

CARDIGAN TIDAL FLOOD RISK MANAGEMENT SCHEME

Volume 1: Environmental Statement Chapter 2 – Project Development

Client's project no. CE0587

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2 Project Development

2.1 Strategic context

2.1.1 National Strategy for Flood and Coastal Erosion Risk Management in Wales (2020)

The Welsh Government National Flood and Coastal Erosion Risk Management Strategy (Welsh Government, 2020) sets out how the Welsh Government intends to manage the risks from flooding and coastal erosion across Wales. The national strategy objectives set the framework for flood and coastal erosion risk management work within Wales:

- A. Improving our understanding and communication of risk
- B. Preparedness and building resilience
- C. Prioritising investment to the most at risk communities
- D. Preventing more people becoming exposed to risk
- E. Providing an effective and sustained response to events.

Every flood risk management action undertaken in Wales must aim to fit with overarching National Flood and Coastal Erosion Risk Management strategy objectives. The Cardigan Tidal Flood Risk Management Scheme ('the Scheme') directly achieves three of these objectives by providing an effective and sustained response; prioritising investment to the more at risk communities; and, preparedness and building resilience.

2.1.2 Natural Resources Wales Flood Risk Management Plan 2023 to 2029

National Overview

The first section of the Natural Resources Wales (NRW) Flood Risk Management Plan (FRMP) (Natural Resources Wales, 2023a) provides a national overview of where is at risk of flooding in Wales and sets out NRW's Wales-wide Objective, Priorities and Measures for managing the risk of flooding from 2023 to 2029.

The FRMP Objective is to 'Reduce the risk to people and communities from flooding from main rivers, reservoirs and the sea'. The FRMP identifies 14 priorities:

Priority 1: Respond to the climate and nature emergencies by seeking innovative practices, promoting adaptation and preparing for future change.

Priority 2: Develop and deliver catchment approaches to reduce flooding and contribute to ecosystem resilience, working with partners and stakeholders where possible and appropriate.

Priority 3: Improve community resilience to current and future flood risk. Work with partners to support communities to become more aware and take action to mitigate their own flood risk.

Priority 4: Seek and take opportunities for enhancement to the health and wellbeing of communities, biodiversity and the environment, and the wider benefits they provide, to support NRW's response to the Nature Emergency.

Priority 5: Increase resilience of flood risk management assets, to reduce the impacts of current and future flood risk

Priority 6: Improve effectiveness of our key products and services, including our digital services, to provide improved services to the public.

Priority 7: Continuously improve our understanding and communication of current and future flood risk (including climate change) so that decisions are based upon the best available evidence and information.

Priority 8: Provide an effective and sustained response to flood events, working in collaboration with Risk Management Authorities and Professional Partners where required.

Priority 9: Continually improve our flood warning service to enable people to take effective action in response to flooding.

Priority 10: Provide effective planning advice on flood risks and consequences to reduce inappropriate development in areas at risk of flooding.

Priority 11: Prioritise our work on a risk basis in alignment with Welsh Government's National FCERM Strategy and develop our evidence base to secure future investment in flood risk management.

Priority 12: Promote, support and implement nature-based solutions where appropriate to reduce the risk and impacts of flooding and to deliver wider ecosystem benefits.

Priority 13: Undertake our strategic oversight role to understand all sources of flood risk on a national basis to inform investment and optimise how we plan work including with other partners.

Priority 14: Ensure we have an FCERM workforce with the appropriate capabilities and skills required to meet our priorities and respond to future challenges.

The FRMP National Overview section provides further information on the level of risk, including what NRW have planned for the communities with the greatest flood risks. By taking an all-Wales approach to the FRMP, NRW can ensure that they prioritise directing efforts to where is at greatest risk of flooding. This is possible through the use of the Wales wide Communities at Risk Register (CaRR) that considers a number of factors to identify the locations (communities) at greatest risk of flooding. Cardigan is identified by the CaRR as a community at risk of flooding.

Mid Wales Place

The second section of the NRW Flood Risk Management Plan is split according to NRW Operational areas, also known as NRW Places. Cardigan is located within the Mid Wales Place. The Mid Wales Place section of the FRMP (Natural Resources Wales, 2023b) provides information about the level of risk at a local scale and describes what is planned for the communities that NRW are most concerned about. The FRMP identifies Cardigan as one of the five communities in Mid Wales Place that are projected to experience the biggest change in danger from the risk of flooding from the sea by 2120.

Measure M8 of the Delivery Plan for the Mid Wales Place is 'Design and construction of flood alleviation scheme' for Cardigan, to be delivered in the short term. This links to FRMP Priority 1.

Overall, the Scheme is in accordance with and is part of delivering the NRW Flood Risk Management Plan.

2.1.3 West of Wales Shoreline Management Plan 2

Shoreline Management Plans (SMPs) set out a shared strategic approach for managing the coastline from coastal flooding and erosion risks. Their aim is to reduce the risks to people, the developed, historic and natural environments over the next century. SMPs are not statutory documents, but the Welsh Government want to see them considered both in local decision-making and strategic planning.

Cardigan is on the shoreline covered by the West of Wales Shoreline Management Plan 2 (SMP2) (West of Wales Coastal Group, 2012). SMP2 divides the coastline into Policy Development Zones (PDZs), within are further split into small sections called policy units. SMP2 describes how these sections will be managed over the:

- short-term (2005-2025)
- medium-term (2025-2055)
- long-term (2055-2105).

There are four approaches that can be applied to each policy unit, for each period of time, based on coastal characteristics, flood risk, and socio-environmental priorities:

- **Hold the line (HTL)** by maintaining or changing the existing standard of protection
- **Advance the line (ATL)** by building new defences on the seaward side of the original defences (although none applied in Wales)
- **Managed realignment (MR)** which allows the shoreline to move backwards and forwards, with management to control or limit the movement
- **No active intervention (NAI)** where there is no investment in coastal defences and natural processes are allowed to continue to create an evolving coastline

Cardigan is within PDZ 5 and the Strand area of Cardigan on the north bank of the River Teifi (Afon Teifi) is within Policy Unit 5.11, Cardigan North. The SMP2 policy for Policy Unit 5.11 is Hold the line in the short, medium and long term. SMP2 includes a preferred policy to implement the plan for PDZ 5, which includes 'Maintain and improve defence to north and south Cardigan' in the medium-term.

The Scheme is in accordance with SMP2 policy to Hold the line for Policy Unit 5.11, but the design does require installing a new flood defence on seawards side of the existing sea wall in some areas: the need for this is set out in Chapter 1: Introduction. When considering compliance with a Hold the line policy, section 5.7.8 of the Shoreline Management Plans: Supplementary guidance for their ongoing maintenance and delivery – Wales (NRW, 2021) states:

"The definitions set out in the 2006 Guidance (volume 1, section 2.3) clearly state that use of the Advance the Line policy should be 'limited to those policy units where significant land reclamation is considered'. This descriptor should not be used for areas where there are already defences but works might encroach seaward to enable the same assets to be protected. This is also covered by the 2006 Guidance, which further states that a Hold the Line policy covers 'those situations where work or operations are carried out in front of the existing defences to improve or maintain the Standard of Protection provided by the existing defence line'."

One of the examples given in the Supplementary Guidance of Hold the Line (Maintain / Replace) is "*Rebuilding with a new line of sheet piling in front of the existing toe to sustain that existing defence line*". The Scheme accords with this example and is therefore considered to be compliant with the Hold the line policy.

2.1.4 Surface water and foul water flood risk

As well as tidal flood risk, Cardigan is affected by surface water, foul water, and fluvial sources of flood risk. A flood event in 2014 was attributed to surface water as it occurred during low tide.

Previously some flooding in the Strand area was caused by surface water and sewer network capacity issues. Recent investment by Dŵr Cymru Welsh Water (DCWW) in the area has delivered a foul water scheme that includes a new pumping station to re-direct water away from the area, particularly at high tide, and an upgraded outfall structure on Strand. NRW worked closely with DCWW to ensure that their outfall structure could be incorporated into a tidal flood defence scheme.

2.1.5 Environment Act (Wales) 2016

The Environment Act (Wales) 2016 sets out the requirement for the 'sustainable management of natural resources' together with new ways to achieve this. It outlines Wales' approach to planning and managing natural resources at a national and local level with a general purpose linked to statutory principles of sustainable management of natural resources.

The Act provides an iterative framework that ensures that sustainability is at the core of decision making. NRW is required to deliver environmental enhancements through Section 4 (Sustainable Management of Natural Resources) and Section 6 (Biodiversity Duty) of the Act.

Mid Wales Area Statement

As part of the delivery framework for the sustainable management of natural resources established by the Environment (Wales) Act, NRW has developed area statements which outline the key challenges facing that particular locality, what can be done to meet those challenges, and how natural resources can be managed for the benefit of future generations.

The Mid Wales Area Statement covers the following themes:

- Improving biodiversity - responding to the nature emergency
- Sustainable land, water and air
- Reconnecting people and places - improving health, well-being and the economy
- Forest resources - managing timber resources effectively
- Climate emergency – adaptation and mitigation across four themes

Of particular relevance to the development of the Scheme are improving biodiversity, reconnecting people and places, and climate emergency.

2.1.6 Well-being of Future Generations (Wales) Act 2015

NRW is required to deliver enhancements/benefits under the Well-being of Future Generations Act.

NRWs well-being objectives are to:

- Champion the Welsh environment and the sustainable management of Wales' natural resources
- Ensure land and water in Wales is managed sustainably and in an integrated way
- Improve the resilience and quality of our ecosystems
- Reduce the risk to people and communities from environmental hazards such as flooding and pollution
- Help people live healthier and more fulfilled lives
- Promote successful and responsible business, using natural resources without damaging them
- Develop NRW into an excellent organisation, delivering first-class customer service.

The Scheme seeks to achieve these objectives wherever possible.

2.1.7 Nature conservation legislation

European sites

The Conservation of Habitats and Species Regulations 2017 (as amended), commonly referred to as the Habitats Regulations, provide for the designation and protection of 'European sites', i.e. Special Protection Areas (SPA) and Special Areas of Conservation (SAC), the protection of European protected species, and the adaption of planning and other controls for the protection of European Sites.

Planning and other consents can only be given if there will be no negative effects on the integrity of any European Site (unless there are reasons of over-riding public interest).

The Cardigan Tidal Flood Risk Management Scheme (TFRMS) is located on the north shore of the tidal section of the Afon Teifi / River Teifi SAC. The Afon Teifi is designated for certain fish species, otter, and certain types of freshwater vegetation. This designation has influenced the Scheme options development, and the Scheme has been designed to avoid having a negative effect on the integrity of the SAC.

A Habitats Regulations Assessment (HRA) has been carried out in accordance with the Habitats Regulations (APEM, 2025). The HRA report details the potential effects to the qualifying features of the SAC that may be affected by the Scheme and required mitigation measures. It concludes that the Scheme is not expected to negatively affect the integrity of the SAC either alone or in combination with other plans or projects.

Nationally Important Sites and Habitats of Principal Importance

The Afon Teifi is also designated as a Site of Special Scientific Interest (SSSI) under the Wildlife and Countryside Act 1980. It is of special interest for a range of river types and associated riverside habitats, otter, fish species, and a range of plant, invertebrate and bird species.

Existing habitats in front of the current river wall include intertidal mudflats and saltmarsh, which are defined as Habitats of Principle Importance (HPI) under Section 7 of the Environment (Wales) Act 2016.

Under Planning Policy Wales 12, there is a presumption against development in a SSSI which is not necessary for the management of the site. Approval for development in or affecting a SSSI should only be given where the development is considered to be appropriate, is not likely to damage a SSSI, and where there is agreement for mitigation and enhancement as part of a development.

Under the Stepwise approach set out in Planning Policy Wales 12, developments should maintain the largest possible area of existing habitat supporting biodiversity and functioning ecosystems, particularly HPI.

Section 6 of Part 1 of the Environment (Wales) Act 2016 (Biodiversity and resilience of ecosystems duty) requires that public authorities must seek to maintain and enhance biodiversity so far as consist with the proper exercise of their functions and in so doing promote the resilience of ecosystems.

These designations and associated planning policy and legislation have influenced the Scheme options and design development, and the Scheme has been designed to avoid having a negative effect on the SSSI and to maintain the area of intertidal habitat.

2.1.8 Historic environment legislation

Cardigan contains a rich concentration of heritage assets, reflecting Cardigan's long and complex history, these include three Scheduled Monuments (Cardigan Bridge, Cardigan Castle and Cardigan Town Walls), listed buildings and the Grade II registered historic park and garden at Cardigan Castle. The Cardigan Conservation Area covers much of the core of the town and is a highly valued historic townscape recognised for its medieval origins, Georgian and Victorian architecture, riverside setting and strong cultural associations.

The Historic Environment (Wales) Act 2023 provides a legal framework for the management and protection of the historic environment in Wales, including Scheduled Monuments, listed buildings and conservation areas.

These designations and legislative requirements have influenced the Scheme design, with the Scheme being designed to avoid direct impacts with any Scheduled Monuments or listed buildings such that specific consents for works affecting these are not required. For further details on the effects of the Scheme on the historic environment see Chapter 7: Historic Environment.

2.2 Design development and consideration of alternatives

2.2.1 Alternatives in EIA

In accordance with the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended) and the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended), this section outlines the main alternatives which have been considered through the development of the Scheme, as required by Schedule 4, paragraph 2 and Part 3, paragraph 2 (iv) of the respective EIA Regulations:

"A description of the reasonable alternatives (for example in terms of development design, technology, location, size and scale) studied by the applicant or appellant which are relevant to the proposed development and its specific characteristics and an indication of the main

reasons for selecting the chosen option, including a comparison of the environmental effects.”¹

This section therefore provides a transparent account of the decision-making process and demonstrates how environmental considerations have influenced the evolution of Scheme design. By outlining the key constraints and opportunities, this section illustrates how the Scheme has been shaped to align with the principles of sustainable development and regulatory compliance.

An options appraisal process was undertaken in two stages prior to the preferred solution being selected.

2.2.2 Long list appraisal

The flooding mechanism to be addressed by this Scheme is tidal. Dredging of the channel was discounted at an early stage, as it would make minimal difference, with the tide just bringing in extra water to reach the same flood height. Likewise upstream flood storage would have minimal impact on tidal flood level and was also discounted.

The 2021 Outline Business Case (OBC) report presented the following long list options considered at this preliminary stage:

- Walk Away – assumes no change to the current scenario with the ongoing risk of flowing.
- Do Minimum - There are currently no formal flood defences in the area. However, in the event of a tidal flood warning NRW will provide support for the community. The flood risk will continue to increase over time without formal defences in place.
- Do Something – Improved property resilience. Individual Property Flood Resilience (PFR) measures have been provided for 60 properties to improve resilience and to reduce the impact of flooding. However, the community has experienced flood depths in excess of 1.5m in recent years, which exceeds the effectiveness of property flood resilience measures.
- Do Something - New defences. New raised defences consisting of walls along both banks of the Teifi and the Lower Mwldan, to include floodgates at slipway access routes.

Following this preliminary stage, the Do Nothing/Do Minimum and Property Flood Resilience options were rejected due to the increasing flood frequency in Cardigan, posing a risk to life. Further consideration was not given to the PFR scenario as whilst it would offer improved resilience to some properties, it would not reduce the risk of life or injury resulting from flooding or reduce the disruption caused by flooding. Therefore, the preferred option of ‘do something, new defences’ was carried forward.

2.2.3 Short list appraisal

Following the selection of the preferred long list option, short list options of new linear defences were considered within the Options Appraisal Report (Short-list) (Binnies, 2024). Binnies UK Ltd (BUK) developed and appraised three linear defence (short-list) options:

¹ This is taken from the Town and Country Planning (Environmental Impact Assessment) (Wales) Regulations 2017 (as amended), very similar wording is used in the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended).

1. Flood wall that is offset to the Afon Teifi – This option offers the advantage of preserving existing heritage aspects by creating sufficient space for defence construction without excavation. It involves backfilling behind the proposed wall and burying the existing revetment and wall. However, this option presents environmental risks due to encroachment on the Afon Teifi Site of Specific Scientific Interest (SSSI) and Special Area of Conservation (SAC).
2. New flood wall following the alignment of the existing riverbank/wall (where possible) – This solution aims to balance impacts by maintaining the alignment with the river (i.e. minimising encroachment into the designated site), preserving heritage aspects, and avoiding negative impacts on adjacent properties.
3. Managed realignment – This option involves a setback wall, providing additional space for water, environmental enhancements and habitat creation opportunities. However, it includes the demolition of some properties to implement the scheme.

The option designs presented split the Scheme into four areas (Areas 1, 2, 3 and 4), with Area 1 at the downstream end of the Scheme next to Cardigan Bridge and Area 4 at the upstream end of the Scheme at Gloster Row car park.

A multi-criteria analysis was undertaken to identify the preferred option alignment. This concluded that Option 2 – provide a flood defence wall along the general alignment of the existing river wall – was the preferred alignment. The reasons for its selection are:

- It minimises incursion upon the Afon Teifi and therefore has reduced effects on the Afon Teifi SSSI and SAC and associated in-river habitats
- It comprises minimum land take, thereby minimising the potential disruption to buried archaeology or historical artefacts
- It achieves the required flood risk mitigation objective
- It presents opportunities to provide environmental enhancements, including developing vertical habitats and habitats on the landward side of the defence.

A public consultation event and feedback period followed the development of the short list options, see section 2.3.1 for details. Feedback from this, where there was a desire by the public to include public realm enhancements, has been incorporated into the design taken forward as combining elements from Option 1 into Option 2.

2.2.4 Design development

Since the identification of the shortlisted option further design development has continued to identify the most effective design to be taken forward for planning. The following environmental, construction and other infrastructural constraints have influenced this design.

Alignment of the flood defence

During the design development process, consideration was given to the alignment of the flood defences to limit associated intertidal habitat losses along the banks of the Afon Teifi. The final alignment selection (Plate 2-1) was informed by habitat loss calculations which calculated the total existing habitat and estimated losses associated with the design. This data was used to

inform the total area of mitigatory habitat which would be required to account for losses associated with the design.

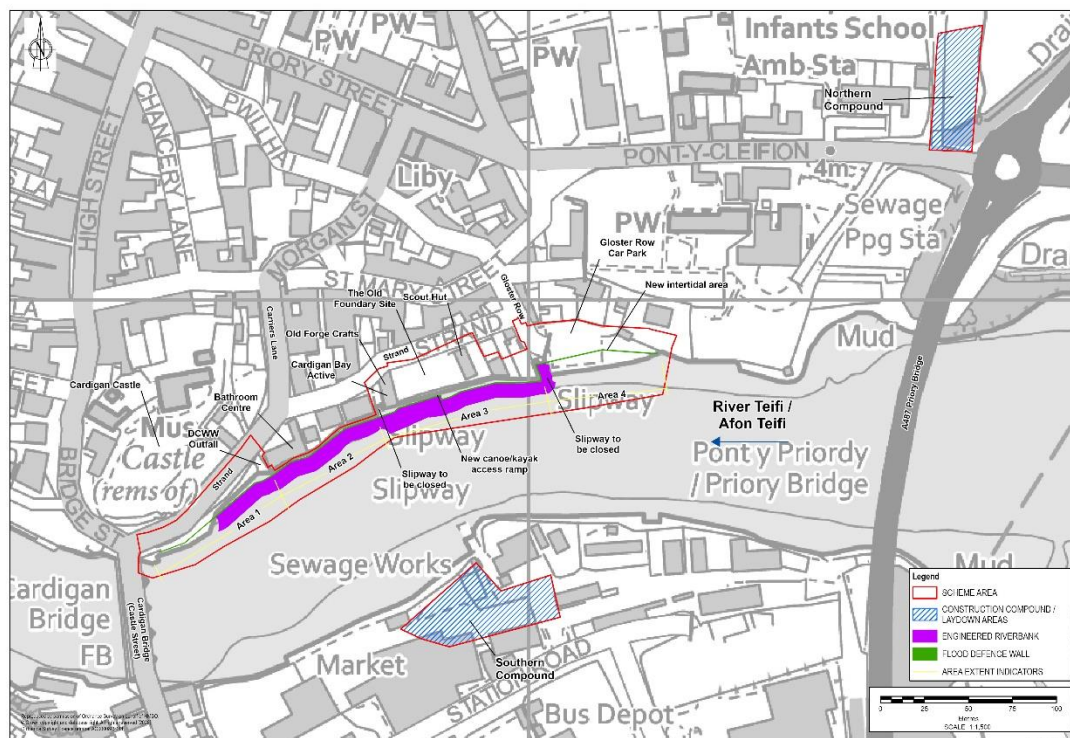


Plate 2-1 – Scheme Layout

Within Area 3 there is a small area of open land at the Old Foundry Site and thereby an opportunity to set back the defence reducing loss of intertidal habitat. It was considered that the construction risk, loss of amenity land for the Sea Scouts, and cost associated with this option outweighed the minimal habitat benefits. Therefore, it was decided that the piles would be installed on the riverwards side of the existing wall, with the offset between the existing wall and new piles as small as possible.

As a consequence of changing the alignment of the flood defence wall in Area 3 the alignment of the flood defence wall in Area 4 was set back to establish an area of intertidal habitat. The alignment of the flood defence wall in Area 4 was constrained by the presence of a Dwr Cymru Welsh Water (DCWW) rising main. To avoid any potential interactions with this utility service, while ensuring the flood defence wall was set back sufficiently to mitigate for the loss of intertidal habitat along the rest of the Scheme, the alignment of the flood defence wall in Area 4 was altered such that it would bisect the Gloucester Row car park leading to a reduction in space for car parking.

These changes to alignment ensure that the total area of intertidal habitat permanently lost from the footprint of the flood defence wall in Area 3 are mitigated for through the setting back of the flood defence wall in Area 4. For further discussion on the effects of the Scheme on intertidal habitats see Chapter 6: Biodiversity and Nature Conservation.

Engineered riverbank finish

The introduction of an engineered riverbank in front of the sheet-piled flood defence was included to help support the reduction of the overall length of sheet piles required, thereby minimising construction impacts such as reduction in the scale of heavy plant use and disturbance to bedrock and less disturbance of properties on the dry side of the wall. This approach also provided the opportunity to soften the appearance of the defence, providing a more natural frontage compared with the harsher aesthetic of an exposed hard-engineered cladded wall, thereby reducing the Scheme's overall visual impact, and allowing for the opportunity for a range of intertidal habitats to establish on the engineered riverbank.

As part of the design process, the alignment and finish of the engineered riverbank was considered to deliver a range of intertidal habitats, increase the likelihood of their success and reduce maintenance requirements. Harder engineered finishes such as concrete revetment blocks were discounted due to carbon cost and their limited value to biodiversity. Development of options for the engineered riverbank finish involved undertaking investigations into bioengineering solutions which identified and appraised three main options:

- rip rap or rocks rolls only
- rip rap or rock rolls with a seeded growing medium on upper sections and crest
- rip rap or rock rolls with planted coir matting on upper sections and crest.

When considering the design options, different tidal events were considered to determine the frequency with which the amount of the engineered riverbank would be under water and therefore how quickly the new riverbank would accrete sediment. Plate 2-2 **Error! Reference source not found.** indicates the Mean High Water Spring (MHWS) level whereby the riverbank at this level would be under water approximately every two weeks. Below the MHWS level the riverbank would be inundated by normal tidal conditions more regularly, with the toe being inundated daily. The Highest Astronomical Tide (HAT) level would be reached approximately twice a year.

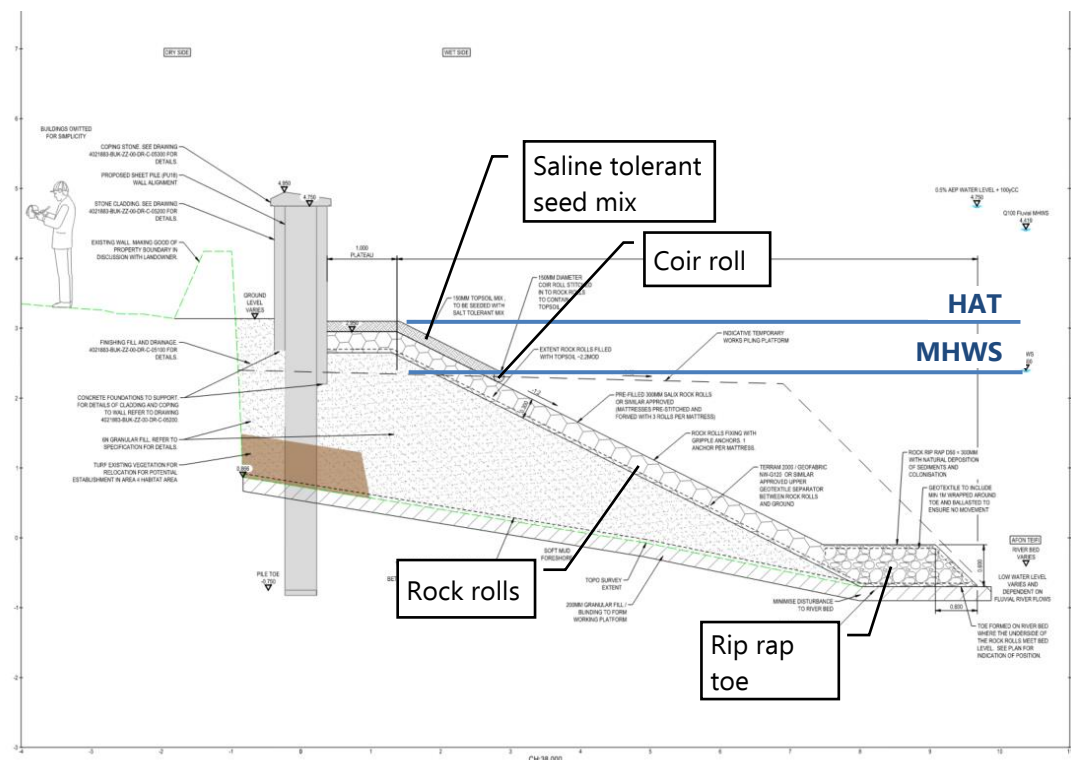


Plate 2-2 – Typical engineered riverbank section showing approximate level MHWS and HAT lines to indicate frequency of tidal inundation

The conclusion to this investigation was to use rock rolls on the lower slope of the new riverbank to approximately two thirds of the height (up to the MHWS level). The remaining upper third of the slope and crest of the new riverbank, which would be inundated by the tide very infrequently, would incorporate a saline tolerant seed mix and imported soil to promote a more natural finish. This would be placed over the rock rolls which would extend up the upper third of the slope and crest providing the required engineered scour protection to protect the new riverbank. To hold soil in a place while the seeded vegetation establishes on the upper slope a single line of coir rolls would be installed, this coir roll would not be planted. A rip rap toe using larger stones than used in the rock rolls is included to ensure the rock rolls remain in position.

As sea level rises in the future more of the engineered riverbank would be inundated by the tide more regularly. The slope of the new riverbank would allow for habitats established on it to migrate upwards as sea level rises, which would increase the length of the time that intertidal habitats are present than without the engineered riverbank.

The use of rock rolls would provide multiple small crevices into which sediment would naturally be deposited by the river, and from which the mud would be less likely to wash away than if a flat surface or larger rocks (i.e. rip rap) were used. This would enable intertidal habitats to remain present, although the type of intertidal habitat would change from mudflats to a habitat of seaweeds and lichen on eu littoral rock and transitioning up the slope to include saltmarsh species. The change from a relatively flat shoreline to a engineered riverbank with gradient of 1V in 2H allows for the progression of intertidal habitats up the new riverbank as sea level rises in the future. This allows for intertidal habitats to be present for longer. For further discussion on the effects of the Scheme on intertidal habitats see Chapter 6: Biodiversity and Nature Conservation.

Planted coir matting was not favoured due to concerns that the matting would be pulled away during flooding events causing damage to the scour protection beneath, leading to increased maintenance requirements.

While it was considered that over time the entirety of the new riverbank would accrete with sediment from the river and naturally colonise, due to the infrequency with which the upper third of the new riverbank and crest would be covered with water it was considered that a seeded growing medium would provide the opportunity for the new riverbank to vegetate more quickly than the use of rip rap or rock rolls only.

It was also considered whether additional items could be incorporated into the engineered riverbank finish (e.g. living boulders) which would generate some additional benefits, without the difficulties encountered by the alternative options presented. However, it was considered that these options would not make a material difference to the establishment of intertidal habitats on the engineered riverbank.

To provide greater assurance of the success of the engineered riverbank finish a review of other similar projects was undertaken. One example of a similar scenario was the Environment Agency project Railway Lane Lewes, which used prefilled rock roll mattresses produced by Salix. The use of bio-engineered rock mattresses here (see Plate 2-3), demonstrates the successful slope stabilisation in a high energy tidal environment. The design captures accreting sediment, enabling vegetation to grow on the slope. This example shows how erosion control and long-term habitat enhancements, can both be achieved.



Plate 2-3 – Rock roll mattresses at Railway Lane, Lewes showing development of intertidal habitat over time (images courtesy of Salix)

For further details of the design of the engineered riverbank taken forwards see Chapter 3: Project Description.

Landscape design

Public realm enhancements are proposed in Area 1 along Strand, between Cardigan Bridge and the Bathroom Centre, aimed at improving the experience of pedestrians and bus stop users, benefitting wildlife, and responding to the historic location of the site.

Two options for this public realm enhancement were initially developed:

- Option 1 – included for an alignment of the flood defence wall closer to the river to allow for a wider pavement, tree planting along Strand and a planting area for biodiversity on the wet side of the defences which would be inaccessible to the public.

- Option 2 – included for an alignment of the flood defence wall closer to Strand to allow for a wider planting area for biodiversity on the wet side of the defences compared to Option 1 but a narrower pavement and less tree planting.

Public consultation for these options was undertaken by NRW in June 2025. This indicated that residents were in favour of a widened pavement and addition of trees and planting to create a 'greener' environment, as well as use of natural stone including slate to tie the area into its surroundings. Several respondents who are parents or carers noted that the existing pavement is too narrow. Option 1 was therefore taken forward and the design for this was developed further. Following consultation with Cadw and Ceredigion County Council, street trees in front of the defensive part of Cardigan Castle which were present in Option 1 were removed, in order to maintain visibility of and significant views from this Scheduled Monument. For further details of the design of the public realm enhancements see Chapter 3: Project Description and Area 1 Landscape Planning drawings (4021883-BUK-ZZ-00-DR-L-01002 and 4021883-BUK-ZZ-00-DR-L-01522).

The changes to the street scene in Area 1 have identified the need to relocate lighting columns which would otherwise be located within the middle of the new wider pavement. It is proposed to relocate the lighting columns towards the river and adjacent to the new flood defence wall. A lighting design would be developed to ensure that sufficient light is provided for road traffic and pedestrian safety and would include for a change in light fixtures which are more suitable for bat species foraging in this area.

The flood defence wall throughout the Scheme would be clad with stone to reflect the existing river side walls and complement the Cardigan Bridge and Cardigan Castle. To minimise impact due to the height of the flood defence wall the coping stone is incorporated into the flood defence level and is therefore of precast concrete, as opposed to natural stone which would not provide a watertight connection to wall below.

2.2.5 Alternative options for compounds, construction access and other ancillary works

The temporary compound locations were selected based upon ease of access for construction traffic, proximity to the area of works, existing hard standing surface and distance from sensitive receptors.

There are two proposed temporary compound areas which would be used for plant/material storage and housing welfare units during construction works. The proposed Northern Compound would be located on the northern side of the Afon Teifi, just to the north of the Pont-y-Cleifion Road (SN 18239 46106). This compound area would be used as the main compound and laydown area for the works. This area has been proposed as it is close to the A487 turn off, which would allow access for large vehicles, and has previously been used as a construction compound for other infrastructure projects in Cardigan.

The proposed Southern Compound would be located on the southern side of the Afon Teifi (SN 17973 45829), within industrial land off Station Road. The use of the existing slipway to transport materials across the river was considered but was discounted as it was considered that construction from the north bank only would be simpler and safer.

The proposed access route to the construction site would follow Pont-y-Cleifion and down Morgan Street and Carrier's Lane to reach Strand. This route has been selected as it passes the Northern Compound and allows for transit towards a laydown area located in Area 1. Construction traffic exiting the site would continue across Cardigan Bridge (Castle Street) onto

the B4546 before either turning onto Station Road for the Southern Compound or rejoining the A487. This route would avoid the need for construction traffic to traverse up the High Street through the town centre.

Alternatively, instead of entering the town centre via Pont-y-Cleifion, construction traffic bound for the Southern Compound can continue along the A487 before turning off on the B4546.

2.2.6 Carbon reduction during design process

To minimise embedded carbon and emissions associated with the production of construction materials and energy usage during construction, alternative designs and construction methodologies have been considered through the design development.

Carbon emissions have been assessed during the design of the Scheme with a carbon calculator. The highest carbon cost in terms of materials is expected from the sheet piles, concrete infill and rock rolls used to form the flood defence, with smaller carbon costs from granular fill and aggregates, stone facing and copings.

Decisions made during design development which have reduced the embedded carbon of the Scheme are:

- Aligning the flood defence wall as close to the existing river wall reduces the need for significant quantities of material to fill the gap between the existing river wall and the proposed flood defence wall.
- Reducing the length of sheet piles by supporting shorter piles with an engineered riverbank. Additionally, this would require smaller plant to install.
- Incorporating the engineered granular fill, used to construct the temporary construction haul route on the river side, into the engineered riverbank.
- By designing the flood defence to a design standard of 1 in 200 annual exceedance probability (AEP) with allowance for climate change with a design life of 100 years reduces the need for future upgrades or rebuilding.
- Trees and planting proposed as part of the Scheme would absorb some carbon.

During construction actions would be taken to reduce emissions from vehicles and plant, with all vehicles to be European Emissions Standard Euro VI compliant and plant to be Stage V compliant where feasible.

2.2.7 Mitigation and enhancements incorporated into the design

As the design of the Scheme has been developed the mitigation measures and enhancements have been incorporated. Environmental enhancements are discussed in detail within the Green Infrastructure Statement (Binnies, 2026) and a full description of the Scheme included these embedded mitigation and enhancements is provided in Chapter 3: Project Description.

Embedded mitigation and enhancements incorporated into the Scheme design are:

- Enhanced public realm within Area 1, including widening of pavements and provision of tree planting

- Use of rock rolls for the scour protection for the new riverbank which would include a seeded growing medium on the upper third of the new riverbank allowing for the adaptation of intertidal habitats
- Setting back the flood defence wall in Area 4 and lowering existing ground levels to create an area for the establishment of intertidal habitats
- Use of suitable stone cladding for the finish of the flood defence wall
- Inclusion of a new boat ramp within Area 3 to enable canoe/kayak access to the water for the Sea Scouts and other permitted organisations.

2.3 Summary of consultation during design development

NRW has carried out consultation throughout the development of the Scheme. Consultations have aimed to provide an opportunity for key organisations and stakeholders, including landowners, members of the public and other interested parties to inform the design of the project, and to consider what they regard as key issues and priorities. In turn, consultation has allowed NRW to gain a clearer understanding of the main issues to be considered at an early stage.

This section summarises the consultation undertaken to date which has informed the Scheme design. Topic specific consultation which has taken place over the course of preparing this Environmental Statement are detailed in their respective chapters.

2.3.1 Public consultation

Through the course of the Scheme development NRW have sought to engage with the local community. Two public consultation events have taken place which have informed the Scheme design:

- A public consultation event took place on 23rd November 2022 at Cardigan Castle to present the options appraisal process and seek the views of the local community on their preferred option from the short-listed options. Information was also available to view online between 11th November and 22nd December 2022. Respondents generally preferred Option 1 due to the improved public realm features. This informed the design through the development of the public realm enhancement in Area 1.
- An online public consultation period between 3rd and 23rd June 2025 sought views from the public and other stakeholders on options for the public realm enhancements in Area 1. There was a general preference towards the provision of wider pavements for accessibility purposes and undertaking tree planting to provide amenity value and shade during warm weather. Additionally, Cadw voiced their preference to not plant trees in front of the main walls of Cardigan Castle as this would affect views of the castle. As detailed in section 2.2.4 (landscape design), these preferences have been incorporated into the Scheme design.

2.3.2 Habitats Regulations Assessment consultation with NRW

A consultation meeting was held on 19th October 2023 with terrestrial and marine fisheries specialists at NRW where the scope of the HRA and proposed mitigation requirements regarding disturbance to various migratory fish species were agreed.

The feedback received during this meeting was included in the production of the HRA (APEM, 2025), which accompanies this Environmental Statement.

2.3.3 Consultation with Ceredigion County Council and NRW

A consultation workshop with environmental, ecological geomorphological specialists at Ceredigion County Council and NRW took place on 18th November 2025. The purpose of this workshop was to present the Scheme design with a focus on how the design has been influenced by environmental conditions and a need to mitigate environmental impacts (see section 2.2.4 for details of this).

Attendants at the workshop had the opportunity to ask questions following a presentation by the project team. In general, attendees were supportive of the measures taken to mitigate the environmental impacts and deliver a Scheme which reduces flood risk to properties while minimising effects to the environment.

Following the workshop presentation slides and meeting minutes were issued to all attendees, no further follow up questions or responses were received.

2.3.4 Formal pre-application consultation

The Planning (Wales) Act 2015 places a requirement upon the developer to undertake a 28 day consultation before applying for planning permission for all Major developments, as defined by Article 2 of the Town and Country Planning (Development Management Procedure) (Wales) Order 2012 (as amended by the 2016 Order). Pre-application consultation for Cardigan TFRMS was undertaken from 7 April 2026 through to 18 May 2026. As part of this consultation process, notices were placed on site, and notice was served on relevant consultees, including all known affected landowners and occupiers.

The pre-application consultation submission included the Environmental Statement, Habitat Regulations Assessment, Design and Access Statement, Planning Statement, Green Infrastructure Statement, scaled plans and drawings as well as several other technical documents. These were made available to view online and at Cardigan Library.

Following completion of the 28 day consultation period a Pre-Application Consultation Report was prepared to document the responses received, issues raised and how these have affected the Scheme design and planning application. The Pre-Application Consultation Report will be submitted along with the other application documentation in support of the planning application.

2.4 References

APEM, 2025. *Cardigan Tidal Flood Risk Management Scheme - Habitats Regulation Assessment*, APEM Report P00016173: December 2025.

Binnies, 2024. *Options Appraisal Report (Short-list)*, s.l.: s.n.

Binnies, 2026. *Cardigan Tidal Flood Risk Management Scheme: Green Infrastructure Statement*, s.l.: s.n.

Natural Resources Wales, 2023a. *Natural Resources Wales Flood Risk Management Plan: National Overview*, Available at: <https://naturalresources.wales/evidence-and-data/research-and-reports/flooding-reports-evidence-and-data/flood-risk-management-plans/?lang=en>.

Natural Resources Wales, 2023b. *Natural Resources Wales Flood Risk Management Plan: Mid Wales Place*, Available at: <https://cdn.cyfoethnaturiol.cymru/3hwgt4vp/frmp-cycle-2-place-section-mid.pdf>.

Welsh Government, 2020. *The National Strategy for Flood and Coastal Erosion Risk Management in Wales*, October 2020: WG40996.

West of Wales Coastal Group, 2012. *West of Wales Shoreline Management Plan 2: Cardigan Bay and Ynys Enlli to the Great Orme Coastal Groups*, June 2012: Final.