

CARDIGAN TIDAL FLOOD RISK MANAGEMENT SCHEME

Appendix 6.1 – Preliminary Ecological Appraisal (PEA) Report



Cyfoeth Naturiol Cymru
Natural Resources Wales



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NATURAL RESOURCES WALES CARDIGAN TIDAL FLOOD RISK MANAGEMENT SCHEME – PRELIMINARY ECOLOGICAL APPRAISAL UPDATE

Project no. 4021883



Prepared for:



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1 Introduction

1.1 Background

Binnies UK limited has been commissioned by Natural Resources Wales (NRW) to undertake an update of a Preliminary Ecological Appraisal (PEA) in relation to a proposed Tidal Flood Risk Management Scheme (TFRMS) at Cardigan in the county of Ceredigion, south-west Wales.

1.2 Site Location and Context

The Scheme is located towards the centre of Cardigan town in west Wales, the permanent works will be located on the north bank of the Afon Teifi. The Scheme is bound to the west by Castle Street (SN177458) and to the east by Gloster Row car park (SN180459). The Cardigan TFRMS scheme will hereafter be referred to as the 'Scheme'. For further details of the location and surveys extent refer to the Location Plan, Drawing ref. 4021883-BUK-ZZ-00-DR-EN-00007 and Phase 1 Plan, Drawing ref. 4021883-BUK-ZZ-00-DR-EN-00002 in Appendix A.

1.3 Scheme

The Scheme will comprise a series of flood defence structures designed to fit within the various constraints along the Afon Teifi frontage between Cardigan Bridge and Gloster Row Car Park (approximately 300 to 400m in length). The flood defences will need to achieve a consistent level of 4.95mAOD to provide the Scheme design standard of 1 in 200 years annual exceedance probability (AEP) with allowance for climate change, which will make the structures up to approximately 2m tall above general ground level (though lower in some sections). The defence will be composed of sheet piles, topped with a reinforced concrete wall. An engineered embankment will be located in front of the reinforced concrete wall where required.

The design considered within this PEA Update comprises the outline design as shown in drawings Appendix A. Drawing ref. 123666-BUK-ZZ-00-DR-C-00021 to 00023, 00026, 00028, 00039 and 00032. Potential design changes and evolutions have and are occurring as part of the design evolution, where relevant for known potential changes this PEA has referred to certain design changes.

1.4 Scope of the Report

The brief provided to Binnies for this PEA, is as follows:

- Provide an updated Extended Phase 1 Habitat survey of the Scheme Area.
- Provide ecological baseline information about the Scheme with particular reference to whether protected designated sites, protected/ notable species/ habitats are present or likely to be present;
- Provide recommendations to enable compliance with relevant nature conservation legislation and planning policy;
- Identify the need for avoidance, mitigation or compensation measures of the proposed options of the Scheme;
- Identify opportunities offered by the Scheme to deliver ecological enhancement; and

- An outline Assessment of DECCA: Diversity, Extent, Condition, Connectivity and Aspects of ecosystem resilience for the project.

1.5 Legislation

The report has been compiled with reference to relevant nature conservation legislation, planning policy and the UK Biodiversity framework from which the protection of sites, habitats and species is derived in Wales. The context of these and how they have been applied is detailed in relevant sections of this report with additional information presented in Appendix C. The following legislation and policy are highlighted:

- The Conservation of Habitats and Species Regulations 2017 (as amended¹) (commonly referred to as the Habitats Regulations);
- The Environment (Wales) Act 2016;
- Wildlife and Countryside Act 1981 (as amended);
- Invasive Alien Species (Enforcement and Permitting) Order 2019; and
- The Environment Act 2021.

Planning Policy Wales (Edition 12, February 2024) translates the principles of Sustainable Management of Natural Resources (SMNR) established by the Environment (Wales) Act 2016 into use for the planning system. Section 6 of The Environment (Wales) Act 2016 requires public authorities, including Planning Authorities and NRW, to seek to maintain and enhance biodiversity in the exercise of their functions and in so doing promote the resilience of ecosystems. This means development should not cause any significant loss of habitats or populations of species, locally or nationally and must provide a net benefit for biodiversity.

The Wellbeing of Future Generations Act 2015 includes a goal for a resilient Wales 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 (for example climate change)'.

Chapter 6 of Planning Policy Wales was updated in April 2024 to set out policies for biodiversity and nature. As part of this, a Green Infrastructure Statement is now required for all new development applications. This statement describes how green infrastructure has been incorporated into the proposal.

As part of the new Green Infrastructure Statement in Wales it is expected that a baseline condition of habitats should be provided, to assess the impact of proposed developments on existing biodiversity and ensures that green infrastructure is appropriately integrated.

¹ As amended by the Conservation of Habitats and Species Regulations (Amendment) (EU Exit) Regulations 2019

2 Methodology

2.1 Guidance and Data Sources

This report is produced with reference to current good practice guidelines by the Chartered Institute of Ecology and Environmental Management (CIEEM, 2017a); (CIEEM, 2017b); (CIEEM, 2020), Joint Nature Conservation Committee (JNCC, 2010) and guidelines contained in the British Standards – Code of Practice for Biodiversity and Development BS42020:2013.

The assessment and recommendations detailed in this ecology report have been informed by the following historic reports:

- Cardigan TFRMS -Preliminary Ecological Appraisal (Binnies UK Ltd, 2023)
- Wintering Bird Surveys Cardigan Tidal Flood Risk Management Scheme (Wyndrush Wild, 2023a)
- Breeding Bird Surveys Cardigan Tidal Flood Risk Management Scheme (Wyndrush Wild, 2023b)
- Afon Teifi / River Teifi Proposed Flood Defences Cardigan. A Preliminary Roost Assessment Report (Just Mammals Ltd, 2023)

The survey methods, detailed findings and any limitations are set out in these specific reports which should be read in conjunction with this assessment.

2.2 Ecological Desk Study

Binnies obtained data for an updated ecological desk study of the Zone of Influence of the proposed Scheme in January 2024.

The Zone of Influence (ZoI) is the area over which ecological features may be affected by biophysical changes as a result of the Proposed Scheme and associated activities. Zones of Influence vary for different ecological features depending on their sensitivity and connectivity to the Scheme Area. This approach is in line with good practice guidelines published by CIEEM (CIEEM, 2017a; CIEEM, 2017b; CIEEM, 2020).

The Zones of Influence for the Scheme were developed to include:

- Areas directly within the land take for the proposed permanent development including permanent access routes for future maintenance (not including adopted highways); this comprises the entire Scheme Area.
- Areas which could be temporarily affected during construction due to temporary access, working areas and noise and visual disturbance; this comprises the entire Scheme Area plus a 2km buffer for designated sites.
- Areas with potential to be impacted by potential hydrological disruption during construction and operation (e.g. within and downslope / downstream of the Scheme Area); this comprises the entire Scheme Area plus a 2km buffer.

When in operation, the proposed Scheme will not generate any noise, vibration or air pollution apart from occasional maintenance visits.

The following data sources have been consulted as part of the desk study:

- Cardigan TFRMS -Preliminary Ecological Appraisal (Binnies UK Ltd, 2023)
- Wintering Bird Surveys Cardigan Tidal Flood Risk Management Scheme (Wyndrush Wild, 2023a)
- Breeding Bird Surveys Cardigan Tidal Flood Risk Management Scheme (Wyndrush Wild, 2023b)
- Afon Teifi / River Teifi Proposed Flood Defences Cardigan. A Preliminary Roost Assessment Report (Just Mammals Ltd, 2023)
- Local Records Centre Records 2024, held by Natural Resource Wales.

Records were sought for the following ecological features and relevant Zones of Influence:

- Statutory designated sites within 2km of the Scheme Area for sites with either a direct, hydrological or qualifying species (mobile species) link to the Scheme Area.
- Non statutory designated sites within 2km of the Scheme Area.
- Priority habitats within 2km of the Scheme Area.
- Protected and notable flora within 2km of the Scheme Area.
- Records of legally protected and notable species within 2km of the Scheme.
- Invasive Non-Native Species (INNS) within 2km of the Scheme Area.

Species records obtained from the various sources were limited to the last ten years to ensure validity.

2.3 Ecological Walkover Survey

An Ecological walkover survey to update of the 2021 Phase 1 habitat survey (Binnies UK Ltd, 2023) was undertaken between 3rd and 4th December 2024 by experienced Binnies ecologists Jon Goodrick BSc CEng MCIEEM and Alex Bell BSc Qualifying member of CIEEM and FISC level four botanist.

2.3.1 Phase 1 Habitat Survey Update

Habitats were described and mapped following the standard Phase 1 survey methodology (JNCC, 2010). Phase 1 is a standard technique for classifying and mapping British habitats. Plant species were recorded, and habitat classified according to their vegetation type and community assemblage. Where appropriate, consideration was given to whether habitats qualify, or could qualify as an HPI, matched to descriptions as detailed in JNCC, 2008.

A floristic survey was carried out at the same time as the update to the Phase 1 habitat survey to record the indicative species composition of each habitat. Plant species lists for each habitat were compiled with relative plant species abundance estimated using the DAFOR scale. DAFOR is a qualitative scale used to measure species abundance within a given habitat area. The scale is:

- Dominant
- Abundant
- Frequent
- Occasional
- Rare

Rare in this scale refers to the species abundance within the habitat area and is not an indication of notability on a national or regional scale. In addition to the above integers the qualifier Locally can be used to describe the species abundance spatially within a habitat for example Locally Dominant.

The scientific names for all plant species mentioned within this report follow those in the New Flora of the British Isles (Stace, 2019).

Habitats were marked on a tablet and were subsequently digitised using a Geographical Information System (GIS).

Common invasive plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and Schedule 2 of the Invasive Alien Species (Enforcement and Permitting) Order 2019 which were evident during the Plant 1 habitat survey were target noted. A full detailed invasive species survey of the Scheme is outside the remit of this commission.

2.3.2 Habitat Condition Assessment

In order to assess the condition of the habitats within the Site for this baseline assessment, the DEFRA condition assessment methodology (DEFRA, 2023) for the Defra Statutory Biodiversity Metric was followed. This methodology is traditionally used for Biodiversity Net Gain Assessments (BNG) required under the Environment Act 2021 in England. Although BNG is not currently used in Wales at this time, this condition assessment methodology is considered suitable to use to assess habitat condition for the purpose of providing a habitat baseline showing the Diversity, Extent and Condition of on-site habitats.

2.3.3 Protected and Notable Species Assessment Update

The potential for the Scheme to support protected and/or notable species was assessed using a combination of desk study results and field observations during the survey. The assessment of suitability for species was based on professional experience and judgement. This was supplemented by good practice guidelines on habitat suitability for key fauna, including but not limited to: (Bibby, 2000), (Collins, 2023), (Gent, 2003), (English Nature, 2001), (Dean, et al., 2016), (Roper, 2010), (Scottish Natural Heritage, 2002), and (Mitchell-Jones & McLeish, 2004), (Strachan, et al., 2011).

2.4 Limitations

Every effort has been made to provide a comprehensive and robust assessment of the Scheme. However, the following limitations remained during the assessment:

- Information obtained during a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a habitat or species does not necessarily mean the absence of habitats or species within the Scheme; and
- The protected and notable vascular plant appraisal provides a preliminary 'snapshot' view of the likelihood of protected species occurring within the Scheme Area. It should not be taken as providing a full and definitive survey of any protected species group.
- The 2024 inspection of structures undertaken as part of the ecology walkover was conducted from accessible areas of the banks of the Afon Teifi and from the Cardigan Bridge using binoculars where appropriate. As a result of these access restrictions certain areas of the structures were not closely inspected (where no safe means of access was available). Where this is the case a precautionary approach has been taken to assessing roost suitability.
- The 2024 phase 1 habitat survey was conducted over two days in winter and therefore only a selection of species which occur within the Survey Area are likely to have been recorded. This limitation has been supplemented by a prior study of the area in 2021 (Binnies UK Ltd, 2023) and desk study records to provide a more comprehensive floristic picture which is sufficient to inform the ecological assessment.
- The Phase 1 habitat map has been reproduced from field notes and plans. Whilst this provides a sufficient level of detail to fulfil the requirements of this report, the maps are not intended to provide exact locations of key habitats.

However, despite the above limitations, this report is still considered to deliver a good initial assessment of the Zone of Influence. The limitations above are not deemed severe enough to significantly affect the outcomes described within this report.

3 Results and Interpretation

3.1 Designated Sites

3.1.1 Statutory Designated sites

Four statutory designated sites were recorded within 2 km of the Scheme Area this included the Afon Teifi and Teifi Estuary Sites of Special Scientific Interest (SSSI), the Afon Teifi Special Area of Conservation (SAC) and Coedmor National Nature Reserve (NNR). Site specific details including distance and direction from the Scheme Area and reason for notification and integral value can be found in Table 3-1 (below).

Table 3-1 Designated statutory nature conservation sites within the Zone of Influence

Designated Site Name	Distance from Survey Area (approx.)	Reasons for Notification and Integral Value
Statutory sites		
Afon Teifi SSSI	Within the Scheme	The Afon Teifi is of special interest for a range of river types and associated riverside habitats; flowering plants; bryophytes; otter <i>Lutra lutra</i> ; Cetti's warbler <i>Cettia cetti</i> ; bottlenose dolphin <i>Tursiops truncatus</i> ; brown hairstreak <i>Thecla betulae</i> ; fish; dragonflies and a variety of other invertebrates as well as both breeding and wintering bird communities and for geomorphological features at Cenarth and Cors Caron. This includes the Teifi Marshes Nature Reserve (approx.. 150m west of the Scheme Area east of the A487 road bridge)
Afon Teifi SAC	Within the Scheme	Designated for; Atlantic salmon <i>Salmo salar</i> , bullhead <i>Cottus gobio</i> , river lamprey <i>Lampetra planeri</i> , floating water-plantain <i>Luronium natans</i> , otter, clear-water lakes or lochs with aquatic vegetation and poor to moderate nutrient levels, rivers with floating vegetation often dominated by water crowfoots. This includes the Teifi Marshes Nature Reserve (Approx 150m west of the Scheme Area east of the A487 road bridge)
Teifi Estuary Woodlands & Marshes SSSI	1.1km south-east of the Scheme (hydrologically linked upstream)	Five distinct areas: Pentood Marsh, which contains saltmarsh and flood-meadows; Upper Teifi Estuary, containing saltmarsh and mudflats important for waterfowl; Rosehill Marsh, an estuarine transition marsh; Teifi Gorge Woods, a rich and diverse primary woodland; and Hafod Wen, a small unimproved pasture of entomological interest.
Coedmor NNR	1.5km south-east of the Scheme (hydrologically linked upstream)	Remnants of a medieval woodland which now only remains in the steep gorges. Other habitats include the river Teifi and marshes. Otters, lichens, fungi, bird species including wood warbler, redstart and pied flycatcher, and over thirty species of butterfly present

3.1.2 Non-Statutory Designated Sites

There are no non-statutory sites within 2km of the Scheme extents. As such, no further consideration is given to non-statutory designated sites as part of the PEA.

3.2 Habitats

The results of the most recent habitat survey are detailed below and concurred largely with the findings of the Phase 1 Habitat survey undertaken by Binnies in 2021 (Binnies UK Ltd, 2023).

A Phase 1 Habitat map for the Survey Area is presented in Drawing 4021883-BUK-ZZ-00-DR-EN-00002 (Appendix A). There are 7 habitats recorded within the Scheme;

- Dense scrub (A2.1)
- Broadleaved scattered trees (A3.1)
- Running water (G2)
- Intertidal mudflats (H1.1)
- Saltmarsh (H2.6)
- Amenity grassland (J1.2)
- Poor semi-improved grassland (B6).

Two habitats were identified that meet the criterion for Habitats of Principal Importance (HPI): Intertidal mudflats; and Saltmarsh within the River Teifi.

Further details of the HPIs and other habitats, including their condition assessments are provided in the following sections.

3.2.1 Dense Scrub

Bramble *Rubus fruticosus* is present in small, discrete patches in between the upper saltmarsh and other habitats (amenity grassland or hardstanding/ residential gardens). These areas were too small to map on the Phase 1 Habitat Plan.

The 2024 assessment also found that bramble scrub is now continuous along the edge of building B7, due to lack of management. The habitat was assessed as poor condition for the following reasons:

- Lack of species diversity with only bramble species recorded.
- Lack of structural diversity due to all the bramble being within the same age group.

No impacts area expected on this habitat type because of the scheme.

3.2.2 Broadleaved Scattered Trees

Broadleaved scattered trees occur infrequently across the Scheme and are located on amenity grassland. One tree is located within the former foundry site in the centre of the Scheme, several mature yew trees are present within land at the churchyard/ cemetery to the east of the Scheme and two immature trees are present to the west of the Scheme on hardstanding by the main road.

The 2024 assessment identified two additional planted laburnum *Laburnum anagyroides* trees in the carpark in the east of the Scheme. Additionally, two young sycamore *Acer pseudoplatanus* trees are present along the edge of the embankment adjacent to the hardstanding paving in the western section of the Scheme (near to Cardigan Bridge).

3.2.3 Running Water

One surface watercourse (Afon Teifi) is present within the Scheme and forms part of the Afon Teifi SAC/ SSSI. At the Scheme location the Afon Teifi is tidally influenced with associated saltmarsh habitat communities fringing the watercourse. Water flow varies with time of day and no vegetation was observed growing within the watercourse.

3.2.4 Intertidal Mudflats

The habitat is present within the Scheme on the Afon Teifi and forms the boundary between the watercourse and the saltmarsh habitats.

Intertidal Mudflats is designated as a Habitat of Principal Importance (HPI) under Environment (Wales) Act (2016), Section 7. This designation cites the habitats high biodiversity value as a result of it supporting large numbers of predatory birds and fish and their associated prey (aquatic and terrestrial invertebrates). The habitat type provides feeding and resting areas for internationally important populations of migrant and wintering waterfowl; and is also important nursery areas for flatfish. This habitat type is maintained by a constant fluctuation of tide level and limited disturbance.

The habitat at Cardigan is dynamic, reliant on silt deposition as a result of river and tidal flow. The habitat is transitional with drier areas transitioning to saltmarsh, whilst new areas of mudflat will be created by river silt deposition and scouring of the saltmarsh habitat by river or tidal action.

Despite the coastal processes being heavily influenced by the artificial sea wall which prevents the natural movement of sediment and water, the habitat was assessed as being in good condition, because there was:

- No evidence of non-native invasive species within the habitat.
- No noticeable signs or sources of water pollution.
- No litter was present within the Scheme Area.

3.2.5 Saltmarsh

Saltmarsh is present along the northern and southern shoreline of the Afon Teifi. The 2021 (Binnies UK Ltd, 2023) survey found that the dominant species present along the shoreline is sea club-rush *Bolboschoenus maritimus*, which forms a colonising band along the foreshore. Other plants indicative of saltmarsh such as saltmarsh grass *Puccinella maritima*, sea purslane *Atriplex portulacoides*, and sea aster *Aster tripolium* are all frequent. The saltmarsh strip is narrower, 10 to 20m where it moves from pioneering saltmarsh to a grass dominant habitat by the existing retaining wall. This grass dominated strip contains saltmarsh species also, with sea aster being constant and other species such as sea couch *Elytrigia atherica* and sea milkwort *Lysimachia maritima* present but occasional. Tall fescue *Festuca arundinacea* and red fescue *Festuca rubra* are also present and frequent.

Saltmarsh is designated as a HPI under Environment (Wales) Act (2016), Section 7. This designation cites the habitats high biodiversity value as a result of it supporting large numbers of predatory birds and fish and their associated prey (aquatic and terrestrial invertebrates). The habitat type provides feeding and resting areas for internationally important populations of

migrant and wintering waterfowl; and is also important nursery areas for flatfish. This habitat type is maintained by a constant fluctuation of tide level and limited disturbance.

The 2024 assessment found that the habitat had increased in size, with the saltmarsh comprising a greater area than recorded in 2021 (Binnies UK Ltd, 2023). Due to the time of year, a comprehensive species list could not be prepared. However, the species composition present indicate that no shift in vegetation composition has occurred since 2021. In the newly mapped sections of the expanded habitat, creeping bent *Agrostis stolonifera* is the dominant species. Sea couch, saltmarsh grass and sea club-rush are also present occasionally.

The habitat was assessed as being in moderate condition. Reasons for the habitat failing to achieve good status included:

- Coastal processes being heavily influenced by the artificial sea wall which prevents the natural movement of sediment and water.
- A lack of transitional habitats and variance in vegetation.

The habitat was assessed as moderate for the following reasons:

- No evidence of non-native invasive species within the habitat.
- No noticeable signs or sources of water pollution.
- No litter present within the habitat.

3.2.6 Amenity Grassland

Amenity grassland is common across the Scheme at the Scout's hut, residential gardens, and by the Gloster Row car park at the eastern end of the Scheme.

The 2024 assessment found that the amenity grasslands have not changed in composition, with the exception being the grassland surrounding Gloster Row long stay car park which has become Poor Semi-improved grassland (and is discussed further below). Perennial ryegrass *Lolium perenne* is the dominant species in the amenity grassland sward, with other species including Yorkshire fog *Holcus lanatus* F, red fescue F, dandelion sp *Taraxacum* sp O, creeping bent LO and common ragwort *Jacobaea vulgaris* R.

The habitat was assessed as being in poor condition. Reasons for the habitat failing to achieve good status included:

- Lack of species diversity.
- Intensive mowing which prevents variance in habitat structure.

3.2.7 Poor Semi-Improved Neutral Grassland

The grassland surrounding Gloster Row long stay car park has had a significant change in management since the 2021 Phase 1 habitat survey (Binnies UK Ltd, 2023). Signs that have been placed in the grassland indicate that the grassland is being mowed infrequently to encourage wildflower growth. Species included perennial ryegrass A, cock's-foot *Dactylis glomerata* LA, red fescue F, ribwort plantain *Plantago lanceolata* R, common daisy *Bellis perennis* F, common

mouse-ear *Cerastium fontanum* LF, thyme-leaved speedwell *Veronica serpyllifolia* O and common knapweed *Centaurea nigra* LO. Along the edges of the grassland, on the stone walls, other species present include navelwort *Umbilicus rupestris* LO, red valerian *Valeriana rubra* LO, biting stonecrop *Sedum acre* LR and Canadian fleabane *Erigeron canadensis* LR.

The habitat was assessed as being in moderate condition. Reasons for the habitat failing to achieve good status included:

- The habitat is an ecotone, transitioning from amenity grassland to semi-improved neutral grassland. As a result, the species composition is not varied enough to achieve good status.

3.3 Species and Species Groups

The potential for the Scheme to support protected and/ or notable species has been assessed using the results of the desktop study and observations made during the habitat survey.

The Scheme is considered suitable to support the following species:

- Amphibians and reptiles
- Badgers
- Bats
- Birds
- Fish
- Invasive species (terrestrial and aquatic)
- Invertebrates (terrestrial and aquatic)
- Marine mammals
- Notable plant species
- Otters
- Water voles
- West European hedgehog

The Scheme does not provide suitable habitat for other protected species. Other species beyond those listed are not considered further in this PEA.

3.3.1 Amphibian and Reptiles

The desk study returned records for three species of reptile; grass snake *Natrix helvetica*, slow worm *Anguis fragilis*, common lizard *Zootoca vivipara* and one species of amphibian, common toad *Bufa bufo*. No records of notable reptiles or amphibians were returned from within the Scheme Area.

The Scheme provides some potential suitable habitat for amphibians and reptiles. These are in the gardens of house owners, especially where compost heaps are present. In addition, saltmarsh habitat can support amphibians and reptiles.

No desk study records within 2km of the Scheme identify great crested newt *Triturus cristatus* and, given the lack of standing water, it is considered unlikely that the species is present within the Scheme Area.

3.3.2 Badger

There are no records of badger *Meles meles* within 2km of the Scheme.

During the survey no features and/ or evidence of badger was found. The Scheme does not offer any sett potential but does offer foraging potential on amenity grassland, although this is limited due to the isolation of habitats within a built environment. The species is considered absent from the Scheme Area.

3.3.3 Bats

The desk study returned twenty-five records of bats (as shown in Table 3-2) from within 2km of the Scheme Area. The desk study identified a number of bat records pre 2014 from in and around the castle Grid Reference SN 17754 45924, approximately 0.06km north of the Scheme Area.

Table 3-2 Bat records within 2km of the Scheme Area.

Scientific Name	Common name	Number of records	Date of most recent records	Distance and Direction
<i>Plecotus auritus</i>	Brown Long-eared Bat	3	30/07/2020	1.19km west
<i>Myotis</i>	Unidentified Bat	1	12/07/2014 - 18/07/2014	1.66km south
<i>Pipistrellus</i>	Pipistrelle	3	24/02/2019	0.3km north
<i>Pipistrellus pygmaeus</i>	Soprano Pipistrelle	5	30/07/2020	0.17km north
<i>Rhinolophus ferrumequinum</i>	Greater Horseshoe Bat	1	09/06/2015	1.21km west
<i>Myotis nattereri</i>	Natterer's Bat	1	12/07/2014 - 18/07/2014	1.67km south
<i>Nyctalus noctula</i>	Noctule Bat	4	09/09/2016	0.17km north
<i>Eptesicus serotinus</i>	Serotine	2	30/07/2020	1.31km west
<i>Myotis mystacinus/brandtii</i>	Whiskered/Brandt's Bat	1	12/07/2014 - 18/07/2014	1.66km south
<i>Pipistrellus pipistrellus</i>	Common Pipistrelle	8	30/07/2020	0.16km north

Specific roost data was not provided during the desk study however where records included comments containing the words roost, roosting or emerging, it was presumed that these were areas of confirmed roosts (as shown in Table 3-3).

Table 3-3 Bat roosts within 2km of the Scheme Area

Species Roosting	Grid Reference	Date	Description	Distance and direction
Brown long-eared bat, soprano pipistrelle, common pipistrelle	SN164458	30/07/2020	Roosting under south pitch; west end; also signs in bat loft, roosting under raised slate, Roosting at wall tops; various locations	1.33km west
Brown long-eared bat, soprano pipistrelle, Natterer's, whiskered/Brandts, Myotis sp	SN1757444195	12/07/2014 - 18/07/2014	Possible maternity in barn; disperse along tree rich lanes and organic managed farmland	1.66km south
Common pipistrelle	SN1785646120	09/09/2016	Returned to roost beneath fascia of building	0.17km north
Common pipistrelle	SN1787146113	09/09/2016	Returned to roost beneath fascia of building	0.16km north

In addition to the records returned by the record search three other roosts are known to be in close proximity to the Scheme Area:

- Cardigan Castle (15m north of the Scheme) has been a long-term roost for greater horseshoe bats for at least the last 20 years as confirmed by the Cardigan Castle Estate Manager (Dellar, 2024). The site was subject of a NRW licence to modify the roost in 2010 (Crompton, 2016) and has been regularly monitored since. The roost regularly hosts hibernation for up to 5 bats within the winter (including winter 2024/25). The roost has also been known to be intermittently used by individual and small numbers of bats in the summer months, although this activity level had dropped in summer 2024. The lesser horseshoes roost within the basement of main castle building on its northern side (approx. 70m north of the Scheme Area). Limited survey information is available for how the bats enter and leave the castle grounds but is suspected that the bats follow the main drive from the house (located to the east of the main house) using the hedgerows walls and large ash, before crossing Strand between Cardigan Bridge and Cardigan Bathroom centre and joining the River Teifi before moving out into the wider countryside (Crompton, 2024). The street lighting on Strand has been recently (within the last couple of years) changed to white LED and there may have had a detrimental influence on summer activity levels. This effect is likely to be exacerbated by the upcoming felling of the large mature ash tree on the castle walls (required due to safety concerns) (Dellar, 2024).
- One of the outbuildings at Cardigan Castle is also suspected to be a pipistrelle maternity roost (Dellar, 2024). This building is located approximately 70m north of the proposed Scheme Area.
- The former hospital building approximately 80m northeast of the Scheme Area is a confirmed roost for individual brown long eared bat and low numbers of soprano pipistrelle bats (Ceredigion County Council, 2021).

Potential roost habitats and features across the Scheme include broadleaved scattered trees and buildings (residential properties, commercial buildings) and the sides and underside of the west and east bridges that bound the survey area and the highway wall which forms part of the Scheme.

The roost suitability for trees, buildings, and groups of buildings determined by the surveys in 2021, 2023 and 2024 are summarised Table 3-4 and should be read in conjunction with Drawing number: 4021883-BUK-ZZ-00-DR-EN-00001. The Binnies report and Just Mammals 2023 reports were both produced prior to the release of the latest edition of the bat survey guidance (Collins, 2023). This updated edition of guidance included changes to the classification process of tree suitability for bats and this is reflected in the table below.

Table 3-4 Bat Roost Potential of Structures/ Trees

Building ref (G=Group; B=single building; T=Tree)	Description	2021 Bat Roost Potential (Binnies UK Ltd, 2023)	2023 Bat Roost Potential (Just Mammals Ltd, 2023)	Roost Potential updated to match (Collins, 2023)
T1	Immature tree with no potential roosting features present.	Negligible	Not surveyed	None
T2	Immature tree with no potential roosting features present.	Negligible	Not surveyed	None
T3	Pear <i>Malus</i> sp. tree within amenity grassland with limited bat roosting potential. There is a shallow gap that is open to the elements at 1m in height from the base of the tree, but this is exposed and therefore of low bat roost potential.	Low	Low	PRF-I
T4	Mature laburnum <i>Laburnum anagyroides</i> tree with shallow, exposed cavity 1m from the ground.	Low	Low	PRF-I
T5	Mature holly tree <i>Ilex aquifolium</i> has undergone recent pollarding, no cavities present.	Moderate	Negligible	None
T8	Mature apple tree <i>Malus</i> sp., no cavities present.	Not surveyed	Negligible	None
Existing river wall	Wall is constructed in stone, which in places is degraded with visible cavities. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer. At the time of the surveys (2021 and 2024) access was not available to inspect the structure thoroughly so provisionally placed as Moderate suitability for roosting bats.	Not surveyed	Not surveyed	Moderate
Cardigan Bridge (Castle Street)	18 th Century stone-built road bridge, with multiple arches over the River Teifi. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer. At the time of the survey	Not surveyed	Not surveyed	Moderate

Building ref (G=Group; B=single building; T=Tree)	Description	2021 Bat Roost Potential (Binnies UK Ltd, 2023)	2023 Bat Roost Potential (Just Mammals Ltd, 2023)	Roost Potential updated to match (Collins, 2023)
	access was not available to inspect the structure thoroughly so provisionally placed as Moderate suitability for roosting bats. The bridge did show some potential cavities in the stonework of the bridge piers on the western side.			
G1	Four buildings with stone wall facing. Some new roofing but some with older roofing that has some bat roost potential.	Moderate	Not surveyed	Moderate
G2	Two storey residential buildings with pitched roofing. Generally in good condition with some buildings with gaps in wooden soffit boards and loose roof slates which could allow ingress to bats.	Moderate	Moderate	Moderate
G3	Two storey buildings of early-mid 20th century origin with pitched roofing. Varying house sizes and external features but some have features that may allow access to bats (such as loose soffit boards, loose roof tiles).	Moderate	Not surveyed	Moderate
G4	Two storey building with modern façade and new roofing. One gap in soffit boarding offering potential for day roosting.	Low	Not surveyed	Low
G5	Two storey buildings of early-mid 20th century origin with pitched roofing. Traditional stone construction. Varying house sizes and external features but some have features that may allow access to bats (such as loose soffit boards, loose roof tiles)	Moderate	Not surveyed	Moderate
G6	Modern buildings with plastic soffits and in good condition.	Negligible	Not surveyed	Negligible
G7	Group of mature yew trees within the churchyard. Trees were in good condition but unable to inspect canopy branches due to density of foliage.	Low-high	Not surveyed	PRF-M
B1	Disused hospital building. Confirmed roost for individual brown long eared bat, low numbers of soprano pipistrelle bats (Ceredigion County Council 2021). Building is disused and lots of loose flashing. Gaps in vents. Missing slates.	Confirmed roost	Not surveyed	Confirmed roost
B2	Two story building with modern façade and new roofing. No potential roosting features present.	Negligible	Not surveyed	Negligible
B3	Large single-story garage with breeze block wall and tin roof. No potential roost features recorded.	Negligible	Not surveyed	Negligible

Building ref (G=Group; B=single building; T=Tree)	Description	2021 Bat Roost Potential (Binnies UK Ltd, 2023)	2023 Bat Roost Potential (Just Mammals Ltd, 2023)	Roost Potential updated to match (Collins, 2023)
B4	Caerhuan, Church Street. Modern mid-20th century building.	Low	Moderate	Moderate
B5	Teifi House, Strand. Traditional stone. Well maintained with slate roof.	Low	Moderate	Moderate
B6	Outbuilding. Breeze blocks with wood cladding. Well-sealed. The structure was inaccessible at the time of the surveys. Pre-cautionary low as a result. The building is constructed above an areas of dilapidated river defense wall.	Negligible	Not surveyed	Low
B7	Scout hut, Strand. Gaps inside and on tiles outside. Concrete panel built with interlocking concrete ridge tiles.	High	Low	Low
B8	The Smithy and Cardigan Bay Active. The Smithy is brick walls and tin roof (Moderate suitability). Cardigan Bay Active is a large corrugated metal shed (negligible). Some small gaps to underside of flashing and joins could allow summer roosting.	Low	Moderate	Moderate
B9	Metal storage building. Building with no roosting potential.	Negligible	Not surveyed	Negligible
B10	Metal storage building. Building with no roosting potential.	Negligible	Not surveyed	Negligible
B11: Previously listed as B10 (Just Mammals Ltd, 2023)	Presbytery, Strand. detached, modern concrete blockwork structure with slate and composite tile roof.	Moderate	Moderate	Moderate
B12	Cardigan Bathroom Centre, Riverside Showrooms. Wood clad building with tight fitting soffits. Some loose flashing on seaward side but only in two places. Summer roosting potential.	Low	Moderate	Moderate
B13	6 Church Street. Old stone walled house with some tiles on roof upturned.	Moderate	Moderate	Moderate
B14	Traditional stone fronted property with vegetation covering join between the roof and walls. Unable to fully assess so given a precautionary bat roost potential of moderate.	Moderate	Not surveyed	Moderate
B15	Small traditional stone building with slate roof. Small gaps seen to top of gable wall could provide access.	Moderate	Not surveyed	Moderate

Additionally, open habitats (such as running water, saltmarsh) were noted to provide suitable commuting and foraging opportunities for bats. The River Teifi is likely to provide a significant connecting corridor of habitat into the wider area.

3.3.4 Birds

Records for 41 species of protected and notable species of birds were returned from within the past 10 years within 2km of the Scheme Area during the desk study. Full details of species and designations can be found in Table 3-5. Records for 20 species protected under Schedule 1 of the Wildlife and Countryside Act were returned. These species, their nest and eggs are all provided legal protection and cannot be destroyed, damaged and/or disturbed.

No bird records were returned from within the Scheme Area. Although records came from all around the Scheme Area, most records were concentrated to the salt marsh habitats affiliated with the Afon Teifi (SSSI, SAC) to the southeast of the Scheme Area.

Table 3-5 Protected and Notable Species of Birds within 2km of the Scheme Area

Scientific Name	Common Name	Number of records	Status ²
<i>Limosa lapponica</i>	Bar-tailed Godwit	2	BDir1, BDir22, S7, WBR(RSPB), LBAP, UKBAm(RSPB)
<i>Chroicocephalus ridibundus</i>	Black-headed Gull	82	BDir22, WCA 7, WBR(RSPB), UKBAm(RSPB)
<i>Limosa limosa</i>	Black-tailed Godwit	25	BDir22, WCA1.1, WBAm(RSPB), UKBR(RSPB)
<i>Luscinia svecica</i>	Bluethroat	1	BDir1, WCA1.1, Bern
<i>Cettia cetti</i>	Cetti's Warbler	62	WCA1.1,
<i>Regulus ignicapilla</i>	Common Firecrest	1	WCA1.1, Bern WBAm(RSPB)
<i>Emberiza schoeniclus</i>	Common Reed Bunting	49	WCA7, Bern, LBAP, WBAm(RSPB), UKBAm(RSPB)
<i>Cuculus canorus</i>	Cuckoo	1	S7, WBR(RSPB), UKBR(RSPB)
<i>Numenius arquata</i>	Curlew	83	BDir22, S7, WBR(RSPB), , UKBR(RSPB)
<i>Prunella modularis</i>	Dunnock	86	S7, Bern, , UKBAm(RSPB)

² Key to Status

BDir 1	- The Birds Directive Annex 1
BDir 22	- The Birds Directive Annex 22
WCA 1.1	- Wildlife and Countryside Act Schedule 1
WCA 9	- Wildlife and Countryside Act Schedule 9
S7	- Environment (Wales) Act Section 7
Bern	- Bern Convention
CITES	- Convention on International Trade in Endangered Species of Wild Fauna and Flora
LBAP	- Local Biodiversity Action Plan
UKBR(RSPB)	- UK Bird Red list Red
UKBAm (RSPB)	- UK Bird Red list Amber
WBR(RSPB)	- Welsh Bird Red list
WBAm(RSPB)	- Welsh Bird list Amber

Scientific Name	Common Name	Number of records	Status ²
<i>Pyrrhula pyrrhula</i>	Eurasian Bullfinch	72	S7, WBR(RSPB), LBAP UKBAm(RSPB)
<i>Alauda arvensis</i>	Eurasian Skylark	4	BDir22, S7, LBAP, WBAm(RSPB), UKBR(RSPB)
<i>Numenius phaeopus</i>	Eurasian Whimbrel	6	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)
<i>Larus argentatus</i>	European Herring Gull	103	BDir22, S7, WBR(RSPB), , UKBR(RSPB)
<i>Ficedula hypoleuca</i>	European Pied Flycatcher	1	S7, WBR(RSPB), , UKBR(RSPB)
<i>Turdus pilaris</i>	Fieldfare	4	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)
<i>Bucephala clangula</i>	Goldeneye	23	BDir22, WCA1.2, , UKBAm(RSPB)
<i>Locustella naevia</i>	Grasshopper Warbler	2	S7, WBR(RSPB),, UKBR(RSPB)
<i>Tringa ochropus</i>	Green Sandpiper	4	WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)
<i>Tringa nebularia</i>	Greenshank	5	BDir22, WCA1.1, LBAP, UKBAm(RSPB)
<i>Falco subbuteo</i>	Hobby	1	WCA1.1, Bern, CITES,
<i>Passer domesticus</i>	House Sparrow	66	S7, , WBAm(RSPB), UKBR(RSPB)
<i>Alcedo atthis</i>	Kingfisher	57	BDir1, WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)
<i>Vanellus vanellus</i>	Lapwing	15	BDir22, S7, WBR(RSPB), UKBR(RSPB)
<i>Acanthis cabaret</i>	Lesser Redpoll	2	S7, LBAP (CON), , WBAm(RSPB), UKBR(RSPB)
<i>Linaria cannabina</i>	Linnet	4	S7, Bern, WBR(RSPB), LBAP UKBR(RSPB)
<i>Poecile palustris</i>	Marsh Tit	6	S7, Bern, WBR(RSPB), , UKBR(RSPB)
<i>Ichthyaetus melanocephalus</i>	Mediterranean Gull	2	BDir1, WCA1.1, Bern, WBAm(RSPB), UKBAm(RSPB)
<i>Falco peregrinus</i>	Peregrine	5	BDir1, WCA1.1, Bern, CITES, LI(VC43)
<i>Anas acuta</i>	Pintail	1	BDir21, WCA1.2, CITES, , WBAm(RSPB), UKBAm(RSPB)
<i>Milvus milvus</i>	Red Kite	18	BDir1, WCA1.1, WCA9, CITES, , WBAm(RSPB)
<i>Turdus iliacus</i>	Redwing	15	BDir22, WCA1.1, P, WBAm(RSPB), UKBR(RSPB)
<i>Aythya marila</i>	Scaup	1	BDir22, WCA1.1, , WBAm(RSPB), UKBR(RSPB)
<i>Turdus philomelos</i>	Song Thrush	63	BDir22, S7, Bern, LBAP, WBAm(RSPB), UKBR(RSPB)
<i>Porzana porzana</i>	Spotted Crake	2	BDir1, WCA1.1, Bern, , WBAm(RSPB), UKBAm(RSPB)
<i>Sturnus vulgaris</i>	Starling	35	BDir22, S7, Bern, WBR(RSPB), , UKBR(RSPB)

Scientific Name	Common Name	Number of records	Status ²
<i>Tyto alba</i>	Western Barn Owl	2	WCA1.1, WCA9, Bern, CITES,
<i>Circus aeruginosus</i>	Western Marsh Harrier	1	BDir1, WCA1.1, CITES, , WBAm(RSPB), UKBR(RSPB), UKBAm(RSPB)
<i>Cygnus cygnus</i>	Whooper Swan	1	BDir1, WCA1.1, Bern, UKBAm(RSPB)
<i>Poecile montanus</i>	Willow Tit	1	S7, Bern, WBR(RSPB), UKBR(RSPB)

The wintering bird surveys conducted in winter 2022/23 (Wyndrush Wild, 2023a) found:

"The section between the two bridges, and downstream to the Lower Quay (Gloster Row) car park, has limited exposed mud and this is reflected in the small number of birds recorded here. The muddy banks opposite and to the west of the (Gloster Row) car park are used by small numbers of ducks, waders and gulls."

"The site is used by a small number of waders, mostly at low tide. The muddy shore alongside the Shampin restaurant to the west of Lower Quay Street Car-park was occasionally used by one or two redshank and curlew, and a small flock of dunlin on one occasion. The opposite shore here was also used by one or two redshank and curlew, as was the exposed shore just to the west of Priory Bridge. The north shore opposite the WTSWW reserve held one or two redshank, curlew, black-tailed godwit and bar-tailed godwit. Very few waders were present on high-tide counts, and no significant roosts were present."

Teal was the most numerous duck from November onwards, with the most significant flocks in the eastern part of the site. Smaller numbers were associated with the patch of reed just to the east of Castle (Cardigan) Bridge, and the shore opposite Lower Quay Car-park. Mallard numbers were more constant, with flocks focussed on the northern shore at or beyond the eastern boundary of the survey site, and on the southern shore opposite Lower Quay Car-park."

"Flocks of herring and lesser black-backed gull were encountered in or alongside the channel by the WTSWW reserve, and in the channel downstream of Lower Quay Car-park. A single greater black-backed gull was also recorded at the latter location on one occasion, whilst three common gulls were recorded once at the former location. Black-headed gulls were more widely distributed across the site, but Lower Quay Car-park was a favoured location, as well as the channel to the east of Priory Bridge. A small number of Mediterranean gulls were associated with the black-headed gulls in the autumn months, but not later in the winter."

Other waterfowl seen included one or two kingfishers, grey herons, little egrets and a small number of cormorants."

The lower reaches of the Teifi hold larger numbers of waterfowl, but annual Welsh Bird Reports compiled by the Welsh Ornithological Society, and recent records posted on the Teifi Birding and Wildlife Blog, indicate that these are still well below significance thresholds. However, the site does support small numbers of 6 species on the UK red-list, and 12 on the amber-list. The site can therefore be considered to be of local significance for its wintering bird populations. The eastern part of the site, alongside the Teifi Marshes reserve (Afon Teifi SAC and SSSI), holds the greatest diversity and number of birds."

The Breeding bird survey conducted in 2023 (Wyndrush Wild, 2023b) found:

"There is very little potential for breeding birds in the constrained intertidal area between the bridges (the Scheme Area)"

"The section between the two bridges, and downstream to the Lower Quay (Gloster Row) car park, has limited exposed mud and this is reflected in the small number of birds recorded here. The muddy banks opposite and to the west of the (Gloster Row) car park are used by small numbers of ducks, waders and gulls."

"A single singing reed warbler was heard in the small reed area immediately west of Priory Bridge. Family parties of Canada goose, mute swan, mallard and blackbird with fledged young were noted here. Adjoining bushes or trees such as those to the south of the churchyard had territories of species such as greenfinch, goldfinch, song thrush and wren. House sparrow was associated with buildings here. Swifts and hirundines fed over the site."

In summary breeding and wintering birds surveys carried out on the Scheme Area found that although the Scheme Area contains HPI habitats of interest for birds, the suitability is limited by their size and proximity to human disturbance and therefore it is unlikely to provide suitable conditions for substantial numbers of rare or notable birds.

3.3.5 Fish

Fish data was provided by NRW, which confirms that the catchment supports significant populations of migratory fish such as Atlantic salmon, brown/ sea trout, eel, sea and river lamprey. These species must pass through the estuary and along the Scheme extents to complete their lifecycle. The SAC, which is located within the Scheme, is designated for fish species including sea lamprey and Atlantic salmon.

Fish monitoring data provided by NRW included two records of lamprey individuals in the vicinity of the Scheme in 2008 and 2014. However, the NRW fish counter data suggest that lamprey presence in the Teifi is more significant than the data from the vicinity of the Scheme suggest (Jason Jones (NRW) pers. comm., 2023).

Data provided by NRW indicated that two Atlantic salmon individuals were recorded during surveys of the Teifi between 2007 and 2021. However, reported rod catches on the Teifi are higher and in 2021 catches were 31 for grilse and 28 for multi sea winter adults (Cefas / EA / NRW, 2022). The assessment for salmon stocks in England and Wales, undertaken jointly by Cefas, NRW and the Environment Agency (Cefas / EA / NRW, 2022) reported that the returning stock estimates for the majority of rivers was lower in 2021 than the five year mean, and for the Afon Teifi the 2021 estimate was the lowest recorded in the time series (since 2010). There has been a general decline in returning stock estimates in the Afon Teifi over this period.

3.3.6 Invasive Non-native Species

Records for six Invasive Non-Native Species (INNS) were returned from within 2km of the Scheme Area. This included one record of butterfly bush *Buddleja davidii* recorded within the Scheme Area, one record of cherry laurel *Prunus laurocerasus* 0.56 km north of the Scheme Area, four records of grey squirrel *Sciurus carolinensis* with the closest record 0.86 km southeast of the Scheme Area, eighty-one records of Canada geese *Branta canadensis* with the closest and majority of records occurring 0.63 km southeast of the Scheme Area, one record of bar-headed goose *Anser indicus* occurring 1.13km southeast of the Scheme Area and one record of Japanese knotweed *Reynoutria japonica* occurring 1.29km southeast.

No invasive species were recorded during the field survey within the Scheme and it is considered that the Scheme is currently absent of invasive non-native species.

3.3.7 Invertebrates

The desk study returned records for 23 species of protected and notable species of moths and butterflies as shown in Table 3-6. No other records protected, or notable species of invertebrates were returned. No records were returned from within the Scheme Area.

During the survey, the running water, saltmarsh and intertidal mudflats within the Scheme and wider landscape were considered to provide suitable habitat for terrestrial and aquatic invertebrates.

Table 3-6 Protected and notable species of Butterfly and Moth with 2km of the Scheme Area

Scientific Name	Common Name	No. of Records	Designations ³
<i>Eugnorisma glareosa</i>	Autumnal Rustic	3	S7
<i>Timandra comae</i>	Blood-vein	2	S7
<i>Thecla betulae</i>	Brown Hairstreak	23	WCA5, S7, RDB1 (UK) - VU
<i>Agrochola litura</i>	Brown-spot Pinion	6	S7
<i>Spilosoma lutea</i>	Buff Ermine	3	S7
<i>Atethmia centrargo</i>	Centre-barred Sallow	2	S7
<i>Tyria jacobaeae</i>	Cinnabar	9	S7
<i>Melanchra persicariae</i>	Dot Moth	1	S7
<i>Apamea remissa</i>	Dusky Brocade	1	S7
<i>Ennomos fuscantaria</i>	Dusky Thorn	4	S7
<i>Agrochola helvola</i>	Flounced Chestnut	6	S7
<i>Arctia caja</i>	Garden Tiger	4	S7
<i>Acronicta rumicis</i>	Knot Grass	1	S7
<i>Malacosoma neustria</i>	Lackey	4	S7
<i>Rhizedra lutosa</i>	Large Wainscot	3	S7
<i>Hydraecia micacea</i>	Rosy Rustic	7	S7
<i>Cirrhia icteritia</i>	Sallow	2	S7
<i>Scotopteryx chenopodiata</i>	Shaded Broad-bar	3	S7
<i>Coenonympha pamphilus</i>	Small Heath	3	S7, RDB1 (UK) - NT
<i>Ecliptopera silaceata</i>	Small Phoenix	1	S7
<i>Lasiommata megera</i>	Wall	7	S7, RDB1 (UK) - NT

³ Key to Status

S7	- Environment (Wales) Act Section 7
RDB1 (UK) – VU	- British Red Data Book 1 -Vulnerable
RDB1 (UK) – NT	- British Red Data Book 1 – Near Threatened
Binnies UK Limited	
Project no. 4021883	

Scientific Name	Common Name	No. of Records	Designations ³
<i>Spilosoma lubricipeda</i>	White Ermine	6	S7
<i>Diarsia rubi</i>	Small Square-spot	2	S7

3.3.8 Marine Mammals

The desk study returned no records of marine mammals from the past 10 years within 2km of the Scheme Area.

Bottlenose dolphin (protected in the UK under the Wildlife and Countryside Act, 1981) is a feature of the Cardigan Bay SAC. The dolphins use the inshore coastal waters for both feeding and reproduction. They have been recorded in the outer estuary but there is no evidence of their occurrence further upstream (NBN Atlas Wales, 2023; Marine Planning Portal Wales, 2023).

Grey seal is a feature of the Cardigan Bay SAC. They have been recorded in the outer estuary but there are no records further upstream in the vicinity of the Scheme Area (NBN Gateway 2023; Wales Marine Planning Portal 2023). The nearest haul out site is over 4 km from the Scheme Area at Ogof Groyn in the outer estuary. As such, it is considered highly unlikely that grey seal would be present in the Scheme Area.

Harbour porpoise is a feature of the West Wales Marine SAC and have been recorded in the inshore waters of the outer estuary. However, the encounter rate in this area is very low (0.038 animals per hour) and more important areas are known further west and offshore where encounter rates are significantly higher (3.7 – 4.7 animals per hour) (Wales Marine Planning Portal 2023). There are no records of harbour porpoise further upstream in the Teifi river (NBN Atlas Wales 2023). As such, it is considered highly unlikely that harbour porpoise would be present in the Scheme Area.

As a result, marine mammals are considered absent from the Scheme Area.

3.3.9 Notable Plant Species

No records of notable plant species were highlighted by the desk study. However, floating water-plantain *Luronium natans* is listed as an Annex II species that is a primary reason for selection of the site as part of the Afon Teifi SAC. This species has been recorded in the nutrient-poor standing waters of the Teifi pools in the headwaters of the river. It has also been recorded in a moderately nutrient-rich stretch of the river immediately downstream of Cors Caron (approximately 94km upstream of Cardigan). The running water habitat located within the Scheme is in the estuarine and tidal, with deep water that is unsuitable to support this species. The species is present further upstream in water with less tidal pressure and less salinity but is considered absent within the Scheme and not considered further.

The ecological surveys carried out to inform this PEA did not record any notable plant species.

3.3.10 Otter

Seven records of otter were returned from within the 2km search radius of the Scheme Area with the most recent record occurring in 2018 0.94km southeast of the Scheme Area. No information regarding holts or resting places were provided with the records. All returned

records occurred within the Afon Teifi and affiliated salt marshes. The SAC, which is located within the Scheme, is designated for otter.

There is a regular otter breeding on the Teifi Marshes upstream of the proposed Scheme. During an inspection of the scout's boat shed in 2014 by NRW, repeated spraints were observed on a pile of old canvas. A camera trap was set for a period of 9 weeks from 25th July through to 2nd October 2014 to determine if there was still otter usage, but only cats were observed (JBA, 2020). It was considered that due to regular disturbance it is highly unlikely the shed supports breeding otter, but it is possible that the shed provides a resting place.

During the survey, running water and associated bank habitats (saltmarsh) within the Scheme and wider landscape were considered to provide suitable habitat for commuting, foraging and resting otter. No suitable holt sites were identified during the survey. The shed was inspected, and no otter field signs were noted. The intertidal mudflats and saltmarsh are prone to regular changes in water height and as such do not provide suitable holt locations. In addition, the housing properties set back from the existing flood wall are regularly disturbed with limited cover opportunities for the species. The Scheme Area and immediate surrounds is unlikely to support natal holts for otter due to it being on the main river.

In conclusion the Scheme Area provides suitable habitat for commuting, foraging and resting otter, but is unlikely to be used as a holt location.

3.3.11 Water Vole

There are no records for water vole within 2km of the Scheme.

During the survey, running water and associated banks within the Scheme and wider landscape were considered to provide negligible potential to support water vole. This is because the tidal influence along the Scheme generates currents too strong to support the species. Water vole is therefore considered absent from the Scheme

3.3.12 West European Hedgehog

Habitats present within the Scheme that could be utilised by hedgehog include the gardens of residential properties. However, no continuous hedge lines or habitat lines were noted, which are preferred by hedgehog. Therefore, although the Scheme Area is considered to be sub-optimal for this species there is still suitability for this species.

4 Discussion

This part of the report considers the potential effects on designated sites, protected and/ or notable species and habitats due to the Scheme. Further surveys, assessment and methods of working may be identified to enable suitable mitigation to be designed to comply with relevant legislation.

4.1 Designated Sites

4.1.1 Statutory Designated Sites

There are four statutory designated sites within 2km of the Scheme, with two of these partially within the Scheme and one hydraulically linked to the site. These are discussed further below.

Part of the Afon Teifi SAC is located within the Scheme extents.

Part of the Afon Teifi SSSI is located within the Scheme extent.

Teifi Estuary Woodlands & Marshes SSSI and Coedmor NNR are located 1.1km away from the Scheme and are hydrologically linked with the Afon Teifi SSSI. There is a hydrological link between the Scheme Area as the SSSI and NNR are within the tidal range of the Teifi estuary. However, the distance between the Scheme Area and the sites, mean that impacts are considered unlikely.

As there is potential for designated sites to be impacted by the Scheme, further mitigation measures are provided in Section 5.

4.2 Habitats and Flora of Principal Importance

Habitats of Principal Importance ('HPIs') recorded within the Scheme are:

- Intertidal mudflats; and
- Saltmarsh

4.2.1 Intertidal Mudflats

Intertidal mudflats HPI are present within the Scheme Area.

The habitat at Cardigan is dynamic, reliant on silt deposition as a result of river and tidal flow. The habitat is transitional with drier areas transitioning to saltmarsh, whilst new areas of mudflat will be created by river silt deposition and scouring of the saltmarsh habitat by river or tidal action.

The Scheme, particularly the construction of the flood defence wall and associated embankment, will result in the partial permanent loss of part of this habitat. The works will also involve disturbance to the retained mudflats risking destabilisation.

As the habitat will be impacted by the Scheme, further mitigation/ recommendations for effective management are provided in Section 5.

4.2.2 Saltmarsh

Saltmarsh HPI is present within the Scheme Area.

The habitat at Cardigan is dynamic, reliant on silt deposition as a result of river and tidal flow. The habitat is interconnected with the mudflat, and will change in extent based on river silt deposition and scouring of the habitat by river or tidal action.

The majority of the saltmarsh recorded in the 2024 survey is outside of the proposed working area. However, the Scheme will result in temporary loss/damage of this habitat in the Gloster Row Car Park construction area adjacent to the new flood defence. The works will also involve disturbance to the retained saltmarsh risking destabilisation.

As this habitat will be impacted by the Scheme, further mitigation/ recommendations for effective management are provided in Section 5.

4.3 Other Habitats of Biodiversity Interest

4.3.1 Running Water

One surface watercourse (Afon Teifi) is present within the Scheme and forms part of the Afon Teifi SAC/ SSSI. At the Scheme location the Afon Teifi is tidally influenced with associated saltmarsh habitat communities fringing the watercourse. Water flow varies with time of day and no vegetation was observed growing within the watercourse. The banks of the river in the Scheme Area have been heavily modified with the addition of man-made bank reinforcements and slipways. Beyond the additional flood protection to Cardigan, the new defence will not affect the natural tidal processes of the Afon Teifi.

Impacts to the river itself will be largely temporary for the duration of the construction period and as a result specific mitigation or compensation measures for running water habitats are not discussed further. Instead the General Good Practice Measures shown in Section 5.3.1 are considered sufficient to prevent impacts on this habitat type.

4.3.2 Broadleaved Scattered Trees

The intention of the Scheme is to retain existing trees wherever possible, however it is likely that individual trees will likely require removal due to their close proximity to the new flood defence line.

As this habitat will be impacted by the Scheme, further mitigation/ recommendations for effective management are provided in Section 5.

4.3.3 Poor Semi-improved Neutral Grassland

There are two main areas of semi-improved grassland within the Scheme Area that will be affected.

- A strip of poor-semi improved grassland on the steep bank between Cardigan Bridge and Cardigan Bathroom Centre will be permanently lost as a result of the construction.
- There is a potential loss of semi-improved natural grassland to the east of Gloster Row car park. The loss of grassland will need to be compensated elsewhere (discussed

further in Section 5.3.3). As this habitat will be impacted by the Scheme, further mitigation/ recommendations for effective management are provided in Section 5.

4.3.4 Amenity Grassland

A strip of the existing amenity grassland adjacent to the existing flood defence within the former foundry site will be lost as a result of the construction. There is the potential for further impacts in this area due to construction of an up and over to maintain access to the river.

As this habitat will be impacted by the Scheme, further recommendations for effective management are provided in Section 5.

4.4 Protected, Notable and Species of Principal Importance

4.4.1 Amphibian and Reptiles

There are four reptile and amphibian species records within 2km of the Scheme; common toad, slow worm, grass snake and common lizard. The Scheme provides suitable foraging, commuting, refuge, basking, and breeding habitat for reptiles, which include saltmarsh and residential gardens. Potential impacts from the Scheme from noise and vibration (piling) and habitat loss could occur.

There is no suitable breeding habitat for amphibians within the Scheme Area or in the immediate surrounds. However, the site does provide suitable terrestrial foraging and refugia habitat for amphibians.

Given the historical records and habitat suitability found during the survey, amphibians reptiles are likely to be present within the Scheme. Therefore, mitigation measures are recommended and detailed in Section 5.

4.4.2 Bats

The historic data search identified a significant number of confirmed roosts within a 2km radius of the Scheme. This included known roosts at Cardigan Castle and the former hospital site within 100m of the Scheme Area.. In addition to the noise and vibration impacts the potential roost features identified by the surveys in the existing river wall will be lost because of the construction of the defence.

Given the habitat suitability and features found during the survey, bats are likely to be present within the Scheme. Therefore, further surveys, mitigation measures are recommended and detailed in Section 5.

4.4.3 Birds

Breeding and wintering birds surveys carried out on the Scheme Area found that although the Scheme Area contains HPI habitats of interest for birds, the suitability is limited by their size and proximity to human disturbance and therefore it is unlikely to provide suitable conditions for substantial numbers of rare or notable birds.

The habitats within the Scheme are likely to be utilised by small numbers of birds for breeding and wintering, and the habitat forms part of a buffer to the larger Teifi Marshes Nature Reserve. Therefore, mitigation measures are recommended and detailed in Section 5.

4.4.4 Fish

There are numerous records returned for fish within 2km of the Scheme, including species such as brown trout, sea trout, Atlantic salmon, bullhead, sea and river lamprey. Also, the Scheme is located within the SAC extents, and is designated for fish species including sea lamprey and Atlantic salmon.

Given the SAC designation and habitat suitability found during the survey (running water), fish (including bullhead and river lamprey) are likely to be present within the Scheme. Potential impacts from the Scheme from noise and vibration (piling) and habitat loss through flood wall construction could occur, which has the potential to impact fish. Therefore, mitigation is recommended as detailed in Section 5.

4.4.5 Invasive non-native Species

There were no INNS observed in the Scheme Area during the survey.

Given the Scheme is located on a riparian corridor and is frequently used by the public there is a risk that INNS could colonise/ be brought into the Scheme Area before construction commences. Therefore, mitigation measures are recommended and detailed in Section 5.

4.4.6 Invertebrates (Terrestrial and Aquatic)

Although no aquatic invertebrates and invertebrates associated with intertidal mudflats/ saltmarsh have been noted during the desk study phase, the potential for a diverse aquatic/ saltmarsh/ intertidal mudflat community exists within the Scheme extents.

Potential impacts from the Scheme from noise and vibration (piling) and temporary habitat loss are unlikely to have a significant long term effect on invertebrate diversity in the area.

The scheme is likely to result in a long term loss of saltmarsh habitat, which would have the potential to impact invertebrate diversity on site. However, in the context of the estuary this small area is unlikely to significantly affect local populations. Further mitigation measures for loss of the saltmarsh, which would also provide mitigation for invertebrates, are included in Section 5. No specific further survey is recommended for invertebrates.

4.4.7 Otter

There are records for otter presence within 1km of the Scheme but with no holt records. The Scheme Area provides suitable foraging, commuting, and resting habitat for otter. Holt creation opportunities were limited, and it is considered that otter holts are absent from the Scheme. Potential impacts from the Scheme from noise and vibration (piling) and habitat loss could occur, which has the potential to impact otter. Therefore, further survey, mitigation measures are recommended and detailed in Section 5.

4.4.8 West European Hedgehog

Habitats present within the Scheme that could be utilised by hedgehog include the gardens of residential properties. Therefore, mitigation measures are recommended and detailed in Section 5.

4.5 DECC Baseline

National Planning Policy in Wales states that every development must deliver a Net Benefit for Biodiversity (NBB). The assessment below is designed to assist in the achievement of this by presenting a baseline assessment ecosystems current baseline with regards Diversity, Extent, Condition and Connectivity (DECC) of habitats and species. This assessment is based upon the DECCA Framework guidance provided within *Planning Policy Wales Edition 12. Implementing the Section 6 Duty* (Welsh Government, 2024).

4.5.1 Diversity

The Afon Teifi is the primary driver of ecological diversity within the study area (Afon Teifi catchment surrounding Cardigan) providing a natural connective corridor for important species such as otter, salmon, lamprey as well as significant bird populations. The river provides resources for these species at all stages of their life cycle. The river habitat within the immediate surrounds of the Scheme Area are composed of intertidal habitats such as saltmarsh and mudflats which can support important communities of bird and invertebrates. Within the Scheme Area itself the river has been modified, man-made river structures restrict the extent of natural habitats. The intertidal habitat is restricted to a limited corridor adjacent to the existing river wall with urban development built up to the river wall. This limits the area's value for biodiversity, as demonstrated by the limited bird numbers and species diversity observed in this area. Floral diversity of the natural saltmarsh habitat is likely to be similar to that elsewhere in the River Teifi, with the primary limitation being water quality and pollution. The floral diversity of the saltmarsh habitat that has formed on the gabion walls is reduced as a result of grassland encroachment, however this is likely to be representative of marginal habitats at the upper portion of the tidal reach elsewhere on the River Teifi.

The urban habitats within the Scheme Area, whilst being of lower biodiversity value than the river, do offer some value. The grassland area adjacent to the Gloster Row car park has been put into a cutting regime to increase its floral diversity and this will have in turn increased its value for invertebrates. The buildings and structures along the river course are considered to have suitability for roosting bats and nesting birds, with a confirmed roost of greater horseshoe bats within Cardigan Castle.

4.5.2 Extent

The phase one survey identified the following habitats that would be considered to fall within the River Teifi SAC and SSSI boundaries (it should be noted that the Phase 1 survey covered a larger area than the extent of the likely Scheme area to allow for potential changes to the design prior to final submission).

- Running water - 1165m²
- Saltmarsh –530m²
- Intertidal Mudflat – 1411m²

For context these the total area of these habitats, represent approximately 0.044% of the total River Teifi SAC area (691.07ha) and 0.039% of the total River Teifi SSSI area (778.18).

In addition to this the following non-estuarine habitats were identified within the Phase 1 study area:

- Scrub – 134m²
- Amenity grassland – 1407m²
- Poor Semi improved grassland – 732m²
- Buildings – 285m²
- Hardstanding – 2443m²

4.5.3 Condition

Of the vegetated habitats recorded within the Scheme Area only one was assessed as being in good condition, intertidal mudflats. However, as this habitat is within the urban area of Cardigan it is at increased risk of two factors that would lower its condition score – INNS presence and litter.

Salt marsh and poor semi-improved grassland were assessed as being in moderate condition with the primary factors lowering their score being lack of species and structural diversity. As with the intertidal mudflats habitats above these habitats are similarly vulnerable due to their urban location.

The dense scrub and amenity grassland habitats were assessed as being in poor condition primarily due to a lack of species and structural diversity.

In the wider study area the Afon Teifi SAC has been found to be in unfavourable condition with the primary negative affect being pollution impacts on water quality (discharge from wastewater treatment, forestry and agricultural run-off, and legacy metal mining pollution) (Goldsworthy, 2023). The salmonid population within the Teifi SAC is considered to be in rapid decline and at risk of extinction within the next 10 years (Goldsworthy, 2023). In addition to water quality the following factors are also considered to pose negative threats and pressures to the conservation status of the SAC (JNCC, 2015):

High Risk

- Invasive non-native species
- Air pollution
- Changes in abiotic conditions

Medium Risk

- Mining and quarrying
- Human induced change in hydrology
- Fishing
- Other human intrusion
- Other ecosystem modification

Low Risk

- Outdoor sports and leisure
- Mowing/cutting of grassland

4.5.4 Connectivity

The Afon Teifi is the primary connective habitat feature within the study area, providing a natural connective corridor for important species such as otter, salmon, lamprey as well as significant bird populations. This is emphasised within *Ceredigion: A Strategy for Greening Towns* (Ceredigion County Council, 2025) that highlights both the Afon Teifi and small woodland areas on tributary streams as the primary habitats of importance to wildlife in Cardigan. Other than these two features Cardigan appears to offer limited connectivity for terrestrial wildlife species as a result of a predominance of urban built habitat. The Afon Teifi also provides a link between significant established hedgerow networks and woodland blocks in the wider landscape, which is likely to make it an important route for species such as bats. In particular, this is likely to be the primary corridor connecting the greater horseshoe roost within Cardigan Castle to the wider landscape.

The primary impacts on connectivity within the study area are likely to be human disturbance and light pollution due the presence of the urban conurbations of Cardigan and St Dogmaels.

5 Recommendations

5.1 Introduction

This section sets out the recommendations on the basis of the Scheme as described in Section 1.3.

The Scheme requires Environmental Impact Assessment (EIA) under both the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 and the Marine Works (Environmental Impact Assessment) Regulations 2017. Biodiversity as a topic has been scoped in for assessment during both construction and operation of the Scheme. Therefore, further assessment of all relevant ecological features will be undertaken through the EIA. The mitigation and compensation measures set out below are based on initial consideration of the potential effects of the Scheme and are likely to develop through the completion of the EIA.

5.2 Further Survey and Assessment Requirements

Further assessment and survey is specifically recommended for the following ecological features.

5.2.1 Designated Sites

Part of the Afon Teifi SAC is located within the Scheme extents. Cardigan Bay and West Wales Marine SAC are located 3.5km downstream of the Scheme and are therefore hydrologically linked. Therefore, an Assessment of Likely Significant Effect ('ALSE') to inform a Habitats Regulation Assessment (HRA) is required to be completed for the Scheme for any works due to be conducted. A shadow HRA was completed by APEM in August 2023 (APEM, 2023). This shadow HRA must be updated to reflect the Scheme design and submitted to the Competent Authority.

Part of the Afon Teifi SSSI is located within the Scheme extents/ SSSI Assent (under the Countryside and Rights of Way ('CRoW') Act) is only required if the Scheme is not subject to planning permission. The Scheme does require planning permission, and therefore no SSSI assent would be necessary.

5.2.2 Broadleaved Scattered Trees

If any trees are to be affected by the works it is recommended that a tree survey is carried out, and the recommendations of the tree survey followed.

5.2.3 Bats

The potential roost features in the existing river wall will be lost because of the construction of the defence. The Scheme also has the potential to disturb bat roosts through vibration and noise as a result of construction (piling and construction works).

Based on previous early contractor engagement it has been assumed that the Scheme will be restricted to low vibration piling and construction methods (due to the close proximity of sensitive structures). Therefore, the impact of noise and vibration will likely be restricted to a 10m radius of the piling line. If this assumption is incorrect, the survey recommendations set out below will need to be revised.

Further survey will be required of all PRFs within the 10m radius of the piling ling to determine conclusively the presence/absence of bat roosts.

In all cases if bats are found during the survey, further survey to establish the population class assessment maybe required.

Table 5-1 Structures/trees requiring further bat survey

Building ref	Description	Roost Potential updated to match (Collins, 2023)	Recommended Survey
T3	Pear <i>Malus</i> sp. tree within amenity grassland with limited bat roosting potential. There is a shallow gap that is open to the elements at 1m in height from the base of the tree, but this is exposed and therefore of low bat roost potential.	PRF-I	Pre-works check by Licensed ecologist
T4	Mature Laburnum <i>Laburnum anagyroides</i> tree with shallow, exposed cavity 1m from the ground.	PRF-I	Pre-works check by Licensed ecologist
Existing river wall	Wall is constructed in stone, which in places degraded with visible cavities. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer. At the time of the surveys (2021 and 2024) access was not available to inspect the entire structure thoroughly so provisionally placed as Moderate suitability for roosting bats.	Moderate	Endoscopic inspection of accessible sections of wall by Licensed ecologist. Followed by Presence/Absence Nocturnal Emergence Surveys. At least 2 visits in the main summer bat activity period (May – September (Including at least one visit June - August)
Cardigan Bridge (Castle Street)	18 th Century stone-built road bridge, with multiple arches over the River Teifi. These will have limited value in winter (due to flood risk), but are likely to offer suitability for roosting bats in summer At the time of the survey access was not available to inspect the structure thoroughly so provisionally placed as Moderate suitability for roosting bats. The bridge did show some potential cavities in the stonework of the bridge piers on the western side.	Moderate	Presence/Absence Nocturnal Emergence Surveys. At least 2 visits in the main summer bat activity period (May – September (Including at least on visit June - August)
B6	Outbuilding. Breeze blocks with wood cladding. Well-sealed. The structure was inaccessible at the time of the surveys. Pre-cautionary low as a result. The building is constructed above an areas of dilapidated river wall.	Low	Presence/Absence Nocturnal Emergence Surveys. At least 1 visit in the main summer bat activity period (May – September)
B7	Scout hut, Strand. Gaps inside and on tiles outside. Concrete panel built with interlocking concrete ridge tiles	Low	Presence/Absence Nocturnal Emergence Surveys. At least 1 visit in the main summer bat

Building ref	Description	Roost Potential updated to match (Collins, 2023)	Recommended Survey
			activity period (May – September)
B8	The Smithy and Cardigan Bay Active. The smithy is brick walls and tin roof (Moderate suitability). Cardigan Bay Active is a large corrugated metal shed (negligible). Some small gaps to underside of flashing and joins could allow summer roosting.	Moderate	Presence/Absence Nocturnal Emergence Surveys. At least 2 visits in the main summer bat activity period (May – September (Including at least on visit June -August)
B11: Listed as B10 in 2023 survey (Just Mammals Ltd, 2023)	Presbytery, Strand. Detached, modern concrete blockwork structure with slate and composite tile roof.	Moderate	Presence/Absence Nocturnal Emergence Surveys. At least 2 visits in the main summer bat activity period (May – September (Including at least on visit June - August)
B12	Cardigan Bathroom Centre, Riverside Showrooms. Wood clad building with well fit soffits. Some loose flashing on seaward side but only in two places. Summer roosting potential.	Moderate	Presence/Absence Nocturnal Emergence Surveys. At least 2 visits in the main summer bat activity period (May – September (Including at least on visit June - August)

5.2.4 Otter

An updated survey for otter field signs, resting areas and holts within 50m of the Scheme Area, should be undertaken to inform the EIA. This should be undertaken with consideration to the previous week's weather conditions, avoiding periods of wet weather and should be undertaken during low tide. If holts or layup areas are observed, then a licence from Natural Resources Wales may be required to legitimise the ongoing works.

5.3 Mitigation and Compensation Measures

5.3.1 General Good Practice Measures

The Scheme has the potential to result in pollution (from fuel oils and increased silt impacting upon the existing watercourses). Therefore, some general good practice measures are recommended. These should be reviewed after the completion of secondary surveys, consultation, and appropriate consents/ permissions:

- Appropriate storage of fuels and chemicals to minimise the risk of accidental spillage and in accordance with CIRIA guidance;
- Pollution control measures in place, such as spill kits and straw bales and in accordance with best practice guidelines: Pollution Prevention Guidelines;
- Siltation control measures must be put in place;
- Protection of trees in accordance with BS 5837:2012 and CIRIA guidance; and

- Best construction practices and environmental management in accordance with the Environmental Damage (Prevention and Remediation) Regulations 2009.

5.3.2 Intertidal Habitats – Saltmarsh and Mudflat

Any direct impacts to Habitats of Principal Importance should be avoided and minimised where possible. The current proposals will result in the temporary and permanent loss of both saltmarsh and intertidal mudflat habitats. Two opportunities have been identified to minimise impacts to intertidal habitats, these comprise:

- Moving the alignment of the defence adjacent to Gloster Row Car Park landwards
- Reducing the footprint of embankments.

As a result of this loss further investigation into the hydrological impacts on saltmarsh/intertidal mudflats to assess the extent of loss, permanence of that loss and establishment time for the newly created saltmarsh habitat. This modelling should then be used to determine the requirement for further mitigation or offsite compensation measures. The primary aim of the Scheme must be to ensure that there is no net loss of habitat function or condition.

5.3.3 Poor Semi-improved Neutral Grassland

If the proposed change in alignment to create additional saltmarsh habitat is adopted, it will result in the loss of poor semi-improved grassland. To compensate for this loss, additional habitat should be created. The simplest means of creating this type of habitat is to improve the floristic value of existing amenity grassland through the changing of mowing regimes, plug planting, re-seeding etc.

The survey area included a significant area of amenity grassland within the former foundry site and if permission could be gained for the appropriate management of this area it could be an ideal compensation area due to its close proximity to the habitat to be lost. There is the potential to integrate the creation of this habitat with provision of the up and over.

5.3.4 Broadleaved Scattered Trees

The intention will be to retain existing trees wherever possible. Where this is the case tree protection measures must be put in place to protect the tree during the construction works.

However, it is likely that individual trees will likely require removal due to their close proximity to the new flood defence line. Any tree lost should be replaced within the Scheme Area at a 3-1 ratio. The new trees should ideally be a mixture of local native varieties with value for wildlife. As this is an urban site consideration could be given to using local heritage varieties of fruit trees as these will both provide value for wildlife but also amenity value to the public.

5.3.5 Amphibian and Reptiles

A Precautionary Method of Working Statement should be implemented and works carried out under the supervision of an Ecological Clerk of Works. This should include the provision that the Ecological Clerk of Works carry out a pre-works check of the working area for the presence of reptiles and amphibians. Any areas of tall vegetation or refugia (such as logs or stone) which will be disturbed by the works will be searched by hand by the ecologist ahead of any works.

5.3.6 Bats

Further mitigation and compensation measures will be defined if roosts are found to be present in the Scheme impact zone, following the further surveys recommended. These measures may include the requirement that a licence be obtained from Natural Resources Wales to legitimise the ongoing works.

5.3.7 Birds

Blocking/removal of crevices within the upper portions of the existing river wall, and any vegetation clearance within the wider construction area required, should be undertaken outside of the breeding bird season (March to September, inclusive). Although the wall will occasionally be inundated river levels are likely to be lower in summer months when the upper part of the existing river wall may be suitable for nest construction. However, if clearance is required during this period, nesting bird checks should be undertaken by an experienced ecologist 24-48 hours prior to clearance. Mitigation for habitats will also benefit birds.

5.3.8 Fish

Due to the location of works within the River Teifi a number of protective measures will need to put in place to minimise the impact on fish populations these recommendations are based on those agreed within the Shadow HRA (APEM, 2023) and subsequent consultation with NRW fisheries specialists and will need to be updated to match any changes within the revised HRA document.

- Measures to limit effects on fish from noise and vibration will need to include the use of plant with lower noise and vibration outputs.
- The upstream and downstream migratory periods of Atlantic salmon, sea and river lamprey in the Afon Teifi extend across much of the year. In order to avoid effects on peak numbers no augering or piling should be conducted in the wet **between March and December inclusive** i.e. only undertaken when the tidal level is below the level of the piling/augering works area. There are no seasonal restrictions for lamprey and Atlantic salmon during January and February.
- In addition to the seasonal in water restrictions above, it is recommended that soft start is used for piling activities. This involves the gradual and incremental increase in piling power until full operational power is reached and provides fish the opportunity to move away from the noise source before the onset of full power.
- Pollution and siltation control and biosecurity measures must be in place to ensure no indirect effects on fish and eel populations.
- A fish rescue plan must be in place for the Scheme.

5.3.9 Invasive Non-native Species

A pre-construction walkover for INNS is recommended. To inform a Biosecurity Risk Assessment which will include methods to prevent the spread of invasive species. The walkover should be carried out in the key INNS growing season from March – October and within a week of the start of the works.

5.3.10 Invertebrates (Terrestrial and Aquatic)

If the final scheme involves an increase in permanent loss of saltmarsh habitat beyond the area described in Section 4.5.2, further survey may be required to inform additional mitigation.

5.3.11 Otter

Further mitigation and compensation measures will be defined if holts or permanent lay-up areas are found to be present in the Scheme impact zone, following the further surveys recommended. These measures are likely to include the requirement that a licence be obtained from Natural Resources Wales to legitimise the ongoing works.

If no further holts of permanent lay-up areas are found during the further survey as a further precaution a pre-works check to verify that no otter are present within any working areas should be conducted immediately prior to any works being undertaken. Piling works should be undertaken during daylight hours to prevent any impact to feeding/foraging otter. Any open excavations or trenches should be covered at night to avoid mammals becoming trapped.

5.3.12 West European Hedgehog

If areas of habitat suitable for hedgehog (e.g. within residential gardens) are to be removed/disturbed as part of the Scheme, then a Precautionary Method of Working Statement would need to be implemented and works carried out under the supervision of an Ecological Clerk of Works. Any open excavations or trenches should be covered at night to avoid mammals becoming trapped.

5.4 Enhancement Measures for Consideration

The enhancements suggested below would require consultation and engagement with land owners where outside the ownership of NRW. The mechanism for securing long term benefits on land outside the ownership of NRW, and potentially outside of the Scheme Area being consented, would require further consideration.

5.4.1 Reinstating floodplain habitats in the Gloster Row car park area

An opportunity has been identified to move the existing river defence alignment further inland adjacent to Gloster Row car park to reduce disturbance impacts to existing intertidal habitats, and provide additional land area for intertidal habitats to recolonise. If adopted into the design this area would likely result in a temporary increase in intertidal mudflats as the area establishes whilst in the long term the proposed realignment would lead to the creation of new saltmarsh habitat in front of the new defence at Gloster Row Car Park (replacing the existing rock gabion bank reinforcement).

5.4.2 Improving the Biodiversity Value of the Embankment and Flood Defence

In line with NRW guidance (Natural Resources Wales, 2022) it is recommended that ecoengineering enhancements be incorporated into the embankment and flood wall design. The purpose of these features should be to create niches both below the waterline and within the tidal reach to create habitat features such as rock pools, crevices, holes for fish, invertebrates and aquatic plant species to exploit. The Scheme design currently shows the embankment top at approximately mean high water springs, which means that the wall itself will not frequently

be in the tidal range. Therefore, tidal features should be focussed on the embankment, or any hard engineered features below mean high water springs (e.g. the Welsh Water asset). In line with the mitigation hierarchy priority should be given to minimising the loss of existing intertidal habitats to the embankment rather than creation of replacement habitat within the embankment. Therefore, the most suitable measures are likely to be add-ons to the minimum required embankment slope such as Bioblocks or precast concrete pool features.

If crevice features are incorporated into the wall in the high winter and spring tidal range these features can provide suitable habitat features for roosting bats or crevice nesting birds during summer months when the tide is unlikely to cover the features.

5.4.3 Improving Biodiversity Value of the Paved Area Adjacent to Cardigan Bridge and Amenity Grassland (Within the Former Foundry Site and Adjacent to Gloster Row Car Park)

The area of disused stone paving should be replaced with vegetation that will provide a net benefit to biodiversity and community engagement. This can include planted scrub species which could act as food source for birds and invertebrates. This could include native scrub species such as wayfaring tree *Viburnum lantana*, guelder rose *Viburnum opulus* and/or juniper *Juniperus communis*.

Amenity grassland and stone paving could be replaced with a more varied seed mix. Where regular mowing is required for health and safety and/or for public consideration, a tapestry lawn could be considered. A tapestry lawn focuses on the planting of low growing flowering plants that are tolerant to regular mowing. This has the advantage of providing flowering plants that can act as source of nectar for protected species, increase flora biodiversity and provide an aesthetically more pleasing environment. Species can include yarrow *Achillea millefolium*, white clover *Trifolium repens*, self-heal *Prunella vulgaris* and pennyroyal *Mentha pulegium*.

5.4.4 Improving the Condition and Extent of Intertidal Habitats – Saltmarsh and Mudflat in the Wider River Teifi Catchment

Intertidal HPI is present in the Scheme Area however, its biodiversity overall functionality is restricted. The survey results indicate for birds the size and proximity to human disturbance limits the area's suitability for large numbers of important or notable species. To provide an overall enhancement, efforts could be made to find larger examples of saltmarsh/mudflats in the local area to focus habitat improvement efforts (such as Teifi Marshes Reserve) to achieve positive biodiversity benefit.

5.4.5 Improving Ecological Connectivity Between Cardigan Castle and the River Teifi and Reducing the Impact of Street Lighting

Light spill from street lighting on Strand is likely to be a major disturbance factor for wildlife utilising the River Teifi.

Anecdotal evidence suggests that the recent change in lighting (moving to white LED) may have had an effect on summer lesser horseshoe activity at Cardigan Castle (Dellar, 2024). This effect is likely to be exacerbated further by the loss of the mature ash tree that currently provides a screening effect for the Castle driveway.

There are a number of ways that the impact of street lighting can be reduced on wildlife (ILP, 2023), (CIEEM, 2021) that have been shown to be effective.

For this Scheme this could include:

- Working with the Local Authority to change the existing white LED lamps to a lamp with less blue light component.
- Plant screening trees in the current paved area adjacent to Cardigan Bridge to both reduce light spill onto the River Teifi and to reduce the habitat "gap" (via a canopy connection) to the mature trees in the Castle Grounds.

These measures would provide a distinct connectivity improvement for both species moving down the River Teifi corridor (such as otter and bats) and for the bat roosts present in Cardigan Castle.

6 References

- Andrews, H., 2018. *Bat Roosts in Trees. A guide to Identification and Assessment for Tree-Care and Ecology Professionals*, Exeter:: Pelagic Publishing.
- APEM, 2023. *Cardigan Tidal Flood Risk Management Scheme - Habitats Regulation Assessment. APEM Report P00011055*, s.l.: APEM.
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