



Habitat Regulations Assessment Report

River Dee Crossing

Dwr Cymru Welsh Water

P00005198

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Executive Summary

Dwr Cymru Welsh Water (DCWW) are planning to install new twin water mains to increase resilience of supply between Connahs Quay and the development areas to the north of the River Dee. The route of the proposed pipelines requires a directional drill beneath the tidal River Dee.

In view of potential significant adverse effects on the interest features of the Dee Estuary SAC, SPA and Ramsar, and the River Dee and Bala Lake SAC, DCWW commissioned APEM Ltd to prepare a Habitats Regulations Assessment (HRA) report. The potential effects on features of the designated sites have been considered sequentially. The potential for interest features to be adversely impacted by the Project is initially assessed (screening) in the absence of mitigation measures. Should any interest feature fail the screening test, the entire site is taken through to HRA stage.

The following potential adverse effects have been 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 assessment was not taken forward to Stage 2 – Appropriate Assessment.

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

1. Introduction

This Habitat Regulations Assessment Report – Likely Significant Effects Assessment (HRA), constitutes a shadow report¹ prepared on behalf of Dwr Cymru Welsh Water (DCWW), in relation to the proposed River Dee pipeline crossing scheme.

1.1 Background to the scheme

DCWW are proposing to install a new twin water main to increase resilience of supply between Connahs Quay and the development areas to the north of the River Dee. The route of the proposed pipelines requires a directional drill beneath the tidal River Dee.

The proposed crossing route commences south of the River Dee within an open field (c. NGR SJ 3006 6953) 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, a salt marsh, the River Dee, a further section of salt marsh, 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 SJ3050 7020). A layout drawing is provided as Appendix A.

DCWW propose to install a new twin water main with two parallel (10m separation) directional drills under the River Dee with 2x c.900 m 500 mm O/D (SDR-9 PE100) Barrier Pipe, with new connections to reconnect to existing pipework on either side.

1.2 Overview of legislative context

The 'Competent Authority' has responsibility for determining whether a project will have a LSE on a European Site or a Ramsar site (wetlands of international importance), which in this case is DCWW (in consultation with Natural Resources Wales as the Statutory Nature Conservation Body). The term European Site is retained in this HRA given its common use², recognising that, following Brexit, Special Areas of Conservation (SACs) and Special Protection Areas (SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network, but rather form part of the National Site Network (NSN). Ramsar sites do not form part of the NSN but also necessitate a HRA.

This shadow HRA report has been prepared to assist DCWW in determining the potential for LSE of the scheme on European Sites to comply with requirements under the Conservation of Habitats and Species Regulations 2017 (as amended). Regulation 63 (1) of the 2017 Regulations states that:

A competent authority, before deciding to...give any consent for a plan or project which is likely to have a significant effect on a European site (either alone or in combination with other plans or projects)... must make an appropriate assessment of the implications of the plan or project in relation to the site's conservation objectives...The competent authority may agree

¹ Shadow report to inform HRA.

² Consistent with the approach advocated by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 i.e. 'there is no operability reason for these [terms] to change'.

to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site.

Should it be found that significant effects are likely, an 'Appropriate Assessment' should then be carried out to further assess those effects. Consent may only be given for the proposed scheme if, following assessment, it is established that it will not adversely affect the integrity of the designated site.

If adverse effects are identified, alternatives should be considered to avoid those effects. However, where no alternative solution exists and so an adverse effect remains, a further assessment should be made of whether the scheme is required for imperative reasons of overriding public interest (IROPI). If the scheme meets that IROPI test, compensatory measures will be required to maintain the overall European Site's status.

The Habitats Directive is implemented in English and Welsh law by the Conservation of Habitats and Species Regulations 2017 (as amended) (the 2017 Regulations). One of the aims of the 2017 Regulations is to "*maintain or restore, at favourable conservation status, natural habitats and species of wild fauna and flora of Community interest*" (Article 2(2)). This aim therefore relates to habitats and species, not the European Sites themselves, although the European Sites have a role in delivering favourable conservation status. The 2017 Regulations also apply the precautionary principle³ to European Sites.

Relevant legislation is discussed further in Section 4.

1.3 Scope of the report

The purpose of this shadow HRA is to:

- Describe the Scheme (sufficient to allow assessment of effects);
- Provide information on the ecological interests and features of the potentially affected European Sites;
- Describe the likely nature and scale of the impacts on the European Sites from the Scheme and any likely 'in combination' effects with other plans and/ or projects; and
- Consider the results to allow a decision, based on the information in this statement, to be made by DCWW, as the Competent Authority under The Conservation of Habitats and Species Regulations 2017 (the Habitats Regulations), as to whether the proposals have the potential to significantly affect any European sites.

1.4 Report structure

This HRA document provides information on the proposed work and the HRA process. It then carries out that process and presents the results and assessment conclusion. This HRA comprises the following sections:

³ The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as: "*When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis*".

- Section 1: Introduction – including legislative context and report purpose/ scope;
- Section 2: The Project - description of the proposed works;
- Section 3: Appropriate Assessment process - description of the HRA process and methods used;
- Section 4: Legislative Context;
- Section 5: European and Ramsar Sites Potentially Affected by the Project;
- Section 6: Potential Impacts of the Project – an overview of the project characteristics and their potential impact;
- Section 7: Supporting studies – a summary of studies and/ or assessments that have been completed relevant to the Project and this HRA;
- Section 8: Screening: Testing for Likely Significant Effects - identification of sites and potential hazards; within this section consideration is given to other plans in the area which may lead to an 'in-combination' effect (if appropriate).
- Section 9 – Conclusions.

2. The Project

2.1 The need for the work

DCWW currently operate twin water mains that cross the River Dee estuary between Connah's Quay and TATA Steel's Shotton Works in a 100-year-old tunnel. Surveys of the tunnel have determined that the tunnel lining is in poor condition, and the supply of water is currently reduced to one of the two pipelines owing to leakage on the other.

DCWW propose replacing the existing water mains tunnel, reinforcing the supply to a 15km² area of Cheshire known as Deeside Industrial Park and Garden City, with twin Horizontal Directional Drilled (HDD), pipelines of 500mm SDR-9 PE100 Blue Barrier Pipe.

2.2 Site description

The proposed crossing route commences south of the River Dee at approximate NGR SJ 3006 6953 (Figure 2-1). A detailed layout drawing is provided as 'Appendix A – Layout drawing' (O'Connor Utilities Ltd 2021).

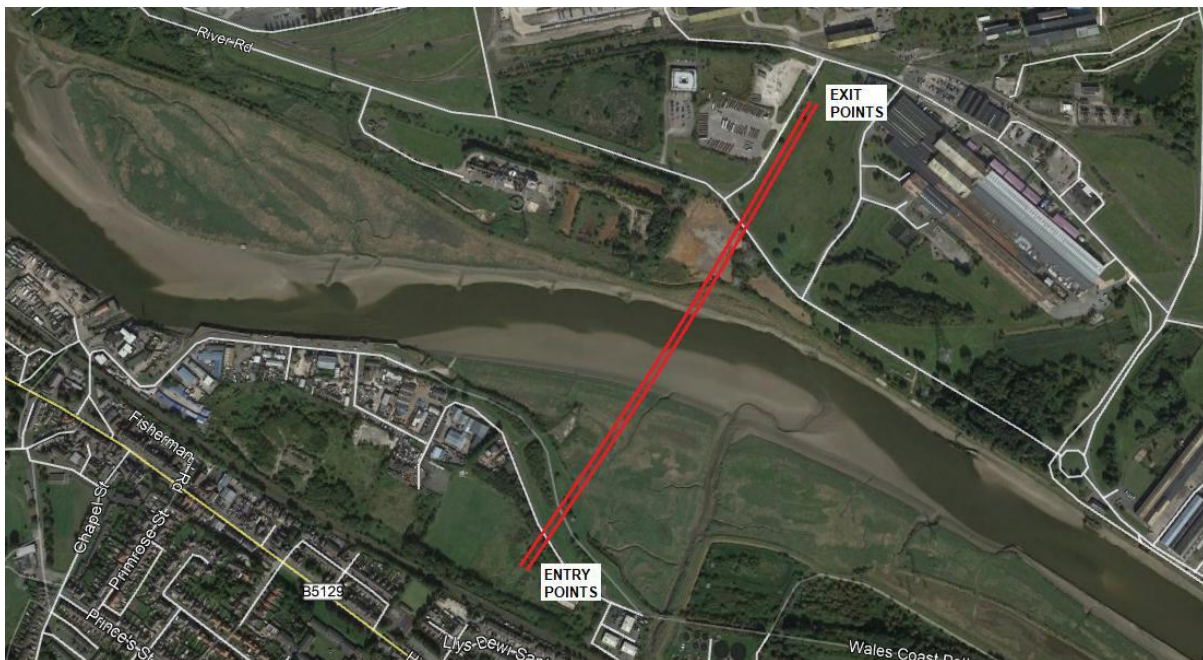


Figure 2-1: Overview figure showing route of the proposed HDD (taken from O'Connor Utilities Ltd 2021).

A series of ecological surveys have been completed to characterise the existing habitats and species on site; this information is presented in an Ecological Survey Report (APEM, 2021). The survey extent is shown in Figure 2-2.

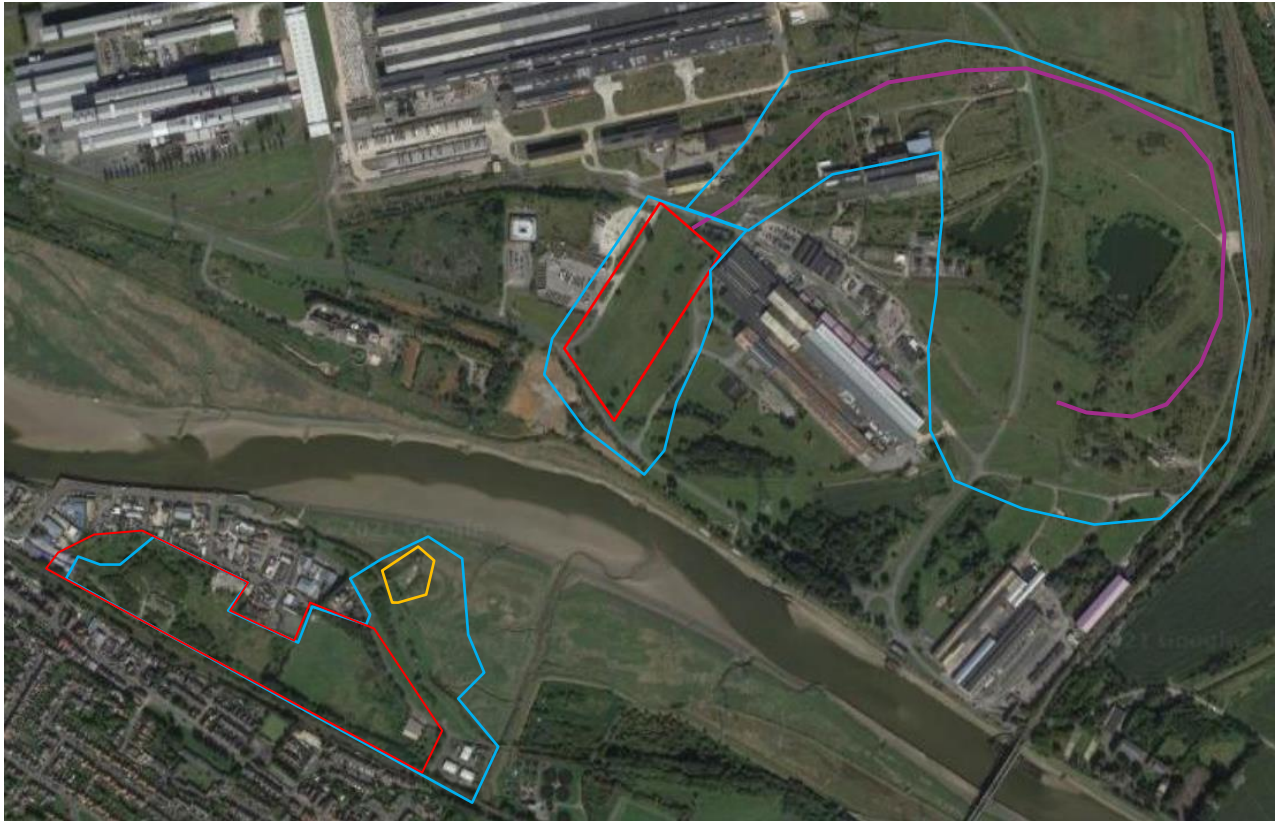


Figure 2-2 Aerial Photograph showing terrestrial ecological survey extent outlined in blue (taken from APEM 2021).

Figure notes: Red = working area excluding laydown; yellow = enhancement area; purple = approximate pipe laydown route.

The south working area (Figure 2-2) comprises a strip of open brownfield land along the northern side of the North Wales Mainline railway, within Connah's Quay, Flintshire. The area currently comprises largely urban regeneration scrub and ruderal vegetation in the northwest, the area known as "Crumps yard", becoming progressively more grass dominated towards the southeast, the southwestern end comprising a managed amenity grassland sports pitch and rough grassland.

The south working area (Figure 2-2) is largely surrounded by development, with industrial units on Dock Road to the west and north, while the railway forms the southern boundary, beyond which is an urban residential area. Only the eastern boundary is substantially undeveloped, with a series of small fields to the southeast, however beyond this is further industrial development. The area is almost entirely isolated from other open habitat by the river and surrounding built up areas, however there are two narrow corridors providing some connectivity to the wider area; the river corridor and the railway line. The railway in particular forms a narrow but densely vegetated corridor connecting the site to open country with hedgerows and small wooded areas to the northwest and southeast. The river corridor is characterised by open saltmarsh habitat of varying width, with limited taller vegetation.

It is understood that a photovoltaic array (PV, or solar farm) will shortly be installed on the north-western part of the south working area on behalf of Flintshire County Council. It is likely

that this work will have been carried out prior to the commencement of the DCWW scheme, (resulting in habitat changes to this part of the survey area).

The north working area lies within the grounds of the large TATA steel works on Deeside (drill exit point located at c. NGR SJ3050 7020) (Figure 2-2). The area is currently very open and comprised almost entirely of short, managed grassland (mostly amenity) with isolated trees, while to the south of the area is a hedgerow dividing the site from a former lagoon, now dried up and comprised of soft sand.

The area is part of the grounds of the larger steelworks complex and is entirely surrounded, either by areas of similar short, managed amenity grassland, or hardstanding and industrial buildings. Connectivity to areas of more ecological interest is limited, but a hedgerow running along the northern coast of the Dee estuary does link to some larger areas of woodland and scrub to the southeast and northwest, around the edges of the steelworks. The saltmarsh on the northern bank of the estuary is narrow and restricted close to the north working area.

The proposed pipe laydown area is also within the grounds of the TATA steel works. The area is very open, but less intensely managed than the north working area, comprising semi-improved neutral rough grassland and scattered and dense scrub, along with roads, rails and buildings. The grassland is intensively managed along the road verges and near buildings; being cut very short here, but is otherwise of mid length, between 0.2 and 0.5m. The rough grassland is evidently managed to prevent scrub encroachment; though some large areas are becoming overgrown with dense scrub of bramble, roses and small trees. The area contains two large ponds which are stocked with fish by a local angling group, and some small woodland fragments. The pipe laydown area is surrounded to the north, south and west by similar works areas of grassland, hardstanding and industrial buildings. The eastern boundary is formed by a railway corridor. Connectivity to areas of more ecological interest is principally via the railway corridor to the east, which contains stands of dense scrub surrounded by open ground around the tracks.

Detailed description of the habitats on site are presented in APEM (2021), which also sets out a number of terrestrial ecological mitigation and monitoring measures (including construction phase surveys and Ecological Clerk of Works (ECoW) requirements).

2.3 Overview of main works

Two parallel HDDs will be undertaken from south of the River Dee (HDD entry point), under the River and will exit in TATA Steel's green open space (brownfield site) to the north of the river (Figure 2-1). Pipes will be installed through the HDD 'tunnels' and connections made to existing pipework on either side of the river.

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 each pipeline pilot hole – a 12-1/4" diameter HDD.

- Drill depth will be in excess of 24 m below the riverbed at all points
- 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 2.90m and 3.60m 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 ~12.5m thick sequence of silty fine to medium Sand before the top of the Clay is encountered at between 15.70m and 15.90m 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 ~2.4m 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 8m³ per day (Appendix B). (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, which will include:
 - 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). Ground investigation and waste strategy information is summarised in ARUP, 2021.

2.4 Timing of works

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

3. Assessment Process

The Habitats Regulations Assessment process (Figure 3-1) is carried out in a sequential manner and the stages of that sequence are described in Planning Inspectorate Advice Note 10 (ECEDG 2002):

- Stage 1 - Screening:

European and Ramsar sites are screened for LSE, both effects from the Project alone and in combination with other projects. The purpose of this first HRA component is to establish whether there is a potential for Likely Significant Effects (LSEs) on nearby European sites that may arise from the scheme either alone or 'in combination' with other plans or projects. The significance of potential effects are assessed in the absence of avoidance or other mitigation measures other than those which are standard construction practices such as pollution control or those incorporated into the scheme. The assessment has been made with awareness of the conservation objectives for the features of the European Sites.

- Stage 2 - Appropriate Assessment:

For those sites where LSE on a European or Ramsar site cannot be excluded in Stage 1 then further information to inform the assessment will be prepared and the test of whether the Project alone or in-combination will adversely affect the integrity of the site in view of its conservation objectives will be applied. This assessment stage will be reported in the form of a HRA Report.

In those cases where the conclusion of the HRA Report is that an adverse effect on the integrity of a European or Ramsar site has been identified then the assessment proceeds to two further stages:

- Stage 3 - Assessment of Alternatives:

The alternatives that have been considered will be assessed. The Planning Inspectorate advise that alternative solutions can include a proposal of a different scale, a different location, and an option of not having the scheme at all – the 'do nothing' approach.

- Stage 4 - Assessment of Imperative Reasons of Overriding Public Interest

If it is demonstrated that there are no alternative solutions to the proposal that would have a lesser effect or avoid an adverse effect on the integrity of the site(s), then a justified case will be prepared that the scheme must be carried out for imperative reasons of overriding public interest (IROPI).

If the conclusion of Stages 3 and 4 is that there is no alternative and that the Project has demonstrated IROPI then the Project may proceed with a requirement that appropriate compensatory measures are delivered.



Figure 3-1: The four-stage approach to Habitats Regulations Assessments of projects (e.g. ECEDG 2002).

4. Legislative Context

The HRA process is based on the requirements of the following specific European Directives and the Regulations that implement their requirements in national law and continue to do so following Brexit.

4.1 The Birds Directive

The EU Directive on the Conservation of Wild Birds (2009/147/EC) (hereafter called the ‘Birds Directive’) provides a framework for the conservation and management of wild birds in Europe. The relevant provisions of the Directive are the identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive and for all regularly occurring migratory species (required by Article 4). The Directive required national Governments to establish SPAs and to have in place mechanisms to protect and manage them. The SPA protection procedures originally set out in Article 4 of the Birds Directive were replaced by the Article 6 provisions of the Habitats Directive.

4.2 The Habitats Directive

The EU Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) provides a framework for the conservation and management of natural habitats, wild fauna (except birds) and flora in Europe. Its aim is to maintain or restore natural habitats and wild species at a favourable conservation status. The relevant provisions of the Directive are the identification and classification of Special Areas of Conservation (SACs) (Article 4) and procedures for the protection of SACs and SPAs (Article 6). SACs are identified based on the presence of natural habitat types listed in Annex I and populations of the species listed in Annex II. The Directive required national Governments to establish SACs and to have in place mechanisms to protect and manage them.

4.3 The Conservation of Habitats and Species Regulations 2017

The Conservation of Habitats and Species Regulations 2017 (as amended), transposes the Birds Directive and the Habitats Directive into national law in the onshore environment, operating in conjunction with the Wildlife and Countryside Act 1981. The Habitats Regulations place an obligation on ‘competent authorities’, e.g. DCWW to carry out an Appropriate Assessment of any proposal likely to affect a SAC or SPA, to seek advice from Natural Resources Wales, and to not approve an application that would have an adverse effect on a

SAC or SPA (except under very tightly constrained conditions that involve decisions by the Welsh Ministers).

4.4 The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019

The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ensures that habitat and species protection and standards as set out under the Nature Directives (European Directives listed above) are implemented in the same way or an equivalent way when the UK exits the EU.

Changes are largely limited to ‘operability changes’ that ensure the regulations can continue to have the same working effect post Brexit as before. Convention dictates that the 2017 Regulations will continue to be officially referred to, quoted as the ‘Conservation of Habitats and Species Regulations 2017 (as amended)’.

4.5 Application of the HRA Process to Designated Sites

In addition to fully designated SACs and fully classified SPAs, the HRA process also has to be applied as a matter of law or policy to the following sites:

- Sites of Community Importance (SCI): HRA process applied as a result of Article 4(5) and Article 6(2)(4) of the Habitats Directive.
- Potential SPAs (pSPAs): HRA process applied as a result of UK Government policy - paragraph 118 of the National Planning Policy Framework (DCLG, 2012).
- Possible SACs (pSACs): HRA process applied as a result of UK Government policy - paragraph 118 of the National Planning Policy Framework (DCLG, 2012).
- Listed and proposed Ramsar sites (internationally important wetlands listed under the Ramsar Convention 1971): HRA process applied as a result of UK Government policy (Defra, 2005; DCLG, 2006).

4.6 In-combination Assessment

The Habitats Regulations require the consideration of the potential effects of a project on European sites (and on Ramsar sites as a matter of Government policy) both alone and in-combination with other plans or projects.

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

- approved plans;
- constructed projects;
- approved but as yet unconstructed projects; and
- projects for which an application has been made, are currently under consideration and will be consented before the proposed works begin.

4.7 Definition of significance

A critical part of the HRA screening process is determining whether the proposals are likely to have a significant effect on European sites and, therefore, if they will require an Appropriate

Assessment. Judgements relating to significance should be made in the context of the qualifying interests for which the site has been designated as having European importance and its conservation objectives.

It is important to note that the burden of evidence is to show, on the basis of objective information, that the project or plan will have no significant effect on a European site. If the effect may be significant, or is not known, it would trigger the need for an Appropriate Assessment.

The definition of a LSE, in this case, is any effect that may be reasonably predicted as a consequence of a plan or Project that may affect the conservation objectives of the features for which the site was designated, but excluding trivial or inconsequential effects.

4.8 Guidance on the HRA Process

In preparing this report, consideration has been given to the relevant guidance issued by a number of Governmental, statutory and industry bodies.

Guidance from Government bodies includes:

- NRW (and partner organisations) guidance 'Habitats regulations assessments: protecting a European site' available on .gov.uk. (NRW, 2021).
- European Commission: Assessment of Plans and Projects Significantly Affecting Natura 2000 Sites (European Commission, 2001).
- Department of Communities and Local Government: Guidance on Planning for the Protection of European Sites: Appropriate Assessment (DCLG, 2006).
- The Planning Inspectorate Advice Note Ten: Habitat Regulations Assessment relevant to nationally significant infrastructure projects (Planning Inspectorate, 2017).

Guidance from the Statutory Nature Conservation Bodies includes:

- English Nature: Habitats Regulations Guidance Note (HRGN 1): The Appropriate Assessment (Regulation 48) The Conservation (Natural Habitats &c) Regulations, 1994.
- English Nature: Habitats Regulations Guidance Note (HRGN 3): The Determination of Likely Significant Effect under the Conservation (Natural Habitats &c) Regulations, 1994.
- English Nature: Habitats Regulations Guidance Note (HRGN 4): Alone or in combination.
- Natural Resources Wales: Environmental Permitting Regulations (England & Wales) 2010. Regulatory Guidance Series, No RGN 4: Setting standards for environmental protection.

Additional relevant guidance:

- Tyldesley, D. and Chapman, C. (2013) The Habitats Regulations Assessment Handbook. DTA Publications Limited.

There is also relevant case law that requires consideration:

- A decision by the Court of Justice of the European Union (CJEU) ‘People Over Wind and Sweetman v Coillte Teoranta’ (C-323/17) (CJEU 2018) dictates that measures intended to avoid or reduce the harmful effects of a proposed project on a European site may no longer be taken into account by competent authorities at the HRA screening stage when judging whether a proposed plan or project is likely to have a significant effect on the integrity of a European designated site. Consistent with C-323/17, the potential for interest features to be adversely impacted by the Project is initially assessed in the absence of design mitigation i.e. in the absence of those measures which are accepted or known impact reducing measures. Examples of design measures include those elements associated with an agreed surface water management strategy. By assessing LSE initially in this manner, a transparent assessment is ensured. Should any interest feature fail the screening test, the entire site is taken through to HRA stage.

5. European and Ramsar Sites and Features Potentially Affected by the Project

5.1 The Protected Site Identification Process

For the screening process, protected sites in the vicinity of the Project which could potentially be influenced by the Project were identified. The different interest features within these sites were then considered individually.

It only requires one site interest feature to be potentially impacted by the Project for the European and/ or Ramsar site to be screened into the Appropriate Assessment, along with each of its associated interest features.

This screening process uses the conceptual ‘source-pathway-receptor’ model. This approach was used to identify potential environmental impacts resulting from the Project. This process provides an easy to follow assessment route between impact sources and potentially sensitive receptors ensuring a transparent assessment. The parameters of the model are defined as follows:

- Source – the origin of a potential impact (noting that one source may have several pathways and receptors).

Example: Silt-contaminated water generated during the Project.

- Pathway – the means by which the effect of the activity could impact a receptor.

Example: Downstream transport of silt-contaminated water and the settling of sediment particles on existing habitat.

- Receptor – the element of the receiving environment that is impacted.

Example: Animal or habitat that is a site interest feature (which may be adversely affected).

Where there is no pathway or the pathway is so long that the effect from the source has dissipated to a negligible level before reaching the receptor, there is justification for that particular receptor to be screened out.

Additionally, where the receptor (site interest feature) only occurs in the area on a seasonal basis and that receptor is not present in the period in which particular elements of a Project are a source of a potential impact, there is justification for that particular receptor to be screened out.

5.2 Potential sites (Receptors)

A GIS based search using the site boundaries published on MAGIC (www.magic.gov.uk) was undertaken to identify sites within a 2 km radius of the proposed scheme. Should any pathways for impact have been identified (at any time throughout this assessment) that had the potential to propagate effects beyond 2 km of the project, then this search radius would have been extended. Potential impacts on transient populations (e.g. disruption of fish migration) could affect sites considerably further afield than 2 km. As a precaution, potential impact pathways to all European sites within the Dee basin designated for migratory fish are therefore included in this HRA.

The following sites were identified:

- Dee Estuary SAC;
- Dee Estuary Special Protection Area (SPA);
- River Dee and Bala Lake Special Area of Conservation (SAC); and
- Dee Estuary Ramsar site.

The following Sites of Special Scientific Interest (SSSI) are also present within the study area. SSSI's are national level designations and do not fall within the assessment scope of a HRA. However, in large part these SSSIs are designated for the same habitats and features, and the sites are regulated by the same regulatory bodies. For completeness (to ensure transparency and allow effective consultations) the following sites are therefore also included in this report:

- Dee Estuary Site of Special Scientific Interest (SSSI);
- Afon Dyfrdwy (River Dee) SSSI;
- River Dee (England) SSSI (just outside of search radius, but site shares many designating features with other sites listed here).

5.3 Overview of Sites

Figure 5-1 presents those protected sites overlapping the site. All the designated sites within 500m of the Project site (all areas) cover the same area, either the River Dee or the saltmarsh area on either bank of the estuary (riverside of the flood defence embankments). As such, the only proposed surface works directly within these sites is the proposed enhancement works to the area north of the flood defence embankment. The route of the proposed pipelines passes beneath these designations i.e. the horizontal directional drill will pass underneath the River Dee and its estuary.



Figure 5-1: Protected sites overlapping and in close proximity to the site (taken from APEM 2021).

Figure notes: The works areas boundaries are outlined in red (noting that actual working area extent will be considerably less i.e. focussed around the drill entry and exit locations). Sites are numbered in yellow: Magenta: Statutory sites, Blue: Non-statutory. 1. Dee Estuary Special Area of Conservation (SPA), Dee Estuary Special Protection Area (SPA), Dee Estuary Site of Special Scientific Interest (SSSI), and Dee Estuary Wetland of International Importance (RAMSAR Site). Not shown – River Dee SSSI (Occupies the river area in the centre only). 2. The River Dee Local Wildlife Site (non-statutory). 3. (outer blue lines) NRW Priority area for saltmarsh habitats. The pipe laydown area (not shown) does not overlap with any protected sites. Figure taken from APEM 2021; Image © Aderyn.

5.3.1 The Dee Estuary SAC

The Dee Estuary SAC is a designated site due to its size and range of geographically important features, including salt marshes, intertidal mudflats and sandflats, as well as the presence of several important floral and faunal species. In particular, the Dee Estuary supports about the seventh largest area of saltmarsh in the UK (NE, 2009), supporting nationally scarce plants such as slender hare's-ear (*Bupleurum tenuissimum*).

The Annex I habitats that are a primary reason for selection of this site (JNCC, undated_a) are:

- 1140 'Mudflats and sandflats not covered by seawater at low tide'
- 1310 'Salicornia and other annual colonising mud and sand'
- 1330 'Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)'

The Annex I habitats present as a qualifying feature, but not a primary reason for site selection (JNCC, undated_a) are:

- 1130 'Estuaries'
- 1210 'Annual vegetation of drift lines'
- 1230 'Vegetated sea cliffs of the Atlantic and Baltic Coasts'
- 2110 'Embryonic shifting dunes'
- 2120 'Shifting dunes along the shoreline with *Ammophila arenaria* ("white dunes")'
- 2130 'Fixed coastal dunes with herbaceous vegetation ("grey dunes")'
- 2190 'Humid dune slacks'

There are no Annex II species that are a primary reason for selection of this site (JNCC, undated_a).

The Annex II species present as a qualifying feature, but not a primary reason for site selection (JNCC, undated_a) are:

- 1095 'Sea lamprey (*Petromyzon marinus*)'
- 1099 'River lamprey (*Lampetra fluviatilis*)'
- 1395 'Petalwort (*Petalophyllum ralfsii*)'

There are three other Annex II species listed in the Natura 2000 Standard Data Form for this site (JNCC, 2015a), but not as primary or qualifying features. Following a precautionary approach, these have been included in this assessment. They are:

- 1103 'Twaite shad (*Alosa fallax*)'
- 1364 'Grey seal (*Halichoerus grypus*)'
- 1355 'Eurasian otter (*Lutra lutra*)'

5.3.2 The Dee Estuary SPA

The Dee Estuary SPA is a designated site due to its importance for wintering waterbirds due to the intertidal flats, saltmarshes and fringing habitats, including coastal grazing marsh/fields providing feeding and roosting sites for internationally important numbers of ducks and waders.

Annex I species for which 1% or more of the Great Britain population use the Dee Estuary SPA are as follows:

- Bar-tailed Godwit (*Limosa lapponica*).
- Common Tern (*Sterna hirundo*).
- Little Tern (*Sterna albifrons*).
- Sandwich Tern (*Sterna sandvicensis*).

Annex II species for which 1% or more of the Great Britain population use the Dee Estuary SPA are as follows:

- Redshank (*Tringa totanus*).
- Shelduck (*Tadorna tadorna*).
- Teal (*Anas crecca*).
- Pintail (*Anas acuta*).
- Oystercatcher (*Haematopus ostralegus*).
- Grey Plover (*Pluvialis squatarola*).
- Knot (*Calidris canutus islandica*).
- Dunlin (*Calidris alpina*).
- Black-tailed Godwit (*Limosa limosa islandica*).
- Curlew (*Numenius arquata*).

5.3.3 The Dee Estuary Ramsar

The Dee Estuary is designated as a Ramsar site due to its internationally important numbers of waterfowl and wader species. It provides a diverse array of habitats, including extensive intertidal mudflats and saltflats, which play important roles in shoreline stabilisation through the retention of sediment and buffering of coastal wave forces.

Ramsar criteria met by the Dee Estuary Ramsar include (JNCC, 2013):

- Criterion 1 (extensive intertidal mud and sand flats, with large expanses of saltmarsh towards the head of the estuary);
- Criterion 2 (supports breeding colonies of the vulnerable Natterjack Toad (*Epidalea calamita*));
- Criterion 5 (assemblages of international importance, represented by peak counts of 120,726 individual waterbirds in the winter); and
- Criterion 6 (species/populations occurring at levels of international importance, represented by multiple breeding and non-breeding bird populations).

5.3.4 Dee Estuary Site of Special Scientific Interest (SSSI)

The Dee Estuary/Aber Afon Dyfrdwy is designated as a SSSI on account of its total populations of internationally important wintering waterfowl; its populations of individual waterfowl and tern species whose numbers reach national and in some cases, internationally important levels; its intertidal mud and sandflats, saltmarsh and transitional habitats; the hard rocky sandstone cliffs of Hilbre Island and Middle Eye with their cliff vegetation and maritime heathland and grassland; its assemblage of nationally scarce plants; and its populations of sandhill rustic moth *Luperina nickerlii gueneei*, a Red Data Book species (Natural England, 2021).

The following are individual habitats or species associated with the Dee Estuary SSSI:

- Nationally significant populations of breeding birds - Common tern (*Sterna hirundo*), Cormorant (*Phalacrocorax carbo sinensis*), and Redshank (*Tringa totanus*).
- Aggregations of non-breeding birds - Bar-tailed Godwit (*Limosa lapponica*), Black-tailed Godwit (*Limosa islandica*), Cormorant (*Phalacrocorax carbo carbo*), Curlew (*Numenius arquata*), Dunlin (*Calidris alpina alpina*), Great Crested Grebe (*Podiceps cristatus*), Grey Plover (*Pluvialis squatarola*), Knot (*Calidris canutus*), Oystercatcher (*Haematopus ostralegus*), Pintail (*Anas acuta*), Redshank (*Tringa totanus*), Ringed

Plover (*Charadrius hiaticula*), Shelduck (*Tadorna tadorna*), Teal (*Anas crecca*), and Wigeon (*Anas penelope*).

- Estuaries.
- Floodplain fen (lowland).
- Hard maritime cliff and slope.
- Lowland wet neutral grassland.
- Sandhill rustic moth (*Luperina nickerlii*).
- Saltmarsh.
- Vascular plant assemblage.

5.3.5 Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI

The River Dee is designated as a SSSI due to its nationally important transition through a range of river types; its fluvial geomorphology; and its populations of Atlantic salmon (*Salmo salar*), Eurasian otter (*Lutra lutra*), and club-tailed dragonfly (*Gomphus vulgatissimus*). The Afon Dyfrdwy is designated as a SSSI also for its fluvial geomorphology, as well as its carboniferous geology; range of river habitat types; numerous plant and aquatic invertebrate species; as well as populations of brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*).

The main channel of the River Dee lies within both Wales and England, and is notified as two separate SSSIs – the Afon Dyfrdwy (River Dee) SSSI in Wales and the River Dee (England) SSSI in England. The features for which the SSSIs are notified, in particular migratory fish, depend upon the whole river ecosystem. Salmon, otter, club-tailed dragonfly, and fluvial geomorphology are of special interest in both Wales and England.

There is a degree of overlap between the species and habitats present and the qualifying features for SSSI designation are listed below (CCW, 2002b; Natural England, 2021).

Afon Dyfrdwy (River Dee):

- Upper Carboniferous stratigraphy (Dee Bridge).
- Saltmarsh transition habitats, supporting slender hare's-ear (*Bupleurum tenuissimum*), sea barley (*Hordeum marinum*), and hard-grass (*Parapholis strigose*).
- Floating water plantain (*Luronium natans*).
- Bullhead (*Cottus gobio*).
- Brook lamprey (*Lampetra planeri*).
- River lamprey (*Lampetra fluviatilis*).
- Sea lamprey (*Petromyzon marinus*).
- Smelt (*Osmerus eperlanus*).
- Twaite shad (*Alosa fallax*).
- Grayling (*Thymallus thymallus*).

River Dee (England):

- Flowing waters - Type VI: base-rich, mesotrophic rivers in western and northern Britain, with a moderate to fast current.

Both:

- Eurasian otter (*Lutra lutra*)
- Fluvial geomorphology (River Dee, Holt to Worthenbury; Agon Dyfrdwy, Rhewl Section)
- Nationally rare and scarce invertebrate species - Club-tailed Dragonfly (*Gomphus vulgatissimus*), the Scarce Yellow Sally stonefly (*Isogenus nubecula*), and the cress tooth weevil (*Aulacobaris lepidii*).
- Atlantic salmon (*Salmo salar*)

5.3.6 River Dee and Bala Lake Special Area of Conservation (SAC)

The River Dee and Bala Lake SAC is a designated site for its water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation, for which it is considered to be one of the best areas in the UK. The SAC also supports habitat for populations of brook lamprey (*Lampetra planeri*), river lamprey (*Lampetra fluviatilis*) and sea lamprey (*Petromyzon marinus*); and offers excellent habitat for Atlantic salmon (*Salmo salar*) and Eurasian otter (*Lutra lutra*).

The Annex I habitats that are a primary reason for selection of the site (JNCC, undated_b) are:

- 3260 Water courses of plain to montane levels with the *Ranunculus fluitantis* and *Callitriche-Batrachion* vegetation.

There are no Annex I habitats present as a qualifying feature (JNCC, undated_b).

The Annex II species that are a primary reason for selection of the site (JNCC, undated_b) are:

- 1106 Atlantic salmon (*Salmo salar*)
- 1831 Floating water-plantain (*Luronium natans*)

The Annex II species present as a qualifying feature, but not a primary reason for site selection (JNCC, undated_b) are:

- 1095 Sea lamprey (*Petromyzon marinus*).
- 1096 Brook lamprey (*Lampetra planeri*).
- 1099 River lamprey (*Lampetra fluviatilis*).
- 1163 Bullhead (*Cottus gobio*).
- 1355 Otter (*Lutra lutra*).

5.4 Features of Interest

The potential impacts of the Project are described in Section 6. Where a potential pathway for impact is identified, those features of interest (relevant designating habitats and species) are screened for potential impact in Section 8.1.

6. Potential impacts of the Project

6.1 The Assessment Process

The process of testing for LSE (Stage 1 - Screening) considers the potential adverse effects that might arise from the Project and identifies whether there is a probability that each potential adverse effect can affect each European site and their interest features.

Where a relevant potential effect is identified, then it is necessary to determine if there is a potential pathway via which the effect could be transferred to/onto the interest features of the relevant European sites. Where a pathway is identified, the length of those pathways, and what may reduce or prevent the potential effect reaching the relevant European sites is considered. Only when there is a source, a pathway and an effect that reaches the interest feature is it judged that there is a LSE that requires the more detailed assessment that is carried out at the Appropriate Assessment stage.

Potential adverse effects of the Project on designated sites have been identified using a combination of:

- Information provided by DCWW and its Project teams (including OCU Ltd as drill contractor);
- Ecological surveys undertaken to characterise the project site; and
- Professional judgement based on experience of conducting numerous assessments of proposed developments in the vicinity of European and Ramsar sites.

6.2 In-combination Assessment

It is a requirement of Regulation 63(a) of the Conservation of Habitats and Species Regulations 2017 (as amended) to not only assess the impacts of a development project alone, but also to investigate whether there might be 'in-combination' effects with other projects or plans proposing development in adjacent authorities. In practice, such an 'in-combination' assessment is of greatest relevance when an impact pathway relating to a project would otherwise be screened out not because there is no impact pathway but because its individual contribution is considered to be inconsequential.

A series of individually modest effects may in-combination produce effects that are likely to adversely affect the integrity of one or more European Sites. Article 6(3) of the Habitats Directive attempts to address this by considering the combination of effects from other plans or projects. Guidance in Section 4.4.3 of 'Managing Natura 2000 Sites: The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC', published by the European Union, states:

'When determining likely significant effects, the combination of other plans or projects should also be considered to take account of cumulative impacts. It would seem appropriate to restrict the combination provision to other plans or projects which have been actually proposed'.

For the purposes of this HRA, we have identified several plans, projects and strategies proposing / aiming for development, which may act in-combination with the Proposed Development. These are summarised in Table 6-1, and will be analysed for the HRA, particularly with regard to the potential cumulative effect of disturbance if increased recreational activity due to Local Plans and Proposed Development construction occurs at the

same time. However, none are expected to result in impact pathways being 'screened in' that have been 'screened out' in this report. This is due to the precautionary nature of the LSE screening exercise undertaken for this HRA.

Table 6-1 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

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, at which time it will be necessary to examine the result of the HRA and consider the potential for in-combination effects with the proposed River Dee construction work in 2022.

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, though an interim HRA was carried out by AECOM in 2019.

The HRA for the Wirral Local Plan 2020-2035 indicated a number of impact pathways, including recreational pressure, loss of functionally linked habitat, water quality, water resources, visual and noise disturbance, and atmospheric pollution.

6.3 Elements of the Project that can give rise to Potential Effects

Section 2.3 has identified the principal activities that will take place during the Project. These activities have been evaluated and the following potential effects identified that could potentially impact on species or habitats that are the interest features of the designated sites:

- General disturbance effects,
- Invasive non-native species,
- Noise & Vibration,
- Chemical discharges, and;
- Drill lubricant release.

6.3.1 *General Disturbance effects (human and physical)*

Increased human and machinery activity in the vicinity of designated sites may cause noise and/or physical disturbance to designated species and habitats.

A directional drill will be used to install the new pipelines under the River Dee and the designated sites, meaning that no plant, footfall or construction activities within the boundaries of the designated sites (no surface activities) will take place. The drill entry and exit pits are located at distance from the river (c.300 m to mean high water (MHW) mark) and are physically separated from the designated areas by existing roads, footpaths, amenity grassland, and flood embankments (and a distance of >100 m). Although outside of the designated sites area, any disturbance e.g. to grassland at the drill compounds will be reinstated (e.g. by seeding). Drill works will not take place continuously over 24 hours.

Given the localised nature of the proposed works (small construction footprint) that is physically separate to the estuary (with which all the designated sites are associated) and separated from the intertidal by roads and flood defence infrastructure, it is not likely that a pathway of effect exists for general disturbance effects to impact the designated sites.

6.3.2 *Introduction of non-native species and/or novel diseases.*

Movement of personnel and machinery into and out of the site represents a risk of introducing, spreading and translocating non-native species, to the detriment of designated species and habitats. Non-native species and/or novel diseases may be introduced on machinery/equipment.

However, HDD works will be confined to beneath a small section of river, and disturbance will be entirely beneath the river. Given the distance between the proposed surface work sites and the watercourse, it is unlikely that any introduction of non-native species (INNS) to the watercourse will take place as a result of the proposed drilling activities. Furthermore, transport of machinery to site will be via road and represents a negligible risk of INNS transfer.

A Preliminary Ecological Appraisal (APEM 2021) has been carried out for the Project Site (as per best practice guidance) and has not identified any current INNS of concern. The distance of construction activities from the designated site areas also reduces any potential for transfer of INNS. It is therefore not likely that a pathway of effect exists for INNS to impact the designated sites.

6.3.3 *Noise and Vibration effects.*

Vibrations may be propagated through the riverbed during HDD activities, which may cause associated impacts on fish eggs, sessile/benthic larvae and other sessile/benthic species.

During the initial overview of sites (Section 5.3), the following fish species were identified as qualifying features of one or more European sites:

- Atlantic salmon,
- Brook lamprey,
- Bullhead,
- Grayling,
- River lamprey,
- Sea lamprey,
- Smelt.

A potential pathway for noise and vibration impacts on the fish features of the designated sites has therefore been identified. Note the HDD drilling profile is >24 m beneath the riverbed and is within the low permeability clay layer. A Noise & Vibration assessment (APEM 2021b; summary provided in Section 7.2) has been conducted and this has confirmed that there will be negligible propagation to the riverbed – the results of the noise and vibration assessment are taken into account within the testing for LSE (Section 8).

6.3.4 Chemical discharges.

Runoff containing polluting concentrations of chemicals, deriving from e.g. fuel spillage or associated with pollutants deriving from the historic landfill have the potential to cause negative effects.

During the work, pollutants deriving from the historic landfill should not be mobilised as 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 in the South (entry pit overlying the old landfill) will be stockpiled (surrounded by impermeable membrane) and replaced in-situ following completion.

To minimise any potential effects, standard construction best practice regarding oils / fuels (e.g. drip trays, spill kits) will be in place to mitigate against runoff throughout the duration of the works.

These are considered 'standard' HDD and 'expected' construction methods (rather than mitigation). The low risk associated with this pathway is assessed within the testing for LSE (Section 8).

6.3.5 Drill lubricant release.

Drill lubricant release (e.g. 'break out' of HDD drill slurry (drill lubricant)) may cause discharge of elevated fine sediment concentrations and drill fluid, with potential consequences including smothering of sensitive species, pollution of the local environment, and negative impacts of elevated fine sediment concentrations on fish. Whilst the impacts of drill lubricant release have been considered in LSE screening below, the following site characteristics and standard best practice measures greatly reduce the likelihood of a break out occurring:

- The drilling profile beneath the river is entirely through the low permeability clay layer, and the potential for any breakout to travel through the surrounding geology is therefore very low.
- Bentonite is the chosen best practice lubricant; Bentonite acts as a clay platelet grout, effectively sealing fractures.
- The pressurised drill fluid system uses small volumes of drill fluid, and is monitored at all times, meaning that any loss of pressure and potential break out will be identified quickly.
- The drill launch pit and reception trench are designed to contain (bund) any drill fluid escape.
- Skips will be on-site to store drill arisings and used fluid (which will be disposed of appropriately to landfill).

7. Supporting studies

A number of ecological surveys were conducted by APEM in 2020-21, comprising a Preliminary Ecological Appraisal (PEA) of the proposed project areas, Great Crested Newt (*Triturus cristatus*, GCN) Environmental DNA pond surveys, bat transect surveys of the southern area, additional badger set inspections and a wintering birds walkover survey. These surveys are reported in the Dee Crossing Ecological Survey Report (APEM 2021).

The ecological surveys (including PEA) confirmed that none of the working areas (or pipe laydown area) contain any habitats that are directly supportive of the designated sites. The Project site for example contains no saltmarsh habitat, which is limited to the area riverside of the flood defence embankment.

The only works proposed within the boundary of the European designated area is the proposed works to enhance the habitat within the 'enhancement area'. The area is currently a mixture of species poor grassland, short perennials and buddleia scrub, all regeneration vegetation on a raised embankment with old infrastructure (the site is underlain by gravel and concrete hardstanding). It is proposed that the existing scrub and concrete is removed and a new species rich neutral grassland habitat created (APEM, 2021).

A specific Underwater Noise and Vibration assessment was conducted by APEM (APEM, 2021b) with the objective of assessing the site specific impact of noise and vibration effects generated by the HDD on ecological receptors in the River Dee (Section 7.2). The conclusions of that assessment are used to support this HRA.

7.1 Wintering Birds Survey (APEM 2021)

A summary of the birds walkover survey is provided in this section given the relevance to considerations of potential impact on the SPA.

7.1.1 Wintering birds survey scope considerations

Consultations held in October 2018 (in support of a previous iteration of this Dee Crossing scheme – which did not advance to completion) with Natural Resources Wales (Neil Smith)

and Natural England (Jed Nicholson) confirmed that overwintering birds surveys would not be required to support project assessments, rather a desktop study would suffice.

A desk-based review was conducted to determine the availability of data, specifically data available to characterise the species of birds which might occur within the proposed Enhancement Area and the River Dee adjacent to the Project site. Most of the national survey areas of the River Dee covered by the British trust for Ornithology's (BTO) Wetland Bird Survey (WeBS) core counts are focussed on the outer estuary (e.g. Figure 7-1), where the majority of the birds associated with the Dee Estuary SPA are known to reside. This could be taken to be evidence in itself that the area of proposed works is unlikely to hold a significant assemblage of birds associated with the SPA.

Due to a lack of data publicly available for the development site, and to ensure completeness, a walkover bird survey was proposed to review what species may reside on or within close proximity to the site that may be connected to the Dee Estuary SPA.

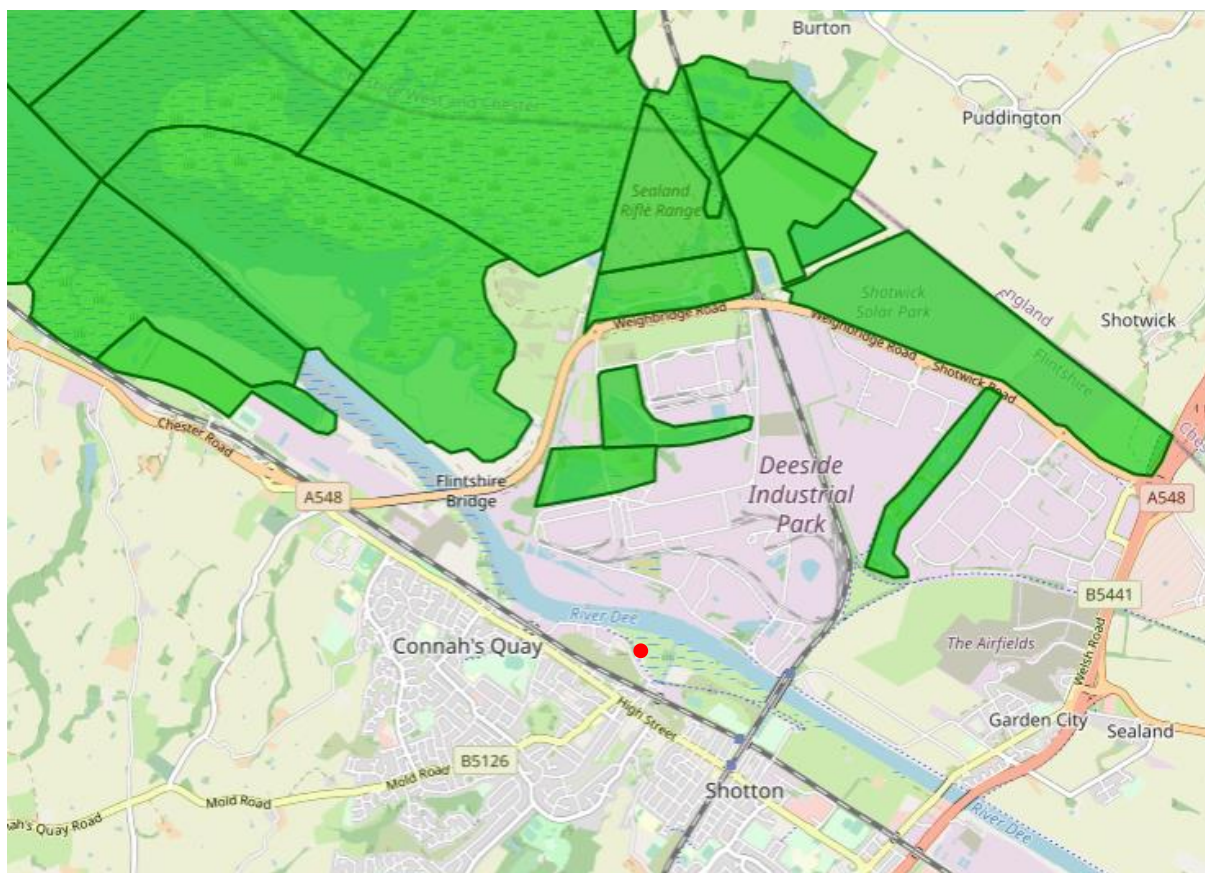


Figure 7-1 WeBS Sites in vicinity of project site

Figure notes: Red dot shows approx. location of the enhancement area. Image copied from WeBS online hosted by the BTO on behalf of the WeBS partners. ©British Trust for Ornithology.

7.1.2 Wintering birds survey methodology

The survey methodology conducted was a ‘total area count’ of all birds present at the time of the survey, based on the WeBS Core Count Method developed by the BTO and widely applied for such data collection purposes. Full methodology details are provided in APEM 2021. The survey areas are presented in Figure 7-2.

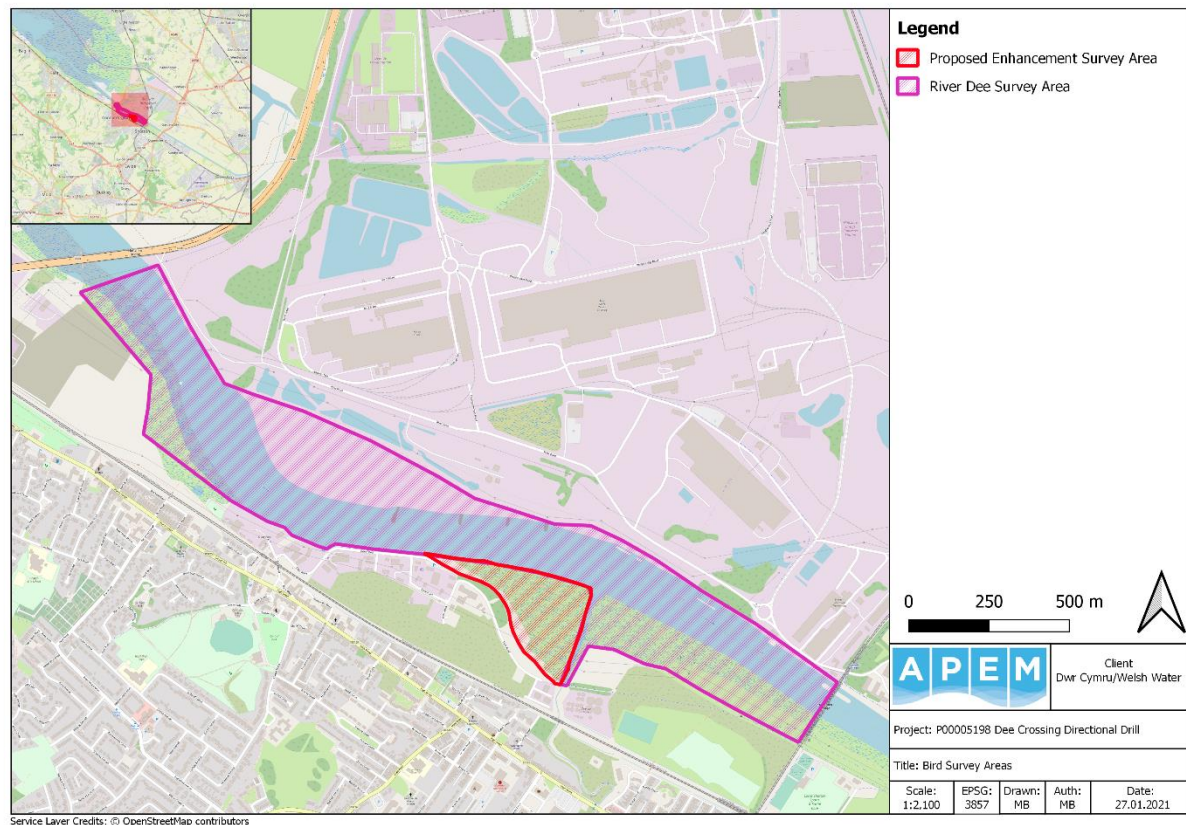


Figure 7-2 Location of the two wintering birds survey areas

Figure notes: Red line/hatching denotes the survey area surrounding the proposed Enhancement Area; the Purple line/hatching denotes the wider survey area of the adjacent River Dee.

7.1.3 Wintering birds survey results

The survey confirmed that the site and the immediately adjacent areas of the Dee Estuary, are located within a canalised and industrialised section of the estuary that does not support significant numbers of waterbirds.

Only three species were recorded which are named features of the Dee Estuary SPA; teal, cormorant and redshank. Teal and cormorant were recorded in small groups primarily roosting on or around a number of old pier structures and groins, which are commonly found along this stretch of the River Dee. A peak count of two redshank were found roosting along the riverbank. Of the three designated species of the Dee Estuary SPA recorded during these surveys none were recorded in numbers of significance, commonly defined as any species recorded with a count reaching 1% of the SPA citation population. In the event that the

proposed works were to be the cause of any disturbance events there is therefore, only a limited pathway to such receptors and any potential resulting impact would be considered unlikely or negligible to the features of the Dee Estuary SPA, which is not significant when assessing potential impacts.

7.2 Noise and Vibration Assessment (APEM 2021b)

An underwater noise and vibration assessment was undertaken by APEM (APEM 2021b) to assess the potential effects of underwater noise and vibration from the HDD on marine ecology receptors.

The main quantitative data for assessment of underwater noise were available from Nedwell et al. (2012) which indicated an unweighted Sound Pressure Level of 129.5 dB re1 μ Pa had been recorded for a riverine HDD project. In addition, using the British Standards Institute empirical predictors for groundborne vibration arising from tunnelling (BS 5228-2:2009; BSI 2009), the predicted vibration levels on the riverbed for the Proposed Development were determined to be less than 2.89 mm/s.

The effects of underwater noise and vibration from HDD under the River Dee were assessed for benthic invertebrates, fish and marine mammals based on available information and underwater noise effect criteria for fish and marine mammals.

Due to insufficient information on the effects of vibration on marine ecology receptors and an absence of exceedance criteria, the assessment was based on previous studies on the effects of noise and vibration on marine ecology receptors together with professional judgement.

The assessment concluded negligible or no underwater noise effects on benthic invertebrates, fish and marine mammals. The assessment concluded negligible or no riverbed vibration effects on benthic invertebrates, fish and marine mammals.

8. Screening: Testing for Likely Significant Effects

The potential effects on features of the designated sites are considered sequentially below. Based on the latest proposed schedule it has been assumed that the Project will be completed between May 2022 and Spring 2023.

8.1 Interest Features

An overview of the interest features associated with the designated sites is provided in the table below. There is significant overlap between SAC, SPA and Ramsar designations, and as such, the features of interest are presented together (Table 8-1).

Table 8-1: Features of interest within protected sites in the vicinity of the project – Dee Estuary SAC, SPA and Ramsar

Qualifying Feature	Description	Habitat requirements	References
Annex I habitats that are a primary reason for selection of this site			
Mudflats and sandflats not covered by seawater at low tide (EU Habitat Code 1140)	The Annex I habitat feature, 'mudflats and sandflats not covered by seawater at low tide', varies in physical structure between sites, and may be comprised of mobile, coarse-sand beaches to stable, fine-sediment mudflats. This habitat is particularly important as feeding grounds for wildfowl and waders.	The intertidal mudflats and sandflats of the Dee Estuary are highly dynamic and change in shape from year to year. They incorporate the full range of sand, muddy sand and mud biotope, and support communities highly representative of estuarine mudflats and sandflats.	Natural England, 2010
<i>Salicornia</i> and other annuals colonising mud and sand (EU Habitat Code 1310)	The Annex I habitat feature, ' <i>Salicornia</i> and other annuals colonising mud and sand', is an important precursor to the development of more stable saltmarsh vegetation, and represents an integral part of sand, mudflat, and saltmarsh vegetation. The Dee Estuary supports approximately 4% of the national UK resource for this feature.	<i>Salicornia</i> prefers dry or moist soil, and tolerates inundation in maritime habitats. It has a wide range of climatic tolerances, and grows on a wide range of marine sediments, from gravels and shelly sands, to silts and fine clays.	Dargie, 2001; Davy et al. 2001; Natural England, 2010
Atlantic salt meadows (<i>Glauco-Puccinellietalia</i>)	The Annex I habitat feature, 'Atlantic salt meadows (<i>Glauco-Puccinellietalia maritimae</i>)', supports a well-developed zonation of plant communities, and represents an area that is still inundated by the tide, but with decreasing	Once established, sediment deposition can occur at a rate of several mm per year; maintaining this rate of accretion relies on consistently moderate wave action, protection from storms and availability of sediment. Any	Dargie, 2001; CCW, 2002a; Doody, 2008; Natural England,

Qualifying Feature	Description	Habitat requirements	References
<i>maritima</i>) (EU Habitat Code 1330)	frequency and duration. Vegetation varies with climate and with the frequency and duration of tidal inundation. The Dee Estuary supports approximately 7% of the total area of saltmarsh in the UK, and is predominantly an accreting system, providing the third largest single expanse of this habitat type in Britain.	disruption to these processes may disrupt the balance of forces promoting accretion, leading to erosion of the habitat.	2010; JNCC, undated_c
Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site			
Estuaries (EU Habitat Code 1130)	The Dee Estuary is one of the largest estuaries in the UK and is dominated by mudflats, sandflats, and saltmarsh. It supports a diverse array of habitats which provide niches for nationally scarce plant species, migratory fish, and a host of breeding and non-breeding populations of migratory and wintering wildfowl and waders.	Estuaries may be exposed to a number of pressures which can cause disturbance and/or deterioration of habitat. These include (but are not limited to) physical loss through dredging or deposition, physical damage via recreational activities or aggregate extraction, toxic contamination, and non-toxic contamination (e.g. changes in nutrient loading).	Natural England, 2010
Annual vegetation of drift lines (EU Habitat Code 1210)	The Annex I habitat feature, 'Annual vegetation of drift lines', represents formations of annuals or representatives of annuals and perennials, occupying accumulations of drift material and gravel rich in nitrogenous organic matter (<i>Cakiletea maritima</i> p.).	These habitats are often dynamic and variable, developing on gravel or mixed gravel and sandy substrates. Species that colonise these habitats are tolerant of periodic disturbance, which may involve the total removal of the surface and subsequent recolonisation with vegetation.	EC, 2013; JNCC, undated_d
Vegetated sea cliffs of the Atlantic and	Vegetated sea cliffs are steep slopes fringing hard or soft coasts, created by past or present	In the UK, the exposed western and northern coasts have extensive cliffs composed of hard, mostly acidic rocks.	JNCC, undated_e

Qualifying Feature	Description	Habitat requirements	References
Baltic Coasts (EU Habitat Code 1230)	marine erosion, and supporting a wide diversity of vegetation types.		
Embryonic shifting dunes (EU Habitat Code 2110)	Embryonic shifting dune vegetation is typically the first type of vegetation to colonise newly forming dunes at the top of a beach. In most cases, these are transient and are either replaced by marram-dominated vegetation (see EU Habitat Code 2120, below), or washed away by storms.	Embryonic shifting dunes require areas with little to no human disturbance, as they are particularly vulnerable to trampling. This habitat type rarely occurs in isolation.	JNCC, undated_f
Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes") (EU Habitat Code 2120)	Shifting dunes are represented by vegetation that colonises unstable dunes where there is active sand movement. The sand-binding marram <i>Ammophila arenaria</i> is always a prominent (and usually dominant) feature. Such vegetation may occur on both accreting and eroding dunes.	This vegetation type relies on a dynamic habitat, and will disappear if stability is imposed.	JNCC, undated_g
Fixed coastal dunes with herbaceous vegetation ("grey dunes") (EU Habitat Code 2130)	Fixed dune vegetation occurs mainly on the largest dune systems, which have the width to allow its development. It represents the vegetation that replaces marram as dune stability and the organic content of sand both increase.	Fixed dunes are a complex habitat type, requiring more stability than shifting dune features, and showing considerable variation in vegetation.	JNCC, undated_h
Humid dune slacks (EU Habitat Code 2190)	Dune slacks are low-lying areas within dune systems, with low nutrient levels and seasonal flooding.	This habitat type favours a wetter climate (e.g. in the west and north of the UK), as they are fed mainly by rain water.	JNCC, undated_i
Annex II species that are a primary reason for selection of this site – <i>not applicable</i>			

Qualifying Feature	Description	Habitat requirements	References
Annex II species present as a qualifying feature, but not a primary reason for selection of this site			
Sea lamprey (<i>Petromyzon marinus</i>) (EU Species Code 1095)	Lampreys are among the most primitive of all living vertebrates. They are not true fish but are often referred to as such. The sea lamprey is the largest of the lampreys found in the UK. It is an anadromous species (i.e. spawning in freshwater but completing its life cycle in the sea) that occurs in estuaries and easily accessible rivers. Like the other species of lamprey, sea lampreys need clean gravel for spawning, and marginal silt or sand for the burrowing juvenile ammocoetes. In the UK spawning predominantly occurs between May and July.	Sea lampreys prefer warm waters in which to spawn. Features such as weirs and dams, as well as polluted sections of river, may impede migration to spawning grounds. The critical habitat requirements of lamprey in freshwater relate to spawning areas and nursery habitat. Larval lamprey commonly burrow into soft sediment in the margins of streams and rivers, but may also be found in detritus overlying coarse substrate, among submerged tree roots, emergent vegetation rooted in silt, shallow patches of fine sediment among coarser substratum, or submerged branches or twigs that have trapped fine sediment.. Sea lamprey also utilise deeper water habitats in the mid-channel. Connectivity between these habitats is vital for sea lamprey to complete their life cycle.	Maitland, 2003a; JNCC, 2015c
River lamprey (<i>Lampetra fluviatilis</i>) (EU Species Code 1099)	Lampreys are among the most primitive of all living vertebrates. They are not true fish but are often referred to as such. This species is found in coastal waters, estuaries, and accessible rivers. The species is normally anadromous (i.e. spawning in freshwater but completing part of its life cycle	The critical habitat requirements of lamprey in freshwater relate to spawning areas and nursery habitat. Larval lamprey commonly burrow into soft sediment in the margins of streams and rivers, but may also be found in detritus overlying coarse substrate, among submerged tree roots, emergent vegetation rooted in silt, shallow patches of fine sediment among coarser substratum, or submerged	Maitland, 2003a; JNCC, 2015c

Qualifying Feature	Description	Habitat requirements	References
	in the sea), and pollution or artificial obstacles such as weirs or dams impede migration. In the UK spawning predominantly occurs between March and May.	branches or twigs that have trapped fine sediment. Connectivity between these habitats is vital for sea lamprey to complete their life cycle.	
Petalwort (<i>Petalophyllum ralfsii</i>) (EU Species Code 1395)	Petalwort is regarded as a rare plant due to its very specific habitat, and is listed as vulnerable in the Red Data Book of European Bryophytes. It is a dioicous species, producing sporophytes regularly in spring and early summer, and is able to reproduce clonally.	Petalwort is a liverwort species that grows in open, damp, calcareous dune slacks, often on low hummocks, on compacted sandy/muddy bryophyte-rich turf. It is commonly associated with the Annex I habitat type 2190 'Humid dune slacks'.	Campbell et al. 2013
Annex II species listed in the Natura 2000 Standard Data Form for the River Dee SAC, but not as primary or qualifying features			
Twaite shad (<i>Alosa fallax</i>) (EU Species Code 1103)	The twaite shad is a member of the herring family with an anadromous lifestyle. This means that at maturity adults stop feeding and gather in estuaries of suitable rivers before moving upstream to spawn. In the UK spawning predominantly occurs between March and June. Twaite shad are not thought however, to congregate in the Dee Estuary, nor be present within the River Dee waterbody, as spawning sites are thought to be confined to south Wales.	Little is understood about the ecology of Twaite shad in European freshwaters. It is generally considered however, that they prefer larger rivers (>10 m wide) with a slow to moderate current speed and without significant natural or artificial obstructions in the lower reaches. Areas of clean gravel are required for spawning in addition to nearby areas of refuge (e.g. deep pools and overhanging banks) for rest and shelter before and after spawning.	Maitland & Hatton-Ellis, 2003
Eurasian otter (<i>Lutra lutra</i>) (EU)	The European otter is a nocturnal predator, feeding on fish, waterbirds, amphibians, and	Otters can exploit most types of water and waterway in the UK, and are known to use	Chanin, 2003

Qualifying Feature	Description	Habitat requirements	References
Species Code 1355)	crustaceans. It therefore requires clean water and an abundant food supply. Otter breeding is generally considered to be aseasonal, and therefore disturbance impacts can occur at any time of year.	suitable coastal as well as freshwater habitats. In coastal areas, otters typically construct burrows in peat, whereas a variety of habitat options are used in freshwater habitats, including rocky banks, piles of debris, and under trees.	
Grey seal (<i>Halichoerus grypus</i>) (EU Species Code 1364)	The grey seal is a coastal or continental shelf marine mammal species, found in temperate waters of the North Atlantic. The UK population of grey seals represents approximately 40% of the world population, and 95% of the EU population.	Grey seals spend most of the year at sea, coming ashore in autumn to form breeding colonies on rocky shores, beaches, in caves, occasionally on sandbanks, and on small, largely uninhabited islands.	EUNIS, 2019
Additional qualifying criteria of the Dee Estuary Ramsar			
Extensive intertidal mud and sand flats, with large expanses of saltmarsh towards the head of the estuary.	The Annex I habitat feature, 'mudflats and sandflats not covered by seawater at low tide', varies in physical structure between sites, and may be comprised of mobile, coarse-sand beaches to stable, fine-sediment mudflats. This habitat is particularly important as feeding grounds for wildfowl and waders.	The intertidal mudflats and sandflats of the Dee Estuary are highly dynamic and change in shape from year to year. They incorporate the full range of sand, muddy sand and mud biotope, and support communities highly representative of estuarine mudflats and sandflats.	Natural England, 2010
Supports breeding colonies of the vulnerable Natterjack Toad (<i>Epidalea calamita</i>).	The Dee estuary supports a breeding colony of the vulnerable Natterjack Toad, located at the Red Rocks SSSI. This species is protected in the UK under the Wildlife and Countryside Act, 1981, and is also a Priority Species under the UK Post-201 Biodiversity Framework. It is also	Natterjack toads are native to sandy and heathland areas of Europe, and require pools with a very slight slope and sparse vegetation on banks and in the water. Chosen pools are often temporary and may dry out during the summer, resulting in the death of resident tadpoles, though this is mitigated somewhat by	Natural England, 2010

Qualifying Feature	Description	Habitat requirements	References
	listed as a European Protected Species under Annex IV of the European Habitats Directive.	an elongated spawning period from April to July.	
Assemblages of international importance	The Dee Estuary supports internationally important wetlands and wetland species, including nationally and internationally important populations of migratory and wintering breeding and non-breeding wildfowl and waders. The estuary regularly supports 20,000 or more waterbirds, and 1% or more of the Great British population of multiple species of waterbirds.	The Dee Estuary offers a variety of habitats that are of major importance for waterbirds, including intertidal flats, saltmarshes, and fringing habitats including coastal grazing marsh/fields.	Natural England, 2010

The features of interest associated with the Dee Estuary SSSI, that are taken forward for screening of LSE are presented in Table 8-2.

Table 8-2: Features of interest within protected sites in the vicinity of the project – Dee Estuary SSSI

Qualifying Feature	Description	Habitat requirements	References
Nationally significant populations of breeding birds	The Dee Estuary supports internationally important wetlands and wetland species, including nationally and internationally important populations of migratory and wintering breeding and non-breeding wildfowl and waders. The estuary regularly supports 20,000 or more waterbirds, and 1% or more of the Great British population of multiple species of waterbirds.	The Dee Estuary offers a variety of habitats that are of major importance for waterbirds, including intertidal flats, saltmarshes, and fringing habitats including coastal grazing marsh/fields.	Natural England, 2010
Aggregations of non-breeding birds			

Qualifying Feature	Description	Habitat requirements	References
Estuaries	See Table 8-1.		
Floodplain fen (lowland), lowland wet neutral grassland, and saltmarsh habitats	Areas of maritime grassland and swamp habitat are limited regionally, and are therefore considered to be of importance within the Dee Estuary. Whilst transitions to swamp vegetation are present on the north bank, the south bank around Connah's Quay represents one of the only areas of this habitat type on the Welsh shoreline.	Grassland, saltmarsh, and swamp habitats present within the Dee Estuary SSSI provide habitat for a wide range of plant species, and are considered to be of regional importance.	Natural England, undated
Hard maritime cliff and slope	Hard maritime cliffs are typically vertical or steeply sloping, supporting few higher plant species other than on ledges and in crevices.	Maritime cliffs and slopes comprise sloping to vertical faces on the coastline where a break in slope is formed by slippage and/or coastal erosion.	Maddock, 2008
Sandhill rustic moth	The sandhill rustic is a noctuid moth found in various parts of western, southern and central Europe.	The species is restricted to sandy and rock coasts, located in sand dunes in the Dee Estuary, close to the sea.	Porter, 1997; Spalding, 2018
Vascular plant assemblage	The saltmarshes of the Dee Estuary support a variety of vegetation communities that are generally characteristic of estuaries in northern and western Britain.	Limestone pavements (part of the inland rock habitat type present within the River Dee SSSI) support shade-tolerant vascular plants, which would otherwise be unsupported by	EC, 2013

Qualifying Feature	Description	Habitat requirements	References
		mudflat and sandflat habitats that are characteristic of the Dee Estuary.	

The features of interest associated with the Afon Dyfrdwy (River Dee) SSSI and the River Dee (England) SSSI, that are taken forward for screening of LSE are presented in Table 8-3.

Table 8-3: Features of interest within protected sites in the vicinity of the project – Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI

Qualifying Feature	Description	Habitat requirements	References
Afon Dyfrdwy (River Dee) SSSI			
Upper Carboniferous stratigraphy (Dee Bridge)	The upper carboniferous stratigraphy in the vicinity of Dee Bridge is characterised by a sequence of shales, sandstones and mudstones deposited adjacent to the river under fluvio-deltaic conditions.	N/A	CCW, 2002b
Saltmarsh transition habitats	Saltmarsh transition habitats that form towards the estuary support a range of habitats, including upper and middle saltmarsh, annual high marsh, and wet neutral grassland. They support a number of rare species of interest,	These habitats are threatened by land reclamation, which has led to the loss of many of these natural transitions around the Dee Estuary. These habitats are more limited and feature particularly around Connah's Quay and	CCW, 2002b

Qualifying Feature	Description	Habitat requirements	References
	including slender hare's-ear (<i>Bupleurum tenuissimum</i>), sea barley (<i>Hordeum marinum</i>), and hard-grass (<i>Parapholis strigosa</i>).	Shotton, where they are considered to be important examples of this habitat feature.	
Floating water-plantain (<i>Luronium natans</i>) (EU Habitat Code 1831)	Floating water plantain is a nationally and internationally rare aquatic plant species, which is considered to be declining through its range.	Floating water plantain occurs in a variety of wetland habitats, including small ponds and pools, natural flowing water, and artificial waterbodies. It is considered to be able to grow in the majority of wetland types, and its presence is therefore rarely constrained by habitat availability. It is intolerant of competition (via chemical or physical suppression, and competition for light or nutrients).	Lansdown & Wade, 2003
Bullhead (<i>Cottus gobio</i>)	Bullhead is a small fish species closely associated with the bed of rivers. They have a crepuscular feeding habit and benthic invertebrates form most of their diet. Bullheads, and their eggs, are vulnerable to predation by many larger fish species, piscivorous birds and invasive crayfish species. In the UK spawning predominantly occurs between March and May.	Bullheads predominantly occur in stony streams and rivers where the flow is moderate, and the water is cool and oxygen rich. The within channel habitat utilised by bullheads differs depending on their life history stage, with juvenile fish exploiting shallow stony riffles and adult fish preferring sheltered sections. During reproduction male bullheads excavate a nest under a large stone onto which females lay their eggs. Therefore, the presence of coarse substrates with large stones is important for breeding. Whilst bullheads are relatively poor swimmers, they are thought to	Tomlinson & Perrow, 2003

Qualifying Feature	Description	Habitat requirements	References
		be able to tolerate relatively high flow velocities if suitable refugia is present. One key threat to bullhead is the presence of silt, which reduces the available habitat of clean gravels and pebbles required for reproduction and shelter.	
Brook lamprey (<i>Lampetra planeri</i>)	Lampreys are among the most primitive of all living vertebrates. They are not true fish but are often referred to as such. The brook lamprey is the smallest of the lampreys found in the UK. It is a non-migratory freshwater species, occurring in streams and occasionally in lakes in north-west Europe. In the UK spawning predominantly occurs between March and April.	The critical habitat requirements of adult lamprey in freshwater relate to spawning areas and nursery habitat. Larval lamprey commonly burrow into soft sediment in the margins of streams and rivers, but may also be found in detritus overlying coarse substrate, among submerged tree roots, emergent vegetation rooted in silt, shallow patches of fine sediment among coarser substratum, or submerged branches or twigs that have trapped fine sediment	Maitland, 2003a; JNCC, 2015c
River lamprey (<i>Lampetra fluviatilis</i>)	See Table 8-1.		
Sea lamprey (<i>Petromyzon marinus</i>)	See Table 8-1.		

Qualifying Feature	Description	Habitat requirements	References
Smelt (<i>Osmerus eperlanus</i>)	Smelt is a declining species in the UK, and has disappeared from many rivers. Although it is not thought to breed within the Afon Dyfrdwy, it has been recorded in the section between Chester and the estuary. There is anecdotal evidence of smelt being caught in salmon traps at Chester by the Environment Agency in 2003.	Smelt are found in coastal waters, but mainly in estuaries, from which they migrate into large, clean rivers at spawning time, which takes place in the early spring. Similarly to their national status, smelt are thought to be locally rare in the Dee Estuary, highlighting their importance in this waterbody.	CCW, 2002b; Maitland, 2003b
Twaite shad (<i>Alosa fallax</i>)	See Table 8-1.		
Grayling (<i>Thymallus thymallus</i>)	Grayling are found throughout the UK, and are a potadromous species, migrating solely within freshwater. This life history strategy means that the Grayling is vulnerable to changing river conditions, which can lead to localised population declines. Given their potadromous nature, grayling are not likely to be found within the vicinity of the proposed works, as they migrate and live solely within freshwater.	Grayling are typically found in wider sections of rivers where the water is cool and well oxygenated, and favour riffles and rapids separated by pools and runs. Whilst they display a tolerance for a wider range of environmental conditions than other salmonids, they are thought to succumb quite quickly to pollution and elevated water temperatures.	Ingram et al. 2000
River Dee (England) SSSI			

Qualifying Feature	Description	Habitat requirements	References
Flowing waters – Type VI	Type VI flowing waters are categorised as base-rich, mesotrophic rivers in western and northern Britain, with a moderate to fast current.	Many Type VI sites are quite large and have exposed riverine sediment beds. Although individual sites may not be species-rich, they are often associated with rivers of high conservation value for their semi-natural geomorphology.	Natural England, 2013
Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI			
Nationally rare and scarce invertebrate species (the club-tailed dragonfly (<i>Gomphus vulgatissimus</i>), the stonefly <i>Isogenus nubecula</i> , and the weevil <i>Baris lepidii</i>)	The lower reaches of the River Dee (freshwater reaches around Bangor) support Britain's only known population of the vulnerable stonefly <i>I. nubecula</i> (NB repeated surveys since 1995 have failed to re-discover this species). The nationally scarce weevil <i>B. lepidii</i> has been recorded on sandy riverbanks along the lower Dee, but not on any other Welsh river.	<i>G. vulgatissimus</i> favours slow-flowing rivers with silt deposits for larvae and adjacent tree cover for adults. <i>I. nubecula</i> is found in large, stony lowland rivers, though they have been noted to retreat to areas of deeper water during a mild pollution event on the River Dee.	Bratton, 1990; Dagnet, 2007; Macadam, 2011
Fluvial geomorphology	This site on the River Dee comprises a meandering reach of the river between Holt and Worthenbury, and consists of some of the most intricately developed river bends or meanders in Britain.	The classification of this site is based on an intricate pattern of meanders, areas of floodplain on either side of the river for the full length of the reach, visibility of all abandoned channels, gravel and sand bars within the main channel, and remnants of ancient river	CCW, 2002b

Qualifying Feature	Description	Habitat requirements	References
		cliffs towards the north-east and south-west margins of the site.	
Atlantic salmon (<i>Salmo salar</i>)	Atlantic salmon is a migratory species whose numbers have been steadily declining in the UK over recent years. Atlantic salmon are anadromous meaning that they spawn in freshwater and feed and grow at sea. In the UK spawning predominantly occurs between October and December.	Atlantic salmon require very good water quality. The physical habitat, principally water depth, velocity, streambed substratum and cover, is also very important in determining suitability for Atlantic salmon. For spawning Atlantic salmon excavate depressions in the substrate called “redds” which the female lays her eggs in. For eggs to be successfully incubated it is important that there is an adequate flow of water through the gravel in the spawning redd. It is therefore important that the content of fines less than 2 mm in grain size should be low. Where the fines content of gravels has been increased by excessive inputs of silts and fine sand, for example from severely eroded banks, suitability for spawning is likely to be reduced.	Hendry & Cragg-Hine, 2003
Eurasian otter (<i>Lutra lutra</i>)	See Table 8-1.		

The features of interest associated with the River Dee and Bala Lake SAC, that are taken forward for screening of LSE are presented in Table 8-4.

Table 8-4: Features of interest within protected sites in the vicinity of the project – River Dee and Bala Lake SAC

Qualifying Feature	Description	Habitat requirements	References
Annex I habitats that are a primary reason for selection of this site			
Water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation (EU Habitat Code 3260)	The Annex I habitat feature, water courses of plain to montane levels with the <i>Ranunculus fluitantis</i> and <i>Callitriche-Batrachion</i> vegetation, is a highly variable habitat type with a range of different species compositions, depending on the type of river. This type of vegetation however, requires freshwater habitat and is therefore not thought to be present within the vicinity of the proposed works.	Any increase in nutrient concentrations is likely to have a negative impact on diversity of the community. Sedimentation is not thought to directly affect this habitat feature.	Mainstone et al. 2000; Hatton-Ellis & Grieve, 2003
Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site – <i>not applicable</i> .			
Annex II species that are a primary reason for selection of this site			
Atlantic salmon (<i>Salmo salar</i>) (EU Species Code 1106)	See Table 8-3.		

Qualifying Feature	Description	Habitat requirements	References
Floating water-plantain (<i>Luronium natans</i>) (EU Habitat Code 1831)	See Table 8-3.		
Annex II species present as a qualifying feature, but not a primary reason for selection of this site			
Sea lamprey (<i>Petromyzon marinus</i>) (EU Species Code 1095)	See Table 8-1.		
River lamprey (<i>Lampetra fluviatilis</i>) (EU Species Code 1099)	See Table 8-1.		
Brook lamprey (<i>Lampetra planeri</i>)	See Table 8-3.		
Bullhead (<i>Cottus gobio</i>)	See Table 8-3.		

Qualifying Feature	Description	Habitat requirements	References
Eurasian otter (<i>Lutra lutra</i>) (EU Species Code 1355)	See Table 8-1.		

8.2 Screening assessment

Screening of the designated sites and their interest features is shown in the following table. As previously referenced, this screening used the conceptual 'source-pathway-receptor' model. This model was used to identify potential environmental impacts resulting from the investigations. This process provides an easy to follow assessment route between impact sources and potentially sensitive receptors, thus ensuring a transparent impact assessment.

Where there is no pathway, there is justification for the screening out of that particular receptor (site interest feature).

Table 8-5 Screening for LSE - Dee Estuary SAC, SPA and Ramsar

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
The Dee Estuary SAC, within 2 km of site.	1095 'Sea lamprey (<i>Petromyzon marinus</i>)' 1099 'River lamprey (<i>Lampetra fluviatilis</i>)' 1103 'Twaite shad' (<i>Alosa fallax</i>) 1130 'Estuaries' 1140 'Mudflats and sandflats not covered by seawater at low tide' 1210 'Annual vegetation of drift lines' 1310 'Salicornia and other annual colonising mud and sand' 1330 'Atlantic salt meadows (<i>Glauco-Puccinellietalia maritima</i>)' 1355 'Eurasian otter (<i>Lutra lutra</i>)' 1395 'Petalwort (<i>Petalophyllum ralfsii</i>)'	General Disturbance effects (human and physical).	No.	No plant, footfall or construction activities within the boundaries of the designated sites (no surface activities). The drill entry and exit pits are located at distance from the river (c.300 m to MHW) and are physically separated from the designated areas.	Screened out – no pathway for impact to occur. No LSE.
		Introduction of non-native species and/or novel diseases	No.	Given the distance between the proposed work sites and the watercourse, it is unlikely that any introduction of non-native species (INNS) will be introduced into the watercourse as a result of the proposed works.	Screened out – no pathway for impact to occur. No LSE.
		Noise and vibration.	No.	Noise and vibration have the potential to pose a barrier to migratory movements of fish resulting in delayed migration up-river and subsequent delays in spawning activity. However a noise and vibration assessment determined negligible/no propagation of impact to the river therefore no pathway.	Screened out based on N&V assessment. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	1364 'Grey seal (<i>Halichoerus grypus</i>)' 1230 'Vegetated sea cliffs of the Atlantic and Baltic Coasts' 2110 'Embryonic shifting dunes' 2120 'Shifting dunes along the shoreline with <i>Ammophila arenaria</i> ("white dunes")' 2130 'Fixed coastal dunes with herbaceous vegetation ("grey dunes")' 2190 'Humid dune slacks'.	Chemical discharges	No.	Pollutants deriving from the historic landfill should not be mobilised because the drill annulus is pressurised and the bentonite drill fluid will act as a fissure grout, effectively sealing the drill. No pathway for impact.. See Section 6.3.4.	Screened out – no pathway for impact to occur. No LSE
		Drill lubricant release	No.	Drill lubricant release (e.g. 'break out' of HDD drill slurry (drill lubricant)) may cause discharge of elevated fine sediment concentrations and drill fluid, with potential consequences including smothering of sensitive species, pollution of the local environment, and negative impacts of elevated fine sediment loads on fish. However, inherent best practice methods and selection of lubricant type dictates no/negligible pathway for impact.	Screened out – no/negligible potential for drill lubricant break out. No LSE.
The Dee Estuary SPA, within 2 km of site.	- Bar-tailed Godwit (<i>Limosa lapponica</i>). - Common Tern (<i>Sterna hirundo</i>).	General Disturbance effects (human and physical).	No.	Only a limited potential pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See e.g. Section 7.1.	Screened out – impacts on birds considered none or

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	- Little Tern (<i>Sterna albifrons</i>). - Sandwich Tern (<i>Sterna sandvicensis</i>). - Redshank (<i>Tringa totanus</i>). - Shelduck (<i>Tadorna tadorna</i>). - Teal (<i>Anas crecca</i>). - Pintail (<i>Anas acuta</i>). - Oystercatcher (<i>Haematopus ostralegus</i>). - Grey Plover (<i>Pluvialis squatarola</i>). - Knot (<i>Calidris canutus islandica</i>). - Dunlin (<i>Calidris alpina</i>). - Black-tailed Godwit (<i>Limosa limosa islandica</i>). - Curlew (<i>Numenius arquata</i>).				negligible. No LSE.
		Introduction of non-native species and/or novel diseases	No.	No pathway to impact on qualifying features.	No LSE.
		Noise and vibration.	No.	Highly unlikely pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	Screened out. No LSE.
		Chemical discharges	No.	No pathway to impact on qualifying features.	No LSE.
		Drill lubricant release	No.	No pathway to impact on qualifying features (see e.g. 6.3.5).	No LSE.
The Dee Estuary Ramsar, within 2 km of site.	<u>Criterion 1</u> (extensive intertidal mud and sand flats, with large expanses of saltmarsh towards the head of the estuary);	General Disturbance effects (human and physical).	No.	Criterion 1 – no pathway due to distance from qualifying features. Criterion 2 – Natterjack Toad breeding colonies located a significant	Screened out – impacts on all features considered unlikely or

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	<u>Criterion 2</u> (supports breeding colonies of the vulnerable Natterjack Toad (<i>Epidalea calamita</i>)); <u>Criterion 5</u> (assemblages of international importance, represented by peak counts of 120,726 individual waterbirds in the winter); and <u>Criterion 6</u> (species/populations occurring at levels of international importance, represented by multiple breeding and non-breeding bird populations).			distance from the proposed site (see Table 8-1). Criterion 5 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1. Criterion 6 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	negligible. No LSE.
		Introduction of non-native species and/or novel diseases	No.	Criterion 1 – no pathway due to distance from qualifying features. Criterion 2 – Natterjack Toad breeding colonies located a significant distance from the proposed site (see Table 8-1). Criterion 5 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	Screened out – impacts on all features considered unlikely or negligible. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
				Criterion 6 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	
		Noise and vibration.	No.	Criterion 1 – no pathway due to distance from qualifying features (and results of N&V assessment). Criterion 2 – Natterjack Toad breeding colonies located a significant distance from the proposed site (see Table 8-1). Criterion 5 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1. Criterion 6 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	Screened out – impacts on all features considered unlikely or negligible. No LSE.
		Chemical discharges	No.	Criterion 1 – no pathway due to e.g. distance from qualifying features.	Screened out – impacts on all features

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
				Criterion 2 – Natterjack Toad breeding colonies located a significant distance from the proposed site (see Table 8-1). Criterion 5 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1. Criterion 6 - Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	considered unlikely or negligible. No LSE.
		Drill lubricant release	No.	Criterion 1 – no pathway due to e.g. distance from qualifying features. Criterion 2 – Natterjack Toad breeding colonies located a significant distance from the proposed site (see Table 8-1).	Screened out – impacts on all features considered unlikely or negligible. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
				Criterion 5 - No pathway to disturbance of birds. See e.g. Section 7.1. Criterion 6 – No pathway to disturbance of birds. See e.g. Section 7.1.	

Table 8-6 Screening for LSE – undertaken for the Dee Estuary SSSI (for completeness only)

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
The Dee Estuary SSSI.	Nationally significant populations of breeding birds - Common tern (<i>Sterna hirundo</i>), Cormorant (<i>Phalacrocorax</i>	General Disturbance effects (human and physical).	No.	No plant, footfall or construction activities within the boundaries of the designated sites (no surface activities). The drill entry and exit pits are located at distance from the river	Screened out – no pathway for impact to occur. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	<i>carbo sinensis</i>), and Redshank (<i>Tringa totanus</i>). - Aggregations of non-breeding birds - Bar-tailed Godwit (<i>Limosa lapponica</i>), Black-tailed Godwit (<i>Limosa islandica</i>), Cormorant (<i>Phalacrocorax carbo carbo</i>), Curlew (<i>Numenius arquata</i>), Dunlin (<i>Calidris alpina alpina</i>), Great Crested Grebe (<i>Podiceps cristatus</i>), Grey Plover (<i>Pluvialis squatarola</i>), Knot (<i>Calidris canutus</i>), Oystercatcher (<i>Haematopus ostralegus</i>), Pintail (<i>Anas acuta</i>), Redshank (<i>Tringa totanus</i>), Ringed Plover (<i>Charadrius hiaticula</i>), Shelduck (<i>Tadorna tadorna</i>), Teal (<i>Anas crecca</i>), and Wigeon (<i>Anas penelope</i>). - Estuaries. - Floodplain fen (lowland). - Lowland wet neutral grassland.			(c.300 m to HMW) and are physically separated from the designated areas. Only a limited pathway to disturbance of birds and any potential resulting impact would be considered unlikely or negligible. See Section 7.1.	
		Introduction of non-native species and/or novel diseases	No.	No pathway to impact on qualifying features.	No LSE.
		Noise and vibration.	No.	No pathway is anticipated for the qualifying features of this site. See e.g. Section 7.2.	Screened out – no pathway for impact to occur. No LSE.
		Chemical discharges	No.	No pathway to impact on qualifying features.	No LSE.
		Drill lubricant release	No.	No pathway to impact on qualifying features.	No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	- Sandhill rustic moth (<i>Luperina nickerlii</i>). - Saltmarsh. - Vascular plant assemblage. - Hard maritime cliff and slope.				

Table 8-7 Screening for LSE – undertaken for the Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI (for completeness only)

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
Afon Dyfrdwy (River Dee) SSSI and River Dee (England) SSSI.	<u>Afon Dyfrdwy (River Dee):</u> - Upper Carboniferous stratigraphy (Dee Bridge). - Saltmarsh transition habitats, supporting slender hare's-ear	General Disturbance effects (human and physical).	No.	No plant, footfall or construction activities within the boundaries of the designated sites (no surface activities). The drill entry and exit pits are located at distance from the river (c.300 m to HMW) and are physically separated from the designated areas.	Screened out – no pathway for impact to occur. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	(<i>Bupleurum tenuissimum</i>), sea barley (<i>Hordeum marinum</i>), and hard-grass (<i>Parapholis strigosa</i>). - Floating water plantain (<i>Luronium natans</i>). - River lamprey (<i>Lampetra fluviatilis</i>). - Sea lamprey (<i>Petromyzon marinus</i>). - Smelt (<i>Osmerus eperlanus</i>). - Grayling (<i>Thymallus thymallus</i>). <u>River Dee (England):</u> - Flowing waters - Type VI: base-rich, mesotrophic rivers in western and northern Britain, with a moderate to fast current. <u>Both:</u> - Eurasian otter (<i>Lutra lutra</i>)	Introduction of non-native species and/or novel diseases	No.	Given the distance between the proposed work sites and the watercourse, it is unlikely that any introduction of non-native species (INNS) will be introduced into the watercourse as a result of the proposed drilling activities.	Screened out – no pathway for impact to occur. No LSE.
		Noise and vibration.	No.	Noise and vibration have the potential to pose a barrier to migratory movements of fish resulting in delayed migration up-river and subsequent delays in spawning activity. However a noise and vibration assessment determined negligible/no propagation of impact to the river therefore no pathway.	Screened out based on N&V assessment. No LSE.
		Chemical discharges	No.	Pollutants deriving from the historic landfill should not be mobilised because the drill annulus is pressurised and the bentonite drill fluid will act as a fissure grout, effectively sealing the drill. Potential negative effects will therefore be minimal. .See Section 6.3.4.	Screened out – no pathway for impact to occur. No LSE.
		Drill lubricant release	No.	Drill lubricant release (e.g. 'break out' of HDD drill slurry (drill lubricant)) may	Screened out – no/negligible

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
	- Fluvial geomorphology (River Dee, Holt to Worthenbury; Agon Dyfrdwy, Rhewl Section) - Nationally rare and scarce invertebrate species - Club-tailed Dragonfly (<i>Gomphus vulgatissimus</i>), the Scarce Yellow Sally stonefly (<i>Isogenus nubecula</i>), and the cress tooth weevil (<i>Aulacobaris lepidii</i>). - Atlantic salmon (<i>Salmo salar</i>)			cause discharge of elevated fine sediment concentrations and drill fluid, with potential consequences including smothering of sensitive species, pollution of the local environment, and negative impacts of elevated fine sediment loads on fish. However, inherent best practice methods and selection of lubricant type dictates no/negligible pathway for impact.	potential for drill lubricant break out. No LSE.

Table 8-8 Screening for LSE - the River Dee and Bala Lake SAC

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
River Dee and Bala Lake SAC.	1095 Sea lamprey (<i>Petromyzon marinus</i>). 1099 River lamprey (<i>Lampetra fluviatilis</i>). 1106 Atlantic salmon (<i>Salmo salar</i>) 1355 Otter (<i>Lutra lutra</i>). 1831 Floating water-plantain (<i>Luronium natans</i>) 1163 Bullhead (<i>Cottus gobio</i>) 1096 Brook lamprey (<i>Lampetra fluviatilis</i>)	General Disturbance effects (human and physical).	No.	No plant, footfall or construction activities within the boundaries of the designated sites (no surface activities). The drill entry and exit pits are located at distance from the river (c.300 m to HMW) and are physically separated from the designated areas.	Screened out – no pathway for impact to occur. No LSE.
		Introduction of non-native species and/or novel diseases	No.	Given the distance between the proposed work sites and the watercourse, it is unlikely that any introduction of non-native species (INNS) will be introduced into the watercourse as a result of the proposed drilling activities.	Screened out – no pathway for impact to occur. No LSE
		Noise and vibration.	No.	Noise and vibration have the potential to pose a barrier to migratory movements of fish resulting in delayed migration up-river and subsequent delays in spawning activity. However a noise and vibration assessment determined negligible/no propagation of impact to the river therefore no pathway.	Screened out based on N&V assessment. No LSE.

European site name and distance to proposed works site	Qualifying feature or species	Pressure	LSE?	Justification	Conclusion
		Chemical discharges	No.	Pollutants deriving from the historic landfill should not be mobilised because the drill annulus is pressurised and the bentonite drill fluid will act as a fissure grout, effectively sealing the drill. Potential negative effects will therefore be minimal.. See Section 6.3.4.	Screened out – no pathway for impact to occur. No LSE.
		Drill lubricant release	No.	Drill lubricant release (e.g. 'break out' of HDD drill slurry (drill lubricant)) may cause discharge of elevated fine sediment concentrations and drill fluid, with potential consequences including smothering of sensitive species, pollution of the local environment, and negative impacts of elevated fine sediment loads on fish. However, inherent best practice methods and selection of lubricant type dictates no/negligible pathway for impact.	Screened out – no/negligible potential for drill lubricant break out. No LSE.

8.3 Screening statement

The possible effects on the protected areas highlighted within Section 5 have been assessed. Likely significant effects (LSEs) have been screened out for all receptors covered in the following European sites:

- Dee Estuary SAC;
- Dee Estuary SPA;
- Dee Estuary Ramsar; and
- River Dee and Bala Lake SAC

The same methodology has also been applied to relevant SSSIs, and has concluded no LSE on:

- Dee Estuary SSSI;
- River Dee (England) SSSI; and
- Afon Dyfrdwy SSSI.

9. Conclusions

9.1 Screening stage

The following potential adverse effects were provisionally 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 for LSE on European and Ramsar sites has been carried out as required under UK law (e.g. The Conservation of Habitats and Species Regulations 2017 (as amended)).

The screening test confirmed no LSE on any of the designated sites.

9.1.1 *In-combination effects.*

For the purposes of this HRA, three development plans were identified which may act in-combination with the Proposed Development (Table 6-1). Given the nature of the plans outlined in Table 6-1, it was concluded that any direct or indirect cumulative effects on any environmental receptors would be highly unlikely. Given the preliminary nature of some of these plans, some uncertainty remains surrounding the precise ecological impacts (and therefore the precise in-combination effects) that may arise from subsequent developments. It is proposed that these plans are reassessed for potential in-combination effects once the precise ecological impacts can be identified.

9.2 Habitats Regulations Assessment

Given the results of the Stage 1 Screening assessment, there is no requirement to undertake a Stage 2 Appropriate Assessment.

9.3 Summary

It is concluded that, the Dee Crossing Project will have no adverse impact on the designated sites detailed in Section 5.2, either alone or in-combination with other plans or projects.

There remains some uncertainty around the potential for other plans (described in Table 6-1) to generate environmental impacts. However, these are located at considerable distance from the Project site and there is little potential for generation of environmental impacts in the vicinity of the Project site. Furthermore, the Dee Crossing Project is assessed to have no adverse impacts on the designated sites of the River Dee and therefore there are no means identified by which the impacts of other schemes or plans could be amplified by the current project.

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Appendix A – Layout drawing

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

Appendix B – Wepre Gutter



Figure B1 Photograph of Wepre Gutter at low tide.