MONA OFFSHORE WIND PROJECT

Environmental Statement

Volume 6, Annex 2.2: Water Framework Directive Coastal Waters Assessment (F02)

Deadline: 7

Application Reference: EN010137

Document Number: MOCNS-J3303-RPS-10070

Document Reference: F6.2.2 F02

14 January 2025

F02

Image of an offshore wind farm

www.morganandmona.com/en

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Review date
F01	Application	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	Feb 2024
F02	Submission at D7	RPS	Mona Offshore Wind Ltd	Mona Offshore Wind Ltd	14 Jan 2025

Prepared by:

RPS

Prepared for:

Mona Offshore Wind Limited.

Errata

Document section	Description of errata
Paragraph 1.4.1.1	The text incorrectly refers to a 12 km buffer for features under consideration for the WFD assessment. This should refer to a buffer of 2 km. The assessment used a distance of 2 km; therefore, the conclusions are unaffected by this discrepancy in the text.

Contents

Tables

Figures

Glossary

Term	Meaning
Applicant	Mona Offshore Wind Limited.
Bathing Waters	Coastal or inland sites designated under the Bathing Water Regulations 2013. Water quality at bathing waters is monitored between 15 May and 30 September and information about the bathing water is actively disseminated to the public in an easily accessible place, in the near vicinity of the bathing water.
Cefas Action Level	Thresholds giving an indication of how suitable sediments are for disposal at sea. Contaminant levels which are below AL1 are considered to be of no concern, while those above AL2 are considered unsuitable for disposal at sea. Those between AL1 and AL2 require further consideration before a licensing decision can be made.
Groundwater	Water present beneath the earth's surface in rock and soil pore spaces and in the fractures of rock formations.
Hydromorphology	The physical characteristics of the waterbody including the size, shape, structure, flow and quantity of water and sediment.
Intertidal area	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Landfall	The area in which the offshore export cables make contact with land and the transitional area where the offshore cabling connects to the onshore cabling.
Marine Conservation Zone	A national marine protected area designated under the Marine and Coastal Access Act 2009 in English, Welsh and Northern Irish territorial and offshore waters to protect a range of nationally important, rare, or threatened species or habitats.
Marine Pollution Contingency Plan	Plan required in some licenced marine activities detailing specific best practice responses and providing guidance on the actions and reporting requirements in the event of any identified chemical or physical pollution incident originating from offshore operations.
Maximum design scenario	The scenario within the design envelope with the potential to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Natural Resources Wales Cycles 2/3	Datasets collated concerning quality indicators in Wales water bodies, with targets set for the implementation of the Water Framework Directive.
Surface Water Body	Any body of water above ground, including streams, rivers, lakes, wetlands, reservoirs, and creeks.
The Planning Inspectorate	The agency responsible for operating the planning process for Nationally Significant Infrastructure Projects (NSIPs).
Transitional Waters	Waters with variable salinity between the land and the sea including fjords, estuaries, lagoons, deltas and rias.
Water Framework Directive	European Union legislation under which Great Britain is obliged to meet targets for the ecological and chemical status of waterbodies over the course of the next 15 years.

Acronyms

Acronym	Description
AEoI	Adverse Effect on Integrity
Cefas	Centre for Environment, Fisheries and Aquaculture Science

Acronym	Description
DO	Dissolved Oxygen
ECoW	Environmental Clerk of Works
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EQSD	Environmental Quality Standards Directive
EU	European Union
HVAC	High Voltage Alternating Current
INNS	Invasive Non-Native Species
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MPCP	Marine Pollution Contingency Plan
NRW	Natural Resources Wales
PDE	Project Design Envelope
PEIR	Preliminary Environmental Impact Report
PLONOR	Poses Little or no Risk
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
TJB	Transition Joint Bay
WFD	Water Framework Directive
ZoI	Zone of Influence

Units

Unit	Description
km	Kilometre
m	Metre
μT	Microtesla
mG	Milligauss
nm	Nautical Mile
%	Percentage
km^2	Square kilometre
m^2	Square metre
V/m	Volts per metre

1 WATER FRAMEWORK DIRECTIVE COASTAL WATERS ASSESSMENT

1.1 Introduction

1.1.1.1 This Water Framework Directive (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) (WFD) coastal waters assessment report provides a WFD screening, scoping and assessment of effects for the Mona Offshore Wind Project against the objectives for the coastal and transitional WFD water bodies relevant to the Mona Offshore Wind Project (Figure 1.1). It has described the current baseline conditions and quantified the potential changes due to the installation and presence of the Mona Offshore Wind Project.

1.1.1.2 The WFD was adopted by the European Commission in December 2000 and was transposed into law in England and Wales by The Water Environment Water Framework Directive) (England and Wales) Regulations 2017 (the 2017 Regulations). The WFD is retained European Union (EU) legislation and is applicable in England and Wales as set out in sections 2 and 3 of the European Union (Withdrawal) Act 2018 and the Floods and Water (Amendment etc.) (EU Exit) Regulations 2019.

1.1.1.3 The WFD applies to all water bodies, including those that are both natural and man-made. Under the WFD, coastal waters, estuaries, rivers, man-made docks and canals are divided into a series of water bodies, and within each water body, the WFD sets ecological and chemical objectives.

1.1.1.4 Recommended guidance for undertaking WFD assessments for England and Wales is provided by the UK Government guidance 'Clearing the Waters for All' (Environment Agency, 2017) which has been followed for this assessment.

1.1.1.5 Whilst Environmental Impact Assessment (EIA) is an efficient mechanism to gather the relevant information for WFD compliance assessment, it needs to be interpreted in relation to the WFD objectives. According to the 'Clearing the Waters for All' guidance (Environment Agency, 2017), impacts on biology, chemistry and hydromorphology need to be considered in relation to WFD status classes and reported under a specific WFD section in any environmental statement or report produced or in a separate WFD compliance report (Environmental Agency, 2010).

1.1.1.6 Therefore, this WFD coastal waters assessment has been undertaken to assess the potential impact of the Mona Offshore Wind Project on WFD transitional and coastal receptors out to 1 nm, as advised in 'Clearing the Waters for All'. WFD compliance of onshore infrastructure has been assessed and presented as part of Volume 3, Chapter 2: Hydrology and flood risk of the Environmental Statement and Volume 7, Annex 2.4: Water Framework Directive surface water and groundwater assessment of the Environmental Statement.

1.1.1.7 The WFD coastal waters assessment has considered the different activities associated with the Mona Offshore Wind Project in the context of the environmental objectives of any affected WFD surface water body. The compliance assessment has also provided the opportunity to inform the detailed design of the Mona Offshore Wind Project to avoid, minimise, mitigate or compensate for the risks to the environmental objectives of WFD surface water receptors where the risk assessment determined that the activities have the potential to:

- cause a surface water body to deteriorate from one WFD status class to another or cause significant localised impacts that could contribute to this happening; and

- prevent or undermine action to get surface water bodies to good status (e.g. compromise the programme of measures put in place to achieve the ultimate water body objective).

1.1.1.8 Using the ‘Clearing the Waters for All’ guidance, the Planning Inspectorate ‘Advice Note 18: Water Framework Directive’ (Planning Inspectorate, 2017) and referring to the relevant chapters of the Mona Offshore Wind Project Environmental Statement, screening, scoping and assessment have been carried out of the potential for the Mona Offshore Wind Project to have a significant non-temporary effect on WFD parameters at water body level. This has been undertaken on the basis of the Mona Offshore Wind Project maximum design scenario (MDS) detailed within Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement. Temporary effects of the Mona Offshore Wind Project have been included for assessment although it is noted in the ‘Clearing the Waters for All’ guidance that these are not considered to constitute a deterioration in WFD status (Environment Agency, 2017).

1.1.1.9 This report should be read alongside the following chapters of the Mona Offshore Wind Project Environmental Statement:

- Volume 2, Chapter 1: Physical processes of the Environmental Statement
- Volume 6, Annex 1.1: Physical processes technical report of the Environmental Statement
- Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement
- Volume 6, Annex 2 1: Benthic subtidal and intertidal ecology technical report of the Environmental Statement
- Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement.

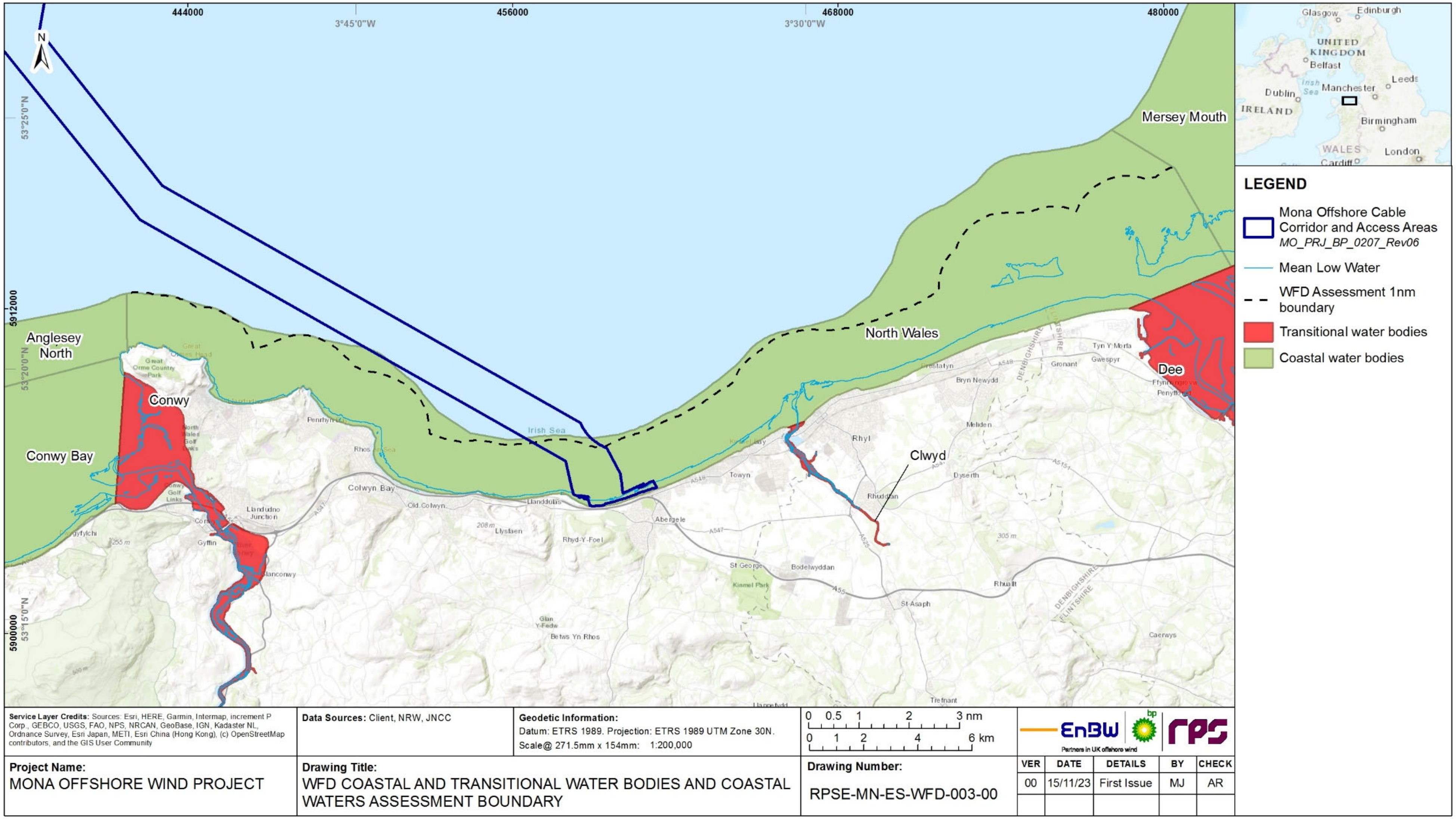


Figure 1.1: WFD coastal and transitional water bodies and coastal waters assessment boundary.

1.1.2 Consultation

1.1.2.1 A summary of the key issues raised during consultation activities undertaken to date specific to WFD coastal waters assessment is presented in Table 1.1 below.

Table 1.1: Summary of key consultation comments received during consultation activities undertaken for the Mona Offshore Wind Project relevant to the Water Framework Directive coastal waters assessment.

Consultee and type of response	Comments	How comments have been addressed
Planning Inspectorate Scoping Opinion: Advice provided by Natural Resources Wales (NRW) 31 May 2022	Where there is overlap of numerical modelling to inform the assessment of Physical Processes with WFD water bodies, NRW (A) recommend that the outcomes of this assessment inform the WFD Compliance Assessment.	Numerical modelling has informed the Zone of Influence (ZoI) for possible impacts of the activity and potential plume envelope for suspended sediment concentration (SSC), and is described in section 1.3.2 as part of the Scoping process.
	NRW (A) advise that, where there is a pathway of effect, for any WFD element in any water body, works must be considered; there may still be a pathway of effect beyond 1 nm.	Effect pathways beyond 1 nm boundary specified by Environment Agency guidance considered in Scoping process.
	It is not just deterioration at a water body level that must be considered within the assessment, but deterioration of any element within a water body, even if it does not result in deterioration at the water body level. Please also note that compensation is not a requirement in WFD terms.	Comment is noted; this WFD Assessment considers potential for deterioration of the water bodies as a whole and the individual elements of the water body. This includes qualifying and conservation objectives features of protected areas, as defined in Environment Agency guidance, considered to be of same importance as overall status of WFD water bodies.
	NRW (A) encourage the Applicant to refer to the Environment Agency's Guidance 'Clearing the Waters for All', which provides information on how to carry out a WFD Compliance Assessment for activities within transitional (estuarine) and coastal waters.	'Clearing the Waters for All' consulted throughout and formed the framework and structure for the WFD assessment.
	NRW (A) advise that the Environment Agency's 'Clearing the Waters for All' is added to the list of guidance documents.	'Clearing the Waters for All' added to list of guidance documents, presented in Table 1.2.
	NRW (A) welcome the opportunity to engage with the Applicant to discuss the scope of the WFD Compliance Assessment associated with the project.	Comment is noted.
	NRW (A) advise that Cycle 3 2021 WFD classifications were published in December 2021 and are now available. These are the most recent classifications and should be used to inform the baseline going forward.	Cycle 3 WFD classifications formed the baseline for informing assessments. Cycle 2 consulted where information was lacking in Cycle 3 (e.g. reason for classification as Highly Modified Water Bodies).

Consultee and type of response	Comments	How comments have been addressed
	North Wales and Mersey Mouth WFD coastal water bodies and the Clwyd transitional water body will need to be considered within the WFD Compliance Assessment as outlined in Table 2.1, however NRW (A) advise that the full list of WFD water bodies will need to be determined by numerical modelling and other assessment methods to fully define the ZoI and any WFD water bodies that fall within it.	North Wales coastal water body and Clwyd transitional water body screened in. Mersey Mouth coastal water body screened out due to distance from cable corridor and low likelihood of effects from activity and the lack of any potential impact (as informed by site specific physical processes modelling).
	NRW (A) note that it is not easy to understand what activities will be scoped in for the individual construction, operations and decommissioning phases of the project.	Individual activities presented with more detail in section 1.2.
	The impact of contaminated runoff on the quality of transitional and coastal water bodies arising from the construction and decommissioning of the onshore transmission assets should be included… as should the potential effects of EMF from cabling and thermal effects from cabling.	Impacts from onshore transmission assets considered in Volume 3, Chapter 2: Hydrology and flood risk of the Environmental Statement, outlined in paragraph 1.1.1.6. Potential Electromagnetic Field (EMF) and thermal effects of cable assessed in section 1.5.
	NRW (A) advise that all WFD water bodies that fall within the geographic scope of the assessment carried out as part of the wider EIA, in terms of both direct impacts, (e.g. physical footprint of cabling), and indirect impacts (e.g. impacts arising from EMFs on migratory fish) should be considered within the WFD Compliance Assessment. Furthermore, NRW (A) agree that the North Wales and Mersey Mouth coastal water bodies, and the Clwyd transitional water body, are included within the assessment, but advise that the list of water bodies is not finalised until the ZoI is fully defined through numerical modelling and other methods.	ZoI defined by numerical modelling and North Wales and Clwyd water bodies screened in. Indirect effects (EMF and heat from cables) included for assessment alongside direct and indirect impacts specified in 'Clearing the Waters for All'.
NRW – Section 42 Response 01 June 2023	For clarity, it would be helpful to accurately signpost where the contaminated sediment assessment of the Environmental Statement takes place.	Information on the contaminated sediment assessment is presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and Volume 6, Annex 2 1: Benthic subtidal and intertidal ecology technical report of the Environmental Statement.
	NRW (A) agree with the scoping conclusions…for WFD receptors in the North Wales coastal water body and the Clwyd transitional water body.	Comment noted, and receptors have been retained for the WFD coastal waters assessment presented in this document.

Consultee and type of response	Comments	How comments have been addressed
	With reference to the Impact Assessment, please refer to comments pertaining to Physical Processes and Benthic Subtidal and Intertidal Ecology around the assessment of impacts on higher sensitivity habitats from landfall works. These concerns, and their solutions, will need to be fed through to the WFD assessment.	Since the submission of the Preliminary Environmental Impact Report (PEIR), open cut trenching has been removed from the Project Design Envelope (PDE) and all export cables at the landfall will be installed via trenchless techniques. The assessments in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement have been updated accordingly and have been used to inform the assessment of the project footprint, notably in the context of biological habitats (Table 1.8 and section 1.5.1: 'Biology – habitats').
	With reference to water quality, in the context of the planned works to be undertaken, phytoplankton need to be assessed using information around suspended sediment.	Additional detail and context have been added to the water quality assessment in section 1.5.1: "Water quality" to incorporate potential effects of increased SSC upon phytoplankton.

1.1.3 Data sources, guidance and relevant policy and legislation

1.1.3.1 Information to inform the WFD coastal waters assessment within the WFD coastal waters assessment study area was collected through a detailed desktop review of existing studies, datasets, guidance, policy and legislation. These are summarised in Table 1.2 below.

Table 1.2: Summary of key desktop sources , guidance and relevant policy and legislation.

Source	Year	Author
Data sources		
Water Watch Wales: Cycle 3 (2021) Web Mapping Application	2022	NRW
Western Wales River Basin Management Plan 2021 to 2027 Summary	2022	NRW
JNCC MPA Mapper	2022	JNCC
Water Watch Wales: Cycle 2 (2018) Web Mapping Application	2018	NRW
Guidance		
Advice note eighteen: The Water Framework Directive	2017	Planning Inspectorate
'Clearing the Waters for All' Guidance. Water Framework assessment: estuarine and coastal waters	2017	Environment Agency
Policy and legislation		
River basin planning: progress report	2021	Environment Agency

Source	Year	Author
Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019	2019	UK Government
The Bathing Water Regulations 2013	2013	UK Government
The Urban Waste Water Treatment (England and Wales) Regulations 1994	1994	UK Government
Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat	1971 (UK ratified 1976)	Ramsar Convention

1.2 Project description of the Environmental Statement

1.2.1 General

1.2.1.1 The location of the Mona Offshore Cable Corridor and Access Areas is illustrated in Figure 1.1 and the maximum design scenario (hereafter MDS) for the Mona Offshore Cable Corridor and Access Areas are presented in Table 1.3. Although the Mona Offshore Cable Corridor and Access Areas has been identified, the exact route of the offshore export cables is yet to be determined and will be based upon geophysical and geotechnical survey information collected during the pre-construction phase.

1.2.1.2 The offshore export cables will be used for the transfer of electricity from the Offshore Substation Platforms to the landfall and onwards to connect to the onshore National Grid substation. Up to four offshore export cables, with a voltage of up to 275 kV will be required for the Mona Offshore Wind Project. Where possible, the cables will be buried below the seabed to landfall. The PDE for the Mona Offshore Cable Corridor and Access Areas and the Llanddulas landfall area are set out in Volume 1, Chapter 3: Project description of the Environmental Statement, and offshore export cables will be located wholly within the Mona Offshore Cable Corridor and Access Areas shown in Figure 1.1. A summary of the MDS for the offshore export cables is given in Table 1.3.

Table 1.3: Maximum design scenario for installation of offshore export cables out to the WFD assessment boundary: 1 nm from Mean High Water Springs (MHWS).

Parameter	Maximum Design Scenario
Maximum number of offshore export circuits	4
Offshore export cable length, per circuit out to 1 nm	1,852 m
Maximum total offshore export cable length out to 1 nm	7,408 m
Maximum cable diameter	350 mm
Intertidal	
Cable installation methodologies – landward of Mean Low Water Springs (MLWS) (intertidal)	Trenchless installation
Maximum distance of trenchless cable installation in intertidal	300 m
Maximum cable burial depth intertidal	25 m
Target cable burial depth intertidal	20 m
Minimum cable burial depth intertidal	5 m

Parameter	Maximum Design Scenario
Maximum area of disturbance in intertidal (assuming installation via trenchless techniques)	0 m^2
Subtidal	
Cable installation methodologies – seaward of MLWS (subtidal)	Prelay plough, plough, trenching, jetting Seabed preparation activities, including sandwave clearance and boulder clearance
Maximum distance of trenchless cable installation in subtidal	1,000 m
Maximum distance of trenchless techniques exit punch out from MHWS	1,300 m
Maximum distance of trenching in subtidal	552 m
Minimum cable burial depth subtidal	0.5 m
Maximum cable burial depth subtidal	3 m
Dimensions of trenchless cable installation exit pits	15 m x 30 m
Footprint of trenchless cable installation exit pits	450 m^2
Maximum width of seabed disturbed by cable installation (per cable) - subtidal	40 m (Sandwave clearance) 20 m (Boulder and debris clearance and cable burial) 20 m (Cable installation tool)
Maximum area of seabed disturbed by cable installation tool – subtidal	44,160 m^2
Percentage of export cables requiring sandwave clearance	20%
Maximum area of seabed requiring sand clearance	17,664 m^2
Maximum area of seabed disturbance – subtidal	54,792 m^2
Cable protection	
Maximum width of cable protection	10 m
Maximum percentage of subtidal cable requiring protection	20%
Maximum area of cable protection – subtidal only	4,416 m^2

1.2.1.3 The project requires flexibility in type, location, depth of burial and protection measures for the offshore export cables to ensure that anticipated physical and technical constraints and changes in available technology can be accommodated within the Mona Offshore Wind Project design.

Construction

1.2.1.4 The offshore export cables will make landfall in Llanddulas, North Wales and be brought through the intertidal area to a location where they can be connected to the onshore export cables.

1.2.1.5 The Mona intertidal area is the area within the Mona Offshore Cable Corridor and Access Areas, between MHWS and Mean Low Water Springs (MLWS). Figure 1.1 presents the Mona Offshore Cable Corridor and Access Areas, including the Mona intertidal area.

1.2.1.6 The offshore export cables are connected to the onshore export cables at the onshore Transition Joint Bays (TJBs) to ensure that connection can take place in a suitable environment, and to protect the joints. Once the joint is completed the TJBs are covered and the land above reinstated.

1.2.1.7 Methods being considered for installation of the export cable in the subtidal area include pre-lay plough, plough, open cut trenching and jetting. Methods being considered for installation of the export cable in the intertidal area include open cut trenching and trenchless techniques.

1.2.1.8 Before export cable burial can be undertaken, seabed preparation works may be required to remove obstacles that may prevent export cables from being buried to the target depth. Preparation works include removal of boulders and clearance of sandwaves and similar bedforms to provide a clear path along which cable burial equipment can move.

1.2.1.9 Cable installation via pre-lay plough, plough, trenching and jetting involves creating a trench within which the cable is laid and the trench or ploughed area is backfilled. It may be carried out using ploughs, excavators, rock cutters or jetting tools. These may be self-powered or can be pulled from the offshore installation vessel, or from winches within the TJB working area (within the landfall construction compound). Where TJBs are to be located above MLWS, the exit pits will be excavated or dredged to the required depth, and side-cast material for backfilling will be stored adjacent to the exit pit. For this option it may include installation of temporary cofferdams in the intertidal to reduce water intrusion.

1.2.1.10 Trenchless techniques, such as horizontal directional drilling, micro tunnelling or thrust bore will be used to cross the intertidal area, which will reduce disturbance to the environment by drilling a borehole underneath the surface.

Operations and maintenance

1.2.1.11 Routine inspections of offshore export cables will be undertaken to ensure the cables are buried to an adequate depth and not exposed. The integrity of the cables and cable protection systems will also be checked. It is expected that on average the cables will require up to one visit per year. Maintenance works to rebury/replace and carry out repair works on export cables, should this be required, are presented in Volume 1, Chapter 3: Project description of the Environmental Statement.

Decommissioning

1.2.1.12 It is expected that the export cable in the intertidal area will be removed up to the TJBs during wind farm decommissioning. The cable ends will be cut, sealed and securely buried as a precautionary measure.

1.2.1.13 The decommissioning sequence will generally be the reverse of the construction sequence and involve similar types and numbers of equipment. The Energy Act 2004 requires that a decommissioning plan must be submitted to the Secretary of State for the Department for Energy Security and Net Zero (formerly the Department for Business, Energy and Industrial Strategy) prior to the construction of the Mona Offshore Wind Project and is typically prepared post-consent. The decommissioning plan and programme will be updated during the Mona Offshore Wind Project's lifetime to take account of changes in regulations, best practice and new technologies.

1.2.2 Proposed measures adopted as part of the project

1.2.2.1 This section provides an overview of the relevant measures which are being adopted as part of the Project, including PDE commitments for the Mona Offshore Wind Project. The provision of the identified plans, as detailed below, will be secured in the DCO (or marine licence). These measures have been developed as part of the EIA process as either primary or tertiary measures specified in the relevant technical topics of the EIA (as set out in section 1.1.1.9).

1.2.2.2 Trenchless techniques will be included as a project commitment to cross the intertidal area, to reduce disturbance to intertidal habitats and species.

1.2.2.3 *Sabellaria alveolata* reef and blue mussel *Mytilus edulis* bed identified during site-specific intertidal habitat surveys are located outside the boundary of the Mona Offshore Cable Corridor and Access Areas. The Applicant commits to a 50 m exclusion buffer from the edge of the *S. alveolata* reef and blue mussel bed as per industry standard best practice. The buffer will be based on the extent of the reef as mapped during the 2023 Mona Phase I intertidal survey. Whilst the reef is located more than 250 m to the west of the intertidal part of the Mona Offshore Cable Corridor and Access Areas, it is approximately 28 m, at the nearest point, from the subtidal part of the Mona Offshore Cable Corridor and Access Areas. Therefore, this primary measure has been included on a precautionary basis to ensure that direct impacts (e.g. habitat loss or disturbance) to the ecologically sensitive and nationally protected *S. alveolata* reef will be avoided. Due to the location of the blue mussel bed to the south of the *S. alveolata* reef, this measure will also ensure direct impacts to this feature are also avoided. This commitment isexpected to be secured within the standalone NRW marine licence.

1.2.2.4 An Ecological Clerk of Works (ECoW) will supervise any planned construction works in the intertidal zone. This is to ensure that all planned works within the intertidal are undertaken in line with the primary measure adopted to avoid the *S. alveolata* reef and the blue mussel bed. The ECoW is expected to be secured within the standalone NRW marine licence.

1.2.2.5 Cable burial will be employed as a primary measure to reduce the potential exposure of benthic organisms to Electromagnetic Fields (EMF) by increasing the distance between the seabed surface and the surface of the cables. It will also reduce the extent of long-term habitat loss associated with cable protection. This commitment will also be secured within the Landfall Construction Method Statement.

1.2.2.6 An Offshore Environmental Management Plan will be produced post-consent and implemented to cover the construction and operations and maintenance phases of the Mona Offshore Wind Project. The Offshore Environmental Management Plan will include a Biosecurity Risk Assessment and an Invasive Non-Native Species (INNS) Management Plan, including actions to minimise INNS, as well as a Marine Pollution Contingency Plan (MPCP) to provide protocols to cover accidental spills and potential contaminant release, and will include key emergency contact details (e.g. NRW, Maritime Coastguard Agency and the project site co-ordinator). The Offshore Environmental Management Plan and MPCP are proposed to be secured within the deemed marine licence in Schedule 14 of the draft DCO and expected to be secured within the standalone NRW marine licence.

1.2.2.7 The purpose of these measures is to ensure that potential for contaminant release is strictly controlled and provides protection to marine life across all phases of the life of the Mona Offshore Wind Project.

1.2.2.8 The Applicant commits to the disposal of sewage and other waste in a manner which complies with all regulatory requirements, including but not limited to the IMO MARPOL requirements.

1.2.2.9 Relevant best practice guidelines will be followed and implemented through the implementation of a Biosecurity Plan as part of the EMP to minimise Invasive Non-Native Species (INNS) introduction/spread. Any vessels used for the delivery of materials to site will adhere to industry legislation, codes of conduct and/or best practice to reduce the risk of introduction or spread of invasive non-native species.

1.3 Methodology

1.3.1 Screening

1.3.1.1 According to the 'Clearing the Waters for All' guidance, the aim of screening is to ensure that only those activities that may cause deterioration or prevent a water body from meeting its objectives are assessed further. Screening excludes any activities that do not need to go through the scoping or impact assessment stages. Activities which can be excluded from scoping are listed in 'Clearing the Waters for All'.

1.3.1.2 According to the guidance referred to above, the Mona Offshore Wind Project is not a low-risk activity, is not a fast-track or accelerated marine licence activity and does not fall into any of the categories of activities where scoping is not required. Therefore, the Mona Offshore Wind Project should proceed to the scoping stage.

1.3.1.3 Impacts scoped in for assessment are considered in the context of the embedded mitigation measures described in section 1.2.2.

1.3.2 Scoping

1.3.2.1 The aim of the scoping stage is to identify elements (receptors) within waterbodies which may be impacted as a result of the Mona Offshore Wind Project. Any identified receptors, both chemical and ecological, will then be taken forward for a detailed impact assessment (section 1.5). A scoping assessment has been undertaken for each water body potentially affected by the Mona Offshore Wind Project. Where robust justification could be provided, impacts on waterbodies were scoped out from further consideration.

1.3.2.2 The receptors, as specified in the 'Clearing the Waters for All' guidance, are:

- Hydromorphology
- Biology – habitats
- Biology – fish
- Water quality
- Protected areas; and
- INNS.

1.3.2.3 The 'Clearing the Waters for All' guidance provides specific criteria for each of the receptors listed above to determine if an assessment of impacts is required and recommends the use of a scoping template as part of the WFD assessment process. These criteria have been considered for each receptor in section 1.4 of this appendix, using the recommended scoping template.

1.3.2.4 The current status of water bodies is detailed within River Basin Management Plans (RBMPs) and supporting Appendices. Each RBMP includes the work undertaken over the preceding five years, and the plans/objectives for the next six years following publication.

1.3.2.5 The aim of the WFD is to maintain and improve surface waters and water bodies out to 1 nm. Therefore, the focus of the WFD assessment is on those elements of the Mona Offshore Wind Project from Mean High Water Springs (MHWS) out to 1 nm. Assessment of inland WFD water bodies is covered in Volume 7, Annex 2.4: Water Framework Directive surface water and groundwater assessment of the Environmental Statement and therefore not considered further in this assessment.

1.3.2.6 As advised by NRW in the Mona Offshore Wind Project Scoping Opinion (received 15 June 2022) (see Table 1.1), the assessment of deterioration should be extended further than 1 nm where an effect pathway may be present for any WFD element in any water body. Additionally, NRW advised that deterioration of any element within a water body, even if it does not result in deterioration at the water body level, should be considered within the assessment.

1.3.2.7 The 'Clearing the Waters for All' guidance stipulates that the footprint of the activity be considered when assessing the impact of the Proposed Development upon WFD water bodies and protected areas. 'Activity' refers to the construction, operations and maintenance, and decommissioning activities associated with the offshore export cables within 1 nm seaward of MHWS. 'Footprint' refers to the area of habitat potentially affected by the installation of the offshore export cable and associated infrastructure.

1.3.2.8 The Zone of Influence (ZoI) of the impact of activities associated with the Mona Offshore Wind Project on water bodies for WFD assessment, following the ‘Clearing the Waters for All’ guidance, is generally considered to be within 2 km of the activity being assessed. The MMO ‘Marine Conservation Zones and Marine Licensing’ guidance (2013) on Marine Conservation Zone (MCZ) assessment recommends the use of a risk-based approach to determine the “nearness” of an activity to protected areas. This includes applying an appropriate buffer zone to the features under consideration as well as a consideration of risks for activities at greater distances. This approach has been adopted for this WFD assessment.

1.3.2.9 Similarly, NRW guidance on WFD assessment (NRW, 2018b) recommends that where there is lack of confidence on whether there is a potential risk to an element, then the element should be scoped in. Advice from NRW in the Mona Offshore Wind Project Scoping Opinion (15 June 2022) states that the waterbodies to be included in the assessment should be derived through numerical modelling and other assessment methods to determine the ZoI.

1.3.2.10 Numerical modelling undertaken for the assessment of impacts upon physical processes in the Mona Array Area (presented in Volume 6, Annex 1.1: Physical processes technical report of the Environmental Statement) indicated a potential plume envelope for sediment suspension of approximately 10 km in either direction from the source, roughly equivalent to one spring tidal excursion. However, this plume envelope is based upon modelling of activities which create the greatest disturbance to the seabed i.e., seabed preparation activities such as sandwave clearance within the Mona Offshore Cable Corridor. which will occur offshore beyond 10 km from any WFD water body. Therefore, no effect pathway for WFD receptors from seabed preparation activities such as sandwave clearance is expected.

1.3.2.11 For activities occurring within 1 nm of MHWS (as described in paragraph 1.3.2.7), which includes installation of offshore export cables within the Mona Offshore Cable Corridor and Access Areas, the sediment plume is expected to be lower. Disturbance to the seabed here will be substantially lower than that for sandwave clearance offshore, and the shallower water would reduce the distance over which suspended sediment is able to travel.

1.3.2.12 Taking all of the above into account a 2 km buffer applied to the Mona Offshore Cable Corridor and Access Areas is considered sufficient in defining the ZoI for the purposes of this WFD assessment. This also corresponds to the 2 km buffer for WFD protected areas, specified in the 'Clearing the Waters for All' guidance and described in paragraph 1.3.2.15.

1.3.2.13 Drawing on the information outlined in Volume 1, Chapter 3: Project description of the Environmental Statement, the primary effects associated with the offshore export cables (hereafter referred to as 'the activity') that are considered to be relevant to the WFD assessment are:

- Installation, operations (and maintenance) and decommissioning of offshore export cables through the intertidal area via trenchless techniques
- Installation, operations (and maintenance) and decommissioning of offshore export cables in the subtidal area, out to 1 nm, via open-cut trenching.

1.3.2.14 Protected sites listed in paragraph 1.5.1.21, and any WFD element in any water body for which there may be a pathway for effect that fall within the ZoI, have been included in the assessment.

1.3.2.15 Any protected areas within the 2 km buffer for the Mona Offshore Cable Corridor and Access Areas were scoped in for a detailed impact assessment. For the purposes of this assessment, protected areas are defined as:

- National Site Network (Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar) sites
- Shellfish waters
- Bathing waters
- Nutrient sensitive areas (under the Urban Waste Water Treatment Directive)
- Nitrate Vulnerable Zones - polluted or sensitive
- Drinking Water Protected Areas (Surface and Ground).

1.3.2.16 Hydromorphology, for the purposes of this assessment, is defined as the physical characteristics of the waterbody including the size, shape, structure and the flow and quantity of water and sediment.

1.3.2.17 Biological habitats (both those designated as higher or lower sensitivity habitats) have been scoped in if the footprint (including sediment plumes and dredging areas) of activities is:

- 0.5 km^2 or greater (within the relevant WFD waterbody)
- 1% of more of the waterbody's area
- Within 500 m of any higher sensitivity habitat
- 1% or more of any lower sensitivity habitat.

Table 1.4: WFD habitat sensitivity to human pressures.

Higher sensitivity habitats	Lower sensitivity habitats
Chalk reef	Cobbles, gravel and shingle
Clam, cockle and oyster beds	Intertidal soft sediments like sand and mud
Intertidal seagrass	Rocky shore
Maerl	Subtidal boulder fields
Mussel beds, including blue and horse mussel	Subtidal rocky reef
Polychaete reef	Subtidal soft sediments like sand and mud
Saltmarsh	

1.3.2.18 The following impacts on fish were scoped in if:

- The activity is in an estuary and could affect the fish in the estuary
- The activity could delay or prevent fish from entering the estuary
- The activity could affect fish migrating through the estuary to freshwater.

1.3.2.19 The impacts resulting from the proposed activities on water quality were scoped in based on:

- Whether it could affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring/neap tidal cycle
- Whether it is in a waterbody/waterbodies with a phytoplankton status of moderate, poor or bad
- Whether the waterbody/waterbodies have a history of harmful algae.

1.3.2.20 The water quality assessment will assess the potential for the release of chemicals (on the Environmental Quality Standards Directive (EQSD) list) and sediment bound contaminants (above Centre for Environment, Fisheries and Aquaculture Science (Cefas) Action Level 1) as a result of the proposed activities.

1.3.3 Impact Assessment

1.3.3.1 Following the scoping stage, if it was determined that the impact assessment stage was required, as per the 'Clearing the Water for All' guidance, an impact assessment was undertaken for each receptor identified as being at risk from the activity. The impact assessment considered what pressures the activity could create on the receptors identified. The key aim of the impact assessment was to determine whether there was potential for deterioration in the status of a waterbody receptor, or any element within a water body.

1.3.3.2 During the impact assessment the requirement for additional mitigation measures, i.e., those not inherent to the project's design, and impact monitoring was considered. All impact assessments inherently consider embedded mitigation.

1.3.3.3 Deterioration is defined as when the status (ecological or chemical) of a quality element reduces by one class, for example, ecological quality elements move from 'good' to 'moderate' status. If a quality element is already at the lowest status (Bad), then any reduction in its condition also counts as deterioration.

1.3.3.4 According to the WFD, “Good status” comprises two parts. The first is “good ecological status” (or “good ecological potential”, for water bodies classed as heavily modified or artificial). The second is “good chemical status”. “Good ecological status/potential” includes biological, hydromorphological and physicochemical quality elements and specific pollutants. “Good chemical status” concerns a series of priority substances, including a number of priority hazardous substances.

1.3.3.5 According to the ‘Clearing the Waters for All’ guidance, temporary effects due to short-duration activities such as construction and maintenance are not considered to cause deterioration if the waterbody would recover in a short time without any restoration measures. However, it was noted that works which are temporary in nature may have longer term effects on aspects such as ecology.

1.3.3.6 Where relevant, mitigation measures were included to avoid or minimise risks of deterioration. This assessment was reliant upon identifying those effects that are non-temporary which, for the purposes of this assessment, is defined as *'A period of time that is greater than the recommended monitoring period interval as stated by the WFD (2000/60/EC).'*

1.3.3.7 According to the ‘Clearing the Waters for All’ guidance, if the activity could cause deterioration or hinder achievement of the waterbody's objective (or potential), either of the quality element or supporting habitat, an explanation must be provided on how this deterioration could occur, including consideration of whether the impact is:

- Direct and immediate - it will happen at the same time and place as the activity; or
- Indirect - it will happen later or further away, including in other linked waterbodies.

1.3.3.8 Where the activity may cause deterioration, alternatives should be considered to minimise the impact, including changes to the materials or substances used, the size, scale or timing of the activity or methods of working and/or how equipment or services are used.

1.3.3.9 In addition to assessing the potential for deterioration of the current status of a waterbody, the impact assessment must consider the risk of jeopardising 'Good status'. Every waterbody has a target status that it is expected to achieve, with an expected date by when this should be achieved, as set out in the RBMPs.

1.3.3.10 Where the status of a waterbody or quality element is less than 'Good', the impact assessment should consider whether the activity may jeopardise the waterbody achieving 'Good status' in the future. These may include activities which reduce the effectiveness of improvement activities taking place or prevent improvement activities taking place in the future. Details of these activities or measures are set out in the RBMPs.

1.3.3.11 Different monitoring periods are defined for different elements under the WFD. In this assessment, deterioration is measured against the potential to jeopardise the waterbody from attaining the same or better status in the subsequent RBMP (i.e. within six years) and the interim classification (i.e. within three years) (i.e. non-temporary deterioration). ‘Clearing the Waters for All’ does not provide a definition of temporary effects, but an appropriate definition was provided in the (now superseded) NRW OGN72 guidance (NRW, 2018b):

"*To qualify as a temporary activity, the water body should recover within a short amount of time and without the need for restoration measures (i) in the water body where the activity is taking place and (ii) in any hydrologically connected water bodies, once the temporary works are removed. If the water body does not recover to the same status as before the activity started, then the activity should not be treated as temporary*."

1.3.3.12 The Applicant also notes that even though activities may be temporary in nature, the impacts to ecology may be longer lasting and will be considered accordingly. Therefore, the temporal nature of each potential impact on a receptor is considered within the impact assessment.

1.3.4 Background information on WFD waterbodies

1.3.4.1 The 'Clearing the Waters for All' guidance stipulates that the WFD Assessment helps the developer and the regulator understand the impact the activity may have on the immediate water body and any linked water bodies.

1.3.4.2 Taking into consideration the ZoI of the Mona Offshore Wind Project, as described in paragraphs 1.3.2.8 to 1.3.2.10, water bodies along the North Wales coast that are likely to be impacted have been identified, as presented in Table 1.5. Further detail on these water bodies is presented in section 1.4.1 and Table 1.6 of this document.

Table 1.5: Water bodies screened into the WFD assessment.

Water body name	Type	Reason for including in screening
North Wales (GB641011650000)	Coastal	Mona Offshore Cable Corridor and Access Areas overlaps with this waterbody.
Clwyd (GB541006608000)	Transitional	Recommended for inclusion following advice from NRW (31/05/2022), based upon proximity to project.

1.4 Scoping

1.4.1 Status of relevant waterbodies

1.4.1.1 The Mona Offshore Cable Corridor and Access Areas crosses the North Wales coastal waterbody (GB641011650000) (Figure 1.1). Following advice from NRW (Table 1.1) the Clwyd transitional water body (GB541006608000) has also been screened in. There are no other coastal or transitional waterbodies within the ZoI of the Mona Offshore Cable Corridor and Access Areas. The Mersey Mouth WFD waterbody (GB641211630001) was previously recommended to be scoped in for assessment, however this water body is outside of the 12 km buffer described in paragraph 1.3.2.8. It is therefore considered that there is no route to impact (or receptor pathway).

1.4.1.2 The current status of the screened-in coastal and transitional WFD waterbodies are presented in Table 1.6. For the North Wales and Clwyd waterbodies the overall and ecological status did not change from 'Moderate' between the Cycle 2 Classifications (2015) and the Cycle 3 Classifications (NRW, 2022a), whereas chemical status improved from 'Fail' during the Cycle 2 Classification to 'High' during the Cycle 3

Classification for Clwyd. In the North Wales coastal waterbody, the waterbody chemical quality remained at 'Moderate', with the goal of 'Good' quality by 2033.

1.4.1.3 Following this scoping stage, those waterbodies and relevant receptors scoped into the assessment will be fully considered in the assessment in section 1.5, and water bodies or features scoped out will not be considered further.

Table 1.6: WFD water bodies screened in as potentially affected by the Mona Offshore Wind Project offshore export cable and landfall works.

NAME	North Wales	Clwyd
ID	GB641011650000	GB541006608000
Type	Coastal	Transitional
Year of assessment	2021	2021
Distance from activity (km)	0: overlap	5.8
Waterbody area (km^2)	409.91	305.82
Overall current potential status	Moderate	Moderate
Current status (ecological)	Moderate	Moderate
Current status (chemical)	Moderate	High
Target	Good by 2033	n/a
Driving ecological quality element	Phytoplankton blooms	Dissolved Inorganic Nitrogen, Mitigation Measures Assessment
Is the waterbody heavily modified?	Yes	Yes
WFD phytoplankton classification	Moderate	Not assessed
Dissolved inorganic nitrogen	Good	Moderate
Hydromorphology	Not Assessed	Not High

1.4.2 Coastal waterbodies scoping

1.4.2.1 This section details the scoping assessment for the identified coastal WFD waterbody, with a summary of the results of scoping for consideration in the impact assessment presented in Table 1.19.

1.4.2.2 As well as the receptors identified in the 'Clearing the Waters for All' guidance, NRW advise that EMF and heat produced by offshore export cables are scoped in for assessment.

North Wales water body

Hydromorphology

1.4.2.3 Specific risk information relating to hydromorphology is provided in Table 1.7.

Table 1.7: Hydromorphology risks for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Could impact on the hydromorphology (for example morphology or tidal patterns) of a waterbody at high status	The hydromorphology status of the North Wales water body has not been classified. However, as this is a heavily modified water body, high morphological status is not possible.	No – impact assessment not required.
Could significantly impact the hydromorphology of any waterbody	Numerical modelling presented within Volume 2, Chapter 1: Physical process of the Environmental Statement indicates that hydromorphology would not be significantly impacted by the proposed activity. Effects of all cable installation activities will be temporary and reversible and any effects to hydromorphology during the operations and maintenance phase (e.g. from cable protection) would be highly localised, if they occur at all.	No – impact assessment not required.
Waterbody is heavily modified for the same use as the proposed activity	The North Wales water body has been designated as a heavily modified water body for the purpose of coastal protection (NRW, 2018a). This designation is not for the same use as the proposed activity.	No – impact assessment not required.

Biology – habitats

1.4.2.4 The 'Clearing the Waters for All' scoping template provides a list of habitats which have a sensitivity to human pressures; split into higher and lower sensitivities. Table 1.7 is a reproduction of the list of sensitive habitats from the WFD scoping template, and Table 1.8 presents the specific risk information for biology habitat receptors.

Table 1.8: Biology – habitats risks for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
0.5 km^2 or greater (standard WFD assessment is on the basis of effects out to 1 nm, therefore risks are considered on the basis of 0.5 km^2 per 1 nm)	Maximum width of seabed affected by installation and sandwave clearance is 40 m per cable. Maximum area of disturbance in intertidal is 0 m^2 since installation is to be undertaken via trenchless techniques. For subtidal the maximum area of disturbance is 54,792 m^2 creating a total disturbance of up to 0.055 km^2 across intertidal and subtidal (see Table 1.3).	No – impact assessment not required. However, this impact has been retained for assessment as this was undertaken as part of the PEIR.
1% or more of the waterbody's area	The total area of this water body is 409.91 km^2, so the disturbance of 0.055 km^2 constitutes 0.013% of the water body's total area, which does not exceed the 1% threshold.	No – impact assessment not required.
Within 500 m of any higher sensitivity habitat	Areas of polychaete reef (specifically *Sabellaria* reef) and mussel beds (specifically blue mussel) are located within the intertidal area of the Mona Offshore Cable Corridor and Access Areas.	Yes – impact assessment required.

Consideration	Key risk issues and justification	Scoped into assessment?
1% or more of any lower sensitivity habitat	Most of the intertidal area is comprised of intertidal sandy sediments (noting there are also areas of polychaete reef and mussel bed, as set out above). In the subtidal environment, the habitats are expected to comprise subtidal soft sediments, including sand, although site specific sampling is not available for this Environmental Statement (these data will be presented in the final application; see Volume 2, Chapter 2; Benthic subtidal and intertidal ecology of the Environmental Statement). As such, it has not been possible to calculate the proportion of lower sensitivity habitats affected within this water body, as such this has been screened in on a precautionary basis.	Yes – impact assessment required.

Biology – fish

1.4.2.5 The 'Clearing the Waters for All' scoping template provides a list of criteria which may impact fish species within relevant water bodies. Table 1.9 presents the specific risk information for biology fish receptors.

Table 1.9: Biology – fish risks for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Is in an estuary and could affect fish in the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	The activity is not located within an estuary and is not likely to delay or prevent fish from entering or migrating through the North Wales water body. Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement predicted that installation or operation of the export cables would not significantly affect fish and shellfish populations, in particular migration of diadromous fish species migrating to/from estuarine habitats.	No – impact assessment not required.
Could impact on normal fish behaviour like movement, migration or spawning (for example by creating a physical barrier, noise, chemical change or a change in depth or flow)	The installation and operation of the offshore export cable beneath the seabed will not cause a change in depth or flow and will not create a physical barrier. The activity does not include a discharge pipe or outfall, and therefore no chemicals will be released into the marine environment that could cause a chemical change. Some noise is expected to be generated as a result of trenchless intertidal cable installation, but the magnitude is not likely to constitute an impact upon normal fish behaviour. Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement predicted that installation or operation of the export cables would not significantly affect fish and shellfish movement, migration or spawning within this WFD waterbody.	No – impact assessment not required.
Could cause entrainment or impingement of fish	The activity will not cause entrainment or impingement of fish.	No – impact assessment not required.

Water quality

1.4.2.6 Table 1.10 provides the specific risk information for water quality receptors.

Table 1.10: Water quality risks for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Could affect water clarity, temperature, salinity, oxygen levels nutrients or microbial patterns continuously for longer than a spring-neap tidal cycle (approximately 14 days).	On the advice of NRW a potential temperature increase from the offshore export cable during the operations and maintenance phase will be considered further. The resuspension of sediments into the water column would result in a short-term increase in SSC and reduction of clarity as a result of construction activities, such as sandwave clearance and cable installation. The methods used for installation would affect the amount of sediment displaced, but the impacts are anticipated to be localised and short lived. SSC would not disperse to a significant level outside the footprint of the activities. A full assessment of sediment displacement is presented in Volume 2, Chapter 1: Physical processes of the Environmental Statement, and an assessment of the potential effects of increased SSC upon benthic ecology receptors is presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement.	Yes – impact assessment required.
Is in a waterbody with a phytoplankton status of moderate, poor or bad	This waterbody was assigned a phytoplankton status of moderate in the most recent Classification Cycle (Cycle 3: 2021).	Yes – impact assessment required.
Is in a waterbody with a history of harmful algae	This water body does not have a history of harmful algae.	No – impact assessment not required.
Release or use of chemicals which are on the EQSD list	This activity does not involve the release of chemicals and the only substance expected to be used is bentonite, during trenchless installation of offshore export cables below the intertidal area. Bentonite is an inert, non-toxic, natural clay mineral (<63 μm particle diameter) which is not on the EQSD list. Bentonite is included in the Cefas List of Notified Chemicals approved for use and discharge into the marine environment and is classified as a group E substance under the Offshore Chemical Notification Scheme (OCNS) (Cefas, 2022). Group E substances are the group least likely to cause environmental harm and are readily biodegradable and do not bioaccumulate. Bentonite is also included on the OSPAR List of Substances Used and Discharged Offshore which are Considered to Pose Little or No Risk to the Environment (PLONOR) (OSPAR, 2019). Any potential risk of accidental release of contaminants will be minimised through the implementation of EMP during the construction, and operations and maintenance phases (see paragraph 1.2.2.6). No deterioration of the status of any sites designated under the WFD is therefore anticipated from the use of bentonite.	No – impact assessment not required.
Disturbance of sediment with contaminants above Cefas Action Level 1	Sediment sampling has been conducted throughout the Mona Offshore Cable Corridor and Access Areas and the Mona Array Area, and no contaminants were observed to exceed Cefas Action Level 1 within the North Wales water body. Full details of sediment contamination analyses are presented in Volume 6, Annex 2.1: Benthic subtidal and intertidal ecology technical report of the Environmental Statement.	No – impact assessment not required. However, this impact will be retained for assessment as this was undertaken as part of the PEIR.

Consideration	Key risk issues and justification	Scoped into assessment?
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the EQSD list.	The activity does not include a discharge pipe or outfall, and therefore no chemicals will be released into the marine environment.	No – impact assessment not required.

Protected areas

1.4.2.7 The WFD assessment considers if WFD protected areas, as outlined in paragraph 1.3.2.15 are at risk from the proposed activity. Table 1.11 presents the specific risk information for WFD protected areas.

Table 1.11: WFD protected areas for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Within 2 km of any WFD protected area.	The 2 km buffer for the activity contains or overlaps with: • One SPA: Liverpool Bay/Bae Lerpŵl • One SAC: Y Fenai a Bae Conwy/Menai Strait and Conwy Bay • One designated bathing water: Abergele (Pensarn). No shellfish waters, Nutrient Sensitive Areas (under the Urban Waste Water Treatment Directive), Nitrate Vulnerable Zones (polluted or sensitive) or Drinking Water Protected Areas (Surface and Ground) are located within 2 km of the activity.	Yes – impact assessment required.

INNS

1.4.2.8 Table 1.12 outlines the INNS risk the proposed development.

Table 1.12: Invasive non-native species risks for the North Wales water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Potential to introduce or spread INNS	The risk of introduction and spread of INNS to benthic ecology receptors has been assessed as minor (Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement), and there is little evidence of adverse effects on fish and shellfish receptors resulting from colonisation of other offshore wind farms by INNS (Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement). Furthermore, adoption of an Environmental Management (EMP), including actions to minimise INNS, aims to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable.	No – impact assessment not required.

1.4.3 Transitional waterbodies scoping

1.4.3.1 This section details the scoping assessment for the identified transitional WFD waterbody, with a summary of the results of scoping for consideration in the impact assessment presented in Table 1.19.

1.4.3.2 As well as the receptors identified in the 'Clearing the Waters for All' guidance, NRW advise that EMF and heat produced by offshore export cables are scoped in for assessment.

Clwyd water body

Hydromorphology

Table 1.13: Hydromorphology risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Could impact on the Hydromorphology (for example morphology or tidal patterns) of a waterbody at high status	The hydromorphology status of the Clwyd water body has been classified as 'not high'.	No – impact assessment not required.
Could significantly impact the Hydromorphology of any waterbody	The assessment of physical processes numerical modelling presented within Volume 2, Chapter 1: Physical processes of the Environmental Statement indicates that hydromorphology would not be significantly impacted by the proposed activity, particularly given the large distance between the offshore export cable and this WFD waterbody.	No – impact assessment not required.
Waterbody is heavily modified for the same use as the proposed activity	The Clwyd water body has been designated as a heavily modified water body for the purposes of coastal protection (NRW, 2018a).	No – impact assessment not required.

Consideration	Key risk issues and justification	Scoped into assessment?
	This designation is not for the same use as the proposed activity, and the activity does not overlap with this water body.	

Biology – habitats

Table 1.14: Biology – habitats risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
0.5 km^2 or greater	The proposed activity does not lie within the Clwyd water body, therefore its size in this context is not relevant to this assessment.	No – impact assessment not required.
1% or more of the waterbody's area	The proposed activity does not lie within the Clwyd water body, therefore its size as a percentage of the water body in this context is not relevant to this assessment.	No – impact assessment not required.
Within 500 m of any higher sensitivity habitat	The proposed activity does not lie within 500 m of the Clwyd waterbody, and therefore does not lie within 500 m of higher sensitivity habitat contained with this water body.	No – impact assessment not required.
1% or more of any lower sensitivity habitat	The proposed activity does not lie within the Clwyd water body, therefore its size as a percentage of lower sensitivity habitat in this context is not relevant to this assessment.	No – impact assessment not required.

Biology – fish

Table 1.15: Biology – fisk risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Could affect fish in the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	The activity is not located within an estuary, but the Clwyd water body is an estuary. The activity will not delay or prevent fish from entering or migrating through the Clwyd water body. Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement predicted that installation or operation of the export cables would not significantly affect fish and shellfish movement, migration or spawning within this WFD waterbody.	No – impact assessment not required.
Could impact on normal fish behaviour like movement, migration or spawning (for example by creating a physical barrier, noise, chemical change or a change in depth or flow)	The presence of the offshore export cable beneath the seabed will not cause a change in depth or flow and will not create a physical barrier to the Clwyd water body. The activity does not include a discharge pipe or outfall, and therefore no chemicals will be released into the marine environment that could cause a chemical change. Some noise is expected to be generated as a result of trenchless intertidal cable installation, but given the distance to	No – impact assessment not required.

Consideration	Key risk issues and justification	Scoped into assessment?
	this water body, the magnitude is not likely to constitute an impact upon normal fish behaviour. Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement predicted that installation or operation of the export cables would not significantly affect fish and shellfish movement, migration or spawning within this WFD waterbody.	
Could cause entrainment or impingement of fish	The activity will not cause entrainment or impingement of fish.	No – impact assessment not required.

Water quality

Table 1.16: Water quality risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Could affect water clarity, temperature, salinity, oxygen levels nutrients or microbial patterns continuously for longer than a spring-neap tidal cycle (approximately 14 days).	Given the distance of the Clwyd water body from the proposed activity it is not anticipated that the temperature or salinity would be affected as a result of offshore export cable installation activities. The resuspension of sediments into the water column would result in a short-term increase in SSC and reduction of clarity as a result of construction activities, such as sandwave clearance and cable installation. The methods used for installation would affect the amount of sediment displaced, but the impacts are anticipated to be localised and short lived. SSC would not disperse to a significant level outside the footprint of the activities and is therefore unlikely to affect water quality in the Clwyd water body. A full assessment of sediment displacement is presented in Volume 2, Chapter 1: Physical processes of the Environmental Statement, and an assessment of the potential effects of increased SSC upon benthic ecology receptors is presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement.	No – impact assessment not required.
Is in a waterbody with a phytoplankton status of moderate, poor or bad	The proposed activity does not lie within the Clwyd water body, therefore the phytoplankton status of the water body in this context is not relevant to this assessment.	No – impact assessment not required.
Is in a waterbody with a history of harmful algae	The Clwyd water body does not have a history of harmful algae.	No – impact assessment not required.
Release or use of chemicals which are on the EQSD list	This activity does not involve the release of chemicals and the only substance expected to be used is bentonite, during trenchless installation of offshore export cables below the intertidal area. Bentonite is an inert, non-toxic, natural clay mineral (<63 µm particle diameter) which is not on the EQSD list. Bentonite is included in the Cefas List of Notified Chemicals approved for use and discharge into the marine environment and is classified as a group E substance under the Offshore Chemical Notification Scheme (OCNS) (Cefas, 2022). Group E	No – impact assessment not required.

Consideration	Key risk issues and justification	Scoped into assessment?
	substances are the group least likely to cause environmental harm and are readily biodegradable and do not bioaccumulate. Bentonite is also included on the OSPAR List of Substances Used and Discharged Offshore which are Considered to PLONOR (OSPAR, 2019). Any potential risk of accidental release of contaminants will be minimised through the implementation of EMP during the construction, and operations and maintenance phases (see paragraph 1.2.2.6). No deterioration of the status of any sites designated under the WFD is therefore anticipated from the use of bentonite.	
Disturbance of sediment with contaminants above Cefas Action Level 1	Sediment contamination analysis has not been conducted within the water body as the footprint of the activity lies entirely outside the Clwyd water body.	No – impact assessment not required.
If your activity has a mixing zone (like a discharge pipeline or outfall) consider if the chemicals released are on the EQSD list.	The activity does not include a discharge pipe or outfall, and therefore no chemicals will be released into the marine environment.	No – impact assessment not required.

Protected areas

Table 1.17: Protected areas risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Within 2 km of any WFD protected area.	The activity is not within 2 km of any protected areas which overlap with the Clwyd water body.	No – impact assessment not required.

INNS

Table 1.18: Invasive non-native species risks for the Clwyd water body.

Consideration	Key risk issues and justification	Scoped into assessment?
Potential to introduce or spread INNS	The risk of introduction and spread of INNS to benthic ecology receptors has been assessed as minor (Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement), and there is little evidence of adverse effects on fish and shellfish receptors resulting from colonisation of other offshore wind farms by INNS (Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement). The distance between the Mona Offshore Cable Corridor and Access Areas and the Clwyd water body will also naturally reduce the likelihood of the introduction or spread of INNS. Furthermore, adoption of an Environmental Management Plan, including actions to minimise INNS, aims to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable.	No – impact assessment not required.

Summary of scoping

Table 1.19: Summary of scoping for WFD receptors in the North Wales coastal water body and the Clwyd transitional water body.

Receptor	Potential risk?	Reason/features affected	Risk issues for impact assessment
North Wales			
Hydromorphology	No	n/a	n/a
Biology – habitats	Yes	Footprint of activity up to 0.055 km^2 (i.e. < 0.5 km^2) but retained for assessment as it was included in the PEIR. Polychaete reef (specifically *Sabellaria* reef) and Mussel beds (specifically blue mussel) located in intertidal area in vicinity of Mona Offshore Cable Corridor and Access Areas. Where the Mona Offshore Cable Corridor and Access Areas crosses lower sensitivity habitat, this may constitute greater than 1% of that habitat in the WFD water body.	0.5 km^2 or greater Within 500 m of any higher sensitivity habitat. 1% or more of any lower sensitivity habitat.
Biology – fish	No	n/a	n/a
Water quality	Yes	The North Wales water body was assigned a phytoplankton status of moderate in Classification Cycle 3, 2021. Sediment contamination analysis has been conducted within the water body, and no contaminants were observed to exceed Cefas Action Level 1. However, this is retained for assessment as it was included in the PEIR.	Is in a waterbody with a phytoplankton status of moderate, poor or bad; Could affect water clarity, temperature, salinity, oxygen levels nutrients or microbial patterns for longer than a spring-neap tidal cycle.
Protected areas	Yes	Liverpool Bay/Bae Lerpŵl SPA Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC Abergele (Pensarn) designated bathing water	Within 2 km of any WFD protected area.
INNS	No	n/a	n/a
Clwyd			
Hydromorphology	No	n/a	n/a
Biology – habitats	No	n/a	n/a
Biology – fish	No	n/a	n/a
Water quality	No	n/a	n/a
Protected areas	No	n/a	n/a
INNS	No	n/a	n/a

1.5 Impact Assessment

1.5.1 Following 'Clearing the Waters for All' guidance

Biology - habitats

1.5.1.1 The seabed disturbance arising from installation of the offshore export cables in subtidal areas via open-cut trenching, including seabed preparation (sandwave clearance and boulder clearance), is expected to be a maximum of 0.055 km^2 which does not exceed the 0.5 km^2 threshold set by the 'Clearing the Waters for All' guidance. There is potential for more than 1% of any lower sensitivity habitat (see Table 1.8) within the North Wales water body to be affected by cable installation works, and this is predominantly expected to be 'intertidal and subtidal soft sediments like sand and mud'. However, since robust data on the spatial distribution of low sensitivity habitats across the whole of the North Wales water body is not available, an accurate calculation of the percentage that may be affected by the activity is not possible. Qualitatively, given the widespread nature of 'intertidal and subtidal soft sediments like sand and mud' within the North Wales water body, and the size of the North Wales water body (409.91 km^2), it is considered unlikely for the maximum footprint of the activity of 0.055 km^2 to exceed 1% of any lower sensitivity habitat.

1.5.1.2 The effect of seabed disturbance in the intertidal and subtidal areas of the Mona Offshore Cable Corridor and Access Areas is fully assessed in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement. Due to the fine-grained substrate, the habitat is expected to return to its previous state during the cable installation process with infilling of sediment, within a couple of tidal cycles, being driven by wave exposure and tidal currents. Benthic communities in these habitats have an overall **low** sensitivity to the disturbance associated with cable installation and are expected to recover within 2 to 10 years (or sooner) based on the life cycle traits of the characterising species. The impact of these activities was therefore assessed to be of **negligible adverse** significance and also does not represent a deterioration in the status of this WFD element of the North Wales water body. Moreover, installation of offshore export cables in the intertidal area will be undertaken via trenchless techniques, and there will subsequently be no direct impacts to habitats in the intertidal area.

1.5.1.3 The Mona Offshore Cable Corridor and Access Areas lies within 500 m of higher sensitivity habitat, as defined by the 'Clearing the Waters for All' guidance. The habitats concerned are 'Polychaete reef' and 'Mussel beds, including blue and horse mussel'. The characteristic species present are *S. alveolata* and blue mussel , respectively. Horse mussel *Modiolus modiolus*, as included in the habitat descriptor, is not present within 500 m of the Mona Offshore Cable Corridor and Access Areas.

1.5.1.4 One area of blue mussel bed was recorded in the west of the intertidal area near the boundary of the Mona Offshore Cable Corridor and Access Areas, and *S. alveolata* polychaete reef was observed in a continuous strip of approximately 700 m length to the south and west of the blue mussel bed (Figure 1.2). Three small patches of *S. alveolata* less than 1 m^2 in size were also observed in the middle of the Mona Offshore Cable Corridor and Access Areas, with all areas of higher sensitivity habitat being located within the intertidal area. The locations of these areas of higher sensitivity habitat with respect to the Mona Offshore Cable Corridor and Access Areas are presented in section 7.4.5 of Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement.

1.5.1.5 Measures will be adopted by the Mona Offshore Wind Project to reduce the direct impact on the intertidal *S. alveolata* reef, detailed in the benthic ecology chapter (Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement). As part of these measures during the construction a 50 m buffer around the reef has been proposed. Whilst the *S. alveolata* reef is located more than 250 m to the west of the intertidal part of the Mona Offshore Cable Corridor and Access Areas, it is approximately 28 m, at the nearest point, from the subtidal part of the Mona Offshore Cable Corridor and Access Areas. Therefore, this measure has been included on a precautionary basis to ensure that direct impacts (e.g. habitat loss or disturbance) to the ecologically sensitive and nationally protected *S. alveolata* reef will be avoided.. An ECoW would also be on site during planned construction to ensure that all planned works within the intertidal are undertaken in line with the primary measure adopted to avoid the *S. alveolata* reef and the blue mussel bed..

1.5.1.6 Abrasion to blue mussel beds can result in mussels being crushed or to their byssus threads becoming weakened or broken, making them vulnerable to displacement (Denny, 1987) and reducing overall survival, and recovery cannot occur until the source of abrasion has ceased.

1.5.1.7 Blue mussel often occur in areas of high suspended sediment and as filter feeders they are adapted to temporary increases in suspended sediment concentration (SSC). Burial of blue mussel beds by large-scale movements of sand and resultant mortalities have been reported from Morecambe Bay, the Cumbrian coast and Solway Firth (Holt *et al*., 1998). Burial experiments by Last *et al.* (2011) found that 16% of buried mussels died after 16 days, compared to almost 50% mortality at 32 days. The continual actions of the tide and waves removing sediment, as well as the ability of mussels to move to the surface, may prevent mortality in the short term following smothering events.

1.5.1.8 Cable installation and operation, however, is likely to have a reduced impact on this habitat because the boundary of the Mona Offshore Cable Corridor and Access Areas has been delineated to avoid the blue mussel bed described in paragraph 1.5.1.4. Moreover, due to the location of the blue mussel bed to the south of the *S. alveolata reef*, this measure will ensure that direct impacts to this feature are also avoided.

1.5.1.9 A full assessment of the impact of the project on *S. alveolata* and blue mussel is presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement. Effects upon these higher sensitivity intertidal habitats were considered during the construction, operations and maintenance and decommissioning phases.

1.5.1.10 The effects of construction were predicted to be of local spatial extent, short term duration, intermittent and of high reversibility. It was predicted that the impact would affect the receptor directly, and the magnitude was considered to be **low**. *S. alveolata* reefs and blue mussel beds were deemed to be of low vulnerability, medium recoverability and national value. The sensitivity of the receptor was therefore, considered to be **medium**.

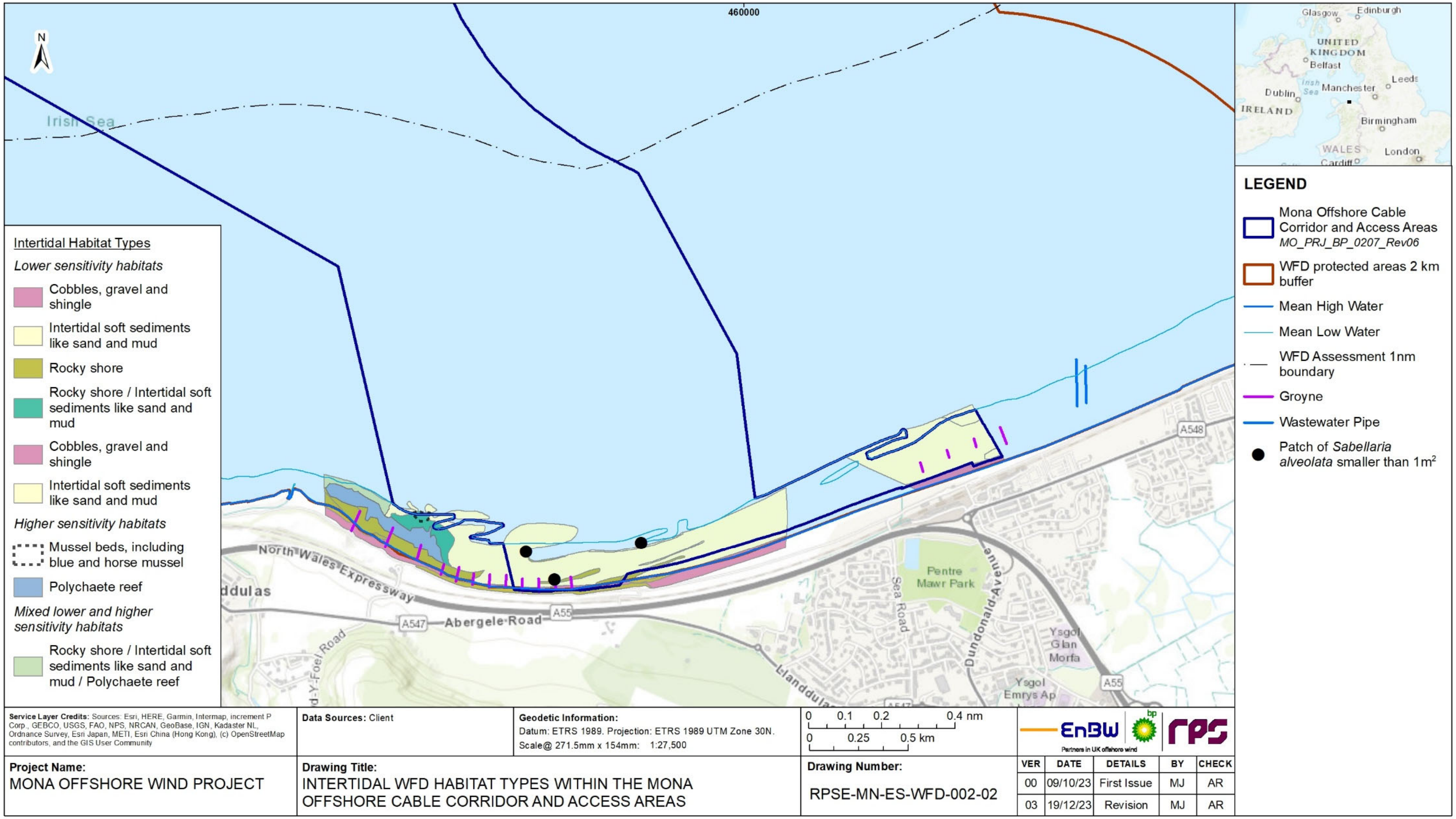


Figure 1.2: Intertidal WFD habitat types within the Mona Offshore Cable Corridor and Access Areas.

1.5.1.11 Overall, the effect of the construction of the offshore export cable on these habitats will be of **minor adverse** significance, which is not significant in EIA terms, and effects during operations and maintenance and decommissioning are expected to be lower still.

1.5.1.12 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cable and landfall works is not predicted to cause a deterioration in the status of the North Wales waterbody with respect to biology – habitats. It is therefore considered, in this respect, to be compliant with the requirements of the WFD.

Water quality

1.5.1.13 The Mona Offshore Cable Corridor and Access Areas crosses the North Wales coastal waterbody and consideration of the potential for a deterioration in water quality within this waterbody is required. Specifically, this includes the potential for the effects of this activity to cause an increase in SSC, nutrients, dissolved oxygen (DO) or bacterial concentrations, over periods greater than a spring-neap tidal cycle (approximately 14 days) and to detrimentally affect the North Wales waterbody Classification Cycle 3 (2021) 'moderate' phytoplankton status. Phytoplankton is not considered to be vulnerable to cable installation or operation or other activities associated with offshore wind farm development, however this has been scoped in due to the 'moderate' phytoplankton status of this waterbody, as outlined in section 1.4 above.

1.5.1.14 Seabed disturbance and an increase in SSC associated with the construction of the offshore export cable and landfall works may introduce the potential for a reduction in water quality and may cause sediment bound contaminants to be released into the water column.

1.5.1.15 An increase in SSC may additionally lead to an increase in bacterial counts within the water column, the level of which is a determinant of water quality at designated bathing waters. The presence of live bacteria, including *E.coli* and intestinal enterococci, is strongly influenced by the amount of UV light penetrating the water column. Under lower UV scenarios, as occurs when SSC is high, survival of bacterium may increase.

1.5.1.16 When nutrient loading or water turbidity (as a result of increased SSC, for instance) is high phytoplankton blooms may occur, after which phytoplankton will die. Bacteria and other decomposer organisms then break down this organic matter and dissolved oxygen (DO) levels may become reduced. The Abergele (Pensarn) bathing water is located approximately 1 km to the east of the Mona Offshore Cable Corridor and Access Areas and does not have a history of phytoplankton blooms (NRW, 2022c). No nutrients are anticipated to be released in significant concentrations from the seabed as a result of this activity, beyond those expected in typical storm conditions. There are no outfalls or discharges associated with the project so the proposed activities are not expected to cause a reduction in DO in the water column.

1.5.1.17 Numerical modelling of SSC indicated that increases in SSC will be greatest close to the site of subtidal cable installation, reducing in magnitude at a range of a few hundred metres from the cable, and falling to background levels at a range of a few kilometres. The effects of increased SSC are expected to be temporary, short-term and intermittent over a 14-day spring/neap tidal cycle. The limited spatial range and short-term potential increase in SSC is therefore not expected to promote conditions that may induce the growth of phytoplankton.

1.5.1.18 The release of sediment-bound contaminants has been scoped into the Environmental Statement WFD assessment as a precautionary approach because sampling of sediments had not been conducted within the North Wales water body before submission of the PEIR. Site-specific analysis of sediment-bound contaminants has subsequently been undertaken, and no contaminants were found to exceed Cefas Action Level 1 at any sampling locations within the North Wales water body.

1.5.1.19 As outlined above, in subtidal areas, increases in SSC and subsequent sediment deposition will be highest in the immediate vicinity of the works, and the release of contaminants from the small proportion of fine sediments is likely to be rapidly dispersed and diluted with the tide. Increased bioavailability of contaminants resulting in adverse eco-toxicological effects is therefore not expected, given the low concentration of contaminants at sampling sites within the North Wales water body, relatively low volumes of sediment disturbed, the temporary nature of the works and the high dilution and dispersion potential in this part of the Irish Sea.

1.5.1.20 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cable and landfall works is not predicted to cause a deterioration in the status of the North Wales waterbody with respect to water quality. Increased SSC is expected to disperse rapidly at distances of hundreds of metres from cable installation works, phytoplankton is not expected to bloom in response to nutrient availability or increased SSC, and sediment-bound contaminants are not likely to increase in bioavailability or eco-toxicological effects. The effects of the activity are therefore expected to be of **negligible** significance, which is not significant in EIA terms. The Mona Offshore Wind Project is therefore considered, in this respect, to be compliant with the requirements of the WFD.

Protected areas

1.5.1.21 The Mona Offshore Cable Corridor and Access Areas lies within 2 km of three WFD protected areas:

- Liverpool Bay/Bae Lerpŵl SPA
- Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC
- Abergele (Pensarn) bathing water.

1.5.1.22 A detailed assessment has been undertaken on all SAC and SPAs within the Mona Habitats Regulations Assessment Stage 2 Information to Inform an Appropriate Assessment. This provides screening for Likely Significant Effects and for those sites screened in, a detailed assessment in order to determine whether there will be any Adverse Effect on Integrity (AEoI) for the project alone or in-combination with other plans or projects. No AEoI has been identified for any of the SAC, SPA or Ramsar sites identified in this WFD Assessment.

1.5.1.23 As outlined in paragraph 1.5.1.13 water-borne *E. coli* and intestinal enterococci are not expected to increase as a result of the activity to a level that would reduce the status of a designated bathing water.

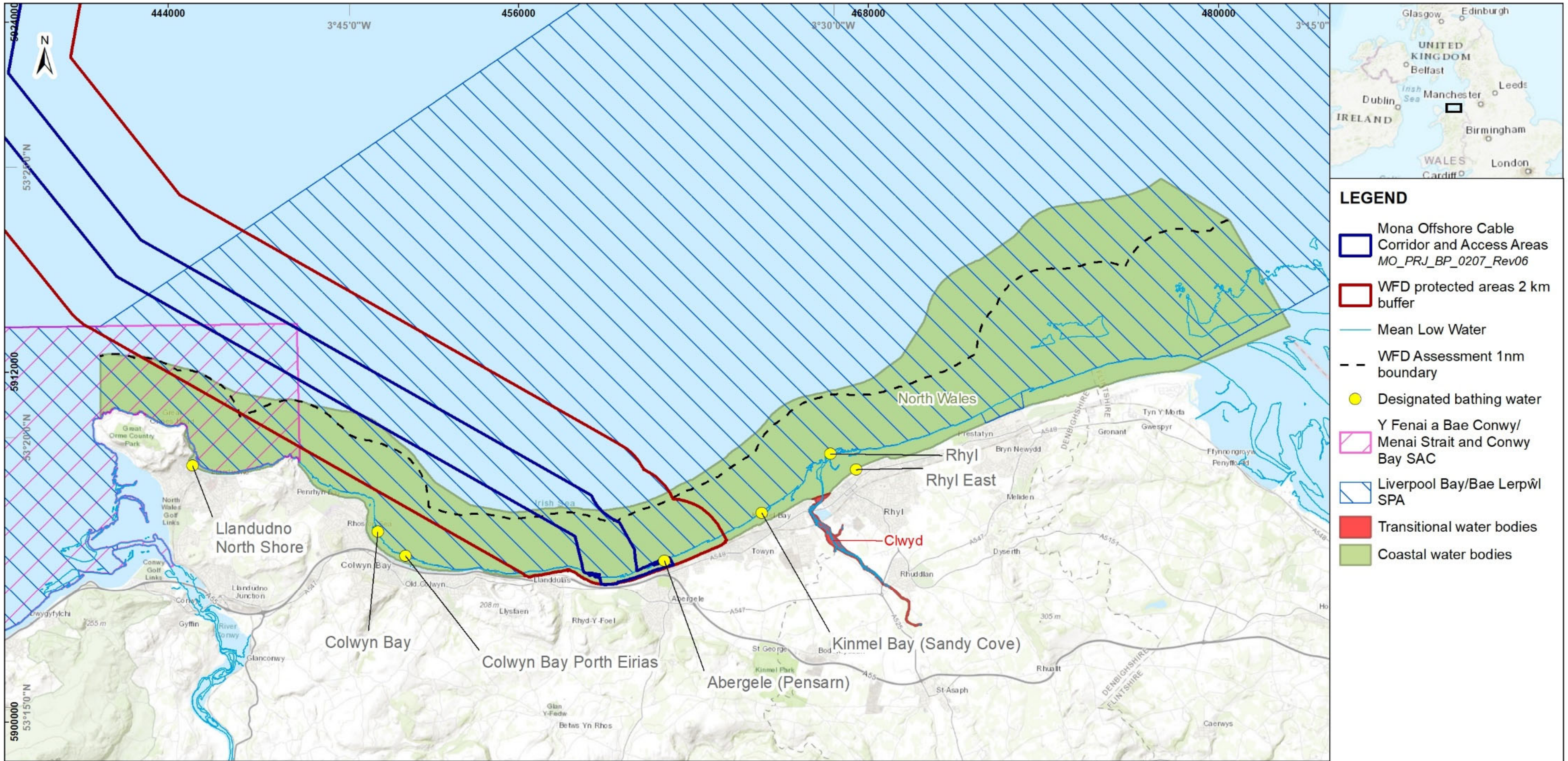
1.5.1.24 The Abergele (Pensarn) bathing water is located approximately 1 km to the east of the Mona Offshore Cable Corridor and Access Areas and received a status of ‘sufficient’ in 2021 (the most recent classification year). The status of this bathing water was also ‘sufficient’ in 2020 and 2019, which was a deterioration from its ‘good’ status in 2018.

1.5.1.25 Kinmel Bay Sewage Treatment Works discharges treated effluent through a 4 km outfall pipe and modelling indicates that discharge should not impact water quality near to the bathing water (NRW, 2022c). During storm events Llanddulas Sewage Pumping

Station discharges to the coastal waters 3.5 km west of Pensarn, which may have the potential to increase bacterial contamination of sediments in the vicinity.

1.5.1.26 Open cut trenching for cable installation in the subtidal may disturb sediment but works within the 1 nm WFD assessment boundary would occur in shallow water (i.e. <6 m) where the potential for sediment resuspension would be minimal. Furthermore, deposition of suspended sediment would occur during and immediately after cable installation, and SSC would reduce rapidly with distance from the cable installation site (as discussed above). Any increase in SSC (and potential bacterial contaminants) associated with cable installation will be temporary, intermittent and highly reversible and deterioration of bathing water quality is unlikely.

1.5.1.27 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cables and landfall works is not predicted to cause a deterioration in the status of the North Wales waterbody with respect to WFD protected areas. It is therefore considered, in this respect, to be compliant with the requirements of the WFD.



Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community	**Data Sources:** Client, NRW, JNCC	**Geodetic Information:** Datum: ETRS 1989. Projection: ETRS 1989 UTM Zone 30N. Scale@ 271.5mm x 154mm: 1:200,000	0 0.5 1 2 3 nm; 0 1 2 4 6 km	EnBW bp rps
Project Name: MONA OFFSHORE WIND PROJECT	**Drawing Title:** WFD WATER BODIES, 1NM COASTAL WATERS ASSESSMENT BOUNDARY AND WFD PROTECTED AREAS RELEVANT TO THE MONA OFFSHORE CABLE CORRIDOR AND ACCESS AREAS	**Drawing Number:** RPSE-MN-ES-WFD-001-03		

VER	DATE	DETAILS	BY	CHECK
00	09/10/23	First Issue	MJ	AR
03	19/12/23	Revision	MJ	AR

Figure 1.3: WFD water bodies, 1nm coastal waters assessment boundary and WFD protected areas relevant to the Mona Offshore Cable Corridor and Access Areas.

1.5.2 NRW consultation advice

1.5.2.1 Assessment of the effects of EMF and heat generated by offshore export cables has been conducted on the advice of NRW, and as part of the consultation process (Table 1.1). As these impacts do not form part of the standard guidance provided in 'Clearing the Waters for All' a summary of the assessments from Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement is presented below to provide additional detail.

EMF generated by offshore export cables

1.5.2.2 A full assessment of the potential effects of EMF on benthic communities is presented in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and on fish and shellfish communities in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement, and the following is a summary of these assessments.

1.5.2.3 EMF comprises both the electrical fields, measured in volts per metre (V/m), and the magnetic fields, measured in microtesla (μT) or milligauss (mG).

1.5.2.4 Gill and Desender (2020) acknowledged that relatively little is known about the effects of EMF on invertebrates such as those common in benthic and demersal communities. This is supported by a recent evaluation which concluded that no direct impact on invertebrate survival has been identified (Hervé, 2021).

1.5.2.5 A variety of design and installation factors affect EMF levels in the vicinity of the cables. These include current flow, number and distance between cables, cable insulation, configuration of cable and burial depth. Cable burial reduces the magnetic field at the seabed due to the distance between the cable and the seabed surface (CSA, 2019). However, it is not considered practical to bury cables at depths that would reduce the magnitude of EMF to below a level that could be detected by organisms that live on or close to the seabed (Gill *et al*., 2005; Gill *et al.,* 2009). The magnetic field is about 10 μT/m for a cable buried 1.5 m in the seabed (Hutchison *et al*., 2021).

1.5.2.6 The strength of the magnetic field (and induced electrical fields) decreases rapidly with distance from source. Inter-array and export cables buried at depths between 1 m to 2 m reduces the magnetic field at the seabed surface four-fold (CSA, 2019). For unburied cables that are instead protected by concrete mattresses or rock berms, the field levels were found to be similar to buried cables.

1.5.2.7 Directly above the cable, EMF decreases with distance from the seafloor to 1 m above the cable, while laterally, magnetic fields at 3 m along the seafloor and at 1 m above the seafloor are comparable. A summary of the relationship between voltage, current, and burial depth is presented in Table 1.20.

Table 1.20: Typical EMF levels over AC undersea power cables from offshore wind energy projects (CSA, 2019).

Power Cable Type	Magnetic Field Levels (mG)			
	Directly Above Cable		3 to 7.5 m laterally away from cable	
	1 m above seafloor	At seafloor	1 m above seafloor	At seafloor
Inter-Array	5 to 15	20 to 65	<0.1 to 7	<0.1 to 10
Export Cable	10 to 40	20 to 165	<0.1 to 12	1 to 15
Power Cable Type	**Induced Field Levels (mG)**			
	Directly Above Cable		**3 to 7.5 m laterally away from cable**	
	1 m above seafloor	At seafloor	1 m above seafloor	At seafloor
Inter-Array	0.1 to 1.2	1.0 to 1.7	0.01 to 0.9	0.01 to 1.1
Export Cable	0.2 to 2.0	1.9 to 3.7	0.02 to 1.1	0.04 to 1.3

1.5.2.8 The EMF which reaches the seabed is measurable at biologically relevant levels (Hutchinson *et al*., 2020). Reported sensitivities to electric fields for invertebrates range from around 3 mV/cm to 20 mV/cm (Steullet *et al.,* 2007). Normandeau (2011) summarised that, despite these sensitivities, no direct evidence of impacts to invertebrates from undersea cable EMFs exists.

1.5.2.9 A number of fish, shellfish and other marine invertebrate species are able to detect electromagnetic fields. Studies examining the effects of EMF from AC undersea power cables on fish behaviours have been conducted to determine the thresholds for detection and response to EMF.

1.5.2.10 Responses vary between species with some exhibiting no response (Kempster and Colin, 2011; Kempster *et al*., 2013; Cresci *et al.,* 2020; Cresci *et al*., 2022), while others show some evidence of behavioural responses, albeit these have been shown to be inconsistent (Vattenfall, 2006; Gill *et al.,* 2009; Gill and Taylor, 2001).

1.5.2.11 Diadromous species including river lamprey, sea lamprey, European eel, and Atlantic salmon may be sensitive to EMF (Gill *et al*., 2005; CSA, 2019) and there is evidence of detection of EMF by European eel through the lateral line (Moore and Riley, 2009). However, studies have concluded that although these species can detect EMFs from power cables, these are unlikely to lead to significant effects on migration, including disruption or delay to migration to and from estuarine or freshwater habitats.

1.5.2.12 It is uncertain whether commercially important Crustacea, including lobster and crab, would respond to magnetic fields. Shellfish which also inhabit the sea floor may be more sensitive to EMF, and exposure may affect physiological processes, for example varying egg volumes and smaller larvae have been recorded in edible crab (Scott *et al*., 2018) and European lobster (Scott *et al*., 2020, Harsanyi *et al*., 2022).

1.5.2.13 Crab movement is unaffected by proximity to undersea AC power cables (buried and unburied), indicating crab are not attracted to or repelled by them (Love *et al*., 2017). Dungeness crab and edible crab have shown increased activity when compared to crab that were not exposed to EMF (Scott *et al*., 2018; Woodruff *et al*., 2012), and may spend less time buried; a predator avoidance behaviour (Rosaria and Martin, 2010). However, many of these studies were undertaken using magnetic and electrical field strengths that were much higher that would typically be expected for a buried cable and recommendations from these studies have suggested that power cables should be buried to ensure any potential effects are avoided or minimised (Scott, 2019; Scott, 2020).

1.5.2.14 No neurological response was found in European lobster when exposed to magnetic field strengths considerably higher than those commonly used for subtidal power transmission (Ueno *et al*., 1986; Normandeau Associates, 2011). Hutchison *et al*. (2018) also observed that exposure to direct current (DC) and AC fields from a buried cable did not cause a barrier to movement or migration in American lobster.

1.5.2.15 Experimental evidence has demonstrated that exposure to EMF did not change the distribution of ragworm *Hediste diversicolor* (Jakubowska *et al.,* 2019), although there is evidence of magnetoreception in marine molluscs and arthropods (Normandeau Associates, 2011).

1.5.2.16 In summary, the range over which fish, shellfish and other marine invertebrate species can detect electric fields is closely related to the proximity of the individual to the source, and is limited to centimetres, to a small number of metres, from the buried cable (CSA, 2019).

1.5.2.17 Pelagic species generally swim well above the seafloor and are expected to rarely be exposed to EMF from buried power cables, resulting in impacts that would be localised and transient. Demersal fish species that dwell on the seabed will be closer to undersea power cables and thus encounter higher EMF levels.

1.5.2.18 Demersal species and shellfish are also likely to be exposed for longer periods of time and may be spatially constrained. However, the rapid decay of EMF with horizontal distance (Bochert and Zettler, 2006) (i.e. within metres) minimises the extent of potential impacts.

1.5.2.19 Based upon assessment of the impact of EMF in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement, the impact of EMF is predicted to be of local spatial extent, long term duration, continuous and high reversibility, and the magnitude is considered to be **negligible**. Fish and shellfish species are of low to medium vulnerability, high recoverability and of local to international importance. Benthic ecology receptors are considered to be of low vulnerability and national to international importance. The sensitivity of fish and shellfish and benthic ecology receptors is considered to be **low**. Overall, the effect has been assessed to be of **negligible** significance, which is not significant in EIA terms.

1.5.2.20 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cables and landfall works is not predicted to cause a deterioration in the status of the North Wales waterbody with respect to EMF generated by offshore export cables. It is therefore considered, in this respect, to be compliant with the requirements of the WFD.

Heat generated by offshore export cables

1.5.2.21 A full assessment of the potential effects of heat generated by offshore export cables on benthic communities is presented in Volume 2, Chapter 2: Benthic ecology of the Environmental Statement, and the following is a summary of these assessments.

1.5.2.22 The presence and operation of offshore export cables may lead to localised heating of the seabed, affecting benthic subtidal and intertidal receptors. Submarine power cables generate heat by energy loss as electrical currents flow and leads to the heating of the cable surface and the warming of the surrounding environment. High voltage cables are used to minimise the amount of energy lost as heat, which in turn minimises the environmental warming effect.

1.5.2.23 Where submarine power cables are buried, the surrounding sediment may be heated. The cables, however, have negligible capability to heat the overlying water column because of the very high heat capacity of water. There is little research on the heat dissipation effect resulting from subsea cables in the field or its effect on benthic receptors. Meißner *et al*. (2007) tested the difference in sediment temperature between a control site and a site 25 cm away from the cable for Nysted Offshore Windfarm in Denmark. Results showed a 2 ^{o}C maximum difference between sites, with a mean difference of 1^{o}C. Similar results were recorded for a High Voltage Alternating Current (HVAC) 33 kV cable and HVAC 132 kV cable (low- and high-voltage cables, respectively) (Meißner *et al*., 2007).

1.5.2.24 The impact of seabed temperature rise as a result of buried cables has also been considered during a project to bury a submarine High Voltage Direct Current cable between New England and Long Island, New York. The project estimated that the rise in temperature at the seabed immediately above the buried cable to be just 0.19^{o}C (BERR, 2008). The seasonal temperature range in the Irish Sea is 11^{o}C – 15^{o}C (Howarth, 2004), therefore any change similar to those observed by the previously described studies would fall well within the natural seasonal variation of this region. Furthermore, the effects of climate change are likely to result in higher average temperatures being the norm.

1.5.2.25 A number of environmental factors influence the way that heat from subsea cables dissipates, one of them being the nature of sediment in which the cable is buried. A lab-based study by Emeana *et al.* (2016) investigated the thermal regime around high voltage submarine cables using a heat source in a large tank to simulate seafloor conditions. When the heat source was buried in fine clay/silt sediments it had a conductive heat transfer mode, only raising temperatures in the immediate radius of the cable. When the heat source was buried in fine permeable sands they observed convective heat transfer when the surface of the heat source reached 20^{o}C above the ambient temperature. When the heat source was buried at 1 m this resulted in temperature change up to 1 m above the heat source. In coarse sands convection occurred at lower temperature (>9^{o}C) and increases in fluid temp were detectable more than 1 m above the heat source. This study however was conducted in a laboratory without the influence of water flow which, in an offshore environment, would quickly dissipate the effects of heat emissions (Worzyk, 2009).

1.5.2.26 During the operations phase of the Mona Offshore Wind Project there will be up to 360 km of 275 kV HVAC export cable (<20 km of which would be installed within the North Wales water body), for which the minimum burial depth will be 0.5 m.

1.5.2.27 The species that characterise the benthic communities within the footprint of the activity are adaptable to the small temperature increases expected to occur in the immediate vicinity of the installed, operational cable, and unlikely to be adversely affected to change of the magnitude described above.

1.5.2.28 Based upon the assessment detailed in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement, and taking a precautionary approach, the impact of heat generated by offshore export cables is predicted to be of local spatial extent, long term duration, continuous and high reversibility, and the magnitude is considered to be **negligible**. The sensitivity of benthic ecology receptors is **low**, and the significance of this impact is **negligible adverse**, which is not significant in EIA terms.

1.5.2.29 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cables and landfall works is not predicted to cause a deterioration in the status of the North Wales waterbody with respect to heat generated by offshore export cables. The Mona Offshore Wind Project therefore considered, in this respect, to be compliant with the requirements of the WFD.

1.6 Summary

1.6.1.1 Based on the WFD Scoping presented in section 1.4 and the assessment of effect presented in section 1.5 there is no potential for deterioration of the two WFD water bodies identified in section 1.3.4, nor the individual elements of these water bodies. In most instances, the relevant activities for the construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project export cables and landfall works have been scoped out of the assessment as they are below the thresholds set by the 'Clearing the Waters for All' guidance.

1.6.1.2 With respect to the 'Biology – habitats' receptor, the criteria which determine whether an assessment of effects is required were met for being "*0.5 km^2 or greater*", occurring "*within 500 m of any higher sensitivity habitat*" and potentially affecting "*1% or more of any lower sensitivity habitat*".

1.6.1.3 The installation of offshore export cables may create seabed disturbance at a maximum of 0.64 km^2, with potential for lower sensitivity intertidal and subtidal soft sediments like sand and mud to be affected. The habitats and benthic communities are expected to recover rapidly following cessation of works, and the impact of these activities was assessed in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement to be of **negligible adverse** significance and also does not represent a deterioration in the status of this WFD element of the North Wales water body.

1.6.1.4 Overall, the effect of the construction and decommissioning of the offshore export cable on these habitats, taking account of designed-in mitigation measures, was assessed to be of **negligible adverse** significance in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and also does not represent a deterioration in the status of this WFD element of the North Wales water body.

1.6.1.5 In the context of water quality, two criteria were met by the activity for scoping impacts into the assessment. The activity "*is in a waterbody with a phytoplankton status of moderate, poor or bad*" and a precautionary approach was also taken as sediment sampling was not conducted in the North Wales WFD water body so "*disturbance of sediment with contaminants above Cefas Action Level 1*" could not be ruled out.

1.6.1.6 Increased SSC from cable installation and decommissioning was expected to disperse rapidly at distances of hundreds of metres from cable installation works, phytoplankton was not expected to bloom in response to nutrient availability, and sediment-bound contaminants were not considered likely to increase in bioavailability or eco-toxicological effects. The effects of the activity were therefore assessed to be of **negligible adverse** significance in Volume 2, Chapter 2: Benthic subtidal and intertidal ecology of the Environmental Statement and also does not represent a deterioration in the status of this WFD element of the North Wales water body.

1.6.1.7 The Mona Offshore Cable Corridor and Access Areas lies "w*ithin 2 km of any WFD protected area*", as defined by the 'Clearing the Waters for All' guidance: Liverpool Bay/Bae Lerpŵl SPA, Y Fenai a Bae Conwy/Menai Strait and Conwy Bay SAC and Abergele (Pensarn) bathing water. The qualifying features of the SPA and SAC, and the parameters for classification of the bathing water, have the potential to be impacted by the activities, particularly during the construction and decommissioning phases.

1.6.1.8 The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project offshore export cables and landfall works was not predicted to jeopardise the conservation objectives of the scoped-in WFD protected areas. The effects of the activity were therefore not predicted to represent a deterioration in the status of this WFD element of the North Wales water body.

1.6.1.9 Following consultation advice from NRW the effects of EMF and heat generated by export cables were also scoped in for assessment. Given the ability of cable burial to reduce the effects of EMF and heat over a short distance, and the low vulnerability of benthic and fish and shellfish receptors to EMF and elevated temperature at the resulting magnitude, these impacts were assessed in Volume 2, Chapter 3: Fish and shellfish ecology of the Environmental Statement to be of **negligible adverse** significance and also does not represent a deterioration in the status of this WFD element of the North Wales water body.

1.6.1.10 Based on the assessment of effects related to the export cables for the Mona Offshore Wind Project, there is no potential for significant impacts on the 'Biology – habitats', water quality or WFD protected areas receptors associated with the North Wales or Clwyd water bodies. Nor is there expected to be a significant effect from EMF or heat generated by export cables. It is unlikely that the activity will significantly impact any element within these water bodies and the ability of these water bodies to achieve good status in the future is likely to be secure. The construction, operations and maintenance and decommissioning of the Mona Offshore Wind Project export cables is therefore considered to be compliant with the requirements of the WFD.

1.7 References

BERR (2008). Review of cabling techniques and environmental effects applicable to the offshore wind farm industry: technical report. Department for Business Enterprise & Regulatory Reform (BERR) in association with the Department for Environment, Food and Rural Affairs (DEFRA), 164 pp. https://webarchive.nationalarchives.gov.uk/ukgwa/+/http:/www.berr.gov.uk/files/file43527.pdf, accessed November 2022.

Berman, J., Burton, M., Gibbs, R., Lock, K., Newman, P., Jones, J. and Bell, J., (2013). Testing the suitability of a morphological monitoring approach for identifying temporal variability in a temperate sponge assemblage. Journal for Nature Conservation, 21 (3), 173-182, [redacted]

Bochert, R., Zettler, M.L. (2006). Effect of Electromagnetic Fields on Marine Organisms. In: Köller, J., Köppel, J., Peters, W. (eds) Offshore Wind [redacted] https://doi.org/10.1007/978-3-540-34677-7_14.

Cefas (2022) Offshore Chemical Notification Scheme (OCNS) Definitive ranked list of registered products. Available at: [redacted] Accessed January 2023

Cresci, A., Allan, B.J., Shema, S.D., Skiftesvik, A.B. and Browman, H.I., (2020). Orientation behavior and swimming speed of Atlantic herring larvae (Clupea harengus) in situ and in laboratory exposures to rotated artificial magnetic fields. Journal of Experimental Marine Biology and Ecology, 526, p.151358, [redacted]

Cresci, A., Perrichon, P., Durif, C.M., Sørhus, E., Johnsen, E., Bjelland, R., Larsen, T., Skiftesvik, A.B. and Browman, H.I., (2022). Magnetic fields generated by the DC cables of offshore wind farms have no effect on spatial distribution or swimming behavior of lesser sandeel larvae (*Ammodytes marinus*). Marine Environmental Research, 176, p.105609, [redacted]

CSA Ocean Sciences Inc. and Exponent. (2019). *Evaluation of Potential EMF Effects on Fish Species of Commercial or Recreational Fishing Importance in Southern New England*. U.S. Dept. of the Interior, Bureau of Ocean Energy Management,49, 59.

Emeana, C.J., Hughes, T.J., Dix, J.K., Gernon, T.M., Henstock, T.J., Thompson, C.E.L., and Pilgrim, J.A. (2006). The thermal regime around buried submarine high-voltage cables. Geophysical Journal International, 206(2), pp. 1051-64, doi: 10.1093/gji/ggw195.

Environment Agency (2017) 'Clearing the Waters for All' Guidance. Water Framework assessment: estuarine and coastal waters. Available at: Water Framework Directive assessment: estuarine and coastal waters - GOV.UK (www.gov.uk). Accessed 20 September 2022.

Gill, A.B. and Taylor. H. (2001) The Potential of Electromagnetic Fields Generated by Cabling between Offshore Wind Turbines upon Elasmobranch Fishes. Report for the Countryside Council for Wales (CCW Science report No. 488) 60pp. https://tethys.pnnl.gov/sites/default/files/publications/Gill-and-Taylor-2001.pdf, accessed November 2022.

Gill, A. B., Gloyne-Phillips, I., Neal, K. J. and Kimber, J. A. (2005). *The Potential Effects of Electromagnetic Fields Generated by Sub-Sea Power Cables Associated with Offshore Wind Farm Developments on Electrically and Magnetically Sensitive Marine Organisms – A Review*. COWRIE 1.5 Electromagnetic Fields Review, https://tethys.pnnl.gov/sites/default/files/publications/The_Potential_Effects_of_Electromagnetic_Fields_Generated_by_Sub_Sea_Power_Cables.pdf, accessed November 2022.

Gill, A.B., Huang, Y., Gloyne-Philips, I., Metcalfe, J., Quayle, V., Spencer, J. and Wearmouth, V. (2009). *COWRIE 2.0 Electromagnetic Fields (EMF) Phase 2: EMF-Sensitive Fish Response to EM Emissions from Sub-Sea Electricity Cables of the Type used by the Offshore Renewable Energy Industry*. COWRIE-EMF-1-06, https://tethys.pnnl.gov/sites/default/files/publications/Sensitive_Fish_Response_to_EM_Emissions_from_Offshore_Renewable.pdf, accessed November 2022.

Gill, A. B. and Desender, M. (2020). State of the Science Report - Chapter 5: Risk to Animals from Electromagnetic Fields Emitted by Electric Cables and Marine Renewable Energy Devices, https://tethys.pnnl.gov/sites/default/files/publications/OES-Environmental-2020-State-of-the-Science-Ch-5_final_hr.pdf, accessed November 2022.

Harsanyi, P., Scott, K., Easton, B.A., de la Cruz Ortiz, G., Chapman, E.C., Piper, A.J., Rochas, C.M. and Lyndon, A.R., (2022) The Effects of Anthropogenic Electromagnetic Fields (EMF) on the Early Development of Two Commercially Important Crustaceans, European Lobster, *Homarus gammarus* (L.) and Edible Crab, *Cancer pagurus* (L.). Journal of Marine Science and Engineering, 10(5), p.564, 10.3390/jmse10050564.

Hervé, L. (2021). *An evaluation of current practice and recommendations for environmental impact assessment of electromagnetic fields from offshore renewables on marine invertebrates and fish*, A dissertation submitted the Department of Civil & Environmental Engineering, University of Strathclyde.

Holt, T.J., Rees, E.I., Hawkins, S.J. and Seed, R. (1998). Biogenic reefs (Volume IX). An overview of dynamic and sensitivity characteristics for conservation management of marine SACs. Scottish Association for Marine Science (UK Marine SACs Project), 174 pp. Available: [redacted]

Howarth, M.J. (2004). Hydrography of the Irish Sea SEA6 Technical Report, Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197294/SEA6_Hydrography_POL.pdf. Accessed September 2022

Huang Y. (2005). *Electromagnetic Simulations of 135-kV Three phase Submarine Power Cables*. Centre for Marine and Coastal Studies, Ltd., doi: [redacted]

Hutchison, Z.L., Gill, A.B., Sigray, P., He, H., and King, J.W. (2020). Anthropogenic electromagnetic fields (EMF) influence the behaviour of bottom-dwelling marine species. Scientific Reports, 10(4219), [redacted]

Hutchison, Z., LaFrance Bartley M., Degraer S., English P., Khan A., Livermore J., Rumes B. and John W. King (2021). *Offshore Wind Energy and Benthic Habitat Changes: Lessons from Block Island Wind Farm*. Oceanography, vol. 33, no. 4, 1 Dec. 2020, pp. 58–69, DOI: 10.5670/oceanog.2020.406, Accessed 10 January 2021.

Jakubowska, M., Urban-Malinga, B., Otremba, Z. and Andrulewicz, E. (2019). *Effect of low frequency electromagnetic field on the behavior and bioenergetics of the polychaete Hediste diversicolor*. Marine Environmental Research. 150, DOI: [redacted]

Kempster, R., and Colin, S. (2011). Electrosensory pore distribution and feeding in the basking shark Cetorhinus maximus (Lamniformes: Cetorhinidae). Aquatic Biology, 12, pp. 33-36, [redacted]

Kempster, R.M., N.S. Hart, and S.P. Collin. (2013). Survival of the Stillest: Predator Avoidance in Shark Embryos. PLoS ONE 8(1):e52551.

Last, K.S., Hendrick V. J, Beveridge C. M and Davies A. J. (2011). Measuring the effects of suspended particulate matter and smothering on the behaviour, growth and survival of key species found in areas associated with aggregate dredging. Report for the Marine Aggregate Levy

Sustainability Fund, Project MEPF 08/P76, 69 pp., [redacted] accessed November 2022.

Love, M.S., Nishimoto, M.M., Clark, S., McCrea, M., and Bull, A.S. (2017). Assessing potential impacts of energized submarine power cables on crab harvests. Continental Shelf Research, 151(1), pp. 23-29, [redacted]

Meißner, K., Schabelon, H., Bellebaum, J. and Sordyl, H. (2007). Impacts of Submarine Cables on the Marine Environment — a Literature Review. Institute of Applied Ecology Ltd., https://tethys.pnnl.gov/sites/default/files/publications/Meissner-et-al-2006.pdf, accessed November 2022.

MMO (2013). Marine conservation zones and marine licensing. Available at: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/410273/Marine_conservation_zones_and_marine_licensing.pdf. Accessed 03 October 2022.

Moore, A., and Riley, W. D. (2009). Magnetic particles associated with the lateral line of the European eel Anguilla anguilla.Journal of Fish Biology, 74,pp. 1629 – 1634, DOI:10.1111/j.1095-8649.2009.02197.x.

Mustapha, K.B., Afli, A., Hattour, A. and El Abed, A. (2004). Sessile megabenthic species from Tunisian littoral sites. MedSudMed Technical Documents, 2, 1-16, [redacted] accessed November 2022.

Normandeau Associates, Exponent Inc., T. Tricas, T. and Gill, A. (2011). *Effects of EMFs from Undersea Power Cables on Elasmobranchs and Other Marine Species*. Available at: https://espis.boem.gov/final reports/5115.pdf, Accessed on: 07 January 2022.

NRW (2018a). Water Framework Directive (WFD) Coastal Waterbodies Cycle 2. Available at: https://waterwatchwales.naturalresourceswales.gov.uk/en/. Accessed 21 October 2022.

NRW (2018b). OGN72 Guidance for assessing activities and projects for compliance with the Water Framework Directive, https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN020015/EN020015-000843-5.12_ES%20Chapter%2012_Water%20Quality,%20Resources%20and%20Flood%20Risk.pdf#:~:text=Operational%20Guidance%20Note%20%28OGN%29%2072%20Guidance%20for%20Assessing,explains%20NRW%27s%20interpretation%20of%20WFD%20water%20body%20deterioration, accessed November 2022.

NRW (2022a). Water Framework Directive (WFD) Coastal Waterbodies Cycle 3. Available at: https://waterwatchwales.naturalresourceswales.gov.uk/en/. Accessed 21 October 2022.

NRW (2022b). Western Wales River Basin Management Plan 2021-2027 Summary. Available at: https://cdn.cyfoethnaturiol.cymru/media/695227/western-wales-rbmp-2021_2027-summary.pdf. Accessed 20 September 2022.

NRW (2022c). 2022 Bathing Water Profile for Abergele (Pensarn). Available at: https://environment.data.gov.uk/wales/bathing-waters/profiles/profile.html?site=ukl1301-40450. Accessed 25 October 2022.

OSPAR (2019) OSPAR List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment' Available at: [redacted]

Planning Inspectorate (2017). Advice note eighteen: The Water Framework Directive. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-18/. Accessed 20 September 2022.

Planning Inspectorate (2022). Mona Offshore Wind Project Scoping Opinion (15 June 2022). https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/EN010137/EN010137-000010-EN010137%20Mona%20Offshore%20Windfarm%20-%20Scoping%20Opinion.pdf,accessed November 2022.

Rosaria, J. C. and Martin, E. R. (2010). Behavioural changes in freshwater crab, *Barytelphusa cunicularis* after exposure to low frequency electromagnetic fields. World J. Fish Mar. Sci. 2, 487–494 (2010), [redacted], accessed November 2022.

Sardá, R., Pinedo, S. and Martin, D., (1999). Seasonal dynamics of macroinfaunal key species inhabiting shallow soft-bottoms in the Bay of Blanes (NW Mediterranean). Publications Elsevier: Paris, [redacted]

Scott, K., Harsanyi, P., and Lyndon, A.R. (2018). Understanding the effects of electromagnetic field emissions from Marine Renewable Energy Devices (MREDs) on the commercially important edible crab, *Cancer pagurus* (L.). Marine Pollution Bulletin, 131(A), pp. 580-8, [redacted]

Scott, K., Piper, A.J.R. Chapman, E.C.N. & Rochas, C.M.V., (2020). Review of the effects of underwater sound, vibration and electromagnetic fields on crustaceans. Seafish Report, Literature Review of the effects of underwater sound vibration and electromagnetic fields on crustaceans — Seafish.

Scott, K., Harsanyi, P., Easton, B., Piper, A., Rochas, C., Lyndon, A., and Chu, K. (2021). Exposure to Electromagnetic Fields (EMF) from Submarine Power Cables Can Trigger Strength-Dependent Behavioural and Physiological Responses in Edible Crab, Cancer pagurus (L.). Journal of Marine Science and Engineering, [redacted].

Steullet, P., D. H. Edwards, and Derby, C.D. (2007). *An electric sense in crayfish?* Biological Bulletin, Vol.213, pp.16-20, [redacted]

Ueno, S., P. Lövsund, and P.Å. Öberg. (1986). Effect of time-varying magnetic fields on the action potential in lobster giant axon. Medical and Biological Engineering and Computing 24(5):521-526, [redacted]

Vattenfall, A. and N. Skov-og. (2006). Danish offshore wind-Key environmental issues (No. NEI-DK-4787). DONG Energy, https://www.osti.gov/etdeweb/biblio/20833733, accessed November 2022.

Woodruff, DL. Ward, JA. Schultz, IR. Cullinan, VI. Marshall, KE. (2012). Effects of Electromagnetic Fields on Fish and Invertebrates Task 2.1.3: Effects on Aquatic Organisms Fiscal Year 2011 Progress Report. US Department of Energy, [redacted]

Worzyk, T. (2009). Submarine Power Cables Design, Installation, Repair, Environmental Aspects. Berlin Springer Berlin, [redacted]