaptable and able to accommodate future sea level rise; and
- Sustainable drainage system (SuDS) features within the development parcels.

## 10.5 Summary and conclusions

A summary of the impact pathways that have been assessed for coast protection and flood defence is presented in Table 28. It is considered that the proposed coastal defence design and construction methodology will minimise and/or avoid the potential for any significant adverse effects. The details of the flood risk are also set out in the separate FCA report (Weetwood, 2019).

**Table 28. Summary of potential impact, mitigation measures and residual impacts for coastal protection and flood defence**

| Receptor         | Potential Impact Pathway      | Impact Significance                                                              | Mitigation Measures/Monitoring | Residual Impact                                                                  | Confidence |
|------------------|-------------------------------|----------------------------------------------------------------------------------|--------------------------------|----------------------------------------------------------------------------------|------------|
| Coast protection | Changes to coastal protection | Major beneficial (at Hafan y Môr Holiday Park)<br>Insignificant (adjacent areas) | None                           | Major beneficial (at Hafan y Môr Holiday Park)<br>Insignificant (adjacent areas) | High       |
| Flood regime     | Changes to flood regime       | Insignificant                                                                    | None                           | Insignificant                                                                    | High       |

## 10.6 References

Weetwood (2019) Flood Consequences And Surface Water Drainage Assessment. Draft Report v1.0. October 2019

Welsh Government (2004). Planning Policy Wales. Technical Advice Note 15: Development and Flood Risk. Available at: <https://gov.wales/sites/default/files/publications/2018-09/tan15-development-flood-risk.pdf> (accessed September 2019).

Welsh Government (2011). National Strategy for Flood and Coastal Erosion Risk Management. Available at: <https://gov.wales/sites/default/files/publications/2019-03/national-strategy-for-flood-and-coastal-erosion-risk-management-in-wales.pdf> (accessed September 2019).

Welsh Government (2018). Planning Policy Wales. Edition 10. December 2018. Available at: <https://gov.wales/sites/default/files/publications/2019-02/planning-policy-wales-edition-10.pdf> (accessed September 2019).

Welsh Government (2019). Draft National Strategy for Flood and Coastal Erosion Risk Management. Available at: <https://gov.wales/national-strategy-flood-and-coastal-erosion-risk-management> (accessed September 2019).

NRW (2019). Long Term Flood Risk Maps. Available at: <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en> (accessed September 2019).

# 11 Cumulative and In-combination Effects

The proposed project will take place alongside other plans, projects and activities. These have the potential to result in additional or modified impacts on the same receptors as those identified for the proposed project alone, resulting in a cumulative and/or in-combination impact.

This section provides a cumulative / in-combination assessment taking account of the total effects of all impacts from the Proposed Development alone acting upon all relevant receptors in seeking to assess the overall cumulative / in-combination significance. Additionally, consideration is given to any other activities and plans or projects, including any impacts that do not directly overlap spatially, but may indirectly result in a cumulative / in-combination impact. By looking at all potential impacts, the information provided in this section addresses the requirements under The Marine Works (EIA) Regulations 2007 (as amended) and also informs the assessment of in-combination impacts in line with the requirements of the Habitats Directive.

The Marine Works Regulations specifically refer to 'cumulative' effects, while the Habitats Regulations refer to 'in combination' effects. However, in practice, both need to be interpreted as referring to cumulative and in-combination effects because the assessments, whether for EIA or for HRA, need to understand the combined influence of all environmental pressures acting upon the relevant receptors in seeking to assess the significance of environmental effects. On this basis, the main difference between the cumulative assessment for EIA and the in-combination assessment for HRA is the range of receptors included in the assessment. For the purposes of this ES, the range of features needs to cover both environmental receptors (including protected interest features) and other human activities and interests that might be affected, while the HRA focuses solely on the relevant features potentially affected within internationally designated sites.

This section is structured as follows. Section 11.1 outlines relevant projects, plans, and activities which should be considered, and the cumulative/in-combination assessment is undertaken in Section 11.2.

## 11.1 Relevant plans, projects, and activities

### 11.1.1 Plans or projects

In order to identify relevant projects and plans, in addition to consultation with relevant stakeholders (who did not highlight specific projects/plans), the following sources were consulted:

- The Nationally Significant Infrastructure Projects register;
- NRW's marine licence layer on the Lle geo-portal;
- Gwynedd Council's 'track and trace' system for planning applications;
- Western Wales Flood Risk Management Plan (Llyn and Eryri catchment);
- The West of Wales Shoreline Management Plan 2;
- The (2017) Anglesey and Gwynedd Joint Local Development Plan 2011 – 2026; and
- The (2012) West of Wales Shoreline Management Plan 2.

This process yielded no plans or projects which were considered to have the potential for having cumulative and/or in-combination effects with the Proposed Development.

It is worth noting that in 2011 several areas at the holiday park were consented for additional static caravans to be constructed (ref. C10D/0141/40/LL). The current status of the 2011 planning permission is presented in Table 29. The majority of the elements of the extant 2011 consent have been

implemented, and those that remain are anticipated to be completed in advance of or superseded by the Proposed Development. There will therefore be no temporal overlap with the Proposed Development and no potential for cumulative and/or in-combination effects.

**Table 29. Current status of elements of the extant 2011 planning permission (ref. C10D/0141/40/LL)**

| Area                                            | Number Approved | Current status                                                                                  |
|-------------------------------------------------|-----------------|-------------------------------------------------------------------------------------------------|
| Existing Static caravans/ Lodges                | 857             | As existing.                                                                                    |
| Northern Perimeter of Site                      | 15              | Completed – 15 static caravans in place.                                                        |
| Area east of park reception                     | 38              | Completed – 38 static caravans in place.                                                        |
| East of Llyn Village (now called Cardigan View) | 33              | Completed – Only 30 out of 33 static caravans in place.                                         |
| Adjacent to The Stables                         | 45              | Completed – 45 static caravans in place.                                                        |
| Static caravans Replacing Llyn Village          | 78              | Some apartments demolished but no static caravans constructed.                                  |
| Static caravans south of railway line           | 78              | Partly completed – 18 static caravans completed and 9 to be constructed shortly (Harlech View). |
| Golf Village                                    | 75              | Partly completed – 69 lodges completed.                                                         |
| Tourers                                         | 75              | Completed.                                                                                      |
| West of Boating Lake                            | 18              | Partly completed – 12 to be built winter 2019.                                                  |
| <b>Total Approved</b>                           | <b>1,305</b>    |                                                                                                 |

### 11.1.2 Activities

No activities have been identified which could have the potential for having cumulative and/or in-combination effects with the Proposed Development. This is due to the location of the Proposed Development, and/or the fact that many activities which would typically have the potential to result in cumulative/ in-combination effects have been scoped out (e.g. commercial and recreational fishing).

## 11.2 Cumulative/In-combination assessment

### 11.2.1 Plans, projects and activities (inter-project effects)

As no plans, projects or activities have been identified with which the Proposed Development (and its pathways) could interact spatially and/or temporally, no inter-project cumulative/in-combination effects will occur.

### 11.2.2 Proposed development alone (intra-project effects)

The following impact pathways that have been identified as having residual adverse impacts as part of this ES:

- Impact Pathway 6: Physical disturbance to intertidal habitats during construction: Minor Adverse
- Impact Pathway 7: Direct loss of intertidal habitat: Minor Adverse
- Impact Pathway 10: Waterbird disturbance during construction: Minor Adverse
- Impact Pathway 13: Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works: Slight Adverse

- Impact Pathway 14: Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations: Slight Adverse (Parcel G and J)
- Impact Pathway 17: Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes: Slight Adverse
- Impact Pathway 19: Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J): Slight Adverse
- Impact Pathway 23: Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats: Slight Adverse

Of these impact pathways, the following have the potential to act on the same receptor, namely intertidal habitat:

- Impact Pathway 6: Physical disturbance to intertidal habitats during construction: Minor Adverse
- Impact Pathway 7: Direct loss of intertidal habitat: Minor Adverse

Although there is the potential for these residual impacts to act on the same receptor (intertidal habitat), these impacts have limited potential to result in a significant cumulative / in-combination effect. This is because Impact Pathway 6 will occur during construction, whereas Impact Pathway 7 will occur during operation, and are therefore temporally isolated and unlikely to interact. The effect resulting Impact Pathway 6 is temporary, and the baseline situation will fully recover upon cessation of the works. Compensatory habitat is being provided to offset the effect resulting from Impact Pathway 7.

### 11.2.3 Summary

In summary, it is concluded that the proposed works at the Hafan y Môr Holiday Park are unlikely to result in significant cumulative/in-combination effects with any other development, project or plan in the vicinity of the site, or within the project itself.

# 12 Mitigation and Monitoring

## 12.1 Introduction

This section provides a summary of all the mitigation measures proposed in the impact assessments throughout this ES, along with acknowledgement of the anticipated monitoring requirements.

Standard best practice procedures and impact reduction measures have been considered as part of this proposal to minimise the potential impact(s) on different receiving environments. Some of these mitigation measures are recommendations of the impact assessment process, whilst others have been incorporated into the design of the proposals.

Adaptive management, linked to a bespoke monitoring programme, will also be undertaken. This is a well-established and recommended way of ensuring that any residual negative effects are addressed in the course of the development and during the subsequent operational phase.

## 12.2 Mitigation requirements

Table 30 summarises the predicted impacts associated with the Proposed Development, the significance of each potential impact, proposed mitigation measures and the significance of the residual impact (i.e. the impact remaining following the implementation of mitigation measures).

**Table 30. Potential impacts, mitigation measures and residual impacts associated with the Proposed Development**

| Receptor                                    | Potential Impact Pathway                                                                                                                                            | Impact Significance                                                                                  | Mitigation                                                                                                                                                                                                                                                                    | Residual Impact |
|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------|
| Physical and Coastal Processes              | Impact Pathway 1: Changes to sediment transport/supply (or 'littoral drift pathways')                                                                               | N/A but marine origin sediment to be re-used within the intertidal<br>Exposure to change: Negligible | N/A                                                                                                                                                                                                                                                                           | N/A             |
|                                             | Impact Pathway 2: Potential for coastal squeeze due to the presence of new defences                                                                                 | N/A<br>Exposure to change: Negligible                                                                |                                                                                                                                                                                                                                                                               | N/A             |
| Water and Sediment Quality                  | Impact Pathway 3: Accidental plant spillages during construction                                                                                                    | Insignificant                                                                                        | Good practice measures, such as those described in 'Guidance for Pollution Prevention: Works and maintenance in or near water (GPP5)', will be used to prevent/reduce the potential for accidental spillages during construction. Such measures will be included in the CEMP. | Insignificant   |
|                                             | Impact Pathway 4: Construction materials and disturbance of sediment                                                                                                | Insignificant                                                                                        | N/A                                                                                                                                                                                                                                                                           | Insignificant   |
|                                             | Impact Pathway 5: Alteration to hydro-morphology, biology or protected areas within Tremadog Bay WFD water body                                                     |                                                                                                      |                                                                                                                                                                                                                                                                               |                 |
| Marine Ecology and Nature Conservation      | Impact Pathway 6: Physical disturbance to intertidal habitats during construction                                                                                   | Minor Adverse                                                                                        | N/A                                                                                                                                                                                                                                                                           | Minor Adverse   |
|                                             | Impact Pathway 7: Direct loss of intertidal habitat under the development footprint                                                                                 | Moderate Adverse                                                                                     | Compensatory habitat provided through the removal of rubble from shingle habitat the north east of the Proposed Development coastal defences                                                                                                                                  | Minor Adverse   |
|                                             | Impact Pathway 8: Changes to intertidal habitat as a result of hydro-morphology and sediment transport                                                              | Insignificant                                                                                        | N/A                                                                                                                                                                                                                                                                           | Insignificant   |
|                                             | Impact Pathway 9: Physical disturbance of intertidal habitats during operational phase maintenance work                                                             | Minor Adverse                                                                                        | N/A                                                                                                                                                                                                                                                                           | Minor Adverse   |
|                                             | Impact Pathway 10: Waterbird disturbance during construction                                                                                                        | Minor Adverse                                                                                        | N/A                                                                                                                                                                                                                                                                           | Minor Adverse   |
|                                             | Impact Pathway 11: Direct physical interaction with geology                                                                                                         | Insignificant                                                                                        | N/A                                                                                                                                                                                                                                                                           | Insignificant   |
| Terrestrial Ecology and Nature Conservation | Impact Pathway 12: Damage or disturbance to landside habitats adjacent to development parcels during construction work                                              | Slight Adverse                                                                                       | Adoption of CEMP and other generic mitigation measures.                                                                                                                                                                                                                       | Neutral         |
|                                             | Impact Pathway 13: Loss of semi-improved grassland habitats (Section 7 priority habitat) as a result of caravan development and coastline defence/realignment works | Moderate Adverse                                                                                     | Grassland mitigation plan to include: management and enhancement plan for grasslands G8-10; management plan for South Lake grasslands (unimproved grassland G1A and G1B); grassland creation within the former car park site; and off-site                                    | Slight Adverse  |

| Receptor | Potential Impact Pathway                                                                                                                                                                                                                         | Impact Significance                                                  | Mitigation                                                                                                                                                                                                                                                                                   | Residual Impact                                                         |
|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------|
|          |                                                                                                                                                                                                                                                  |                                                                      | grassland creation and or management, under agreement with the NWWT.                                                                                                                                                                                                                         |                                                                         |
|          | Impact Pathway 14: Weakening or loss of ecological corridor along the coast, caused by removal or fragmentation of existing habitats. Possibly resulting in long term fragmentation of species' populations                                      | Moderate Adverse (Parcel G and J)<br>Slight Adverse (Parcel H and J) | Incorporation of a 10 m belt of wildflower grassland along the realigned coastal frontage across the new coastal boundaries of Parcels G and H.                                                                                                                                              | Slight Adverse (Parcel G and J)<br>Moderate Beneficial (Parcel H and J) |
|          | Impact Pathway 15: Loss of soft maritime cliff (Section 7 priority habitat) as a result of coastline defence/realignment works                                                                                                                   | Moderate Adverse                                                     | Implementation of a management plan for about 650 linear metres of existing soft maritime cliff, plus the creation of 'bee banks' within the former car park ecological mitigation area and the inclusion of 'bee hotels' within development parcels, where possible.                        | Neutral                                                                 |
|          | Impact Pathway 16: Habitat loss and disturbance of otters (qualifying feature of SAC and European Protected Species), during construction work (including potential for sediment run-off and contamination of watercourses used by this species) | Slight Adverse                                                       | Good practice measure to prevent pollution of aquatic habitats and sensitive working measure (e.g. no works buffer zones). Such measures will be included in the CEMP. Removal of lying-up sites compensated through vision of two artificial pipe and chamber holts at a suitable location. | Neutral                                                                 |
|          | Impact Pathway 17: Disturbance to otter (qualifying feature of SAC and European Protected Species) during operational phases of the development, including modifications to dispersal routes                                                     | Moderate Adverse                                                     | Two new road crossings over WC1 to allow safe passage for otters underneath. Maintenance of a strip of dense vegetation along the bank top of WC1 to ensure that the stream corridor is protected from direct human disturbance.                                                             | Slight Adverse                                                          |
|          | Impact Pathway 18: Loss of bat roosts and potential for harm to bats (European Protected Species) caused by demolition of chalet blocks, and/or disturbance of bat dispersal routes and/or foraging areas                                        | Slight Adverse                                                       | Eight woodcrete bat boxes to be installed on nearby trees to compensate for the loss of roosting habitat. Buildings B1 and B2 within Parcel F will be removed under an NRW mitigation licence, under the supervision of a licensed ecologist.                                                | Neutral                                                                 |
|          | Impact Pathway 19: Loss of reptile habitats and direct impacts on four species of reptile (all Section 7 and UK Protected Species) caused by proposed caravan development (Parcels E and G) and coastline defence/realignment works (Parcel J)   | Slight Adverse (Parcel E)<br>Moderate Adverse (Parcel G and J)       | Where populations are small (Parcel E) habitat management techniques will be used to displace resident populations. For the larger and more important populations (Parcels J and G), reptiles would be trapped and translocated to a prepared receptor site.                                 | Slight Adverse                                                          |
|          | Impact Pathway 20: Direct impacts on nesting birds (all species protected from harm while nesting) during construction (e.g. site clearance)                                                                                                     | Slight Adverse                                                       | Sensitive vegetation clearance works either outside of the main breeding bird season or, if not possible, under the supervision of a suitably experienced ecologist with checks prior to clearance.                                                                                          | Neutral                                                                 |

| Receptor                           | Potential Impact Pathway                                                                                                             | Impact Significance                                                                                       | Mitigation                                                                                                                                                                                                                                                                                                     | Residual Impact                                                                                           |
|------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------|
|                                    | Impact Pathway 21: Potential for increase in abundance or/and distribution of invasive non-native plant species                      | Moderate Adverse                                                                                          | A Biosecurity Plan will be prepared and included within a CEMP.                                                                                                                                                                                                                                                | Neutral                                                                                                   |
|                                    | Impact Pathway 22: Potential effects on bee and wasp fauna associated with the removal of soft maritime cliff and grassland habitats | Moderate Adverse                                                                                          | Same as for Impact Pathway 14.                                                                                                                                                                                                                                                                                 | Neutral                                                                                                   |
|                                    | Impact Pathway 23: Potential effects on black oil beetle associated with the removal of soft maritime cliff and grassland habitats   | Moderate Adverse                                                                                          | Strongly linked to Impact Pathway 14 and 21. Retained cliff section to the north east of the coastal works, and by creating flower-rich habitat for foraging for solitary bees (Afon Wen fields), and bare ground habitat (such as bee banks) for nesting (ecological mitigation area on the former car park). | Slight Adverse                                                                                            |
|                                    | Impact Pathway 24: Other disturbance effects caused by operation of the developments, on species and habitats                        | Slight Adverse                                                                                            | Various measures incorporated in CEMP.                                                                                                                                                                                                                                                                         | Neutral                                                                                                   |
| Coast Protection and Flood Defence | Impact Pathway 25: Changes to coastal protection                                                                                     | Major beneficial (at location of the Hafan y Môr Holiday Park)<br>Insignificant in adjacent coastal areas | N/A                                                                                                                                                                                                                                                                                                            | Major beneficial (at location of the Hafan y Môr Holiday Park)<br>Insignificant in adjacent coastal areas |
|                                    | Impact Pathway 26: Changes to existing flood regime                                                                                  | Insignificant                                                                                             | N/A                                                                                                                                                                                                                                                                                                            | Insignificant                                                                                             |

## 12.3 Monitoring proposals

For this project there will also be requirements for ongoing (post-construction) site mitigation/compensation, monitoring and management that will be set out in the CEMP. Operational monitoring in particular is proposed to account for the uncertainties associated with the future evolution of compensatory habitat and the efficacy of the terrestrial habitat mitigation plan. Monitoring to inform management of the coastal defence structure, for example maintenance raking, cleaning, and response (rebuilding) after major storms, will also be undertaken.

The preparation of a detailed monitoring programme is likely to be a condition of the planning permission and marine licence consent. This monitoring programme will follow common industry practice and up to date requirements from NRW, Gwynedd Council and their advisors.

## 13 Conclusions

This ES has considered and assessed potential environmental impacts associated with the Proposed Development on all relevant (scoped-in) environmental receptors. Consultation with key stakeholders has been undertaken prior to and throughout the assessment in order to discuss environmental issues and agree the scope of and approach to the assessment. This was also valuable for ensuring that the Proposed Development will have the lowest environmental impact of any available alternative.

The key issues identified in the ES were those associated with the physical disturbance of intertidal habitat during construction, the direct loss of designated habitat (including SAC upper intertidal sandflat habitat), the loss of supporting habitats for species (e.g. reptiles and black oil beetle), the disturbance of species (e.g. waterbirds and otters), and the weakening or loss of ecological corridor along the coast. The residual impacts identified in this ES have been assessed to be at worst of minor adverse significance following the application of best practice procedures, and appropriate mitigation and compensation measures. Once the Proposed Development has been constructed, no significant impacts are anticipated during operation.

## 14 Abbreviations/Acronyms

|         |                                                             |
|---------|-------------------------------------------------------------|
| AA      | Appropriate Assessment                                      |
| ABP     | Associated British Ports                                    |
| ADP     | Andrew Davis Partnership                                    |
| AEoI    | Adverse Effect on Integrity                                 |
| AWB     | Artificial Water Body                                       |
| BAP     | Biodiversity Action Plan                                    |
| BOD     | Biological Oxygen Demand                                    |
| BS      | British Standards                                           |
| BSI     | British Standards Institute                                 |
| BTO     | British Trust for Ornithology                               |
| CCW     | Countryside Council for Wales                               |
| CDM     | Construction, Design and Management                         |
| CEMP    | Construction Environment Management Plan                    |
| CIEEM   | Chartered Institute of Ecology and Environmental Management |
| CIRIA   | Construction Industry Research and Information Association  |
| COD     | Chemical Oxygen Demand                                      |
| cSAC    | Candidate Special Area of Conservation                      |
| cWS     | Candidate Wildlife Site                                     |
| DAM     | Development Advice Map                                      |
| DETR    | Department of the Environment, Transport and the Regions    |
| DTM     | Digital Terrain Model                                       |
| EC      | European Commission                                         |
| EclA    | Ecological Impact Assessment                                |
| ECow    | Ecological Clerk of Works                                   |
| EEC     | European Economic Community                                 |
| EIA     | Environmental Impact Assessment                             |
| ELMP    | Ecological and Landscape Management Plan                    |
| EMEP    | Ecological Management and Enhancement Plan                  |
| EMODnet | European Marine Observation and Data Network                |
| EPS     | European Protected Species                                  |
| EQS     | Environmental Quality Standards                             |
| EQSD    | Environmental Quality Standards Directive                   |
| ES      | Environmental Statement                                     |
| EU      | European Union                                              |
| FCA     | Flood Consequences Assessment                               |
| FTE     | Full-Time Equivalent                                        |
| GCS     | Good Chemical Status                                        |
| GEP     | Good Ecological Potential                                   |
| GES     | Good Ecological Status                                      |
| GHG     | Greenhouse Gas                                              |
| GIS     | Geographic Information System                               |
| GN      | Guidance Note                                               |
| GPP     | Guidance for Pollution Prevention                           |
| GS      | Good Status                                                 |
| GVA     | Gross Value Added                                           |
| HAT     | Highest Astronomical Tide                                   |
| HLMO    | High Level Marine Objective                                 |
| HM      | Her Majesty's                                               |

|        |                                                                                        |
|--------|----------------------------------------------------------------------------------------|
| HMWB   | Heavily Modified Water Bodies                                                          |
| HRA    | Habitats Regulations Assessment                                                        |
| HRGN   | Habitats Regulations Guidance Note                                                     |
| HTL    | Hold the Line                                                                          |
| ID     | Identification / Identity                                                              |
| IECS   | Institute of Estuarine and Coastal Studies                                             |
| IEMA   | Institute for Environmental Management                                                 |
| INNS   | Invasive Non-native Species                                                            |
| IROPI  | Imperative Reasons of Over-riding Public Interest                                      |
| JLDP   | Joint Local Development Plan                                                           |
| JNCC   | Joint Nature Conservation Committee                                                    |
| LDP    | Local Development Plan                                                                 |
| LED    | Light Emitting Diode                                                                   |
| LiDAR  | Light Detection and Ranging                                                            |
| LLP    | Limited Liability Partnerships                                                         |
| LSE    | Likely Significant Effect                                                              |
| MAFF   | Ministry of Agriculture, Fisheries, and Food                                           |
| MAGIC  | Multi-Agency Geographic Information for the Countryside                                |
| MarESA | Marine Evidence based Sensitivity Assessment                                           |
| MarLIN | Marine Life Information Network                                                        |
| MCA    | Maritime and Coastguard Agency                                                         |
| MCAA   | Marine and Coastal Access Act                                                          |
| MCZ    | Marine Conservation Zone                                                               |
| MHWN   | Mean High Water Neaps                                                                  |
| MHWS   | Mean High Water Springs                                                                |
| MMO    | Marine Management Organisation                                                         |
| MNCR   | Marine Nature Conservation Review                                                      |
| MSFD   | Marine Strategy Framework Directive                                                    |
| MSL    | Mean Sea Level                                                                         |
| N/A    | Not Applicable                                                                         |
| NAI    | No Active Intervention                                                                 |
| NBN    | National Biodiversity Network                                                          |
| NERC   | Natural Environment and Rural Communities                                              |
| NEWS   | Non-Estuarine Waterbird Survey                                                         |
| NRW    | Natural Resources Wales                                                                |
| NTS    | Non-Technical Summary                                                                  |
| NTSLF  | National Tidal and Sea Level Facility                                                  |
| NVC    | National Vegetation Classification                                                     |
| NVZ    | Nitrate Vulnerable Zones                                                               |
| NVZS   | Nitrate Vulnerable Zones                                                               |
| NWWT   | North Wales Wildlife Trust                                                             |
| ODN    | Ordnance Datum Newlyn                                                                  |
| OGC    | Office of Government Commerce                                                          |
| OGN    | Operational Guidance Note                                                              |
| OMHPDL | Open mosaic habitats on previously developed land                                      |
| OSPAR  | The Convention for the Protection of the Marine Environment of the North-East Atlantic |
| PAC    | Pre-Application Consultation                                                           |
| PPG    | Pollution Prevention Guidance                                                          |
| PPW    | Planning Policy Wales                                                                  |
| PSA    | Particle Size Analysis                                                                 |
| PSD    | Particle Size Diameter                                                                 |
| PSD    | Priority Substances Directive                                                          |

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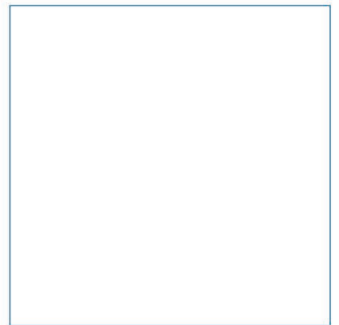
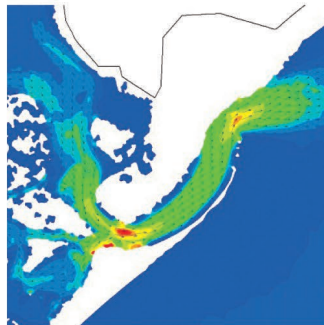
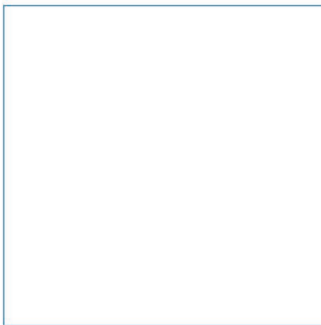
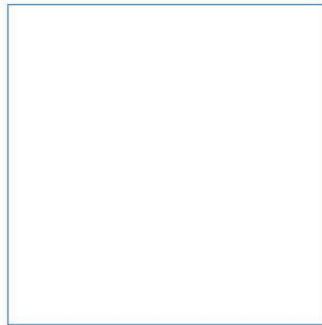
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|--------|----------------------------------------|
| pSPA   | Proposed Special Protection Area       |
| RBMP   | River Basin Management Plan            |
| RNLI   | Royal National Lifeboat Institution    |
| RTPI   | Royal Town Planning Institute          |
| RYA    | Royal Yachting Association             |
| SAB    | Sustainable Drainage Approving Body    |
| SAC    | Special Area of Conservation           |
| SEPA   | Scottish Environment Protection Agency |
| SLR    | Sea Level Rise                         |
| SMP    | Shoreline Management Plan              |
| SNCB   | Statutory Nature Conservation Body     |
| SoNaRR | State of Natural Resources Report      |
| SoS    | Secretary of State                     |
| SPA    | Special Protection Area                |
| SSSI   | Special Site of Scientific Interest    |
| STP    | Sewage Treatment Plant                 |
| SuDS   | Sustainable Drainage System            |
| TAG    | Transport Analysis Guidance            |
| TAN    | Technical Advice Note                  |
| TCP    | Town and Country Planning              |
| THLS   | Trinity House Lighthouse Service       |
| UK     | United Kingdom                         |
| UKCP18 | UK Climate Projections (2018)          |
| WAG    | Welsh Assembly Government              |
| WCA    | Wildlife and Countryside Act           |
| WCI    | Watercourse                            |
| WeBS   | Wetland Bird Surveys                   |
| WFD    | Water Framework Directive              |
| WNMP   | Welsh National Marine Plan             |

Cardinal points/directions are used unless otherwise stated.

SI units are used unless otherwise stated.

# Appendices (Provided Separately in ABPmer R.3282 Volume 2)

- A 2030 Masterplan and Vision for Hafan y Môr
- B Screening and Scoping Opinions
- C Numerical Modelling of Coastal Defences
- D Coastal Defences Technical Review
- E Marine Ecology Survey Report
- F Terrestrial Ecology with Aculeate Report
- G Terrestrial Ecology Figures
- H Landscape Appraisal
- I Traffic Appraisal
- J Economic Statement
- K Appropriate Assessment Information
- L Water Framework Directive (WFD) Compliance Assessment



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