



CPF8169



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Content

Content	4
Background	4
Introduction	4
Legislative Background.....	4
WFD Assessment in Stages	6
The Proposal	6
WFD Assessment.....	8
WFD Classification.....	10
WFD Assessment - Screening:.....	10
WFD Assessment – Scoping Exercise:	10
Hydromorphology:	11
Biology - habitats:	13
Biology – fish	14
Water Quality:	17
WFD Protected Areas	18
Invasive Non-Native Species (INNS).....	19
Summary of Scoping:.....	20
Assessment of impacts on waterbody quality elements.....	20
WFD Compliance	21
Hydromorphology	22
Water Quality	22
Protected Areas.....	23
Conclusion	25
Appendices.....	2

Background

YGC have been successful in obtaining grant funding to develop the Flood Alleviation Scheme (FAS) for the Harbour frontage of Barmouth (See Appendix A for Location Plan and General Arrangement) which involves work within the estuary of the Afon Mawddach and in close proximity to the Cardigan Bay waterbody. The work briefly includes surface water drainage network improvements, sea defence betterment and Property Level Protection (PLP) installation. This WFD Assessment is to be submitted as part of the Marine Licence application to Natural Resources Wales (NRW) in line with the Water Framework Directive requirements.

Introduction

The works to be undertaken are to an existing sea wall. The sea wall currently has several defects and collapses and also suffers overtopping during high tide and storm conditions. This overtopping causes flooding to properties and highway behind the wall. The FAS is to reduce the risk of flooding to these properties and receptors through improving the current sea wall.

The works is detailed further in the Proposal below and on plans appended to this report. The works briefly includes:

1. Repair, strengthen and raising an approx. 60m section of sea wall.
2. Erect new setback wall and floodgate/barrier.
3. Install new drainage network to manage surface water and overtopping in the area behind the setback wall and flood gates.
4. Installation of Property Level Protection (PLP).

The study area lies within the estuary of the Afon Mawddach and directly adjacent to the Cardigan Bay waterbody (see Appendix A for location plan and general arrangement).

This report will outline the works to be undertaken including background context of the area where the works are located, assesses the WFD requirements based on the proposed works, and will summarise the final findings and conclusions.

Legislative Background

The Water Framework Directive (WFD) is a European Directive which sets out a strategic planning process for the purposes of managing, protecting and improving the water environment. The WFD introduces new environmental requirements which aim to meet good status in all water bodies. For surface waters, good status is made up of 'good ecological status (GES)' (or good ecological potential (GEP) where artificial or heavily modified) and 'good chemical status'. Ecological status and potential are made up of a number of biological, hydromorphological and physio-chemical quality elements. Chemical status is recorded as either good or failing. For groundwater to be in overall 'good' status, both quantitative and chemical status must be 'good'. The WFD also requires prevention of deterioration in water body status including deterioration of any of the individual quality elements.

The main objectives of the WFD are to:

- Prevent deterioration in the status of aquatic ecosystems, protect them and improve the ecological condition of waters;
- Aim to achieve at least 'Good Status' for all waters by 2015 (2021 or 2027 where fully justified within an extended deadline under Article 4.4);
- Promote sustainable use of water;
- 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; and
- Help reduce the effects of floods and droughts.

New activities and schemes that affect the water environment may adversely impact biological, hydromorphological, physico-chemical and/or chemical quality elements (WFD quality elements), leading to deterioration in water body status. They may also render proposed improvement measures ineffective, leading to the water body failing to meet its WFD objectives for GES/GEP. Under the WFD, activities must not cause deterioration in water body status or prevent a water body from meeting GES/GEP by invalidating improvement measures.

WFD Assessment in Stages

The Water Framework Directive Assessment can have up to three stages, which are

- **Screening Stage:** excludes any activities that do not need to go through the scoping or impact assessment stages
- **Scoping Stage:** identifies the receptors that are potentially at risk from your activity and need impact assessment
- **Impact Assessment Stage:** considers the potential impacts of your activity, identifies ways to avoid or minimise impacts, and shows if your activity may cause deterioration or jeopardise the water body achieving good status

The Proposal

Your activity	Description, notes or more information
Name of activity	Barmouth Viaduct Gardens FAS.
Brief description of activity	The scheme is located on the eastern side of Barmouth, Gwynedd, directly adjacent to the railway viaduct on the lower reaches of the Mawddach Estuary. The scheduled works briefly includes – 1: Repair, strengthen and raising an approx. 60m section of sea wall; 2: Erect new setback wall and floodgate/barrier; 3: Install new drainage network to manage surface water and overtopping in the area behind the setback wall and flood gates; 4: Installation of Property Level Protection (PLP).
Location of activity (central point XY coordinates or national	Grid Reference – SH 61586 15543, East: 261585 North: 315543
Footprint of activity (ha)	The length of the frontage wall to be repaired and improved is approximately 60m. A new surface water outfall is being incorporated as part of the work, which will extend out from the wall onto the beach for a distance of approx. 13m. the footprint of the work within the waterbody will be 217m ² .
Timings of activity (including start and finish	<i>Start date: 01/05/2024</i> <i>End date: *01/12/2024</i> <i>*Exact timings to be confirmed on contractor appointment.</i>

Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	The preferred option presented consists of improvements to the Viaduct Gardens sea wall. The height of the existing wall will be increased in this area. The works can be summarised into the following elements: - The garden area behind the existing sea wall will be stabilised through the use of sheet piling and/or king post walls. The installation of these will be mainly from the Viaduct Garden side of the wall. - The existing wall will be demolished in sections, with the existing rock armour at toe of wall moved back from the wall to expose the face (rock armour material to be re-used upon completion of new wall). - Construction of new wall consist of lower and middle section, with a reinforced concrete parapet on top. A concrete foundation slab is to be cast in situ, with precast L shaped units laid on the foundation base. The lower section will be backfilled with mass concrete. The parapet wall will be installed as an in-situ wall once the lower and mid sections are complete. - Rock armour is to be installed along the base of the new wall. Previously removed armour will be used, along with some additional armour. - A new surface water pipe outfall is to be constructed which involves the installation of a 750mm diameter pipe, which will protrude approx 13m from the new wall face. Beach material will need to be excavated to accommodate the pipe, which will sit on a concrete mattress and be encased in 250mm thick concrete. An anti-scour basin will be constructed at the outfall, consisting of rock armour. - The free outfall peak flows for the surface water outfall during a range of storm events are provided below, note these have been calculated a 40% allowance for climate change. A pumping station will need to be provided due to tide locking of the system at highwater. <table border="1" data-bbox="625 1209 1227 1442"> <thead> <tr> <th>Return Period</th><th>Free Outfall Peak Flow (l/s)</th></tr> </thead> <tbody> <tr> <td>1</td><td>348</td></tr> <tr> <td>5</td><td>532</td></tr> <tr> <td>30</td><td>858</td></tr> <tr> <td>100</td><td>1182</td></tr> </tbody> </table>	Return Period	Free Outfall Peak Flow (l/s)	1	348	5	532	30	858	100	1182
Return Period	Free Outfall Peak Flow (l/s)										
1	348										
5	532										
30	858										
100	1182										
Use or release of chemicals (state which ones)	None										

WFD Assessment

WFD Classification

The WFD classification for a defined water body is produced by assessment of a wide variety of different 'elements' which includes:

- 'biological elements' such as fish, invertebrates, phyto-benthos (which includes plants, macro-algae and phytoplankton);
- 'supporting elements' that include chemical measurements such as ammonia, dissolved oxygen, pH, phosphate, copper, zinc and temperature; and
- 'supporting conditions' (sometimes referred to as hydromorphology), that assess the physical attributes of the water body such as 'quantity and dynamics of flow' and 'morphology'.

The assessment given for each element is also accompanied by a measure of certainty in the result. The status classification is published in the River Basin Management Plan (RBMP)¹ and provides a baseline condition against which compliance and future improvements can be measured.

The activity / proposal involves the Mawddach Estuary and Cardigan Bay waterbodies, and a summary of key elements for both are provided below.

Mawddach Estuary	
Water body¹	Description, notes or more information
WFD water body name	<i>Mawddach</i>
Water body ID	GB511006407100
River basin district name	<i>Western Wales River Basin</i>
Water body type (estuarine or coastal)	<i>Transitional</i>
Water body total area (ha)	<i>9.51km² which equals 951ha</i>
Overall water body status (2018)	<i>Moderate</i>
Ecological status	<i>Good</i>
Chemical status	<i>Fail</i>
Target water body status and deadline	<i>Not Designated</i>
Hydromorphology status of water body	<i>Not Designated</i>
Heavily modified water body and for what use	<i>No</i>
Higher sensitivity habitats present	<i>Not within or close to the scheme footprint</i>

¹ <https://www.gov.uk/government/collections/river-basin-management-plans-2015#north-west-river-basin-district-rbmp:-2015>

Lower sensitivity habitats present	<i>Intertidal soft sediment (mudflats and sandflats), gravel and cobbles (intertidal and subtidal coarse sediment), subtidal soft sediment (sand, mud and mixed), rockyshore (intertidal rock)</i>
Phytoplankton status	<i>Not specified</i>
History of harmful algae	<i>Not specified</i>
WFD protected areas within 2km	<i>Pen Llyn a'r Sarnau SAC, Meirionnydd Oakwoods and Bat Sites SAC, Abermawddach SSSI (also part of Pen Llyn a'r Sarnau SAC).</i>

Cardigan Bay Waterbody	
Water body¹	Description, notes or more information
WFD water body name	<i>Cardigan Bay North</i>
Water body ID	<i>GB621009600000</i>
River basin district name	<i>Western Wales River Basin</i>
Water body type (estuarine or coastal)	<i>Coastal</i>
Water body total area (ha)	<i>712.19km² which equals 71219ha</i>
Overall water body status (2018)	<i>Moderate</i>
Ecological status	<i>Good</i>
Chemical status	<i>Fail</i>
Target water body status and deadline	<i>Not Designated</i>
Hydromorphology status of water body	<i>Not Designated</i>
Heavily modified water body and for what use	<i>No</i>
Higher sensitivity habitats present	<i>Not within the scheme footprint.</i>
Lower sensitivity habitats present	<i>Intertidal soft sediment (mudflats and sandflats), gravel and cobbles (intertidal and subtidal coarse sediment), subtidal soft sediment (sand, mud and mixed), rockyshore (intertidal rock)</i>
Phytoplankton status	<i>Not specified</i>
History of harmful algae	<i>Not specified</i>
WFD protected areas within 2km	<i>Pen Llyn a'r Sarnau SAC, Meirionnydd Oakwoods and Bat Sites SAC, Abermawddach SSSI (also part of Pen Llyn a'r Sarnau SAC).</i>

WFD Assessment - Screening:

The WFD is also required in support of a Band 2 Marine Licence Application, by NRW.

WFD Assessment – Scoping Exercise:

The scoping exercise is carried out to identify all the potential risks to each receptor element that are used to determine the status of the waterbody. The receptors / elements are:

- Hydromorphology
- biology – habitats
- biology – fish
- water quality
- protected areas

These receptors are based on the water body's quality elements (supporting elements, biological elements, and chemical elements).

The scoping exercise has been undertaken following the template provided on the gov.uk² website.

Hydromorphology:

Cardigan Bay Waterbody			
Consider if your activity:	Yes	No	Hydromorphology risk issue(s) / observations
Could impact on the hydro morphology (for example morphology or tidal patterns) of a water body at high status	Requires impact assessment	Impact assessment not required	The proposal does not impact on a waterbody of high status.
Could significantly impact the hydro morphology of any water body	Requires impact assessment	Impact assessment not required	The location and nature of the proposal in relation to the Cardigan Bay Waterbody, mean that no significant changes to hydro morphology are likely to occur.
Is in a waterbody that is heavily modified for the same use as your activity	Requires impact assessment	Impact assessment not required	The proposed activity is not within a heavily modified waterbody.

Mawddach Estuary			
Consider if your activity:	Yes	No	Hydromorphology risk issue(s) / observations
Could impact on the hydro morphology (for example morphology or tidal patterns) of a water body at high status	Requires impact assessment	Impact assessment not required	The proposal does not impact on a waterbody of high status.
Could significantly impact the hydro morphology of any water body	Requires impact assessment	Impact assessment not required	The proposal could impact the hydro morphology of the harbour area through the inclusion of a new surface water outfall pipe, and therefore requires further assessment.
Is in a waterbody that is heavily modified for the same use as your activity	Requires impact assessment	Impact assessment not required	The proposed activity is not within a heavily modified waterbody.

Biology - habitats:

Consider if habitats are at risk from your activity.

Higher sensitivity habitats ³	Lower sensitivity habitats ⁴
chalk reef	cobbles, gravel and shingle
clam, cockle and oyster beds	intertidal soft sediments like sand and mud
intertidal seagrass	rocky shore
maerl	subtidal boulder fields
mussel beds, including blue and horse mussel	subtidal rocky reef
polychaete reef	subtidal soft sediments like sand and mud
saltmarsh	
subtidal kelp beds	
subtidal seagrass	

Cardigan Bay Waterbody			
Consider if the footprint ⁵ of your activity is:	Yes	No	Biology habitats risk issue(s) / observations

0.5km ² or larger	Yes to one or more – requires impact assessment	No to all-impact assessment not required	No – the total area of the proposed activity is 217m ² , which equates to 0.000217km ² .
1% or more of the water body's area			No - the total area of water body is 712.19km ² , 1% would therefore be 71.219km ² . The footprint of this activity is 0.000217km ² . .
Within 500m of any higher sensitivity habitat			No – the activity isn't within 500m of higher sensitivity habitat.

Mawddach Estuary

Consider if the footprint ⁵ of your activity is:	Yes	No	Biology habitats risk issue(s) / observations
0.5km ² or larger	Yes to one or more – requires impact assessment	No to all-impact assessment not required	No – the total area of the proposed activity is 217m ² , which equates to 0.000217km ² .
1% or more of the water body's area			No - the total area of water body is 9.51km ² , 1% would therefore be 0.0951km ² . The footprint of this activity is 0.000217km ² . .
Within 500m of any higher sensitivity habitat			No – the activity isn't within 500m of higher sensitivity habitat.
1% or more of any lower sensitivity habitat		No to all-impact assessment not required	No – There are lower sensitivity habitats within the area of the works (intertidal soft sediments like sand and mud). However, the footprint of the scheme would not exceed a total area of more than 1% of the habitat area.

³ Higher sensitivity habitats have a low resistance to, and recovery rate, from human pressures.

⁴ Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures.

⁵ Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5

Biology – fish

Consider if fish are at risk from your activity, but only if your activity is in an estuary or could affect fish in or entering an estuary.

Mawddach Estuary - Only			
Consider if your activity:	Yes	No	Biology fish risk issue(s) / observations
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	Continue with questions	Go to next section	Whilst the work is located on the lower reaches of Afon Mawddach, the work does not involve creating any physical barriers within the watercourse that would impact fish movement. No other works, such as piling within the water column, is scheduled either that would result in underwater noise that would deter fish from migrating up the river. Any tidal work would be undertaken at low to mid water in the dry.
Could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	Requires impact assessment	Impact assessment not required	No physical barriers, underwater noise, chemical changes or significant changes in water depth or flow will occur as part of the activity.
Could cause entrainment or impingement of fish	Requires impact assessment	Impact assessment not required	Not applicable

Water Quality:

Consider if water quality is at risk from your activity.

Cardigan Bay Waterbody			
Consider if your activity:	Yes	No	Water quality risk issue(s) / observations
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Requires impact assessment	Impact assessment not required	No – the proposed work would predominantly be carried out above tide level, and therefore would not directly impact water clarity, temperature, oxygen levels, nutrients or microbial patterns of the water body, especially not for continuous periods longer than 14 days. There may be some discoloration of water and sediment resuspension during construction, however, this would clear within 1 tidal cycle i.e. high water – low water – high water.
Is in a water body with a phytoplankton status of moderate, poor or bad	Requires impact assessment	Impact assessment not required	No – From available information, the waterbody does not have a phytoplankton status of moderate, poor or bad.
Is in a water body with a history of harmful algae	Requires impact assessment	Impact assessment not required	No – As far as we are aware, the waterbody does not have a history of harmful algae.

Mawddach Estuary			
Consider if your activity:	Yes	No	Water quality risk issue(s) / observations
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Requires impact assessment	Impact assessment not required	No – the proposed work would predominantly be carried out above tide level, and therefore would not directly impact water clarity, temperature, oxygen levels, nutrients or microbial patterns of the water body, especially not for continuous periods longer than 14 days. There may be some discoloration of water and sediment resuspension during construction, however, this would clear within 1 tidal cycle i.e. high water – low water – high water. The drainage improvements, resulting in the separation of surface water from the combined sewer network will provide an improvement in the quality of the water discharging into the waterbody. It will provide greater capacity within the sewer network through the removal of surface water, leading to less failures of sewer capacity and the use of emergency overflows, which currently outfall into the harbour.
Is in a water body with a phytoplankton status of moderate, poor or bad	Requires impact assessment	Impact assessment not required	No – From available information, the waterbody does not have a phytoplankton status of moderate, poor or bad.
Is in a water body with a history of harmful algae	Requires impact assessment	Impact assessment not required	No – As far as we are aware, the waterbody does not have a history of harmful algae.

Consider if water quality is at risk from your activity through the use, release or disturbance of chemicals.

Cardigan Bay Waterbody			
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s) / observations
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	Plant machinery will be required to undertake the proposed activity and will be required to work within and adjacent to the water body Further assessment is required to ensure adequate measures are in place to prevent the accidental spilling of chemical pollutants.
It disturbs sediment with contaminants above Cefas Action Level 1	Requires impact assessment	Impact assessment not required	The activity will not disturb sediments with contaminants above Cefas Action Level 1 within the water body. No excavation will take place within the waterbody.

Mawddach Estuary			
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s) / observations
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	Plant machinery will be required to undertake the proposed activity and will be required to work within and adjacent to the water body Further assessment is required to ensure adequate measures are in place to prevent

			the accidental spillage of chemical pollutants.
It disturbs sediment with contaminants above Cefas Action Level 1	Requires impact assessment	Impact assessment not required	Sediment sampling has taken place within the Harbour in 2021 as part of a dredging feasibility study. The nearest sampling point to the works was 100m south east, where surface sediment samples were tested. None of the contaminants sampled were above CEFAS Action Level 1 at this point.

Cardigan Bay Waterbody			
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s) / observations
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment	Impact assessment not required	No – the proposal does not discharge into the waterbody.

Mawddach Estuary			
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s) / observations
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list	Requires impact assessment ⁵	Impact assessment not required	The proposal involves the construction of a new surface water drainage system and outfall and therefore requires further assessment.

WFD Protected Areas

Consider if WFD protected areas are at risk from your activity. These include:

- Special Areas of Conservation (SAC)
- Special Protection Areas (SPA)
- Shellfish waters

- Bathing Waters
- Nutrient Sensitive Areas

Cardigan Bay Waterbody and Mawddach estuary			
Consider if your activity is:	Yes	No	Protected areas risk issue(s) / observations
Within 2km of any WFD protected area ⁶	Requires impact assessment	Impact assessment not required	Part of the activity is within the Pen Llyn a'r Sarnnau SAC and the Aber Mawddach SSSI. The Mawddach Shellfish Water Protected Area and there are two designated bathing waters within the local area.

Invasive Non-Native Species (INNS)

Consider if there is a risk your activity could introduce or spread INNS.

Risks of introducing or spreading INNS include:

- materials or equipment that have come from, had use in or travelled through other water bodies
- activities that help spread existing INNS, either within the immediate water body or nearby

Cardigan Bay Waterbody and Mawddach Estuary			
Consider if your activity could:	Yes	No	INNS risk issue(s) / observations
Introduce or spread INNS	Requires impact assessment	Impact assessment not required	The works will be carried out by terrestrial plant and machinery in dry conditions (above tide level), therefore the risk of introducing marine or water based INNS is negligible. The risk will be managed further by ensuring the plant are cleaned before leaving the existing / preceding site, and are clean on arrival onto this site. The materials used for construction will be primary building materials, with no import of subsoil or topsoil required.

Summary of Scoping – Mawddach Estuary and Cardigan Bay Waterbody:

Waterbody and Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	Yes	The proposal could impact the hydro morphology of the harbour area through the inclusion of a new surface water outfall pipe, and therefore requires further assessment.
Biology: habitats	No	There is no Higher Sensitivity Habitat directly impacted or within close proximity to the work, or 1% or more of any lower sensitivity habitat

Biology: fish	No	Whilst the work is located within the Mawddach Estuary, the work does not involve creating any physical barriers within the watercourse that would impact fish movement. No other works such as piling in the water column is scheduled either that would result in noise that would deter fish from migrating up the river.
Water quality	Yes	Plant and machinery will be required to undertake the proposed activity, and therefore there is an inherent risk of releasing oils and fuels (PAHs) into the environment, albeit the risk is considered to be low.
Protected areas	Yes	The proposed activity is being undertaken on the boundary and within protected areas, therefore, the potential impact to protected sites cannot be ruled out at scoping stage.
Invasive non-native species	No	The works will be carried out by terrestrial plant and machinery in dry conditions (above tide level), therefore the risk of introducing marine or water-based INNS is negligible. The risk will be managed further by ensuring the plant are cleaned before leaving the existing / preceding site and are clean on arrival onto this site.

Assessment of impacts on waterbody quality elements

WFD Compliance

There are three key objectives against which the impacts of proposed works on a water body need to be assessed to determine compliance with the overarching objectives of the WFD:

- Objective 1: The Scheme will not cause deterioration in any element of water body classification.
- Objective 2: The Scheme will not prevent the WFD status objectives from being reached within the water body or other downstream water bodies.
- Objective 3: The Scheme will contribute to the delivery of the relevant WFD objectives. In this case it will be what contribution the Scheme can make towards the water body reaching its objective Good Ecological Potential (GEP) through planned RBMP mitigation measures.

The first two objections must be met to avoid infringement of the WFD. The delivery of the third objective is central to the implementation of the WFD, where it can be supported through its operational activities. If it is considered that the scheme is likely to cause deterioration in water body status or prevent a water body from meeting its ecological objectives then an assessment would be made against the conditions listed in Article 4.7 of the WFD. Article 4.7 can be invoked if; 'new modifications' are of overriding public interest and/or the environmental and social benefits of achieving the WFD objectives are outweighed by the benefits of the new modifications to human health, safety and sustainable development; there are no significantly better environmental options that are technically feasible or not disproportionately costly; and all practicable steps for mitigation have been taken.

Hydromorphology – Mawddach Estuary Only

The scoping exercise identified that the provision of a new surface water outfall within the harbour could change sediment movement and flows within the Mawddach Estuary waterbody. The new surface water pipe outfall will be a 750mm diameter pipe, which will protrude approx. 13m from the new wall face.

This requires the excavation of beach material for the pipe bed, the placement of a concrete mattress for support, and laying of the pipe. Temporary anchors will ensure correct pipe positioning until the concrete surround is in place. Rock armour will be placed each side of the pipe at the lower section to prevent scour. The system will also incorporate an anti-scour basin constructed at the outfall and the installation of a one-way valve at the end of the pipe. Beach restoration and debris removal conclude the construction activities

Tidal currents and sediment transport in this area of the harbour are heavily influenced by manmade structures, such as the harbour wall itself and the railway viaduct piers and embankment. The pipe will be located approximately 2m west of the existing railway.

A Coastal Processes Assessment has been carried out for the proposed works (available as part of the marine licence submission). The assessment concludes that there will be very limited changes in coastal processes as a result of upgrading the sea wall and installation of the outfall. The direct loss of mapped intertidal habitat is predicted to be *circa* 67 m² as a result of the footprint of the new outfall. Where changes may occur due to blockage effects of the outfall they will be very minor due to its sheltered location and position in the tidal frame. As a result the assessment expects that the direct and indirect effects on coastal processes (and therefore Annex 1 habitats) will be negligible.

The coastal processes assessment has also concluded some 0.75ha losses of the mudflats and sandflats habitat due to coastal squeeze losses from the maintenance and upgrade of the existing defence. The proposed work has therefore been assessed via a Habitats Regulations Assessment (HRA). The assessments have concluded an adverse effect on the integrity of the Pen Llyn a'r Sarnau SAC due to coastal squeeze losses. However the project is justified through no alternatives being present, the Imperative Reasons of Overriding Public Interest (IROPI) test and that the habitat loss will be compensated through the National Habitats Creation Programme (NHCP) in line with the SMP2 HRA and in accordance with NRW GN 062 guidance.

The Scheme will not cause deterioration in any element of water body classification nor prevent the WFD status objectives from being reached within the water body or other downstream water

bodies. The Scheme will contribute to the delivery of the relevant WFD objectives of the Mawddach Estuary through delivering water quality enhancements, as described below.

Water Quality

Plant and machinery will be required to undertake the proposed activity, and therefore there is an inherent risk of releasing oils and fuels into the environment, although the risk is considered to be low due to no in water works, the impact on the waterbody could not be completely ruled out at the scoping stage. The following Reasonable Avoidance and Mitigation Measures will be implemented during the course of the proposed work:

- Vehicles to use biodegradable oils.
- Use of spill kits and personnel trained to use the kit will be available on site on case of oil leak.
- Good working practices will be taken, such as adhering to GPP5 Works and maintenance in or near water.
- The contractor has a designated company, which they use to deal with accidental spillages this forms part of their emergency plan.
- The staff will be trained to contain any oil/diesel and clean up.
- NRW emergency help line (0300 065 3000) will be contacted in the case of an emergency spill.

Since the plant and machinery would not directly enter the waterbody, and assuming that machinery used are well maintained, it is considered unlikely that the proposed activity would result in a contravention of Objective 1. However, accidents do happen – and by having the above measures in place it will reduce any impact should an accident occur.

The project will remove a significant volume of surface water from the existing combined sewer system and provide a direct pathway for the surface water to be discharged into the estuary. This will lead to an increase the capacity and performance of the combined sewer system. The existing system cannot cope the current volume of water during certain storm events, which leads to failure of the pumped sewer system leading to use of a combined sewer outfall (CSO), which discharges directly into the estuary. The removal of surface water from the combined system will reduce the number of CSO incidents leading to an improvement in water quality.

Protected Areas

Part of the activity is within the Pen Llyn a'r Sarnau SAC and its component SSSI, the Aber Mawddach SSSI. A Habitat Regulations Assessment (HRA), has been undertaken to assess the proposals potential impact on the above sites – a copy of which is enclosed as part of this Marine Licence Application, the conclusions are summarised below.

Following a Screening Assessment, the first stage of the HRA identified that there would be 'Likely Significant Effects' for Pen Llyn a'r Sarnau SAC and Afon Eden – Cors Goch Trawsfynydd SAC due to

mobile species. Therefore, the assessment progressed to Stage 2 'Appropriate Assessment' stage, which considered the potential for the works to have an adverse effect on the integrity of the sites, taking proposed mitigation measures into account.

The assessment concluded that without mitigation the two SACs could be affected, by pollution, habitat degradation, and disturbance of mobile species, therefore mitigation measures would need to be implemented that would eliminate the chance of any residual effects on the integrity of the sites. The mitigation measures which need to be implemented are listed below. Contractor to prepare and adhere to a Construction Environment Management Plan (CEMP) which will detail what measures will be in place to protect the surrounding environment. Location of adjacent protected sites shall be clearly highlighted.

- Materials stored on site shall be located more than 10m away from watercourses or estuary habitat at all times.
- Pollution spill kits to be readily available on site and in plant/machinery at all times, with staff suitably trained in how to deploy.
- Contractor to have emergency incident response procedure in place in the case of a spillage.
- Contractor to adhere to pollution prevention best practice guidelines, including;
 - PPG1: Understanding your environmental responsibilities.
 - GGP5: Works and maintenance in or near water.
 - PPG6: Working at construction and demolition sites.
 - GPP21: Pollution response planning.
 - GPP22: Dealing with spills.
- Biodegradable lubricant and hydraulic oil to be used in plant machinery where possible. Biodegradable oils are less toxic than most synthetic oil but should still be stored to the same standards as other oils and prevented from entering the water environment.
- Works to take place at low tide conditions only. No works to be completed within the intertidal area when the adjacent mudflat and sandflats are inundated with seawater.
- Any excess concrete material or wash-water shall be fully and securely contained and disposed of appropriately off site
- All concreting works to take place at low tide conditions, allowing sufficient time for concrete to set prior to any potential tidal inundation. Curing accelerators to be used where necessary.
- Contractor to monitor tidal and weather conditions / forecasts and plan work accordingly
- Materials stored on site shall be located more than 10m away from watercourses or estuary habitat at all times.
- Works to take place at low tide conditions only. No works to be completed within the intertidal area when the adjacent mudflat and sandflats are inundated with seawater.
- Access to and along the intertidal area to be via the main harbour slipway and along a designated pathway to keep potential habitat disturbance to a minimum.
- Bog mats to be used under plant/machinery in any soft parts of the intertidal areas to reduce potential compaction impacts.
- There shall be no access to mid – to lower shore where trafficking of vehicles may directly impact sensitive marine habitats.
- Excavations to be backfilled in same layers as they were removed, so that the top 1m layer of sediment removed goes back in at this level, and anoxic materials lower down is returned to the bottom of the excavations. This will aid recovery of the habitat following excavation works.
- Beach material excavated for the pipe is to be placed within the surrounding intertidal area and not taken from site.
- Beach levels to be restored around the new pipe once construction work is complete, using existing excavated beach material.
- Piling and other related construction works shall occur in dry conditions only.

- Pilling will cease and standing time will be implemented during high tide.
- All relevant persons on site to be made aware of the mitigation and obligations in place, and to be briefed with a toolbox talk on the relevant ecological issues prior to commencement of the work.
- Works shall be confined to daylight hours and no additional artificial lighting shall be used.

In terms of potential **pollution** of the adjacent estuary habitat during construction leading to degradation of habitat features and of the prey population of the otter feature of the Pen Llyn a'r Sarnau SAC and Afon Eden – Cors Goch Trawsfynydd SAC, it was considered that with mitigation in place, there would be no adverse effect on the integrity of these sites, with no residual effects.

In terms of **degradation** of intertidal habitat, in particular regard to the mudflat and sandflat habitat, through construction activities and installation of the new outfall pipe and as a result of coastal squeeze losses, it could not be concluded at the Appropriate Assessment Stage that there would be no adverse effect on the integrity of the site. For this reason, this particular element was carried forward into Stage 3 and 4 of the assessment. It was concluded that no alternative options were present, that IROPI was justified and that the loss would be compensated through the National Habitats Creation Programme (NHCP), in line with the SMP2 HRA and in accordance with NRW GN 062 guidance.

In terms of **disturbance** of mobile species during the proposed works, the assessment found that although there would be temporary increases in noise pollution during construction works, due to existing high levels of disturbance in the area and with the implementation of mitigation measures, any effects would be minimal, and there would be no adverse effects on the integrity of the sites, with no residual effects.

The above mitigation measures will also ensure that there are no direct or indirect impacts on the Mawddach Shellfish Water Protected Area and bathing water areas as result of construction activities as they will minimize any potential water pollution impacts.

During operation the new drainage system project will remove a significant volume of surface water from the existing combined sewer system and provide a direct pathway for the surface water to be discharged into the estuary. This will lead to an increase the capacity and performance of the combined sewer system. The existing system cannot cope the current volume of water during certain storm events, which leads to failure of the pumped sewer system leading to use of a combined sewer outfall (CSO), which discharges directly into the estuary. The removal of surface water from the combined system will reduce the number of CSO incidents leading to an improvement in water quality, benefiting both the Shellfish Water protected area and bathing water areas.

Conclusion

It is established through the assessment above that by implementing good working practices and reasonable avoidance measures that the proposed works would not lead to deterioration of any quality element of the waterbodies (objective 1) nor would prevent the overall objectives for the waterbodies being met (Objective 2). Through delivering water quality improvements during operation, the proposal should contribute positively towards Objective 3 for both waterbodies.

Appendices

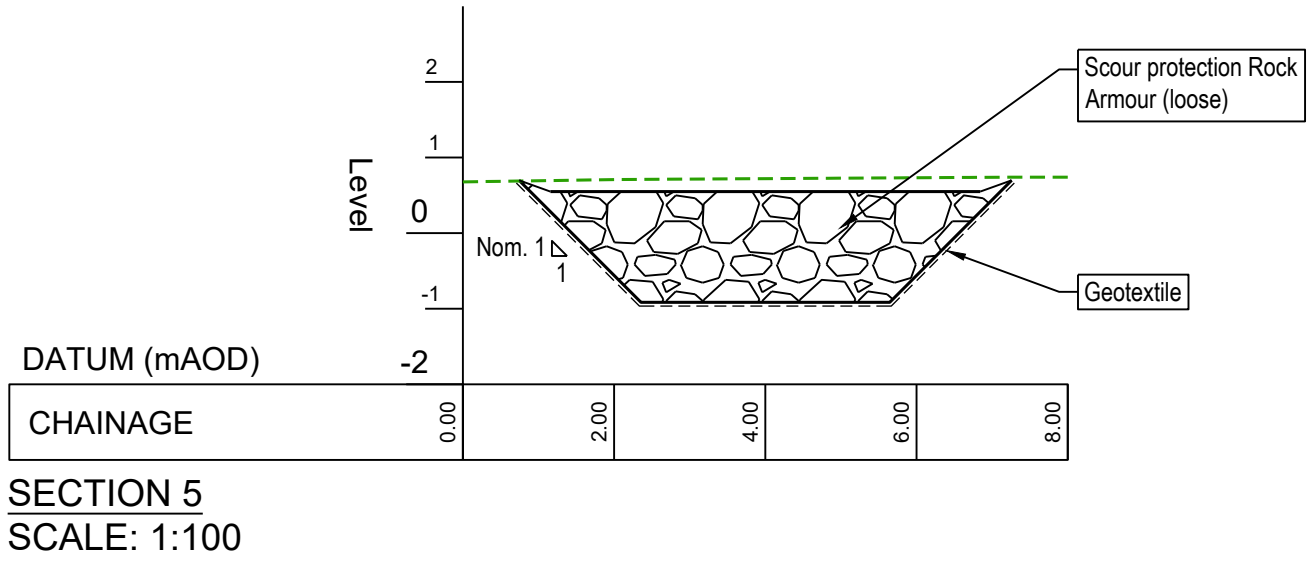
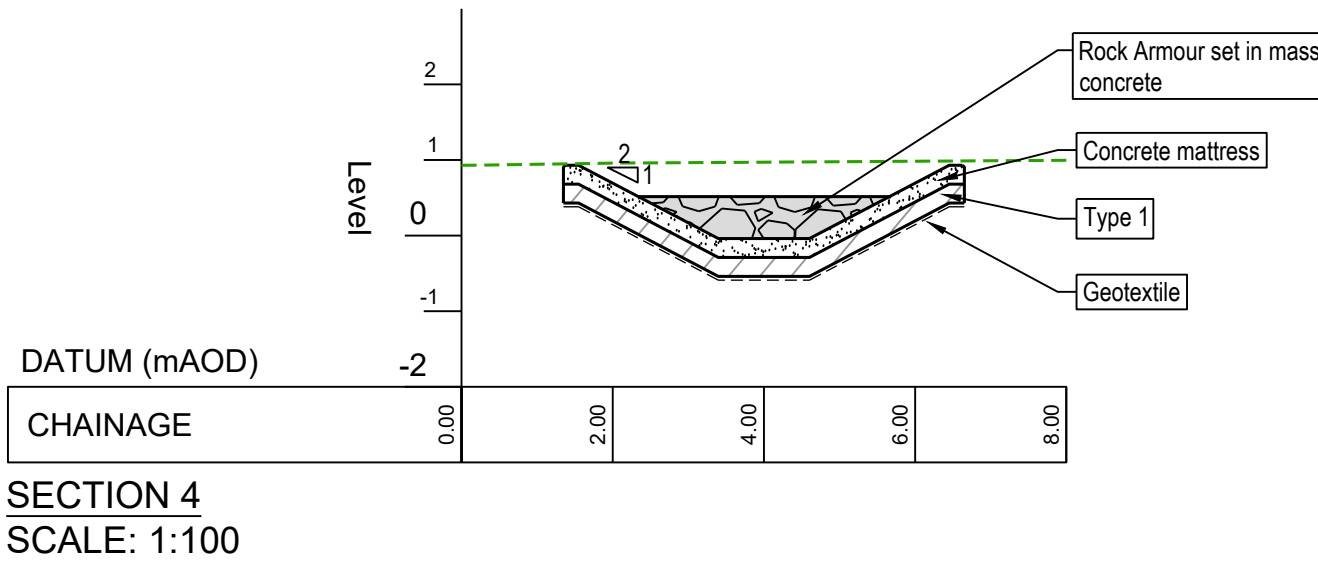
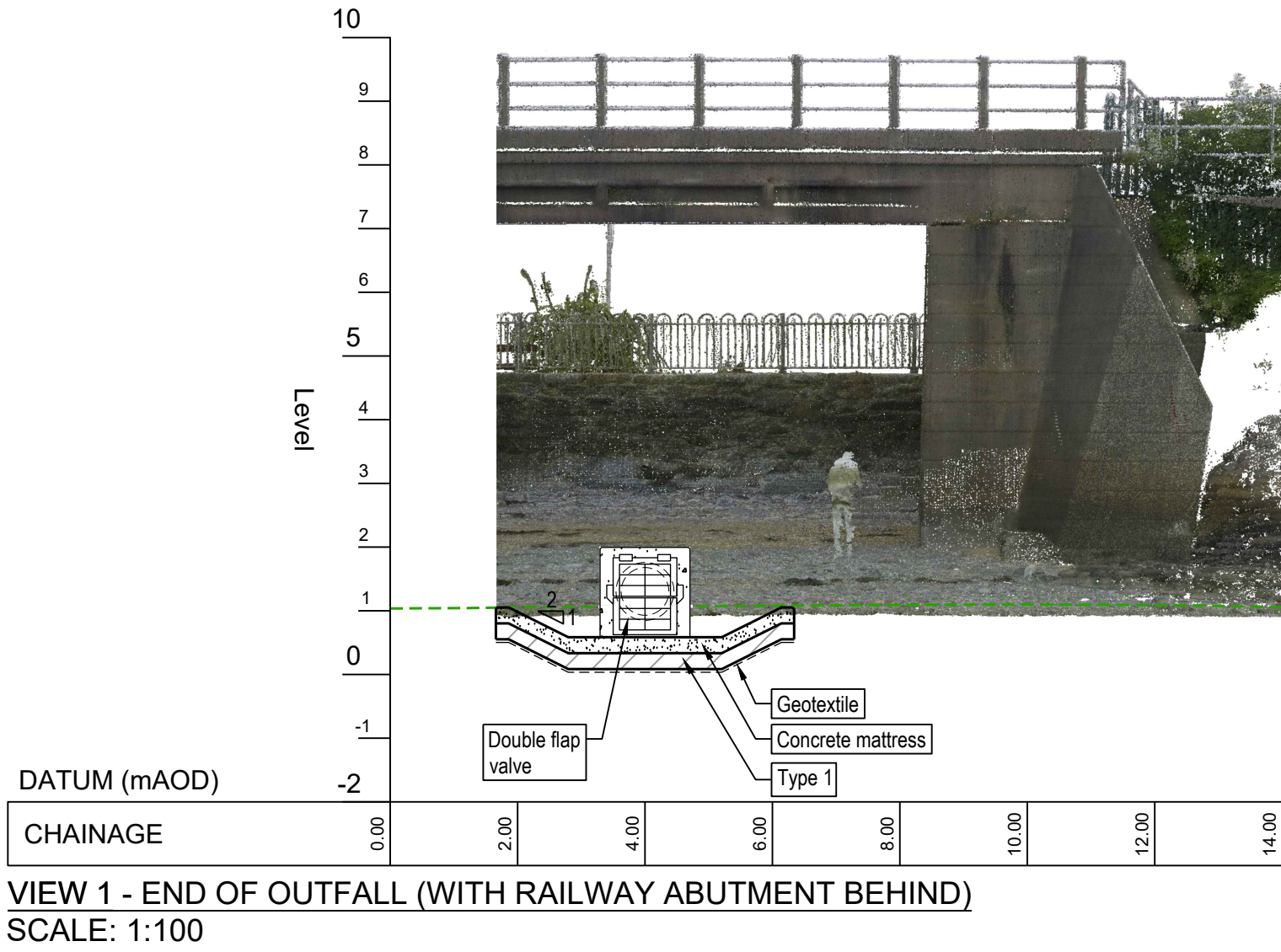
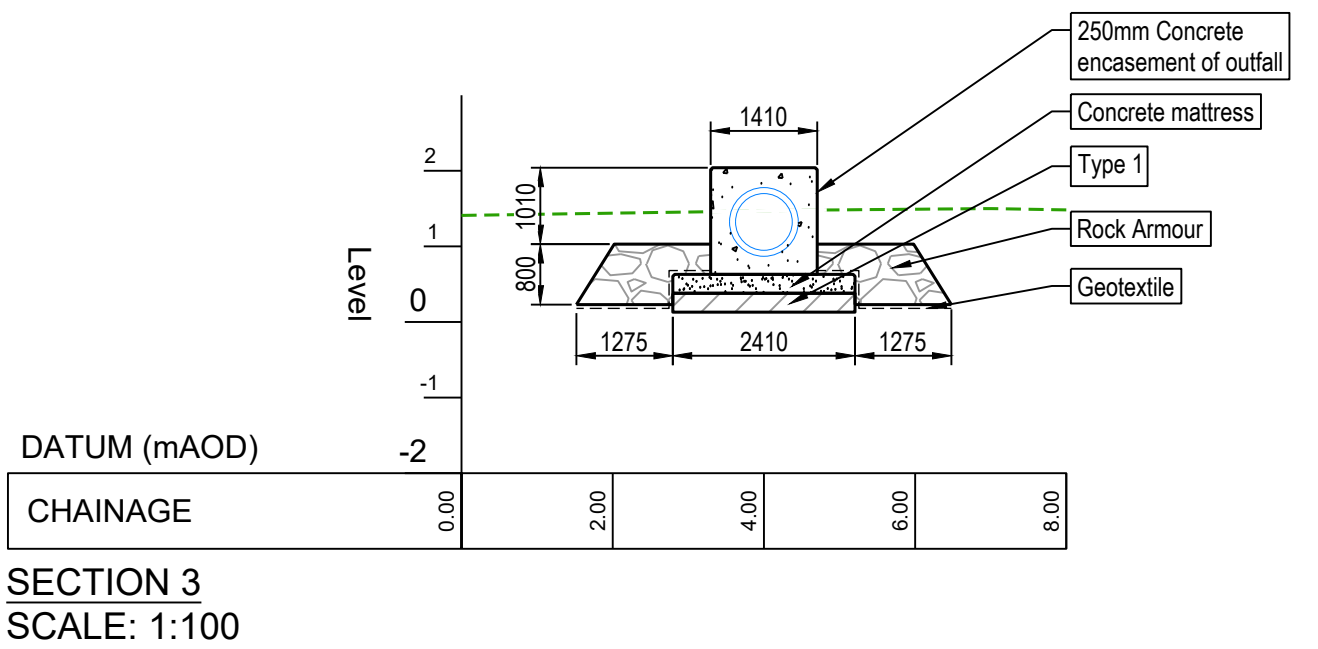
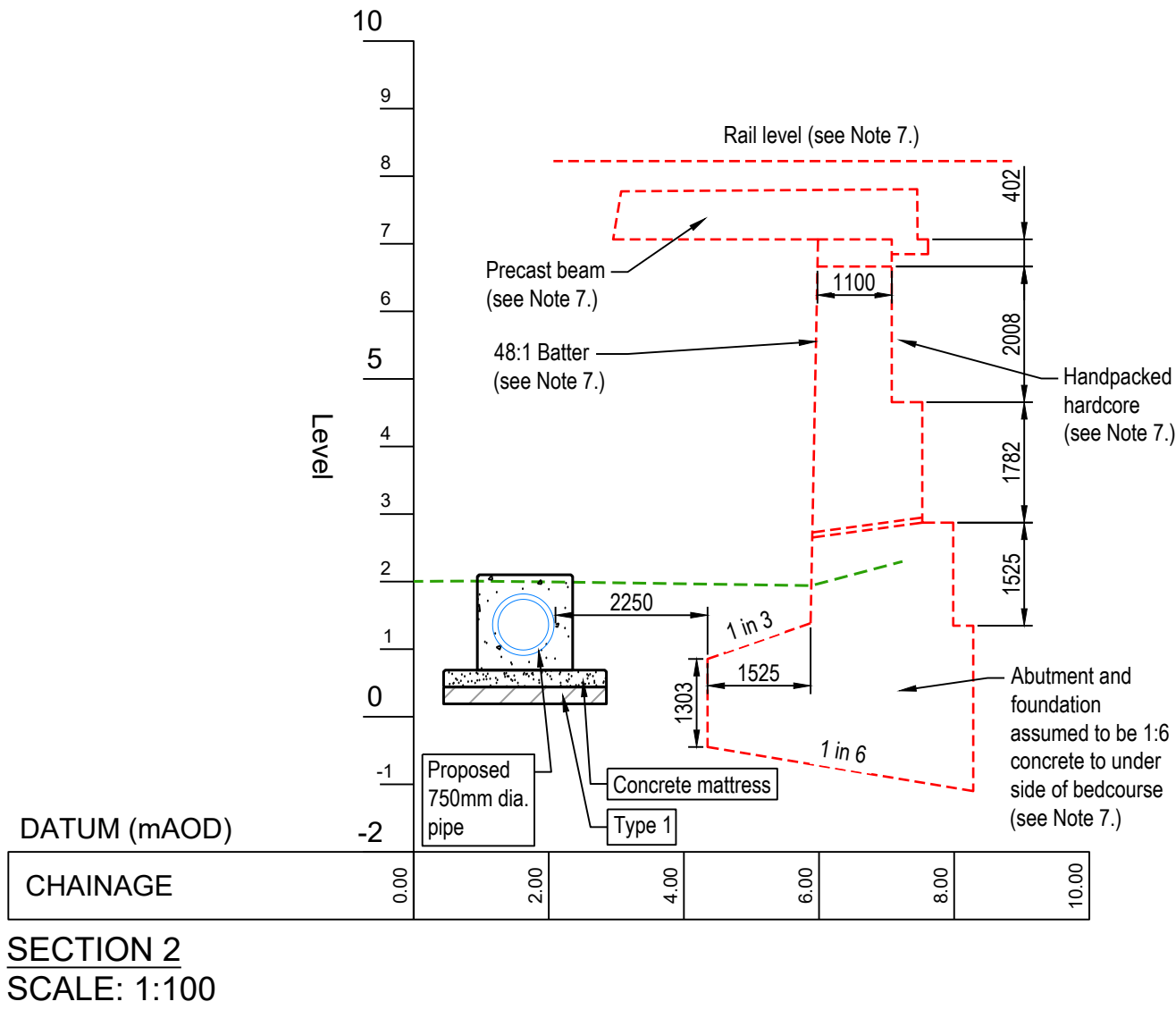
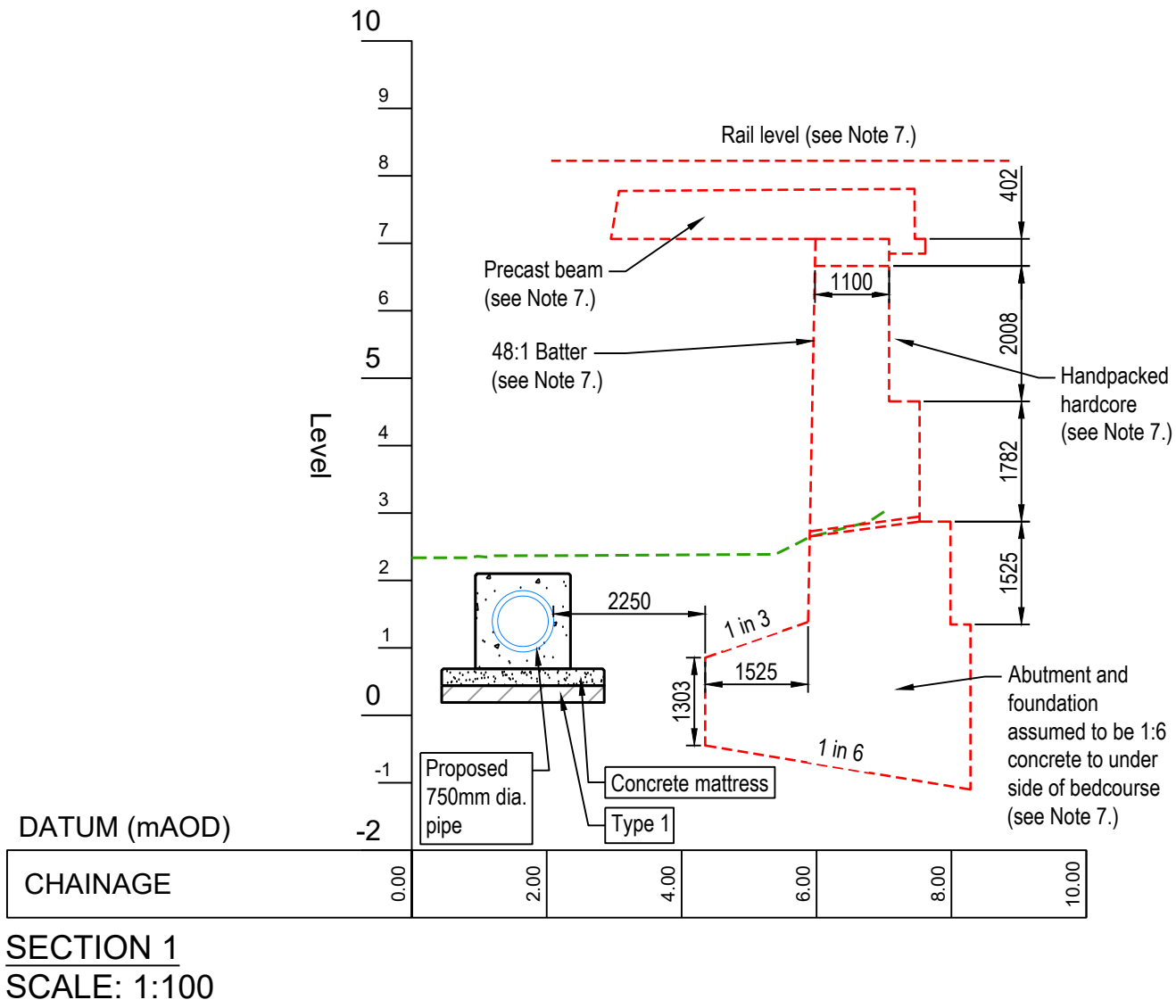
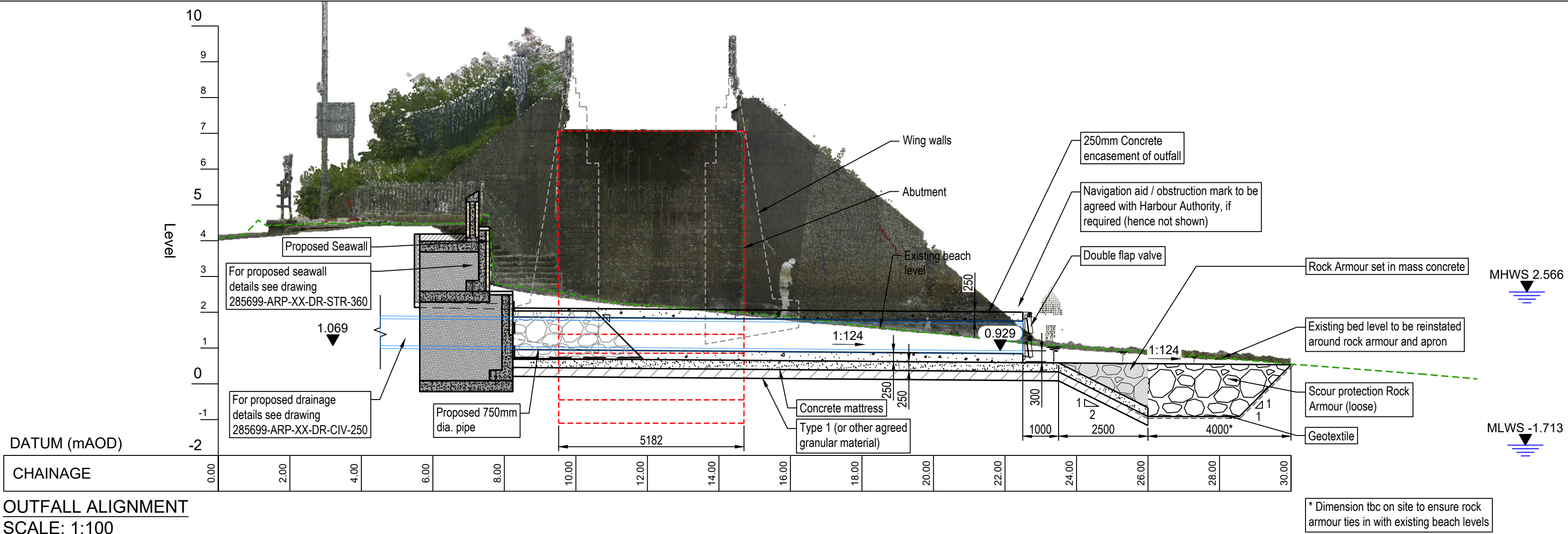
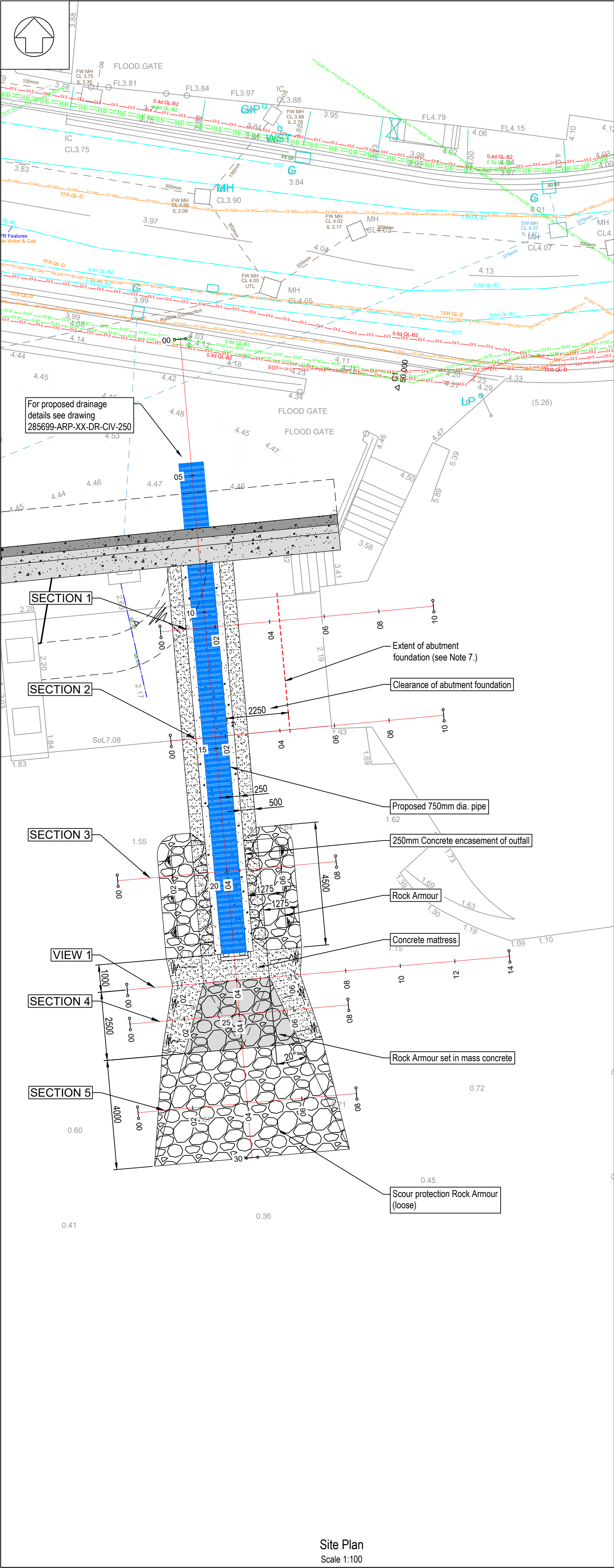
Appendix A – General Arrangement Drawing

Appendix B - Scheme Construction Drawings (provided as separate documents)

Appendix C - Scheme Method Statement (provided as separate document)

Habitats Regulations Assessment (provided as separate document)

Appendix A – General Arrangement Drawing



- A1**
- Nodiadur / Notes
- All dimensions are in millimetres unless noted otherwise.
 - All levels are in metres relative to ordnance datum Newlyn (mAOD) unless noted otherwise.
 - All coordinates are in metres relative to ordnance survey national grid.
 - Do not scale from this drawing. All dimensions must be checked / verified on site.
 - Refer to PN22427 Barmouth Viaduct Gardens Factual Report on Ground Investigation, Geotechnics (February 2023).
 - Outfall to extend on the foreshore until invert level is 300mm above bed level (minimum).
 - Abutment shown as derived from historical drawing of Barmouth Reconstruction of Old Chapel Viaduct Substructure.

- Legend**
- Information derived from historical drawings (see Note 7.)
 - Existing beach level
 - Mean high water springs
 - Mean low water springs
- Legend - Existing Utilities**
- EX GAS / EX GAS Low Pressure Gas
 - EX BT / EX BT BT / Openreach
 - EX BT OH / EX BT OH BT / Openreach (overhead)
 - EX E / EX E Electricity
 - EX W / EX W Water
 - Foul Sewer
 - Surface Water
 - Unidentified RFL
 - Unidentified GPR

Tide Levels	
Datum	mAOD
HAT	3.26
MHWS	2.56
MHWN	1.26
MSL	0.26
MLWN	-0.54
MLWS	-1.74
LAT	-2.14

Hanes Fersiwn / Version History				
P03	06.10.23	CF	JB	BM
AMENDMENTS TO SHORTEN OUTFALL				
P02	08.06.23	CF	DO	BM
DRAFT FOR COMMENT				
P01	31.05.23	CF	DO	BM
DRAFT FOR COMMENT				
Rev	Date	By	Chkd	Appd

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Cleient / Client

YGC

Llywodraeth Cymru
Welsh Government

Enw a Rhif y Proiect Cynyr Gwynedd / Gynedd Council Project Name and Number

Cynllun arfordirol Gerddi Traphont

Viaduct Gardens Coastal Scheme

Tell Luniad / Drawing Title

Proposed Drainage Sections - New Outfall

Graddfa yn A1 / Scale at A1	
1:100 @ A1	
Rhan / Role	
Civil Engineer	
Addasrwydd / Suitability	
For Information	
Rhif y Proiect Arup / Arup Project Number	Statws / Status
285699-00	S2
Rhif y Luniad / Drawing Number	Adolygiad / Rev
	P03

285699-ARP-XX-DR-CIV-290

