

River Dee Crossing WFD Assessment

Dwr Cymru Welsh Water

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Executive Summary

Dwr Cymru Welsh Water (DCWW) are proposing to install a new twin water main to increase resilience of supply between Connah's Quay and the development areas to the north of the River Dee. The route of the proposed pipeline requires a directional drill beneath the tidal river Dee (the Proposed Development).

This WFD Assessment report is required to determine how the Proposed Development could affect the current status/potential (or future objective status/potential) of relevant WFD supporting elements in the Dee (North Wales) transitional water body.

The assessment approach is based on the following three stages in the Environment Agency's (EA) 'Clearing the Waters for All' guidance (EA 2017): screening, scoping and impact assessment.

Screening determined that the proposed activities were not classed as low risk activities and as such the assessment proceeded to the scoping stage.

Scoping for the Dee Estuary (N. Wales) transitional water body took forward the following receptors to the impact assessment stage:

- Biology – Habitats (higher sensitivity; due to presence of saltmarsh)
- Biology – Fish
- Water quality – Physicochemical parameters and chemicals (potentially including chemicals on the EQSD)
- WFD Protected Areas

The following receptors were scoped out of assessment:

- Hydromorphology
- Biology - Habitats (lower sensitivity)
- Water quality - Physiochemical parameters
- Water quality - Chemicals above Cefas Action Level 1
- Water quality - Phytoplankton
- Water quality - Harmful algae
- INNS

At the assessment stage, available evidence was assessed to determine if there could be any impacts of the Proposed Development on the potential of the Dee Estuary (N. Wales) transitional water body. A range of embedded mitigation measures were considered as part of the assessment.

Overall, the proposed activities are not anticipated to jeopardise River Basin Management Plan mitigation measures in place for the Dee Estuary catchment, the achievement of good

status for the Dee (N. Wales) transitional water body or the achievement of any WFD objectives for freshwater bodies or groundwater bodies either now, or in the future.

This is the case when considering the proposed activities in isolation and when considering cumulative effects with other projects.

1. Background information for the Development

1.1 Introduction to the WFD assessment

Dwr Cymru Welsh Water (DCWW) are proposing to install a new twin water main to increase resilience of supply between Connah's Quay and the development areas to the north of the River Dee. The route of the proposed pipeline requires Horizontal Directional Drilling (HDD) to be conducted beneath the tidal River Dee (Proposed Development) which is within the Dee (North Wales) Water Framework Directive (WFD) transitional water body.

The report provides the WFD assessment for the Proposed Development.

1.2 Location & Context

The proposed crossing route commences south of the River Dee within an open field (c. NGR SJ 30067 69506) where it is to be connected to the existing water main. The route follows a north-easterly direction beneath Dock Road, a short section of green open space, an access road, an area of saltmarsh, the river Dee, a further section of saltmarsh, a flood bund and TATA Steel's infilled pond/lagoon. It will reconnect to the existing water main in TATA Steel's green open space (brownfield site) (c. NGR SJ 30528 70238), (Figure 1 and Appendix A).

To install the new twin water main, two parallel (10m separation) Horizontal Directional Drills (HDD) will be conducted under the River Dee to receive 2x c.900 m 500 mm O/D (SDR-9 PE100) Barrier Pipe, with new connections to existing pipework on either side.

The location of the Proposed Development in relation to the Dee (N. Wales) transitional water body is indicated in Figure 2.



Figure 1: Aerial image of the location of the proposed pipeline route. From O'Connor Utilities Ltd 2021.

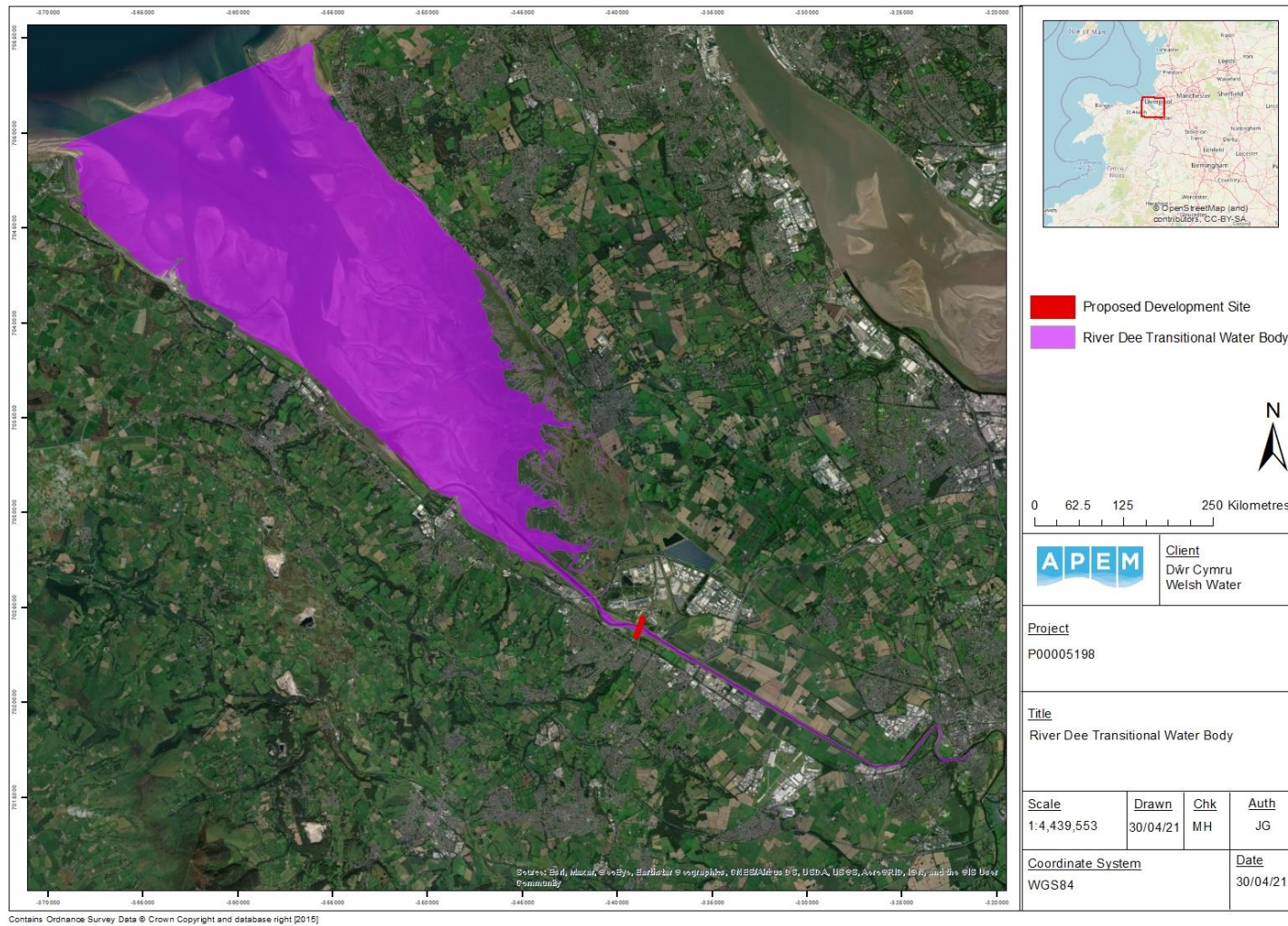


Figure 2: Location of the proposed pipeline route in relation to the Dee (N. Wales) transitional water body.

1.3 WFD Assessment Objectives

The objective of this assessment is to consider the available data for WFD supporting elements in the Dee (N. Wales) transitional water body in accordance with the Environment Agency's (EA) 'Clearing the Waters for All' guidance (EA 2017).

The WFD assessment for the Dee (N. Wales) transitional water body considered the potential effects of the proposed development on the status/potential of the following types of WFD parameter:

- Ecological potential
 - Biological supporting elements
 - Physicochemical supporting elements (and Specific Pollutants¹)
 - Hydromorphological considerations
- Chemical status
 - 'Priority Substances¹
 - 'Other Pollutants¹
 - 'Priority hazardous substances¹

1.4 Summary of works for the Proposed Development

The pipe will run from south of the river Dee, where it will be connected to the existing water main, through to the existing water main in TATA Steel's green open space (brownfield site); a distance of approximately 1 km (Appendix A).

The main works activities are summarised in the following bullets:

- Mobilisation, which will include:
 - Construction of an area for parking of the rig and support vehicles at the drill Entry Point (approximately 50 m x 50 m), and a working area at the Exit Point for pipe handling and drilling fluid transfer (approximately 20 m x 20 m). NB these areas need not be square but can be flexible to avoid e.g. tree root zones.
 - Excavation of a 'launch pit' and a 'reception trench', both 2.0 m x 2.0 m x 1.2 m deep.
- Construction, which will include:
 - Drilling of the pipeline pilot hole – a 12-1/4" diameter HDD.

¹ Limited to chemicals on Environmental Quality Standards Directive (EQSD) list for WFD (as provided in EA 2017). Environmental thresholds are summarised in Defra (2015).

- Drill depth will be in excess of 24 m below the river bed at all points and along most of the tunnel route it will be at a depth of 32 m below the river.
- With the exception of the entry descent and exit climbs, the drill is wholly contained within clay geology. The HDD bores will penetrate the top of the clay before drilling under the historic landfill site to the north of the Dock Road, and remain within the clay while drilling under the River Dee and the leachate lagoon on the north bank of the river.
- Made ground at the entry site (between 2.90 m and 3.60 m thick) will contain landfill waste – old council general refuse site. Ground investigations and a waste strategy have been completed.
- Below the Made Ground is a ~12.5 m thick sequence of silty fine to medium Sand before the top of the Clay is encountered at between 15.70 m and 15.90 m bgl.
- At exit the bore will drill back up through the silty gravelly Sand before encountering Made Ground including cobbles and boulders of concrete and brick from a depth of ~2.4 m bgl (construction rubble).
- Hole opening passes – progressively larger reamers (e.g. 18”, 24” and 28”) are pulled through to open the pilot hole to the required finished diameter.
- Abstraction of water (to facilitate drilling) from the Wepre Gutter, a tidal creek located adjacent to the south working area, at around 8 m³ per day. (NB this abstraction rate falls below the abstraction licensing threshold of 20 m³/day).
- Use of drilling fluid (under pressure) as a drill lubricant, coolant, hole wall sealant and finished barrier pipe grout surround. Drill fluid is continuously recycled and is deployed during both pilot holes and reamer passes.
- Removal of cuttings via the drilling fluids to the mud pit. The mud pit is a pit that is excavated close to the HDD entry point. The sidewalls of the mud pit are built up to form a bund around the mud pit.
- Disposal of waste drilling fluid (at the end of the operation) to landfill (non-hazardous waste classification). Cuttings will remain on site for use in reinstatement or landscaping (non-hazardous waste classification).
- Laydown, jointing, inspection and testing of the barrier pipe in the north, prior to pulling in.
- Pulling in and testing of the barrier pipe.
- Connection works – shallow excavations will facilitate connections to the existing water mains in proximity to the HDD entry and exit points.
- Demobilisation including reinstatement of the site.
- Enhancement works

- Works to improve the habitat of an area on the parcel of land to the north of Dock Road, with intention of biodiversity net gain. Works will replace old concrete, hardstanding and scrub with a new species rich grassland habitat.

Further details of the methods are provided in the Method Statement and supporting appendices (O'Connor Utilities Ltd 2021).

The works (mobilisation – demobilisation) are planned between May 2022 and April 2023, with the drill period scheduled 25th July 2022 to 11th November 2022.

2. Water Framework Directive Requirements

2.1 Water Framework Directive – overview

The WFD establishes a framework for the management and protection of Europe's water resources. It is implemented in England and Wales through the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (the Water Framework Regulations). Central to the WFD is the philosophy to make water bodies better through sustainable development for the joint benefits of aquatic habitats and the human environment. The application of the WFD (and associated Directives discussed in this assessment) in England and Wales is preserved post-Brexit.

For surface waters including transitional water bodies, ecological status is an expression of the quality of the structure and functioning of surface water ecosystems as indicated by the condition of a number of 'quality elements'. These include biological and chemical indicators.

The development and implementation of strategic long-term River Basin Management Plans (RBMPs) is a key requirement of the WFD. They include a programme of measures outlining the on-going monitoring and management actions required for water bodies to achieve future objectives. The RBMPs are published by Natural Resources Wales and the EA every six years. The first RBMPs were published in 2009, and the current Cycle 2 RBMPs were published in 2015 (with a 2018 update available for the Dee (N. Wales) transitional water body).

Proposed developments or activities that have the potential to affect the water environment require a WFD Assessment. In this context, compliance with the WFD means prevention of deterioration (of ecological status, chemical status and supporting element status) and avoiding prevention of ability to achieve future targets. However, WFD Article 4.7 provides legislation for exemption conditions that could allow implementation of schemes that cause deterioration in ecological status, for example for reasons of overriding public interest.

The subsequent (to the WFD) Priority Substances Directive sets out Environmental Quality Standards (EQSs; 2008/105/EC) for priority substances which is known as the EQS Directive and there have been subsequent amendments (2013/39/EU; Defra 2015 & NRW 2015). The environmental objectives of the WFD and its associated directives include the following:

- to prevent deterioration of aquatic ecosystems;
- to protect, enhance and restore water bodies to 'good' status; based on ecology (with its supporting hydromorphological and physico-chemical factors) and chemical factors for surface waters; and
- to progressively reduce pollution from priority substances and cease or phase out discharges of priority hazardous substances.

The default objective of the WFD is for all rivers, lakes, estuaries, groundwater and coastal water bodies to achieve 'good' status by 2027 at the latest. Where it is not possible to achieve this, alternative objectives can be set. The existing status, and measures required to achieve the 2027 status objective are set out for each water body in the relevant RBMPs. The plans set out the current baseline condition of the water environment at the time of publication and provide details on the measures needed and timescales required to attain their target status.

For the following surface water bodies: rivers, lakes, estuaries and coastal waters, the overall water body status has both an ecological and a chemical component. Good ecological status (GES) is defined as a 'slight variation from undisturbed natural conditions, with minimal distortion arising from human activity'. The ecological status of water bodies is determined by examining biological elements (e.g. fish, invertebrates, plants) and a number of supporting elements and conditions, including physico-chemical (e.g. metals and organic compounds), and hydromorphological (e.g. depth, width, flow, and 'structure') factors.

A flow chart illustrating how quality elements are combined (Cycle 2) to provide an overall water body status/potential is provided in Figure 3. The classification hierarchy for surface waters (for Cycle 2) is illustrated in Figure 4. Only biological supporting elements have classification boundaries defined for 'high' through to 'bad' (Figure 3). Chemicals supporting 'chemical status' that do not meet EQS concentrations are classified as 'Failing to achieve Good' (Figure 3).

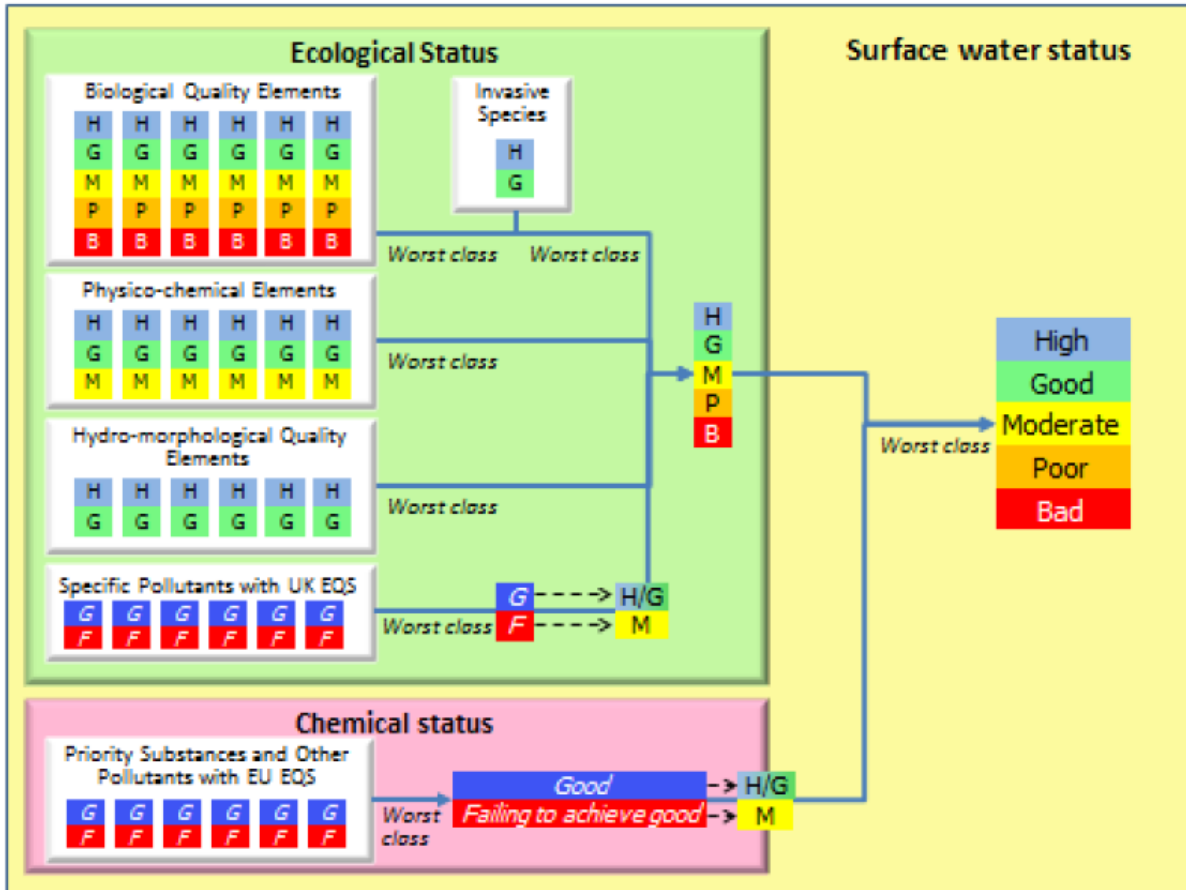


Figure 3. WFD classification elements – Bringing all of the strands of evidence together (Environment Agency, 2015)

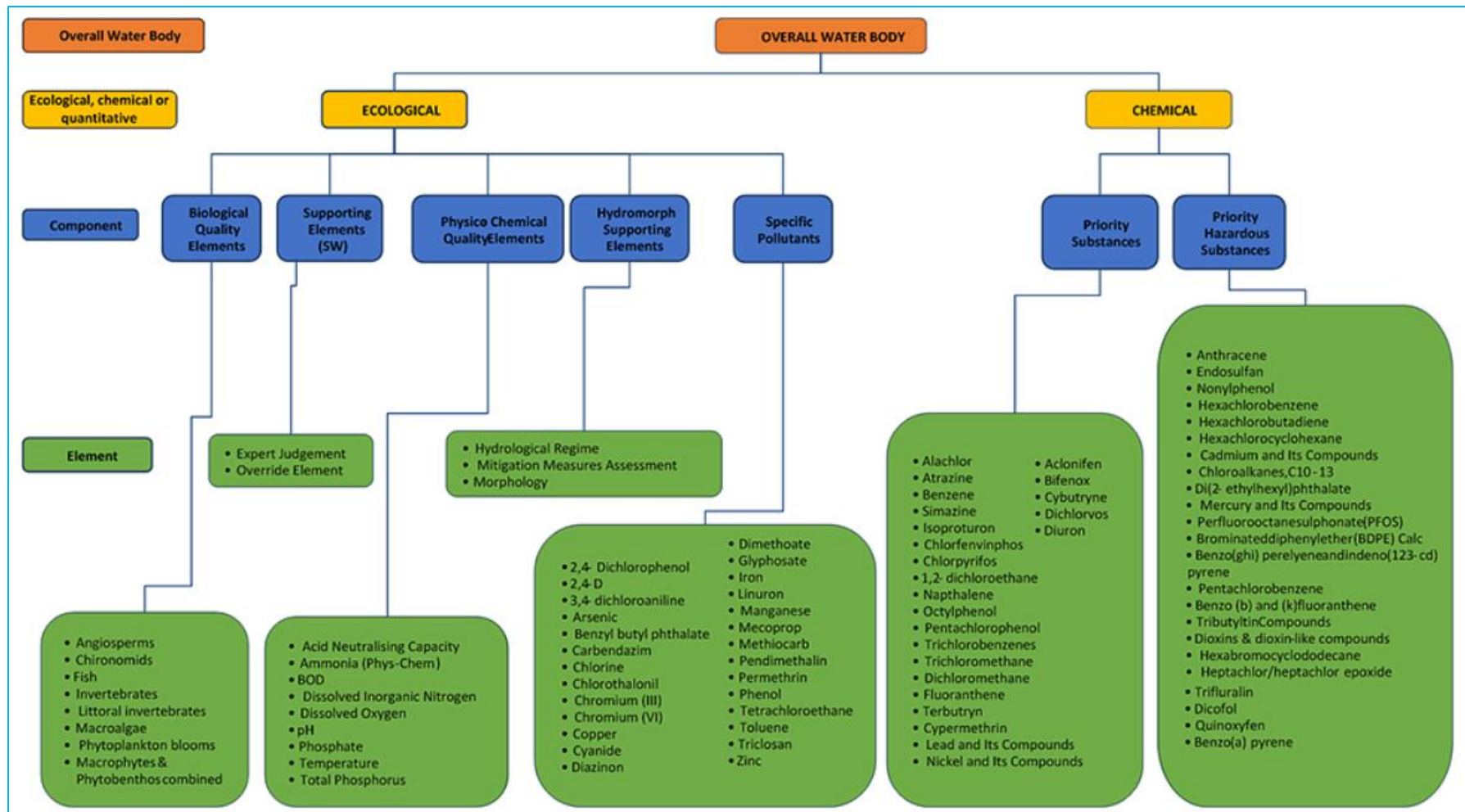


Figure 4. Classification hierarchy for surface waters (extracted from EA 2018).

2.1.1 Transitional Water Bodies

Transitional water bodies include bodies of surface water in the vicinity of river mouths that typically correspond (in the UK) to estuaries. Therefore, they are influenced by tides and are characterised both by saline water due to their proximity to coastal waters and by freshwater due to inputs of river flows. The Proposed Development is situated along the tidal reach of the River Dee and is located within the Dee (N. Wales) transitional WFD water body. The status of the water body is indicated in Table 1.

The WFD classification elements for transitional WFD water bodies such as the Dee (N. Wales) transitional water body are as follows:

- Hydromorphological:
 - tidal regime:
 - freshwater flow; and
 - wave exposure.
 - morphological conditions:
 - depth variation;
 - quantity, structure and substrate of the bed; and
 - structure of the intertidal zone.
- Biological:
 - phytoplankton;
 - other aquatic flora;
 - benthic invertebrates; and
 - fish.
- Physico-chemical and chemical:
 - transparency;
 - thermal conditions;
 - dissolved oxygen;
 - nutrients;
 - salinity; and
 - pollution by substances being discharged (e.g. chemicals, metals, pesticides).

The Dee (N. Wales) transitional water body is designated as a Heavily Modified Water Body (HMWB) for 'navigation, ports and harbours'. Where a water body is defined as a HMWB, the term 'ecological status' (combination of multiple biological, physical and some chemical supporting elements) is replaced by 'ecological potential'. The term 'chemical status' (combination of other chemical supporting elements), however, remains unchanged when considering HMWBs.

Table 1: Cycle 2 classifications for 2018 for the Dee (N. Wales) transitional water body.

Parameter		Year
		2018
Water Body ID		GB531106708200
Water Body Area		10927.59 ha
Water Body Type		Transitional Water
Hydromorphological designation		Heavily Modified
Overall Potential		Moderate
Chemical Status		Failing to achieve Good
Priority Substances		Moderate
Priority Hazardous Substances		Moderate
Ecological Potential		Moderate
Biological Quality Elements	Angiosperms	Good
	Fish	Good
	Invertebrates	Good
	Macroalgae	Good
	Phytoplankton	Good
Physico-chemical Quality Elements	Dissolved Inorganic Nitrogen	Moderate
	Dissolved Oxygen	High
Specific Pollutants	Various	High

3. Methods

The assessment followed the EA's 'Clearing the Waters for All' guidance (EA 2017), which was developed specifically to assess the effects of activities in transitional and coastal waters in relation to WFD targets. The assessment approach is based on the following three stages:

- Screening
- Scoping

- Assessment

3.1 Screening

The screening stage is used to determine if the proposed works are classed as a low risk activity. Low risk activities are identified as:

- a fast-track or accelerated marine licence activity that meets specific conditions;
- maintaining pumps at pumping stations;
- removing blockages or obstacles like litter or debris within 10 m of an existing structure to maintain flow;
- replacing or removing existing pipes, cables or services crossing over a water body – but not including any new structure or supports, or new bed or bank reinforcement;
- ‘over water’ replacement or repairs to, for example, bridge, pier and jetty surfaces, if you minimise bank or bed disturbance.

Where the proposed works do not fulfil criteria for a low risk activity, the assessment continues to the Scoping stage.

3.2 Scoping

For this stage, biological, hydromorphological and chemical quality elements potentially affected by the proposed development are first considered using the Scoping Template provided in the EA guidance (EA 2017). The Scoping Template indicates criteria to consider for a range of parameters to determine the potential for adverse effects on WFD receptors and identify whether there is a requirement to take these receptors to the impact assessment stage.

3.3 Impact Assessment

The impact assessment stage involves determination of the potential effects of the work activities on the specific parameters that are taken forward from Scoping (EA 2017).

The assessment involved consideration of whether the activities will have a non-temporary effect on status/potential of WFD quality elements in the Dee (N. Wales) transitional water body (i.e. cause deterioration or compromise the achievement of measures set out in the Dee River Basin District RBMP programme of measures and therefore future objective status/potential) (NRW, 2015). The scope of the assessment was determined following the steps in the impact assessment section of EA (2017).

The WFD assessment has also followed principles of EIA guidance where applicable in that the following aspects have been considered when assessing the potential for a change in WFD status/potential due to effects on WFD quality elements (CIEEM 2018). Although these aspects have been considered, they are not necessarily referred to directly in the assessment text:

- Nature of effect i.e. beneficial / adverse; direct / indirect;
- Extent of the effect (geographical area e.g. site-wide, local, district, regional, and the size of the population affected);
- Likelihood of effect occurring;
- Value and sensitivity of receptor;
- Magnitude of effect;
- Duration:
 - Temporary or permanent effect. If the effect occurs on all of, or a proportion of, a community/population on a continual basis it can be considered to be permanent (e.g. a continual cooling water discharge). If it is not on a continual basis when considering the community/assemblage/population or habitat level it can be described as temporary.

If it were considered that the activity would not affect the potential/status of a given WFD receptor then no further evaluation or mitigation was required for the WFD assessment for that receptor (WFD supporting element). If possible adverse effects were identified, then the next step was to identify suitable mitigation measures to address the potential effect (EA 2017).

4. WFD Assessment

4.1 Screening

The proposed activities were compared to the list of low risk activities identified under the EA guidance (EA, 2017) and in Section 3.1. They do not qualify as low risk activities and, accordingly, they were taken forward to the scoping stage.

4.2 Scoping

For the Dee (N. Wales) transitional water body the proposed activities (for construction and operation phases) were scoped for potential risks to hydromorphological, biological (habitats and fish), water quality, protected areas and INNS receptors using the Scoping Templates provided in the EA guidance (EA, 2017). The completed scoping templates for the Dee (N. Wales) transitional water body are provided in Appendix B.

4.2.1 *Dee (N. Wales) Transitional Water Body*

The following risks to receptors were scoped into the requirement for more detailed assessment for the construction phase:

- Biology – Habitats (higher sensitivity):
 - Defra's MAGIC website (MAGIC 2021) and design information indicated proposed activities are within 500 m of saltmarsh.

- Biology – Fish:
 - Proposed activities could produce underwater noise or vibration that could affect fish in the estuary, outside the estuary and could delay or prevent fish entering it or could affect fish migrating through the estuary; and
 - Proposed activities could impact on normal fish behaviour like movement, migration or spawning do to underwater noise.
- Water quality – Physicochemical parameters and chemicals on the Environmental Quality Standards Directive (EQSD).
 - There is potential for some chemicals to enter the water column if there is a break out on the river bed but these substances (clay derived drill lubricants) are not anticipated to be on the Environmental Quality Standards Directive (EQSD). Such break out could result in increased levels of suspended solids in the water column (NB a break out contingency plan has been prepared mitigating this risk to negligible).
 - The only potential for chemicals on the EQSD to be introduced to the environment is due to spillage of fuels or other chemicals at the point of entry of the HDD into the ground which is c.300 m from the southern bank of the river, or mobilisation of chemicals associated with a historic landfill (a historic, general refuse council landfill) at the entry point.
- WFD protected areas:
 - Proposed activities are within (beneath) the Dee Estuary Special Protected Area (SPA), Special Area of Conservation (SAC), Site of Special Scientific Importance (SSSI) and Ramsar. The River Dee and Bala lake SAC and SSSI is over 10 km from the Proposed Development.

A number of risks to receptors were scoped out of the requirement for more detailed assessment for the construction phase (see Appendix B).

- Hydromorphology:
 - Activities will take place significantly below the water body with no direct pathway of effect for hydromorphology.
- Biology – Habitats (lower sensitivity):
 - The Proposed Development does not cover more than 1% of any lower sensitivity habitat.
- Water Quality:

- Phytoplankton was scoped out as its status within the water body is currently Good in the Dee (N. Wales) transitional water body.
- Harmful algae was also scoped out of the assessment for the Dee (N. Wales) transitional water body as although there is history of harmful algae, the works will be taking place significantly below the water column with no direct pathway of effect for harmful algae.
- Invasive non-native species:
 - INNS were scoped out as there will be no interaction with the transitional water body. The works will be taking place significantly below the water column with no direct pathway of effect.

4.3 Impact Assessment

4.3.1 Biology: Habitats – higher sensitivity

The reason for inclusion as outlined in the Scoping Template in Appendix B is that the proposed activities:

- are within 500 m of the higher sensitivity habitat saltmarsh.

Saltmarsh in the vicinity of the Proposed Development was surveyed for the project (APEM 2021b).

South of River Dee

Below the flood defence embankment was recorded a broad expanse of saltmarsh beside the River Dee. This was drying out in its upper reaches (towards the south), and included saltmarsh grass (*Puccinellia maritima*), Cord grass (*Spartina anglica*), sea purslane (*Halimione portulacoides*), and sea aster (*Tripolium pannonicum*). The upper reaches are becoming dominated by red fescue and other terrestrial grasses. The area is periodically grazed by cattle, though not frequently. Some small standing water pools were found in the northwest, with some dense stands of common cub rush (*Schoenoplectus lacustris*) (APEM 2021b).

North of River Dee

A narrow strip of saltmarsh (<20m) is present on the north bank of the River Dee. Although outside of the habitat walkover area (APEM 2021) it is assumed that this includes similar species to those recorded in the area south of the River Dee.

Assessment

Saltmarsh is within close proximity to the project footprint. However, works will take place significantly below the water body and drilling will be many metres below the saltmarsh surface. The drilling will commence over ~150 m away from the saltmarsh and the works areas are physically separated from the river by roads, cycle paths and the flood defence

embankments on both sides of the river. There will be no plant or personnel requirement on the saltmarsh. Therefore, there is no pathway for effect on the saltmarsh.

Overall, it is concluded that there are not expected to be any non-temporary effects on the saltmarsh quality element at water body level and the construction activities would not prevent the Dee (N. Wales) transitional water body from meeting its WFD objectives of Good potential for saltmarsh (angiosperms).

4.3.2 *Biology: Fish*

Reasons for inclusion as outlined in the Scoping Template in Appendix B are the proposed activities:

- are in an estuary and could affect fish in the estuary, outside the estuary and could delay or prevent fish entering it or could affect fish migrating through the estuary; and
- 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).

Potts & Swaby (1993) indicated that 21 fish species had been recorded in the Dee Estuary. It is known that at least 46 fish species have been recorded within the Mersey Estuary which has been studied more intensively (data collated from ERL (1992), Hering (1998), and APEM (2007 & 2011) and EA monitoring data) and it is likely that many of these species could also be found in the neighbouring Dee Estuary.

Sea lamprey (*Petromyzon marinus*), river lamprey (*Lampetra fluviatilis*), brook lamprey (*Lampetra planeri*), smelt (*Osmerus eperlanus*), Twaite shad (*Alosa fallax*), grayling (*Thymallus thymallus*), bullhead (*Cottus gobio*), and Atlantic salmon (*Salmo salar*) are all known to be within the River Dee and are designated Annex II species in several surrounding protected sites (CCW, 2002; Natural England, 2021). Of these, sea lamprey, river lamprey, smelt, twaite shad and Atlantic salmon are diadromous, migrating between marine and freshwater environments. In addition, the diadromous species European eel (*Anguilla anguilla*) could be present. This species is protected under European eel management plan legislation (Eel Recovery Plan, Council Regulation No 110/2007) implemented under The Eels (Wales and England) Regulations 2009.

Fish fauna are assessed as a quality element in WFD transitional water bodies, and each water body is classified using the Transitional Fish Classification Index (TFCI) (WFD-UKTAG, 2014). The Dee (N. Wales) transitional water body is classified as being at Good potential for fish (based on the 2018 assessment).

The TFCI is a multi-metric index composed of ten individual components, known as metrics, and each metric is assessed by comparing the observed metric values with those expected metric values under reference conditions. The ten metrics are:

- species composition;

- presence of indicator species;
- species relative abundance;
- number of taxa that make up 90% of the abundance;
- number of estuarine resident taxa;
- number of estuarine-dependent marine taxa;
- functional guild composition;
- number of benthic invertebrate feeding taxa;
- number of piscivorous taxa; and
- feeding guild composition.

The species relevant to the calculation of the TFCI are predominantly marine/estuarine residents. Consideration is specifically given to diadromous species within one metric of the TFCI, but only as an indicative presence/absence measure.

Normative definitions set out in Annex V of the WFD describe the aspects of the fish fauna biological quality element in transitional waters that must be included in the ecological status assessment of transitional waters, namely:

- species composition;
- abundance; and
- disturbance-sensitive species.

The WFD normative definitions of ‘High’, ‘Good’, and ‘Moderate’ status for transitional water body fish as described in Annex V of the Directive are set out in Table 2.

Table 2. Normative definitions of ‘High’, ‘Good’ and ‘Moderate’ status/potential for transitional fish.

High Status/Potential	Good Status/Potential	Moderate Status/Potential
Species composition and abundance is consistent with undisturbed conditions.	The abundance of the disturbance-sensitive species shows slight signs of distortion from type-specific conditions attributable to anthropogenic impacts on physico-chemical or hydromorphological quality elements.	A moderate proportion of the type-specific disturbance-sensitive species are absent as a result of anthropogenic impacts on physicochemical or hydromorphological quality elements.

Construction impacts

The potential effects of the works on fish within the Dee (N. Wales) transitional waterbody are as follows.

- Noise and vibration

Assessment

Underwater noise and vibration from drilling works (HDD operation) has the potential to pose a barrier to migratory movements, resulting in delayed migration up-river and subsequent delays in spawning activity. The HDD has been designed with best practice in mind, and the drilling profile is >24 m beneath the riverbed and is within the low permeability clay layer. A full assessment of the potential effects of underwater noise and vibration from this source has been provided in APEM (2021). The assessment concluded that any effects of underwater noise and vibration on fish would be of negligible significance.

In relation to this WFD assessment the key consideration is that HDD is not anticipated to notably affect any of the ten metrics indicated above for the TFCI. Any effects will be temporary during the construction period and there are extensive windows of time when no HDD would be conducted.

Overall, it is concluded that there are not expected to be any non-temporary effects on the fish quality element at water body level and the construction activities would not prevent the Dee (N. Wales) transitional water body from meeting its WFD objectives of Good potential for fish.

4.3.3 Water Quality

Regarding potential introduction of chemicals to the water column, the risk of accidental spillage is minimised due to the distance of the working areas and the drill pits themselves from the River Dee (the entry point is c.300 m from the River Dee). In addition, a wide range of measures will be applied to prevent chemical spillages and pollution of the environment (outlined in O'Connor Utilities Ltd 2021).

During drilling of the hole, drilling fluid lubricates the drill string, removes solids from the borehole, and cools the drilling bit and downhole instruments. A freshwater bentonite suspension (chemically inert) will be used as the drilling fluid.

Pollutants deriving from the historic landfill at the entry point are not expected to be mobilised because the drill annulus is pressurised and the bentonite drill fluid will act as a fissure grout, effectively sealing the drill. All drill fluid and particle arisings will be collected and disposed of appropriately according to waste disposal classifications (a waste strategy has been developed, ARUP 2021). Shallow excavation arisings collected south of the river (entry pit overlying the old landfill) will be stockpiled (surrounded by impermeable membrane) and replaced *in situ* following completion.

One of the primary functions of drilling mud in Horizontal Directional Drilling, is that it provides a very good 'filter cake'. This means that, due to the flat clay platelets and the minute size of the particles, the mud pervades into permeable and porous drilled hole walls and provides a seal preventing the development of pathways for contaminated groundwater migration (O'Connor Utilities Ltd 2021).

Assessment

The assessment included consideration of the following embedded mitigation:

- The range of mitigation measures to prevent spillage and pollution of the environment in O'Connor Utilities Ltd (2021);
- The waste strategy for collection and disposal of drill fluid and particle arisings (ARUP 2021);
- The pressure in the fluid will be monitored continuously so that any break outs will be identified quickly and the volumes that would be released are small;
- A contingency plan is in place for break outs consisting of the following stages: Prevention; Containment; Control (O'Connor Utilities Ltd 2018).

With these measures in place the risk of break outs and effects on the WFD water body are considered to be small and As Low As Reasonably Practicable (ALARP).

Overall, it is concluded that there are not expected to be any non-temporary effects on the water quality element at water body level and the construction activities would not prevent the water body from meeting its WFD objectives in terms of chemical status (the water body is currently failing in terms of chemical status, see Table 1).

4.3.4 Protected Sites

The site is within the Dee Estuary SPA, SAC, SSSI and Ramsar. The River Dee and Bala lake SAC and SSSI is over 10 km from the Proposed Development.

A (shadow) Habitats Regulations Assessment (HRA) report has been prepared by APEM (APEM 2021c) which assessed the potential for the scheme to adversely impact these protected sites (including the SSSIs).

The following potential adverse effects were identified that could potentially impact on species or habitats that are the interest features of relevant designated sites:

- General Disturbance effects;
- Introduction of non-native species;
- Vibration effects;
- Chemical discharges; and
- Drill lubricant release.

Screening of these potential effects, with specific consideration of Sources, Pathways and Receptors confirmed that no adverse impacts are anticipated, and therefore the HRA assessment was not taken forward to Stage 2 – Appropriate Assessment.

The HRA assessment (APEM 2021c) concluded that the DCWW River Dee crossing project will have no adverse effects on protected sites, either alone or in-combination with other plans or projects.

5. Cumulative Assessment

The identification of plans and projects to include in the cumulative assessment can be based on:

- Approved plans;
- Constructed projects;
- Approved but as yet unconstructed projects; and
- Projects for which an application has been made, and currently under consideration and will be consented before the proposed activities begin.

This cumulative effects section assesses effects of the proposed activities on the Dee (N. Wales) transitional water body supporting elements when combined with the effects of other plans and projects in the area.

For the purposes of this WFD assessment, proposed plans, projects and strategies have been identified which may act in-combination with the Proposed Development. These are summarised in Table 3 with further details below.

Table 3 Plans, projects, or strategies to be assessed in combination

Planning reference	Location	Description	Potential cumulative effect on site
CML1820/ NRW Marine Licence	Connah's Quay	RNLI beach re-profiling works and maintenance to Lifeboat Station Boathouses. Construction across project until 17/04/2029	No
DDP4/20/01627	West Kirby	Wirral Council flood barrier to be constructed along 1.1 km length of West Kirby promenade.	Unknown
N/A	Wirral	A new Local Plan is in preparation for 2020-2035.	Unknown

CML1820 RNLI West Region - Regional License for Low Impact Maintenance

RLNI application to undertake beach re-profiling and maintenance works for the lifeboat station boathouses at Flint and Connah's Quay.

Application was submitted in 2018 and approved in 2019 for a 10-year licence period so there is the potential for overlap between the Proposed Development works and the RLNI maintenance works. The RLNI works are low impact and as such unlikely to impact alone on the WFD potential of the Dee (N. Wales) transitional water body. Together with the limited effects from the Proposed Development on WFD quality elements as outlined in this report, it is concluded that the cumulative effects would not have any non-temporary effects on the WFD potential and would not prevent the Dee (N. Wales) transitional water body from meeting WFD objectives.

DDP4/20/01627 West Kirby Flood Alleviation Scheme

Wirral Council is working in tandem with the Environment Agency to build a 1.1 km flood barrier on South Parade, between its junctions with Sandy Lane and Riversdale Road, to reduce the risk of flooding. This will involve the creation of a new 1.2 m high pre-cast concrete flood wall along South Parade.

According to the Wirral Council website, detailed plans will be officially lodged in November 2021, which could result in the potential for overlap with the Proposed Development in 2022. However the Proposed Development will have limited effects in relation to WFD quality elements therefore it is concluded that the cumulative effects would not have any non-temporary effects on the WFD potential and would not prevent the Dee (N. Wales) transitional water body from meeting WFD objectives.

Wirral Local Plan 2020-2035 (no planning reference found)

A new Local Plan is being prepared by Wirral Council for the period of 2020 to 2035. This is currently at the public consultation stage and it has been indicated a number of impact pathways could arise from the plans including recreational pressure, loss of functionally linked habitat, effects on water quality, effects on water resources, visual and noise disturbance, and atmospheric pollution. The Proposed Development is anticipated to have negligible effects on WFD quality elements and it is concluded that the cumulative effects would not have any non-temporary effects on the WFD potential and would not prevent the Dee (N. Wales) transitional water body from meeting WFD objectives.

6. Summary

This assessment has considered the potential effects of the Proposed Development on WFD receptors in the Dee Estuary water body. The assessment has considered how the proposed activities may pose potential risks to the hydromorphological, biological and chemical quality elements for these water bodies.

For the Dee (N. Wales) transitional water body, the scoping stage identified that the following receptors could be affected during construction and were taken forward to the Impact Assessment stage:

- Biology – Habitats (higher sensitivity; due to presence of saltmarsh)
- Biology – Fish
- Water quality – Physicochemical parameters and chemicals (potentially including chemicals on the EQSD)
- WFD Protected Areas

The receptors that could be scoped out with no need for further assessment were:

- Hydromorphology
- Biology - Habitats (lower sensitivity)
- Water quality - Physiochemical parameters
- Water quality - Chemicals above Cefas Action Level 1
- Water quality - Phytoplankton
- Water quality - Harmful algae
- INNS

Assessment

The assessment has taken into account the following embedded mitigation measures which would be implemented in line with best practice:

- Restriction of working hours (i.e. no work carried out overnight);
- The range of mitigation measures to prevent spillage and pollution of the environment in O'Connor Utilities Ltd (2021);
- The pressure in the drill fluid will be monitored continuously so that any break outs will be identified quickly and the volumes that would be released are small;
- A contingency plan is in place for break outs consisting of the stages prevention, containment and control (O'Connor Utilities Ltd 2018);

- The drill profile which will pass under the River Dee with >24m of overlying strata (between the HDD and the river bed).

It was concluded that with these embedded mitigation/avoidance measures in place the Proposed Development is not expected to produce non-temporary effects on the biological, hydromorphological and chemical quality elements of the Dee (N. Wales) transitional WFD water body and is not expected to prevent the water body from meeting its WFD objectives.

Future Good Status

The status objective for the Dee River waterbody as reported within the 2015 RBMP is Good by 2021, the objective is therefore currently not being met. The focus of the WFD and RBMP is to prevent deterioration of status in all water bodies, including the Dee (North Wales) transitional water body, which is assessed above. At present there are Local and National targeted measures within the catchment to maintain or achieve improvements the status of the water body:

- Local
 - Water Body Measures
 - Removal of invasive plants along a length of designated river or changes in land management practices to address diffuse pollution
- National
 - Provisioning Services (Food, Water for non-consumptive use)
 - Regulating Services (Climate Regulations, Water Regulation, Soil and Erosion Regulation, Water Purification and Wate Treatment)
 - Cultural Services (Cultural Heritage, Recreation and Tourism, Aesthetic Value)
 - Supporting Services (Provision of Habitat)

The Proposed Development will not have any effect on the implementation of these measures.

Statement of Competence

The assessment provided in this document demonstrates that the Proposed Development is compliant with the objectives of the WFD. Therefore, there is no requirement for an Article 4.7 assessment.

7. References

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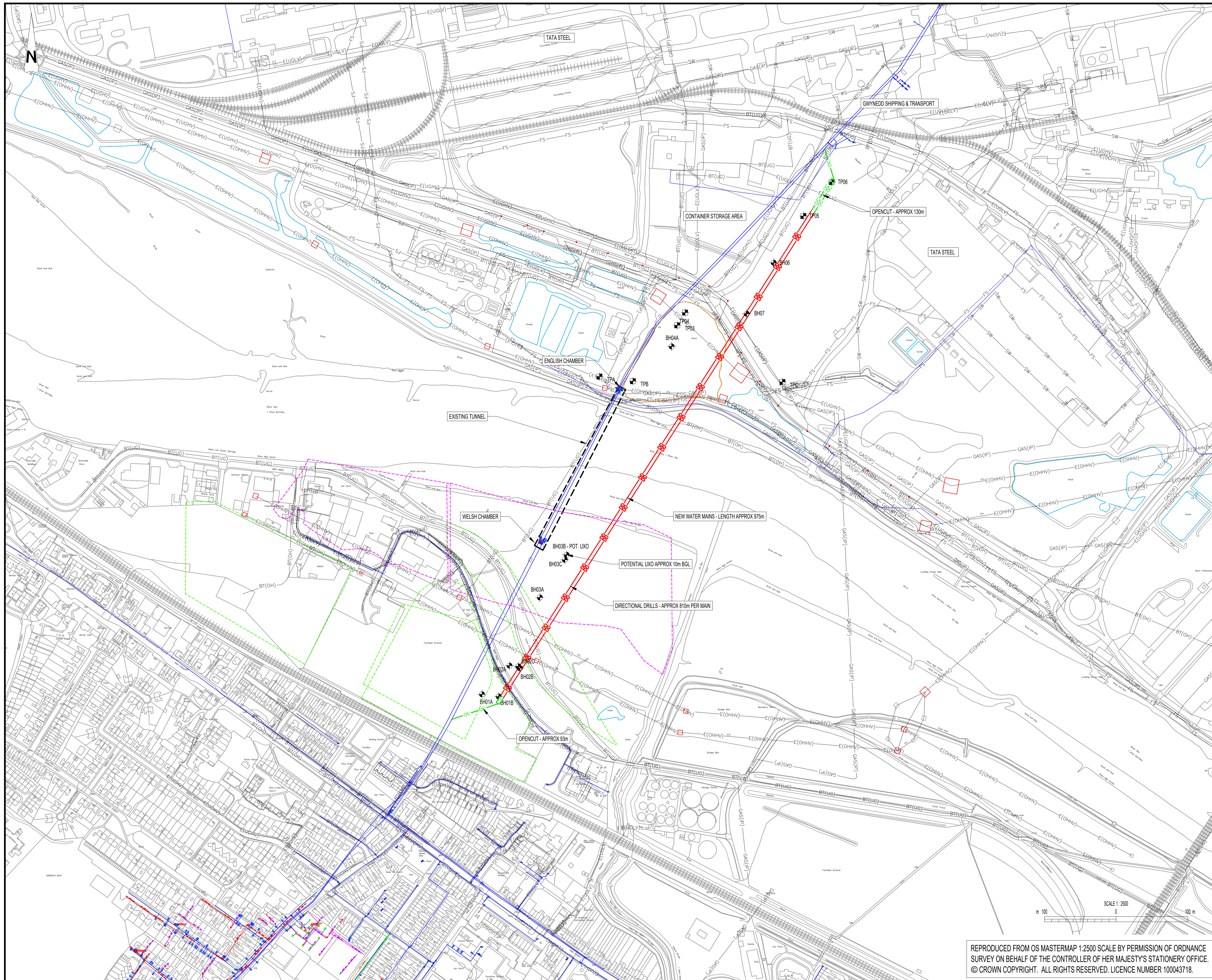
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WFD-UKTAG 2014. UKTAG Transitional and Coastal Water Assessment Method: Fish Fauna Transitional Fish Classification Index.

Appendix A Layout drawing

Drawing no: Q11938-104137-13-BG-DR-CA-DD2002



NOTES

- ALL DIMENSIONS IN MILLIMETRES AND ALL LEVELS IN METRES ABOVE ORDNANCE DATUM UNLESS SHOWN OTHERWISE.
- THIS DESIGN IS PROPOSED ON THE BASIS OF CLIENT BRIEF, SPECIFICATIONS, BEST PRACTICE AND RISK REDUCTION / ELIMINATION. THE DESIGNER MUST BE CONSULTED ON ANY PROPOSED CHANGES, BEFORE THEY ARE CONSIDERED FOR IMPLEMENTATION.

KEY

- PROPOSED WATER MAIN - DIRECTIONAL DRILLING
- PROPOSED WATER MAIN - OPEN CUT
- EXISTING POTABLE WATER MAIN
- EXISTING SURFACE WATER DRAIN / SEWER
- EXISTING FOUL WATER DRAIN / SEWER
- EXISTING INTERMEDIATE PRESSURE GAS MAIN
- EXISTING OVERHEAD HIGH VOLTAGE ELECTRIC CABLE(S)
- EXISTING OVERHEAD LOW VOLTAGE ELECTRIC CABLE(S)
- EXISTING UNDERGROUND HIGH VOLTAGE ELECTRIC CABLE
- EXISTING UNDERGROUND LOW VOLTAGE ELECTRIC CABLE
- EXISTING OVERHEAD TELECOM CABLE(S)
- EXISTING UNDERGROUND FIBRE CABLE
- - - EXTENT OF HISTORIC LANDFILL
- - - EXTENT OF INFILLED LAGOON
- - - EXTENT OF POTENTIAL INFILLED LAND (WATER)
- BOREHOLE RECORD
- TRIAL PIT RECORD

CAUTION: THE MANAGEMENT AND DESIGN OF ANY AND ALL TEMPORARY WORKS REQUIRED TO EXECUTE THIS DESIGN ARE THE RESPONSIBILITY OF THE CONTRACTOR.

SITE LOCATION
 GRID REFERENCE: 330165, 369714

PI2	03-03-2021	UPDATED LAYOUT TO SHOW SINGLE P.O.C	CJC	GP	PMU
PI1	01-10-2020	FIRST ISSUE	CJC	GP	PMU

REV.	DATE	DESCRIPTION	ORIG	CHK	APP
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CLIENT

PRINCIPAL DESIGNER
 DWR CYMRU WELSH WATER

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 Lon Parcwr Business Park, Ruthin LL15 1NJ
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 www.waterco.co.uk

SCHEME
 DEE CROSSING
 NEW WATER MAIN

TITLE
 RIVER CROSSING LAYOUT

ORIGINATOR C.CLISHAM	CHECKED G.PRICE	APPROVED P.JONES
STATUS ISSUED FOR INFORMATION	SUITABILITY S2	
WATERCO SCHEME NO. 12432	SCALE / SHEET SIZE 1 : 2500 / A1	REV P02
DRAWING NO. Q11938-104137-13-BG-DR-CA-DD2002		

REPRODUCED FROM OS MASTERMAP 1:2500 SCALE BY PERMISSION OF ORDNANCE SURVEY ON BEHALF OF THE CONTROLLER OF HER MAJESTY'S STATIONERY OFFICE. © CROWN COPYRIGHT. ALL RIGHTS RESERVED. LICENCE NUMBER 100043718.

Appendix B Completed Scoping Template

Dee (N. Wales) Transitional Water Body

Dee (N. Wales) - Water body	Description, notes or more information
WFD water body name	Dee (N. Wales)
Water body ID	GB531106708200
River basin district name	Dee
Water body type (estuarine or coastal)	Estuarine
Water body total area (ha)	10927.59 ha
Overall water body status (2018)	Moderate
Ecological status/potential (2018)	Moderate
Chemical status (2018)	Fail
Target water body status and deadline	Good - 2021
Hydromorphology status of water body	Supports Good
Heavily modified water body and for what use	Yes – for 'navigation, ports and harbours'
Higher sensitivity habitats present	Yes: Saltmarsh
Lower sensitivity habitats present	Yes: Intertidal soft sediment, Subtidal soft sediment, Rocky shore
Phytoplankton status (2019)	Moderate
History of harmful algae	Yes
WFD protected areas within 2km	Dee Estuary SPA, SAC, SSSI and Ramsar, River Dee and Bala lake SAC and SSSI

Section 2: Biology

Construction

Consider if your activity could:	Yes	No	Hydromorphology risk issue(s)
Dee Water body			
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	Works are significantly below the bed of the water body (>24m) and there will be no pathway for effect for hydromorphology.
Could significantly impact the hydromorphology of any water body		✓	Works are significantly below the bed of the water body (>24m) and there will be no pathway for effect for hydromorphology.
Is in a water body that is heavily modified for the same use as your activity		✓	The Dee Water body is classified as heavily modified for 'navigation, ports and harbours'

Section 2: Biology

Habitats

Construction

Consider if the footprint of your activity is:	Yes	No	Biology habitats risk issue(s)
Dee Water body			
0.5 km ² or larger		✓	The Proposed Development is less than 0.5 km ² .
1% or more of the water body's area		✓	The Proposed Development is less than 1% of the water body's area (i.e. less than 109.27 ha (i.e. 1.09 km ²))
Within 500 m of any higher sensitivity habitat	✓		Saltmarsh within close proximity of footprint. However, works will take place significantly below the water body and access to the site is over 100 m away from the waters edge. Therefore there is no pathway for effect for higher sensitivity habitats.
1% or more of any lower sensitivity habitat		✓	Subtidal Soft Sediment (A5.2, A5.3, A5.4) and Intertidal soft sediment (A2.2, A2.3, A2.4) in close proximity of footprint, but footprint does not take up 1% or more of lower sensitivity habitat

Section 3: Fish

Construction

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Dee Water body			
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	✓		Underwater noise and vibration from drilling could affect migratory fish species.
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)	✓		Underwater noise and vibration caused from drilling could disturb fish movement, migration or spawning.
Could cause entrainment or impingement of fish		✓	There is no entrainment or impingement risk from the drilling activities.

Section 4: Water quality

Construction

Consider if your activity:	Yes	No	Water quality risk issue(s)
Dee Water body			
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	Works are significantly below the water body and will not have a pathway for effect for water quality.
Is in a water body with a phytoplankton status of moderate, poor or bad		✓	No, good phytoplankton status.
Is in a water body with a history of harmful algae	✓		Data supporting history of harmful algae; however this was scoped out of the assessment as there is no direct pathway for any effects on harmful algae due to the Proposed Development
If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:			
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	✓		Chemicals could potentially be released although it is anticipated the only chemicals on the EQSD list could be derived from fuel or from mobilisation of chemicals already present in a historic landfill. This has been screened in taking a precautionary approach.
It disturbs sediment with contaminants above Cefas Action Level 1		✓	Ground penetrating works taking place >100 m from water body and no evidence of contaminants in sediment

Section 5: WFD protected areas

Consider if your activity is:	Yes	No	Protected areas risk issue(s)
Dee Water body			
Within 2km of any WFD protected area ⁶	✓		Dee water body overlaps with WFD protected sites - Dee Estuary SPA, SAC, SSSI and Ramsar and the nearby River Dee and Bala lake SAC and SSSI. Works taking place within Dee water body.

Section 6: Invasive non-native species (INNS)

Consider if your activity could:	Yes	No	INNS risk issue(s)
Dee Water body			
Introduce or spread INNS		✓	Works are significantly below the water body and will not have a direct pathway for effect for INNS.

Summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Dee Water body		
<i>Hydromorphology</i>	No	Works are significantly below the water body and will not have a direct pathway of effect for hydromorphology.
<i>Biology: habitats</i>	Yes	The works are in the vicinity of the higher sensitivity habitat saltmarsh.
<i>Biology: fish</i>	Yes	Underwater noise and vibration from drilling could affect migratory fish species.
<i>Water quality</i>	Yes	There is potential for some release of chemicals to the environment during the works.
<i>Protected areas</i>	Yes	Dee water body overlaps with WDF protected sites, Dee Estuary SPA, SAC, SSSI and Ramsar and the nearby River Dee and Bala lake SAC and SSSI. Works taking place within Dee water body.
<i>Invasive non-native species</i>	No	Works are significantly below the water body and will not have a direct pathway of effect for INNS.