Afon Wen Seawall Defence Works

Water Framework Directive Assessment

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Abbreviations

NVZ.....Nitrate Vulnerable Zones
PEA.....Preliminary Ecological Appraisal
RBD.....River Basin District
RBMP.....River Basin Management Plan
SAC.....Special Area of Conservation
SgZ.....Safeguard Zones
SPA.....Special Protection Area
WFD.....Water Framework Directive

1 Introduction

1.1 WFD Overview

The Water Framework Directive (WFD) came into force in 2000 and is the most substantial piece of EU water legislation to date. The Directive imposes legal requirements to protect and improve the water environment. All activities in the water environment need to take the Directive into account. The EU Water Framework Directive was transposed into law in England and Wales by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003. The 2003 regulations were consolidated and replaced with the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Floods and Water (Amendment etc.) (EU Exit) Regulations 2019 ensure that floods and water legislation continues to be operable in the United Kingdom following withdrawal from the EU in January 2021. The instrument addresses deficiencies in retained EU law arising from the UK's withdrawal from the EU. The purpose of the instrument is to preserve and protect the existing policy regime rather than to introduce new policy. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, as amended by the Floods and Water (Amendment etc.) (EU exit) Regulations 2019, are hereafter referred to as the WFD Regulations in this report.

1.1.1 Scope of the WFD Assessment

The WFD Regulations require that Environmental Objectives be set for all surface and ground waters in England and Wales to enable them to achieve Good Status (or Good Ecological Potential for Heavily Modified and Artificial Water Bodies) by a defined date. These Environmental Objectives are listed below:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters.
- Aim to achieve at least good status/potential for all water bodies by 2021. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status/potential by 2027.
- Meet the requirements of Water Framework Directive Protected Areas.
- Promote sustainable use of water as a natural resource.
- Conserve habitats and species that depend directly on water.
- Progressively reduce or phase out the release of individual pollutants or groups of pollutants that present a significant threat to the aquatic environment.
- Progressively reduce the pollution of groundwater and prevent or limit the entry of pollutants.
- Contribute to mitigating the effects of floods and droughts.

1.1.2 Preventing Deterioration in Status

Any activity which has the potential to have an impact on the ecology of a water body will need consideration in terms of whether it could cause deterioration in its Ecological Status or Potential (Environment Agency, 2010).

For each water body, three different status objectives are identified within the RBMP. These are the overall status objective, the ecological status or potential objective and the chemical status objective. A default objective for all water bodies is to prevent the deterioration in the Ecological Status (or Ecological Potential for Heavily Modified and Artificial Water Bodies) of the water body. Note, the Ecological Status applies only to surface water bodies, and not ground water bodies. A separate assessment may be required to assess the impacts on the chemical and quantitative status of a ground water body, if the proposed activity is likely to cause impact.

The Ecological Status of a water body is determined through analysis of its constituent Biological Quality Elements. These elements are in turn supported by a series of Physico-Chemical and Hydromorphological Quality Elements. These Quality Elements are taken from Annex V of the WFD Regulations and are listed below. The overall Ecological Status is determined by the lowest element status.

The Biological Quality Elements assessed in the WFD include:

- Fish
- Invertebrates
- Macrophytes
- Phytobenthos

The WFD defines the flow, shape and physical characteristics of a watercourse as its 'hydromorphology'. Any in-channel works can impact upon the shape of a watercourse and the natural processes that occur within it, including, but not limited to:

- Hydrological flow patterns (tidal regime)
- Variation in channel depth
- Modification to bed structure and substrate
- Sediment availability / transport
- Ecology and biology (i.e., habitats which support plants and animals)
- The WFD considers the chemistry of a watercourse through general water quality (physico-chemical measurements) and chemical pollutants. All three environmental components; morphology, hydrology and chemistry, support the biology of a water body.

Any activity that has the potential to have an impact upon any of the quality elements will need consideration in terms of whether it could cause a deterioration in the status of a water body. The activity will also need to be considered in terms of whether it will

compromise the ability of the water body to reach "Good" ecological status or "Good" ecological potential by the date specified in the Catchment Data Explorer.

Any adverse impacts can cause a water body's ecology to deteriorate and prevent environmental improvements from being undertaken. Nevertheless, in-channel works can also be beneficial if they can be designed to help achieve environmental improvements included in the RBMP, thus enhancing the water environment for plants and animals.

1.1.3 Artificial or Heavily Modified Water Bodies

Whilst good ecological status is defined as a slight variation from undisturbed natural conditions in natural water bodies, artificial and heavily modified water bodies are unable to achieve natural conditions. Instead, artificial, and heavily modified water bodies have a target to achieve "Good" Ecological Potential, which recognises their important uses, whilst making sure ecology is protected as far as possible. Ecological potential is also measured on the scale high, good, moderate, poor and bad. The chemical status of these water bodies is measured in the same way as for natural water bodies.

Specific mitigation measures have been identified for each Artificial and Heavily Modified Water body and are listed in the RBMP. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the water body and all measures need to be in place in order for the water body to achieve "Good" Ecological Status or Potential.

1.2 Purpose of this WFD Assessment

JBA Consulting was commissioned by MPH Construction to undertake a WFD assessment, Habitat Regulations Assessment (HRA) and Preliminary Ecological Assessment (PEA) to assess the potential impacts to WFD water bodies arising from the proposed repair works to the coastal defences along the frontage at Afon Wen, North Wales (approximate location: 52°54'33.6"N 4°18'39.2"W).

This WFD assessment aims to determine the effects of the proposed works on ecological, hydromorphological and chemical quality elements and identify any potential impacts that could cause deterioration in the current status of the water body or could hinder the water body from meeting its WFD objectives in the future.

The proposed works are located adjacent to the Tremadog Bay coastal water body and fall within the Western Wales River Basin District. The environmental objectives, together with specific actions (mitigation measures) necessary to enable the water body to meet these objectives, are set out in the Natural Resources Wales (NRW) Western Wales River Basin District - River Basin Management Plan (RBMP) (NRW, 2022).

2 Assessment Methodology

2.1 Overview

The following figure summarises the WFD Assessment process.

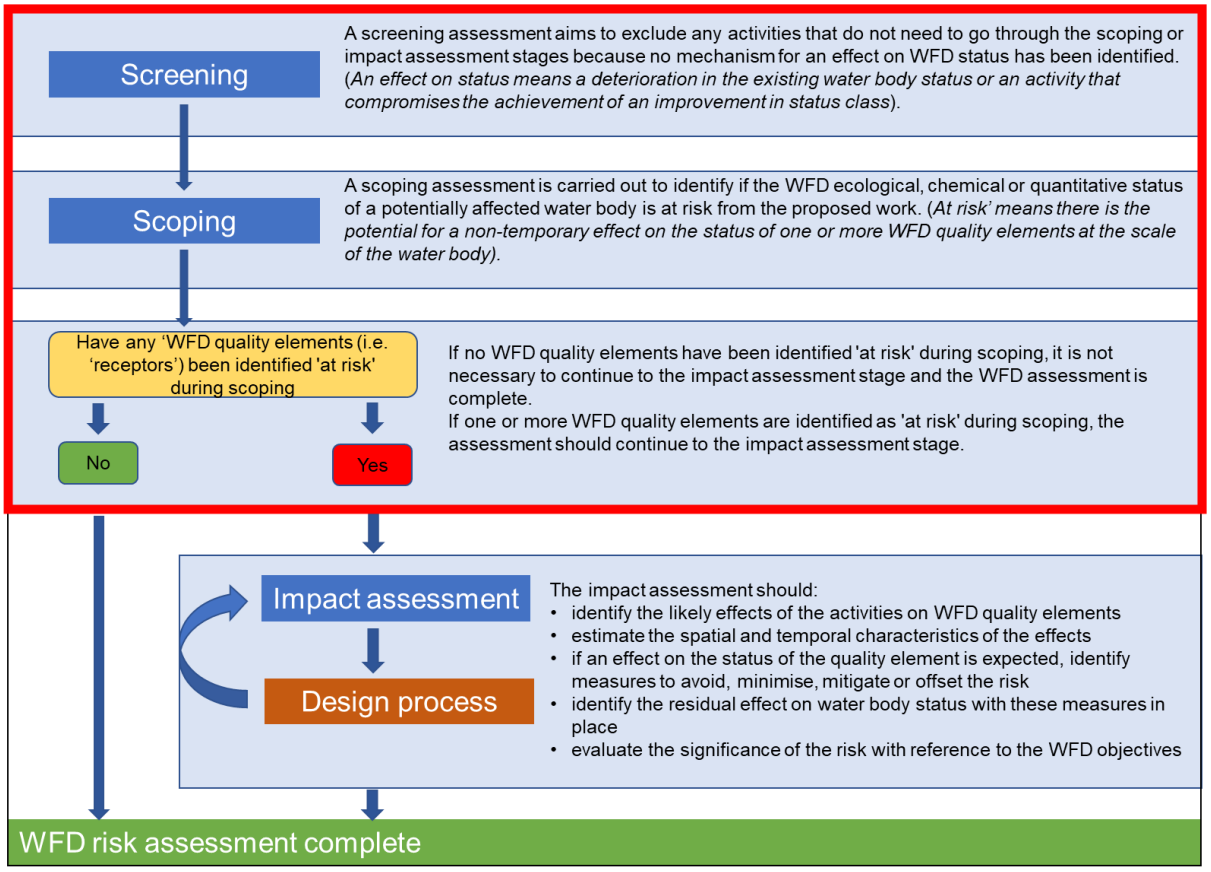

Figure 2-1: WFD assessment process flow chart

2.2 Screening Assessment

The Screening Assessment aims to exclude any activities that do not need to go through the scoping or impact assessment stages. The Water Watch Wales web-based data explorer website was used to determine which water bodies could be potentially affected by the proposed works. The names, ID numbers, designation, status classification and objectives for all relevant water bodies were obtained and downloaded from the Water Watch Wales web-based data map explorer website.

The initial stage of the assessment screens the proposed works against the ecological, hydromorphological and chemical status objectives for the water bodies potentially affected by the works, together with their quality elements. The aim of this process is to determine whether the works could have an impact upon any of these criteria. Those criteria for which no potential adverse effects are identified are not

considered further in the assessment. Any potential adverse effects are screened into the assessment and are carried forward to a more detailed assessment.

2.3 Scoping Assessment

A detailed assessment is then undertaken to determine the effects that the proposed works could have upon those quality elements screened into the assessment. Any impacts identified are then considered in relation to the ecological status of the water body, which comprises biology, hydrology, hydromorphology and water chemistry, and the water body objectives.

The following assessment objectives are then used to determine whether the proposed works comply with the overarching objectives of the WFD. These objectives were therefore derived from the Environmental Objectives of the Directive (as listed in section 1.1.2).

- Objective 1: The proposed scheme does not cause deterioration in the Status of the Ecological Elements of the water body.
- Objective 2: The proposed scheme does not compromise the ability of the water body to achieve its WFD status objectives.
- Objective 3: The proposed scheme does not cause a permanent exclusion or compromised achievement of the WFD objectives in other bodies of water within the same RBD.
- Objective 4: The proposed scheme contributes to the delivery of the WFD objectives.

In order to establish whether the proposed works comply with the WFD it is necessary to ascertain whether the works have the potential to result in:

- Failure of a water body to achieve "Good" Ecological Status or Potential; or
- Failure to prevent a deterioration in the Ecological Status or Potential of a water body

If the answer to these questions is ‘no’ the proposed works can be considered WFD compliant. If either of these failures is identified and if any receptors are identified as ‘at risk’, further assessment may be required to identify if the proposed works meet all of the conditions set out by the WFD Legislation.

2.4 Impact Assessment

The third stage of the WFD Assessment, if determined as necessary from the Screening and Scoping Assessments, is to undertake an Impact Assessment to consider the impacts of the proposed scheme in more detail and recommend necessary mitigation measures. An impact assessment must be carried out for each receptor identified during scoping as being at risk from the proposed activity.

The Impact Assessment describes how any identified impacts from the proposed works will be mitigated, to either avoid or minimise the impacts. The assessment shows how any impact on a WFD receptor caused by the proposed activity fits with the objectives of any affected WFD water bodies. After the works have been amended to try and avoid, minimise, mitigate or compensate for the risks to WFD receptors the following questions will need to be answered:

- Could the activity still cause a water body to deteriorate from one WFD status class to another or cause significant localised impacts that could contribute to this happening?
- Could the activity prevent or undermine action to get water bodies to "Good" status?

When these questions are answered, the following should be borne in mind:

- A water body deteriorates in status when one WFD receptor (an "element") is affected such that it drops from one WFD status class to another.
- A significant localised impact on an element is one that is either long-lasting; causes severe harm; or affects a wide area within a water body. These are likely to contribute to a water body dropping from one status to another and highly likely to prevent action to get water bodies to good status.
- Elements at high status are very sensitive. The assessment will need to demonstrate that there will be a negligible impact on those aspects of the water environment.
- Elements at bad status must not be made worse.

If it cannot be demonstrated with a high level of confidence that the activity supports the water body objectives, then in order for the Environment Agency to permit the activity it must be shown that the activity meets the criteria set out in Article 4(7) of the WFD. Article 4(7) sets out stringent environmental and socio-economic tests to assess if a scheme meets strict environmental and sustainability criteria.

3 Project Description

3.1 Project Overview

The proposed works are required to repair damage caused to the sea defences at Afon Wen (Figure 3-1). Repeated exposure to storm wave activity has resulted in damage, and removal of several sheet piles that front the seawall. The loss of the sheet piles has opened a series of voids below the concrete base of the seawall.

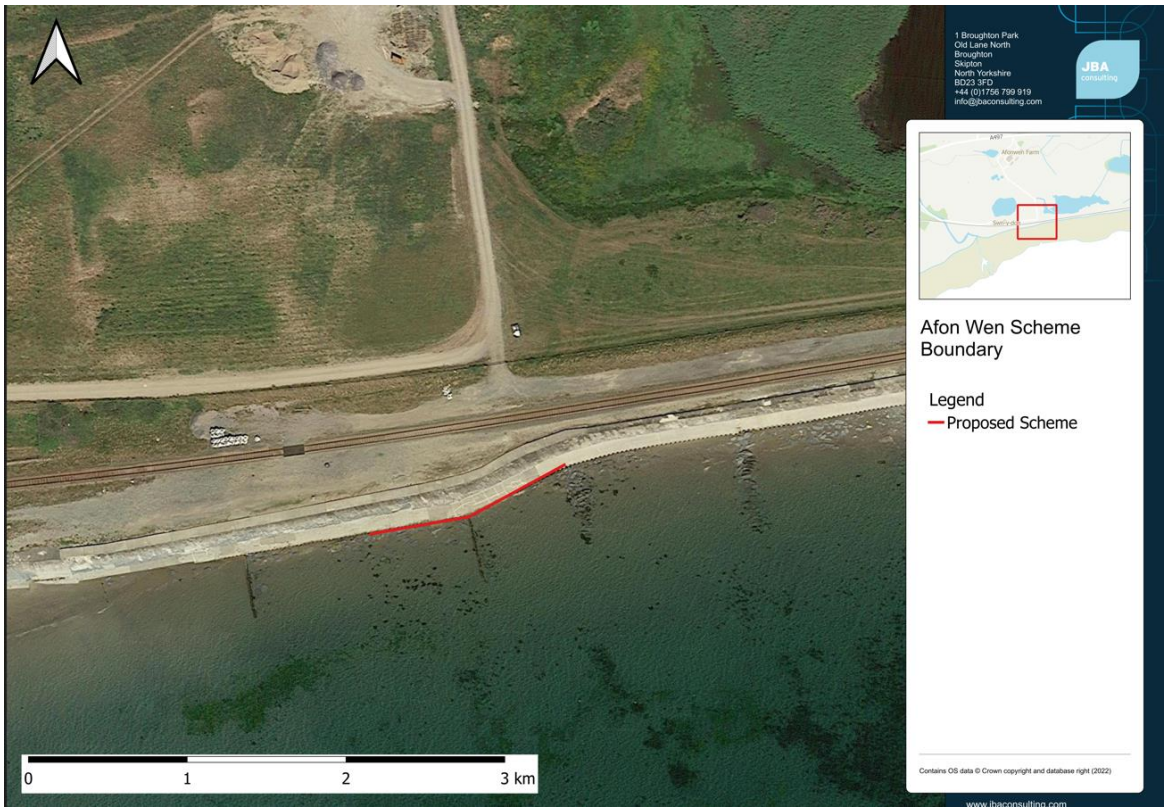

Figure 3-1: Site location, Afon Wen with area of works highlighted (red diamond).

3.2 Proposed Works

The proposed works involve repairs to the existing coastal defence along the frontage at Afon Wen. The works are required to reinstate the defences and protect the railway line which runs approximately 10 - 15 m behind the current coastal defences.

Storm damage to the defence has displaced a number of sheet piles which has resulted in the removal of material from beneath the concrete seawall embankments. This has led to the creation of several voids that present a risk of undermining the structure.

The proposed works are planned to fill the void spaces with pumped concrete prior to reinstating approximately eight sheet piles using a piling hammer positioned on the

beach. The proposal is to then install rock armour in front of the piles to protect them from wave attack and limit movement in future.

The works are further detailed as below, and Figure 3-2 and Figure 3-3:

- Existing sheet pile wall to be removed.
- Existing concrete infill behind current sheet pile wall to be removed.
- Piling works to reinstate storm damaged sheet piling - repair works are to be completed using a piling hammer. Construction of proposed sheet pile wall (13.0 m long, see
- Grout injection into known voids behind new sheet pile wall.
- Installation of rock armour in front of the sheet piles to prevent future damage.

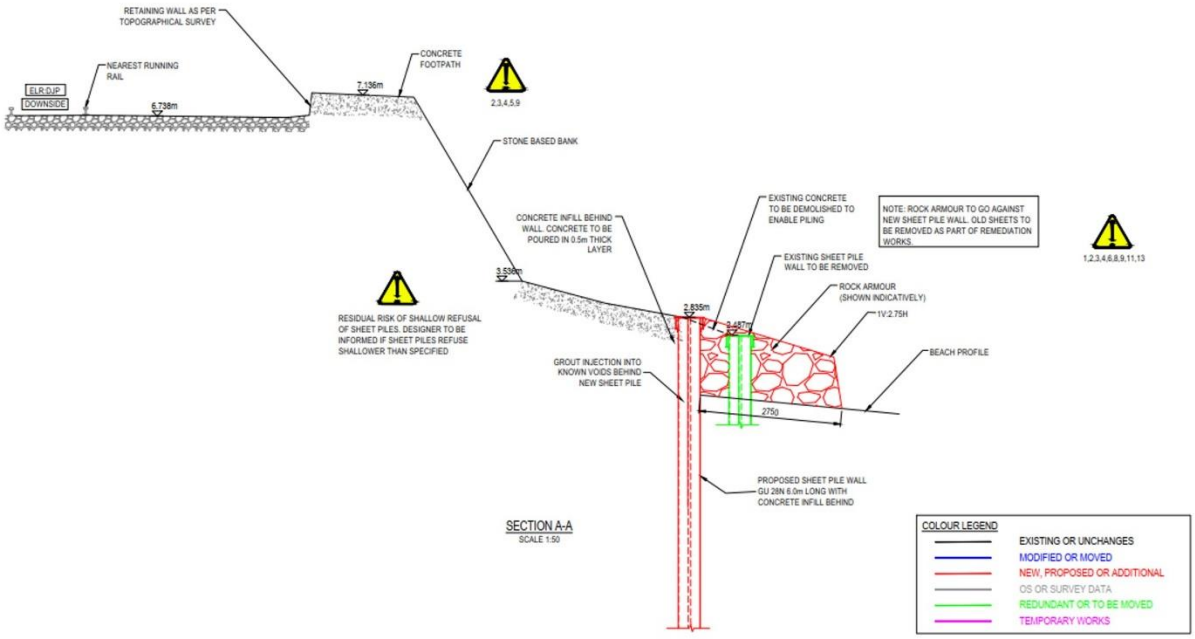

Figure 3-2: General Arrangement drawing section (profile view) - image capture taken from 'PROPOSED SECTIONS' created by Crouch Waterfall, Project Number: 23162B / Drawing Number: 001 - Revision B03, dated June 2023, provided by Daniel Overson (MPH Construction) on 23rd February 2024.

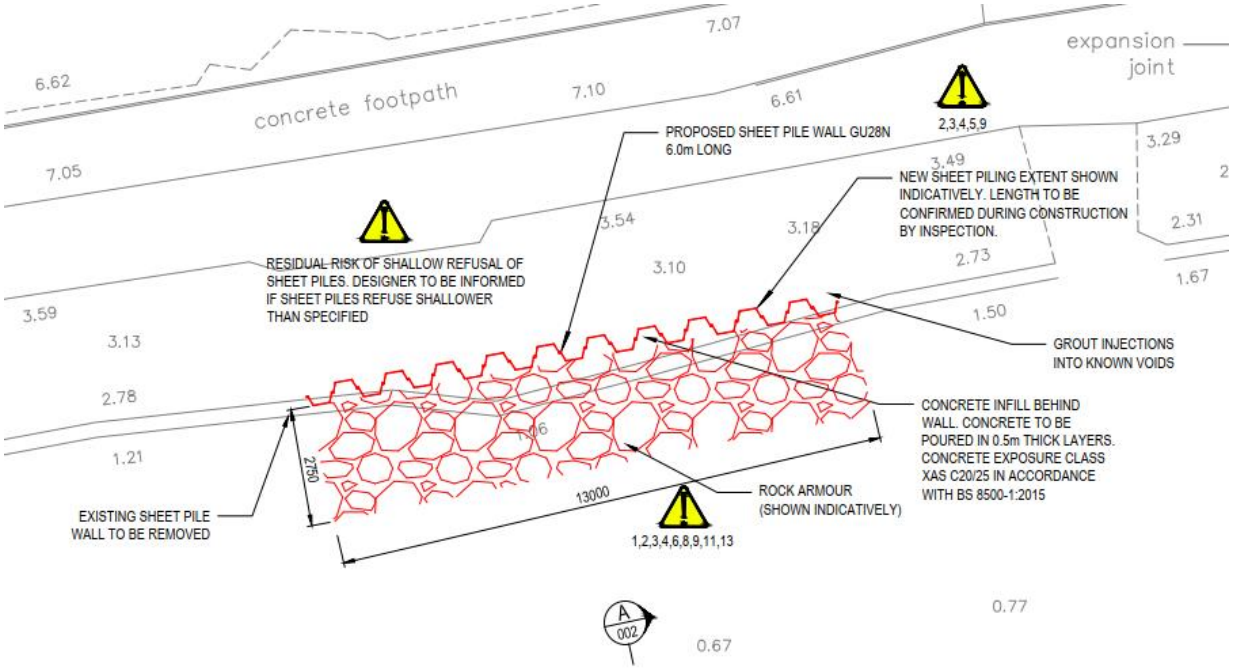

Figure 3-3: General Arrangement drawing section - image capture taken from 'GA ON PROPOSED SHEET PILE WALL AND ROCK ARMOUR' created by Crouch Waterfall, Project Number: 23162B / Drawing Number: 001 - Revision B03, dated June 2023, provided by Daniel Overson (MPH Construction) on 23rd February 2024.

General arrangement design drawing (Figure 3-3) indicate the extent of the sheet pile and associated rock armour placement. The revised drawings indicate that the sheet pile and rock armour extent being repaired will be 13.0 m in length and will extend 2.75 m seaward of the emplaced sheet pile, as per communication from Daniel Overson (MPH Construction), on 22nd March 2023.

Subsequently, the footprint of the proposed repair works are expected to cover 35.75 m^2 of the intertidal area.

4 WFD Screening Assessment

4.1 Overview

This screening assessment aims to screen in any works that require WFD Assessment and to identify which WFD water bodies are within and near to the proposed works.

The results of the screening assessment are presented below. The baseline status of the quality elements within the water bodies screened into the assessment are discussed in this chapter. As mentioned in the Introduction and Methodology, if this

section finds there is potential for the proposed works to cause deterioration in the status of a water body, or prevent it from achieving its status objectives, the relevant water body and its quality elements should be taken forward and consider further in the Scoping Assessment chapter.

4.2 WFD Water Bodies

The site is located within the Llyn and Eryri TraC Operational Catchment. The following water bodies are considered:

- Tremadog Bay (Water Body ID - GB651009350000) - Coastal water body
- Dwyfor (Water Body ID - GB511006511000) - Transitional water body
- Wen (Lleyn Peninsula) (Water Body ID - GB110065053680) - River water body
- Llyn and Eryri (Water Body ID - GB41002G204600) - Groundwater water body

4.2.1 Current Status

Details of the 2019 classification, status and objectives of the considered water bodies, as described by the Natural Resources Wales (2023) Water Watch Wales Map Gallery, are summarised in Table 4-1.

Table 4-1: Current WFD Status

Water Body ID	Water Body Name	Hydromorphological Designation	Current Ecological Status	Overall Water body Status
GB651009350000	Tremadog Bay	Natural	Good	Good
GB511006511000	Dwyfor	Natural	Good	Good
GB110065053680	Wen (Lleyn Peninsula)	Natural	Good	Good
GB41002G204600	Llyn and Eryri	Natural	Not applicable	Poor

4.3 Screening Outcome: Water Bodies

The following table indicates which water bodies have been screened in or out of the assessment and the reasons for this decision.

Table 4-2: Water Body Screening Outcome

Water Body (Type)	Reason	Screening Outcome
Tremadog Bay (Coastal)	The proposed works are to be conducted adjacent to/within the coastal waterbody. The impacts of the works are to be further assessed relative to their ability to impact on WFD quality elements.	Screened In

Water Body (Type)	Reason	Screening Outcome
Dwyfor (Transitional)	The Dwyfor transitional water body is situated adjacent to the Tremadog Bay water body. However, the boundary of the water body is approximately 3.3 km from the proposed works. Given the localised nature and limited scope of repair works required the impacts of the construction and operational phases of the works are not expected to present a significant impact to the WFD quality elements.	Screened Out
Wen (Lleyn Peninsula) (River)	The boundary of the Wen waterbody is connected to the Tremadog Bay. The boundary between the two is located approximately 1.3 km upstream of where the works are being conducted. Given the tidal influence of the adjoining coastal waterbody and the potential for any impacts associated with the works may be transferred upriver. Therefore, the works are to be further assessed relative to their ability to impact on WFD quality elements. Of the water body.	Screened In
Llyn and Eryri (Groundwater)	The Llyn and Eryri groundwater is located adjacent to the area of the proposed works. However, given the localised nature and limited scope of repair works required the impacts of the construction and operational phases of the works are not expected to present a significant impact to the WFD quality elements.	Screened Out

4.4 Baseline Status of Screened in Water Bodies

For the stated water bodies screened into the assessment, details on the status of each element, as described by the Natural Resources Wales (2023) Water Watch Wales Map Gallery, are provided below.

4.4.1 Tremadog Bay - GB651009350000

The tables below describe the current status of the key classification elements according to the most recent WFD cycle for the Tremadog Bay water body.

Table 4-3: Biological Quality Elements Status (Tremadog Bay)

Biological Quality Element	Current Status (2021)
Ecology	Good
Angiosperms	Not assessed
Fish	Not assessed
Invertebrates	Good
Macroalgae	Not assessed
Imposex	Good
Phytoplankton	Not assessed
Infaunal Quality Index	High

Table 4-4: Hydromorphological Quality Element Status (Tremadog Bay)

Hydromorphological Quality Element	Current Status (2021)
Hydrological Regime	Not Assessed
Morphology	High

Table 4-5: Physico-Chemical Quality Elements Status (Tremadog Bay)

Physico-Chemical Quality Element	Current Status (2021)
Dissolved Inorganic Nitrogen (DIN)	Not Assessed
Dissolved Oxygen (DO)	Not Assessed

Table 4-6: Chemical substances status (Tremadog Bay)

Chemical substances	Current Status (2021)
Priority hazardous substances	Not Assessed
Specific Pollutants	Not Assessed

4.4.2 Wen (Lleyn Peninsula) GB110065053680

The table below describes the current status of the water body classifications according to the most recent WFD cycle for the Wen water body.

Table 4-7: Biological Quality Elements Status (Wen)

Biological Quality Element	Current Status (2021)
Ecology	Good
Angiosperms	Not assessed
Fish	Not assessed
Invertebrates	High

Biological Quality Element	Current Status (2021)
Macrophyte and phytobenthos combined	Good

Table 4 4: Hydromorphological Quality Element Status (Wen)

Hydromorphological Quality Element	Current Status (2021)
Hydrological Regime	High
Morphology	Not High

Table 4-8: Physico-Chemical Quality Elements Status (Wen)

Physico-Chemical Quality Element	Current Status (2021)
Dissolved Oxygen (DO)	High
Phosphate	Good
Ammonia	High
pH	High

4.5 Protected Areas

The WFD specifies that areas requiring special protection under other retained EC Directive and waters used for the abstraction of drinking water are identified as protected areas. These areas have their own objectives and standards. Article 4 of the WFD requires Member States to achieve compliance with the standards and objectives set for each protected area by 22nd December 2015, unless otherwise specified in the legislation under which the protected area was established. WFD Protected Areas include Nitrate Vulnerable Zones (NVZ), Drinking Water Protected Areas (DrWPA) and European Sites (designated for the conservation of habitats and species).

4.5.1 European designated nature conservation sites

The water bodies screened in above are linked to the Pen Llŷn a'r Sarnau/ Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC) and the Gogledd Bae Ceredigion/ Northern Cardigan Bay Special Protection Area (SPA). Therefore, these protected sites will be screened into the scoping assessment.

4.5.1.1 Pen Llŷn a'r Sarnau/ Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC)

Qualifying Features

The SAC comprises 92.6% marine areas and sea inlets, 5.4% tidal rivers, estuaries, mudflats, sandflats and lagoons (including saltwork basins, 1.2% salt marshes, salt pastures, salt steppes, 0.5% coastal sand dunes, sand beaches, machair, 0.2% shingle, sea cliffs, islets and 0.1% bogs, marshes, water fringed vegetation and fens.

Annex I habitats that are a primary reason for selection of this site:

- 1110 Sandbanks which are slightly covered by sea water all the time
- 1130 Estuaries
- 1150 Coastal lagoons
- 1160 Large shallow inlets and bays
- 1170 Reefs

Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site:

- 1140 Mudflats and sandflats not covered by seawater at low tide
- 1310 Salicornia and other annuals colonizing mud and sand
- 1330 Atlantic salt meadows (*Glauco-Puccinellietalia* maritime)
- 8330 Submerged or partially submerged sea caves

Annex II species present as a qualifying feature, but not a primary reason for site selection:

- 1349 Bottlenose dolphin *Tursiops truncatus*
- 1355 Otter *Lutra lutra*
- 1364 Grey seal *Halichoerus grypus*

Conservation Objectives

To achieve favourable conservation status all the following, subject to natural processes, need to be fulfilled and maintained in the long-term. If these objectives are not met restoration measures will be needed to achieve favourable conservation status.

- Habitat Features
    - The overall distribution and extent of the habitat features within the site, and each of their main component parts is stable or increasing.
    - The physical biological and chemical structure and functions necessary for the long-term maintenance and quality of the habitat are not degraded.
    - The presence, abundance, condition and diversity of typical species is such that habitat quality is not degraded.
- Species Features

- The population is maintaining itself on a long-term basis as a viable component of its natural habitat.
- The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.
- The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing.
- As part of this objective it should be noted that for the bottlenose dolphin and otter, populations should be increasing.

4.5.1.2 Gogledd Bae Ceredigion/ Northern Cardigan Bay Special Protection Area (SPA)

Qualifying Features

- The site qualifies under Article 4.1- Qualification (79/409/EEC):
  - Over winter the area regularly supports: Red-throated diver *Gavia stellata*, 1,186 individuals representing 7% of the wintering population in Great Britain (2001/02 – 2003/04)

Conservation Objectives

The single qualifying feature of the proposed SPA is the nationally important nonbreeding population of Red-throated diver *Gavia stellata*. The conservation objectives outlined for this feature include:

- The wintering population of Red-throated diver should be stable or increasing.
- The foraging habitat of this species should not decrease significantly, and its quality should remain unaffected by anthropogenic factors.

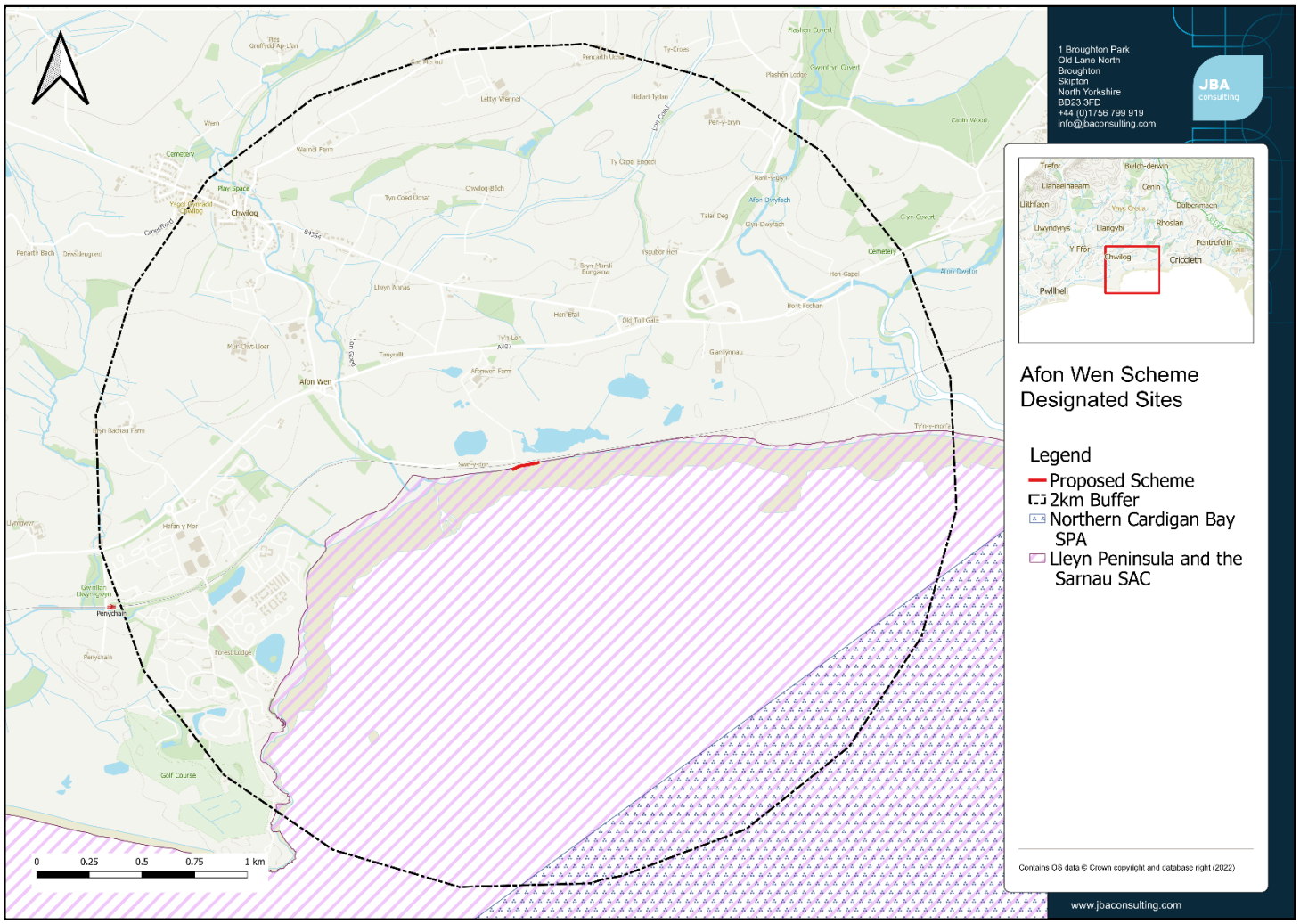

Figure 4-1: European designated Special Area of Conservation (SAC) and Special Protection Area (SPA) within proximity of the works

4.5.2 Nitrate Vulnerable Zones (NVZ)

The retained European Commission Nitrates Directive requires areas of land that drain into waters polluted by nitrates to be designated as Nitrate Vulnerable Zones (NVZs). There are no reported NVZ's within the vicinity of the proposed works.

4.5.3 Drinking Water Groundwater Safeguard Zones (SgZ)

Drinking Water Protected Areas (DrWPA) are designated under the Water Framework Directive, with the aim of avoiding deterioration in their quality in order to reduce the level of purification treatment required in the production of drinking water. SgZs are areas where actions will be targeted to address the causes of DrWPA objective failure/risk of failure. The proposed works are located seaward of the nearest Groundwater Drinking Water Protected Areas with Risk - GB41002G204600 which is

currently classified as being, not at risk. The proposed works are not expected to impact on the current or future status of the DrWPA.

4.5.4 Designated Bathing Waters

The area of the proposed works is located approximately 5.6 km from the nearest bathing area, as designated under the Bathing Water Regulations 2013 (2013/1675). The distance of the designated bathing water from the site of works is considered to be beyond the zone of influence of any associated impacts and is therefore screened out and not considered further. The current bathing water classification is indicated in Table 4-1.

Table 4-1: Bathing Waters within the Zone of Influence

Designated Bathing Water	Current Classification (2021)	Distance from scheme
Criccieth	Sufficient	5.6 km

4.6 Summary

To conclude, the screening assessment has identified the following water body and quality elements as needing further consideration within the Scoping Assessment:

Tremadog Bay (Water Body ID - GB651009350000) - Coastal water body

- Biological Elements
- Hydromorphological Elements*
- Physico-chemical Elements*
- Chemical Substances*
- Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay SPA

Wen (Lleyn Peninsula) (Water Body ID - GB110065053680) - River water body

- Biological Elements
- Hydromorphological Elements
- Physico-chemical Elements
- Lleyn Peninsula and the Sarnau SAC
- Northern Cardigan Bay SPA

* Although the Water Watch Wales web resource does not report the current status of all stated quality elements these have been included for further consideration within the Scoping Assessment with respect to the proposed works.

5 WFD Scoping Assessment

5.1 Overview

This scoping assessment identifies whether the water body's receptors, identified during the screening assessment, are at risk from the proposed works discussed in Chapter 3. The proposed development works are being appraised in terms of their impact on WFD status and objectives. If any quality elements are found to be at risk of detrimental impact, further assessment and/or mitigation may be required in the next chapter (as demonstrated by the final column).

Some WFD quality elements have not been formally assessed as part of the classification for this water body. However, due to the scale and nature of the proposed works, all WFD quality elements have been included in the previous screening and any identified impacts have been considered in relation to the status of the water body and the status objectives.

Article 4.7 of the Directive defends deterioration in status or failure to meet WFD objectives resulting from new modifications or sustainable human development activities (if all conditions set out under this Article are met). If the assessment procedure predicts that an activity will cause deterioration in water body status or prevent a water body from meeting its ecological objectives, then an assessment is also required against the conditions listed in Article 4.7 of the WFD. If all the assessment conditions are met, there will not be a breach of the WFD and compliance will be attained.

5.2 Scoping Assessment

As part of the Scoping Assessment the impacts associated with the proposed works on the WFD status of the Tremadog Bay coastal water body and Wen river water body are to be considered further.

5.2.1 Tremadog Bay - Biological Quality Assessment

Table 5-1 presents an assessment of the proposed works against the biological quality elements of the Tremadog Bay coastal water body.

Table 5-1: Assessment of the proposed works against the Biological quality elements of the Tremadog Bay coastal water body

WFD Biological Quality Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Ecology	Good	The ecology elements of the transitional water body have the potential to be affected by the proposed scheme. There is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body. Operations during the construction phase could cause noise and visual disturbance to species associated with the of the transitional water body.	Yes
Angiosperms	Not assessed	All of the biological quality elements of the transitional water body have the potential to be affected by the proposed scheme, there is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body.	Yes
Fish	Not assessed		
Invertebrates	Good		
Macroalgae	Not assessed		
Phytoplankton	Not assessed		
Infaunal Quality Index	High		

5.2.2 Tremadog Bay - Hydromorphological Quality Assessment

Table 5-2 presents an assessment of the proposed works against the hydromorphological quality elements of the Tremadog coastal water body.

Table 5-2: Assessment of the proposed works against the Hydromorphological quality elements of the Tremadog coastal water body

WFD Hydromorphological Quality Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Morphology: Depth variation	Not assessed	The listed WFD hydromorphological quality elements are not expected to be modified by the proposed works being undertaken in the adjacent water body. Whilst the proposed design will encroach into the intertidal zone the minimal footprint which is expected not to exceed 35.75 m^2 will be insignificant in scale relative to the wider coastal water body. Subsequently, the impacts are expected to have a negligible impact on the listed WFD Quality Elements.	No
Morphology: Structure and substrate of the bed	Not assessed		No
Morphology: Structure of the intertidal zone	Not assessed		No
Tidal regime: Direction of dominant currents	Not assessed		No
Tidal regime: wave exposure	Not assessed		No

5.2.3 Tremadog Bay - Physico-Chemical Quality Assessment

Table 5-3 presents an assessment of the proposed works against the physico-chemical quality elements of the Tremadog Bay coastal water body.

Table 5-3: Assessment of the Proposed Works against the Physico-Chemical quality elements of the Tremadog Bay coastal water body

WFD Physico-Chemical Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Dissolved Inorganic Nitrogen (DIN)	Not Assessed	The proposed works are not expected to result in increased concentrations of DIN or a change to the WFD status that may lead to nutrient enrichment of the water body.	No
Dissolved Oxygen (DO)	Not Assessed	Although the extent of the works are small when considering the scale of the coastal water body there is potential for short term, localised alteration in DO levels via the transfer of construction materials, namely concrete, to the water body. Furthermore, there is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body.	Yes

5.2.4 Tremadog Bay - Chemical substances status

Table 5-4 presents an assessment of the proposed works against the Chemical substances status of the Tremadog Bay coastal water body.

Table 5-4: Assessment of the Proposed Works against the Chemical substances status of the Tremadog Bay coastal water body

WFD Chemical Substances	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Priority hazardous	Not	The extent of the works are	

WFD Chemical Substances	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
substances	Assessed	small when considering the scale of the coastal water body and are not expected to result in significant direct impacts on chemical substances status within the water body. However, there is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body.	Yes
Specific Pollutants	Not Assessed		

5.2.5 Wen - Biological Quality Assessment

Table 5-5presents an assessment of the proposed works against the Wen water body.

Table 5-5: Assessment of the proposed works against the Biological quality elements of the Wen river water body

WFD Biological Quality Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Ecology	Good	All of the biological quality elements of the transitional water body have the potential to be affected by the proposed scheme, there is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body.	Yes
Angiosperms	Not assessed		
Fish	Not assessed		
Invertebrates	High		
Macrophyte and phytobenthos combined	Good		

5.2.6 Wen - Hydromorphological Quality Assessment

Table 5-6 presents an assessment of the proposed works against the hydromorphological quality elements of the Wen river water body.

Table 5-6: Assessment of the proposed works against the Hydromorphological quality elements of the Wen river water body

WFD Hydromorphological Quality Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Quantity and dynamics of water flow	Not assessed	The listed WFD hydromorphological quality elements for the Wen river water body are not expected to be modified by the proposed works in the adjoined coastal water body. The limited scale of the works being undertaken in the adjoining coastal water body and the distance to the Wen water body (1.3 km) are not expected to have an impact on the listed WFD Quality Elements.	No
Connection to groundwater bodies	Not assessed		No
River Continuity	Not assessed		No
River depth and width variation	Not assessed		No
Structure and substrate of the river-bed	Not assessed		No

5.2.7 Wen - Physico-Chemical Quality Assessment

Table 5-7 presents an assessment of the proposed works against the physico-chemical quality elements of the Wen river water body.

Table 5-7: Assessment of the Proposed Works against the Physico-Chemical quality elements of the Wen river water body

WFD Physico-Chemical Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
Dissolved Oxygen (DO)	High	There is potential for impacts to some of the listed WFD Physico-Chemical Elements as a result of the	Yes
Phosphate	Good		
Ammonia	High		

WFD Physico-Chemical Element	Current Status	Potential Impact	Further Assessment and/or Mitigation Required?
pH	High	proposed works although these are likely to be limited given the scale of the works and the distance to the Wen water body (1.3 km). Impacts to concentrations of phosphate and ammonia are not anticipated - the works are not expected to result in nutrient enrichment. Similarly, direct impacts to DO are not anticipated to occur as a result of the works. Key concerns arise from the use of concrete which given the calcium carbonate content may raise pH levels should excessive amounts come into contact with water. This may then be transferred to the Wen water body on the incoming tide. Indirect temporary impacts may occur via accidental pollution spillages from plant machinery operating in the vicinity of the water body.	

5.3 Impacts of the Proposed Works on Protected Sites

Table 5-8 presents an assessment of the proposed works against any protected sites identified in close proximity to the

A Habitats Regulations Assessment (HRA) has been completed which details the impacts of the proposed scheme on these sites.

Table 5-8: Assessment of the Proposed Works on Protected Sites

WFD Quality Element	Potential Impact	Further Assessment and/or Mitigation Required?
Lleyn Peninsula and the Sarnau SAC	Low	Yes
Northern Cardigan Bay SPA	Low	Yes

6 WFD Impact Assessment

6.1 Overview

The Scoping Assessment presented in Section 5 identified some receptors may potentially be at risk from the proposed works. An Impact Assessment is therefore required to describe how these identified impacts will be mitigated.

The Impact Assessment needs to consider if there is a pathway linking the pressure to the receptor. If there is no pathway there can be no impact on the receptor and there is no need for any further assessment of that receptor to be carried out. If there is a potential pathway the assessment should consider if the activity, and the pressure it creates, may cause deterioration of the receptor.

In order to effectively assess the potential impacts of the proposed works and decide upon suitable mitigation measures, a good understanding of the proposed scheme and design is required. Should any revisions be made to the proposed works that could impact any of the WFD Quality Elements, this section should be revised.

6.2 Impact Assessment

Table 6-1 and Table 6-2 discuss the receptors identified as being potentially at risk in the scoping assessment. Mitigation measures are recommended to eliminate/reduce the effects of the proposed works.

Table 6-1: Impacts and Mitigation Measures - Tremadog coastal water body

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
Ecology	Indirect	**Temporary impact:** The ecology elements of the transitional water body have the potential to be affected by the proposed scheme. There is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are outlined in section 6.4.

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
	Direct	**Temporary impact:** Operations during the construction phase, particularly pilling, could cause noise and visual disturbance to species associated with the of the transitional water body. **Mitigation:** Soundex Noise Sound Barriers will be erected at the proposed site during the proposed pilling works. Noise Sound barriers will reduce noise to <60dbs and act as a visual barrier to reduce human visual presence.
Fish Invertebrates Macroalgae Phytoplankton	Indirect	**Temporary impact:** Fish, Invertebrates, Macroalgae and Phytoplankton associated with the transitional water body have the potential to be affected by the proposed scheme. There is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are outlined in section 6.4.
Physico-chemical - Dissolved Oxygen	Direct & Indirect	**Temporary Direct Impact:** the proposed works may present a direct impact to DO concentrations within the coastal water body via the potential for construction materials, namely concrete to enter, or come into contact with the water body. **Temporary Indirect Impact:** the proposed works present an indirect impact to DO concentrations within the coastal water body via the potential for accidental pollution spillages from plant machinery during the construction phase of the works which could lead to chemicals entering the

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
		water body resulting in a temporary change and/or deterioration in concentrations of DO. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are to include the following: • Reduced interaction between the waterbody and concrete; all pumped concrete should be injected into void spaces when the tide is receding, opposed to incoming. This will provide additional time for the concrete to cure. • Plant machinery should avoid movement on the beach, particularly when using concrete, when the tide is in. Work should be conducted during dry conditions. This will require tide tables and weather forecasts to be referenced and work schedules arranged accordingly in advance of any works taking place. • Pollution prevention measures including daily machinery checks to be completed and recorded. • Any concrete and fuel left on-site is to be located in the works compound away from the water body. Fuel should be stored in bunded fuel bowsers. • The works compound will be fenced off and padlocked for security. • Spill kits will be available on site in the event of any fuel/chemical spillage.

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
Chemical Substances - Priority hazardous substances & Specific Pollutants	Indirect	**Temporary Indirect Impact:** the proposed works present an indirect impact to the coastal water body via the potential for accidental pollution spillages from plant machinery during the construction phase of the works. This could lead to priority hazardous substances and/or specific pollutants entering the water body resulting in a temporary change and/or deterioration in WFD status. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are to reflect the same mitigation measures listed above for Dissolved Oxygen.

Table 6-2: Impacts and Mitigation Measures - Wen river water body

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
Ecology Angiosperms Fish Invertebrates	Indirect	**Temporary impact:** The ecology elements associated with the transitional water body have the potential to be affected by the proposed scheme. There is the potential for indirect temporary impacts via accidental pollution spillages from plant machinery operating in the vicinity of the water body. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are outlined in section 6.4.

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
Physico-Chemical Elements (Dissolved Oxygen, Phosphate, Ammonia & pH)	Direct & Indirect	**Temporary Direct Impact:** the use of concrete in the adjacent coastal water body has the potential to impact on pH levels in the Wen water body should any concrete be mobilised on the incoming tide. This could raise pH levels and impact on aquatic species and alter the water chemistry. **Temporary Indirect Impact:** the proposed works present an indirect impact to the river water body via the potential for accidental pollution spillages from plant machinery during the construction phase of the works. This could lead to temporary change and/or deterioration in WFD status should pollutants enter the water body. **Mitigation:** Standard construction industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works. These measures are to include the following: • Plant machinery should avoid movement on the beach when the tide is in. Work should be conducted under dry conditions. This will require tide tables and weather forecasts to be referenced and work schedules arranged accordingly. • Reduced interaction between the waterbody and concrete; all pumped concrete should be injected into void spaces when the tide is receding, opposed to incoming. This will provide additional time for the concrete to cure.

WFD Quality Element	Pathway (Direct/Indirect)	Potential Impact / Mitigation Measures
		• Pollution prevention measures including daily machinery checks to be completed and recorded. • Any concrete and fuel left on-site is to be located in the works compound away from the water body. Fuel should be stored in bunded fuel bowsers. • The works compound will be fenced off and padlocked for security. • Spill kits will be available on site in the event of any fuel/chemical spillage.

6.3 Water Body Mitigation Measures

Specific mitigation measures are applied to each Artificial and Heavily Modified Water body. These mitigation measures are necessary to reduce the existing hydromorphological impacts on the water body and all measures need to be adopted in order for the water body to achieve "Good" Ecological Status or Potential.

Given that the Tremadog and Wen water bodies are not considered Artificial and/or Heavily Modified, (both are classified as Natural), they are not subject to designated mitigation measures as detailed in the NRW Mitigation Measure Assessment data spreadsheet - updated July 2022.

6.4 Pollution Prevention Measures

Appropriate pollution prevention measures will be implemented to ensure that the habitats within proximity of the works, including the interest features and supporting habitats of the Lleyn Peninsula and the Sarnau SAC and the Northern Cardigan Bay SPA are not degraded as a result of pollution events during the construction phase. This mitigation will include:

- Reduced interaction between the waterbody and concrete; all pumped concrete should be injected into void spaces when the tide is receding, opposed to incoming. This will provide additional time for the concrete to cure.
- Plant machinery should avoid movement on the beach, particularly when using concrete, when the tide is in. Work should be conducted during dry conditions. This will require tide tables and weather forecasts to be referenced and work schedules arranged accordingly in advance of any works taking place.

- Following relevant guidance e.g. CIRIA Guidance: Control of water pollution from construction sites. Guidance for consultants and contractors (C532D) (Masters-Williams, 2001), including the delivery of toolbox talks to site staff.
- Any chemical, fuel and oil stores will be located on impervious bases within a secured bund with a storage capacity 110% of the stored volume.
- Biodegradable oils and fuels will be used where possible.
- Drip trays will be placed underneath any standing machinery to prevent pollution by oil/fuel leaks. Refuelling of vehicles and machinery will be carried out on an impermeable surface in one designated area well away from the high tide mark with capture of any spillages.
- Emergency spill kits will be available on site and staff trained in their use.
- Operators will check their vehicles on a daily basis before starting work to confirm the absence of leakages. Any leakages will be reported immediately.
- Daily checks will be carried out and records kept on a weekly basis and any items that have been repaired/replaced/rejected noted and recorded. Any items of plant machinery found to be defective will be removed from site immediately or positioned in a place of safety until such time that it can be removed.
- This mitigation is industry standard practice and as a result will be incorporated into the project through the Environmental Management Plan (EMP).

6.5 WFD Assessment Objectives

Following consideration of the potential impacts and proposed mitigation measures recommended in Table 6-1 and Table 6-2, Table 6-3 assesses whether the proposed works comply with the overarching objectives of the WFD.

Table 6-3: Assessment of the Proposed Works against the WFD Objectives

WFD Assessment Objective	Assessment of the Proposed Works
Objective 1: The proposed works do not cause deterioration in the status of the ecological elements of the water body	By adopting the mitigation measures highlighted herein the proposed works are not expected to cause deterioration of the status of the ecological elements in either the Tremadog and/or Wen water bodies.
Objective 2: The proposed works do not compromise the ability of the water body to achieve its WFD status objectives	The proposed works are not expected to compromise the ability of the Tremadog and/or Wen water bodies in achieving their WFD status objectives.
Objective 3: The proposed works do not cause a permanent exclusion or compromised achievement of the WFD	The proposed works are not expected to result in exclusion or compromise of the current and/or future WFD status of

WFD Assessment Objective	Assessment of the Proposed Works
objectives in other bodies of water within the same RBD	water bodies within the Western Wales River Basin Management Plan District.
Objective 4: The proposed works contribute to the delivery of the WFD objectives	By adopting the mitigation measures highlighted herein the proposed works are not expected to impact on the delivery and/or prevent the achievement of the WFD objectives.

7 Discussion and Conclusions

7.1 Assessment Summary

The proposed works involve repairs to the seawall frontage at Afon Wen, North Wales. The works involve pumping concrete into existing void spaces under the seawall, replacing damaged sheet piles with a new sheet pile wall. Following construction of the wall rock armour protection will be placed against the wall to prevent future damage and undermining.

7.1.1 Biological Assessment

The proposed works have the potential to lead to direct and indirect localised impacts to a number of ecological receptors during the construction works. These include impacts to fish, invertebrates, macroalgae and phytoplankton through potential pollution events as well as impacts to species associated with the water bodies screened in this assessment such as Otter, Grey seal, marine mammals and over-wintering birds through noise and visual disturbance.

However, the proposed works are not anticipated to pose a significant threat to the biological quality elements of the waterbodies, providing recommended mitigation measures are followed. These include:

- Pollution prevention: appropriate pollution prevention measures will need to be implemented during the construction phase and within the final design in line with relevant guidance and best practice. This should include appropriate sediment control procedures, reducing interaction between the waterbody and the use of drip tray and emergency spill kits. On outline of pollution prevention measures is detailed in section 6.4
- Soundex Noise Sound Barriers will be erected at the proposed site during the proposed pilling works. Noise Sound barriers will reduce noise to <60dbs and act as a visual barrier to reduce human visual presence.
- A Habitat Regulations Assessment (HRA) has been completed which details the impacts of the proposed scheme on the Pen Llŷn a'r Sarnau/ Lleyn Peninsula and the Sarnau Special Area of Conservation (SAC) and the Gogledd Bae Ceredigion/ Northern Cardigan Bay Special Protection Area (SPA).

7.1.2 Hydromorphological Assessment

An assessment has identified that the proposed works are not likely to present a significant risk or impact to the hydromorphology of either the Tremadog coastal water body, or the Wen river water body. The design drawings indicate that the footprint of the repair works are expected to cover 35.75 m^2 of the intertidal area. Subsequently, the scale, and nature of the proposed works relative to the size of the Tremadog

coastal water body and the distance to the Wen water body (1.3 km) mean that any potential impacts to the WFD hydromorphological supporting elements are likely to be negligible. Subsequently, any impacts are not expected to adversely affect the wider water body and/or cause deterioration to WFD hydromorphological supporting elements during either the construction or operational phases of the proposed work. All operations are to be undertaken in accordance with best practice, which will further reduce the likelihood of any potential impacts on the WFD hydromorphological supporting elements.

7.1.3 Physico-Chemical Assessment

The Tremadog coastal water body and Wen river water body have been assessed for physico-chemical and chemical quality elements within the WFD framework. Provided the proposed mitigation measures detailed herein are adhered to there is no expectation that the works will lead to a deterioration in the physico-chemical and chemical quality elements of either WFD water body during either the construction or operational phases of the proposed work.

7.2 Scheme Recommendations / Key Considerations

The impact assessment determines whether the proposed works have the potential to significantly impact any of the quality elements screened into the assessment. Any mitigation measures that need to be considered to make the works compliant with the WFD are presented in Table 6-1 and Table 6-2; however, the critical ones are listed below:

- Soundex Noise Sound Barriers will be erected at the proposed site during the proposed pilling works. Noise Sound barriers will reduce noise to <60dbs and act as a visual barrier to reduce human visual presence.
- Standard industry practices and associated measures for the management of pollution prevention are required throughout the duration of the proposed works.
- Use of plant machinery and use of cement on the beach should be limited to dry periods when the tide is receding.

7.3 Conclusions

The proposed works are expected to be compliant with WFD objectives if the appropriate mitigation measures described in relation to each potential impact are incorporated into the works design. The extent of the proposed rock armour is expected to cover not more than 35.75 m^2 of the intertidal area. Subsequently the works are not expected to have a significant impact on WFD quality elements or contribute considerably to coastal squeeze when considered relative to the wider Tremadog Bay coastal water body.

Should the design or scope of the work alter significantly, this report would need to be revised to ensure the mitigation measures and recommendations outlined in this report have been considered and to determine whether the final scheme is WFD-compliant.

Collectively, the proposed works are not expected to contribute towards the failure or deterioration of the water bodies that have been assessed. Additionally, there is not expected to be a significant impact on any WFD receptors and no significant short-term, or long-term impacts are predicted during the construction and/or operational phases of the works. The expectation is that the water bodies assessed will maintain "Good" status during and following the proposed repair works.

References

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