Liverpool Bay CCS Ltd

HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Environmental Statement
Volume 3

EHE7228B
Liverpool Bay CCS Limited
Final
February 2024
Offshore ES

rpsgroup.com

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Liverpool Bay CCS Limited

Glossary

Term	Meaning
The Applicant	This is Liverpool Bay CCS Ltd.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Environmental Statement	The document presenting the results of the Environmental Impact Assessment process for the Proposed Development.
Mitigation Measure (MM)	Measure which would avoid, reduce, or remediate an impact.
Primary mitigation	These include modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Proposed Development and do not require additional action to be taken. This includes measures such as identifying an archaeological feature which should remain unaffected by the Proposed Development.
Project	The HyNet Carbon Dioxide Transportation and Storage Project.
Proposed Development	The offshore components of the Project which are subject of this Environmental Statement, as described in volume 1, chapter 3.
Secondary mitigation	These include actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the consents and licences, or through inclusion in the Offshore ES. This includes measures such as those required to restore a sensitive habitat.
Tertiary mitigation	Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects. This includes measures such as the Environmental Management Plans (EMPs).

Acronyms and Initialisations

Acronym/Initialisation	Description
ADD	Acoustic Deterrent Devices
AEZs	Archaeological Exclusion Zones
AtoN	Aid to Navigation
CAA	Civil Aviation Authority
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture Storage
CLV	Cable Lay Vessel
CMS	Construction Method Statement
CO_2	Carbon Dioxide
COLREGs	International Regulations for Preventing Collisions at Sea
CSIP	Cable Specification and Installation Plan
EIA	Environmental Impact Assessment
EMP	Environmental Management Plan
ES	Environmental Statement

Acronym/Initialisation	Description
FIR	Fishing Industry Representative
FLCP	Fisheries Liaison and Coexistence Plan
FLO	Fisheries Liaison Officer
HDD	Horizontal Directional Drilling
ICPC	International Cable Protection Committee
IMO	International Maritime Organization
INNS	Invasive Non-Native Species
INNSMP	Invasive Non-Native Species Management Plan
LDAR	Leak Detection and Repair
LED	Light Emitting Diode
LMP	Lighting and Marking Plan
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Access Act
MM	Mitigation Measure
MMMP	Marine Mammal Mitigation Protocol
MMObs	Marine Mammal Observers
MPCP	Marine Pollution Contingency Plan
NAVTEX	Navigational Telex
NSP	Navigational Safety Plan
NtM	Notices to Mariners
OFLO	Offshore Fisheries Liaison Officer
OP	Offshore Platform
PAD	Protocol for Archaeological Discoveries
PAM	Passive Acoustic Monitoring
ROV	Remotely Operated Vehicle
TAEZ	Temporary Archaeological Exclusion Zones
SAC	Special Area of Conservation
SAR	Search and Rescue
SOLAS	the International Convention for the Safety of Life at Sea
SPA	Special Protection Areas
UXO	unexploded ordnance
VFDs	variable frequency drives
VMP	Vessel Management Plan
WSI	Written Scheme of Archaeological Investigation

Units

Unit	Description
m	Metre (distance)

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1 INTRODUCTION

1.1 Purpose and scope

This chapter sets out a summary of the designed in measures, mitigation and monitoring commitments detailed within the Environmental Statement (ES) for the offshore components of the HyNet Carbon Dioxide Transportation and Storage Project (hereafter referred to as 'the Proposed Development'). For each commitment, the means of implementation is also specified.

Table 1.1: Summary Of Enhancement, Mitigation And Monitoring Commitments

Reference	Proposed Development Phase: Construction	Proposed Development Phase: Operation and maintenance	Proposed Development Phase: Decommissioning	Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance: Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change	Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
MM1		✓		Scour protection (e.g. rock berms) will only be used at third-party cable crossings and monitored as per MM3.	To reduce the potential for scouring of seabed sediments to occur.	To reduce interactions between metocean regime (wave, sand and currents) and seabed structures.		✓				✓						P
MM2	✓	✓	✓	Suitable implementation and monitoring of Cable Protection	Suitable implementation and monitoring of cable protection informed by a Cable Burial Risk Assessment (CBRA). Cables will be buried to a target depth of 2-3m and only be protected using external protection (e.g. rock berms) at third-party crossings.	Minimises the risk of underwater allision with cable protection, anchor or fishing gear interaction with subsea cables and interference with magnetic position fixing equipment.						✓	✓					T
MM3		✓		Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent which will include cable burial where possible (in accordance with the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (HM Government, 2021)) and cable protection, as necessary.	The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in advance of CSIP submission. The CSIP will include a detailed CBRA to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. Measures will seek to reduce the amount of EMF which benthic and fish and shellfish receptors are exposed to during the operations and maintenance phase by increasing the distance between the seabed surface and the surface of the cables.	There is a potential for cable exposure to occur due to interactions between Metocean regime (wave, sand and currents). The sediment transport can lead to exposure of cables and infrastructure, the use of a cable burial depth alongside the cable installation strategy should provide sufficient depth to avoid exposure.		✓	✓			✓	✓		✓		The CSIP will be conditioned in the Marine Licence.	P
MM4		✓		Cable protection to have a profiled cross section and height mitigated to < 1 m	To minimise changes to physical processes such as tidal current, wave regime and sediment transport pathways, particularly if located in shallow water.			✓										P
MM5	✓	✓	✓	No external cable protection in the intertidal area.	To minimise potential impacts on intertidal habitats within the Dee Estuary Special Area of	Trenchless techniques (e.g. Horizontal Directional Drilling (HDD)) will be used for cable		✓	✓									P

Reference	Proposed Development Phase			Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance									Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
	Construction	Operation and maintenance	Decommissioning					Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change		
					Conservation (SAC) and Special Protection Areas (SPA).	installation which will not result in any direct habitat disturbance or scour to intertidal habitats												
MM6	✓	✓	✓	The HDD exit pit will be 3 m below seafloor.	Embedded mitigation to ensure no materials are placed on the seafloor of the intertidal zone.			✓	✓									P
MM7	✓	✓	✓	Development of and adherence to an Environmental Management Plan (EMP) that will be prepared and implemented during the construction, operational and maintenance and decommissioning phases of the Proposed Development. The EMP will include appendices detailing actions to minimise INNS (the INNSMP), and a MPCP will be developed which will include planning for accidental spills, address all potential contaminant releases and include key emergency contact details	Measures will be adopted to ensure that the potential for release of pollutants from construction, operational and maintenance and decommissioning plant is minimised. These will likely include: designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and takes containing hazardous substances, and storage of these substances in impenetrable bunds. All vessels will be required to comply with the standards set out in the International Convention for the Prevention of Pollution from Ships (MARPOL).	Provides a means to ensure the efficient management and communication of commitments made for the management of the potential environmental impacts.	Outline EMP, with INNSMP	✓	✓			✓					Secured within a Marine Licence condition.	P
MM8	✓	✓	✓	Actions to minimise INNS, including a biosecurity plan to limit spread and introduction of INNS.	These measures will aim to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable to best protect the biological integrity of the local natural environment and communities.	Provides a means to ensure the efficient management and communication of commitments made for the management of the potential environmental impacts with respect to the potential introduction and spread of INNS.			✓								Secured within a Marine Licence condition.	T
MM9	✓			Material arising from drilling and/or sandwave clearance will be deposited in close proximity to the works.	To retain material within sediment cell and maintain sediment transport regimes.			✓									Secured within a Marine Licence condition.	T
MM10	✓			Development of, and adherence, to a Construction Method Statement (CMS).	This measure will confirm the actual methodology, timing, and duration that will be employed to construct the Proposed Development, provide details on aspects of the methodology not known at the application stage and confirm that the methodology falls within the parameters assessed in the ES.	Provided as a means of controlling specific environmental, health and safety risks that have been identified and to secure the health and safety aspects of the development are secured.			✓		✓						Secured within a Marine Licence condition.	T

Reference	Proposed Development Phase			Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance									Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
	Construction	Operation and maintenance	Decommissioning					Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change		
MM11			✓	Development of, and adherence to, a Decommissioning Plan	The aim of this plan is to adhere to the relevant UK and international legislation and guidance in place at the time, with decommissioning industry practice applied to reduce the amount of long-term disturbance to the environment so far as reasonably practicable.	To minimise the potential for disturbance to the environment following the decommissioning phase.			✓								Secured within a Marine Licence condition.	T
MM12	✓	✓	✓	Development of, and adherence to, an EMP, which will be issued to all vessel operators, requiring them to not deliberately approach marine mammals, marine turtles, and basking sharks; keep vessel speed to a minimum; and avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride.	To minimise the potential for collision risk, or potential injury to, marine mammals and megafauna this code of conduct outlines in the EMP will be adhered to at all times.				✓			✓					An EMP will be issued to all Project vessel operators. Proposed to be secured through a condition in the marine licence(s).	T
MM13	✓			Implementation of piling initiation, soft-start, and ramp-up measures within the Marine Mammal Mitigation Protocol (MMMP). An initiation stage and soft starts will be used during the installation of pin piles. This involves the implementation of an initial low hammer energy with a low number of strikes, followed by lower hammer energies at a higher strike rate at the beginning of the piling sequence before energy input is 'ramped up' (increased) over time to required higher levels.	This measure will minimise the risk of injury to some fish, marine mammal, and marine turtle species in the immediate vicinity of piling activities, allowing individuals to move away from the area before noise levels reach a level at which injury may occur.	The MMMP will set out the designed-in measures to apply in advance of and during piling activities. The implementation of an approved MMMP will mitigate for the risk of physical or permanent auditory injury to marine mammals.	Outline MMMP		✓								Proposed to be secured as a condition of the marine licence(s).	P
MM14	✓			Inclusion of low order techniques as an unexploded ordnance (UXO) clearance option noting, however, that it is not possible to fully commit to this measure at this stage. Low order techniques are not always possible and are dependent upon the individual situations surrounding each UXO. Given that high order detonation may be required, the MMMP will also include mitigation to reduce the risk of injury from UXO clearance.	Low order techniques generate less underwater noise than high order techniques and therefore present a lower risk to sound-sensitive receptors such as fish, marine mammals, and marine turtles during UXO clearance.	To mitigate injury and disturbance from underwater noise generated from UXO clearance.			✓									P
MM15				Development of and adherence to a MMMP, based on a draft MMMP submitted alongside the ES. The MMMP will present measures for Piling UXO clearance and some types of geophysical activities. The MMMP will be developed on the basis of the most recent published statutory guidance and in consultation with key stakeholders.	**Piling:** for the purpose of developing the MMMP, a mitigation zone of 500 m will be applied, following the JNCC (2010a) guidance. The Draft MMMP will set out the measures to apply in advance of and during piling activity including the use of Marine Mammal Observers (MMObs), Passive Acoustic Monitoring (PAM), and Acoustic Deterrent Devices	The MMMP will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals.			✓	✓								T

Reference	Proposed Development Phase: Construction	Proposed Development Phase: Operation and maintenance	Proposed Development Phase: Decommissioning	Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance: Physical processes	Topics of Relevance: Marine Biodiversity	Topics of Relevance: Underwater noise	Topics of Relevance: Offshore ornithology	Topics of Relevance: Shipping and navigation	Topics of Relevance: Commercial fisheries	Topics of Relevance: Marine archaeology	Topics of Relevance: Infrastructure and Other Sea Users	Topics of Relevance: Climate change	Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
					(ADD), thereby following the latest JNCC guidance (JNCC, 2010a). **UXO Clearance:** Measures including visual and acoustic monitoring (MMObs and PAM), the use of an ADD, and soft start charges will be applied to deter animals from the mitigation zone as defined by sound modelling for the largest possible UXO following the latest JNCC (2010b) guidance. **Geophysical and Seismic Surveys**: Mitigation for injury during high resolution geophysical and seismic site-investigation surveys using a sub-surface sensor from a conventional vessel will involve the use of MMObs and PAM to ensure that the risk of injury over the defined mitigation zone is reduced in line with JNCC (2017) guidance (500 m). Soft start is not possible for SBP equipment but will be applied for other high-resolution surveys where possible. It should be noted that some multi-beam surveys in shallow waters (<200m) are not subject to the requirements of mitigation.													
MM16	✓	✓		Where practicable, any requirements for cable protection will be compliant with Maritime and Coastguard Agency (MCA)'s methodology (Annex 1 of Marine Guidance Note (MGN) 654) (MCA, 2021).	Following further survey and detailed engineering, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out and additional mitigations agreed as required.	Ensures the final array layout is suitable for Search and Rescue (SAR) operations and that reductions in under keel clearance are acceptable.						✓						T
MM17	✓	✓	✓	The Applicant is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including the MCA, Civil Aviation Authority (CAA) and Trinity House. This will include appropriate lighting and marking of Offshore Platforms (OPs). The Applicant will also ensure the project is adequately marked on nautical charts. A lighting and marking plan will be secured.	The new Carbon Capture Storage (CCS) platform will exhibit lights, marks, sounds, signals and other aids to navigation as required by the Standard Marking Schedule, and in consultation with Trinity House. The platform and cables will be suitably marked on Admiralty Charts, with associated note.	Maximises awareness of the Proposed Development in both day and night conditions including in restricted visibility and assists with SAR operations. Measure will ensure other marine users are aware of operations and infrastructure associated						✓			✓		Secured within a Marine Licence condition.	T

Reference	Proposed Development Phase: Construction	Proposed Development Phase: Operation and maintenance	Proposed Development Phase: Decommissioning	Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance: Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change	Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
						with the Proposed Development.												
MM18	✓	✓	✓	Lighting and marking of project vessels.	Cable Lay Vessels (CLVs) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability.	Maximises awareness of the Proposed Development allowing vessels to passage plan in advance.						✓					Secured within a Marine Licence condition.	T
MM19	✓	✓	✓	Promulgation of information advising on the nature, timing and location of activities, Safety Zones and advisory safe passing distances, including through Notices to Mariners.	Timely circulation of information via Notices to Mariners (NtM), Kingfisher/KIS-ORCA notifications, Radio Navigational Warnings, Navigational Telex (NAVTEX), and/or other navigational broadcast warnings as soon as reasonably practicable in advance of and during the works.	To ensure other marine users are aware of operations associated with the Proposed Development.						✓	✓		✓		Secured within a Marine Licence condition.	T
MM20	✓	✓	✓	Advisory safe passing distances and safety zones.	Passing vessels will be requested to maintain an advisory safe passing distance around project vessels (e.g. cable installation vessels) restricted in manoeuvrability. It is assumed that a 500 m Safety Zone for the new Douglas CCS platform will be applied for post-consent.	To minimise the likelihood of involvement in incidents.						✓					Secured within a Marine Licence condition.	T
MM21	✓	✓	✓	A Vessel Management Plan (VMP) will be developed which will determine vessel routing to and from construction areas and ports to avoid areas of high risk to marine mammals.	The VMP will be issued to all vessel operators, requiring them to: • not deliberately approach marine mammals, marine turtles, and basking sharks; • keep vessel speed to a minimum; and • avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride.	Ensures project vessels are suitably managed to minimise the likelihood of involvement in incidents and maximise the ability to assist in the event of a third-party incident.			✓			✓					Secured in the VMP	T
MM22	✓	✓	✓	Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the International Regulations for Preventing Collisions at Sea (COLREGs) (IMO, 1972/78) and the International Convention for the Safety of Life at Sea (SOLAS) (IMO, 1974).	Compliance of project vessels with international marine regulations as adopted by the Flag State, including the COLREGs (International Maritime Organization (IMO), 1972/77) and SOLAS (IMO, 1974).	To minimise the risk introduced due to the presence of project vessels.						✓						T

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MM23	✓	✓	✓	Where required, based on risk assessment, guard vessels and/or temporary Aids to Navigation (AtoNs) may be deployed to guide vessels around any areas of construction activity.	Where cable exposures exist that would result in significant risk (e.g. if cable burial is carried out post cable lay), guard vessels will be used where appropriate until the risk has been mitigated by burial and/or other protection methods.	To maximise awareness of temporary hazards.						✓						T
MM24	✓	✓	✓	Use of guard vessels at cable exposures	Where cable exposures exist that would result in significant risk (e.g. if cable burial is carried out post cable lay), guard vessels will be used where appropriate until the risk has been mitigated by burial and/or other protection methods.													
MM25	✓		✓	Liaison with local ports and harbours, particularly the Port of Mostyn, during the construction phase.	Maximises awareness of the Proposed Development through consultation and ensures project vessels are suitably managed.	Minimises the risk introduced due to the presence of project vessels.						✓						T
MM26	✓	✓	✓	Ongoing liaison with fishing fleets will be maintained via an appointed Fisheries Liaison Officer (FLO) and Fishing Industry Representative (FIR). Prior to construction, a Fisheries Liaison and Coexistence Plan (FLCP) will be developed, setting out in detail the planned approach to fisheries liaison and means of delivering any other relevant mitigation measures.	To maintain effective communications between the project and fishermen and appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works. To provide warnings to the fishing community and advance warning of project activities and associated Safety Zones and advisory safety distances.	The Applicant is committed to ongoing liaison with fishermen throughout all stages of the project. To provide a point of contact to liaise and engage with the fishing industry						✓	✓					P
MM27	✓	✓	✓	A dropped objects plan will be developed for reporting and recovery of dropped objects where they pose a potential hazard to other marine users.	For the reporting and recovery of dropped objects.	Dropped objects could pose a potential hazard to other marine users.							✓				To be secured within a Marine Licence condition	P
MM28	✓	✓	✓	The identification and implementation of Archaeological Exclusion Zones (AEZs) around those sites identified as having high and medium archaeological potential as identified in Table 11.14 of volume 2, chapter 11.	AEZs will ensure offshore infrastructure avoids any known wrecks. The size of the AEZ will be evidence based and established using the precautionary principle to ensure that it is of sufficient size to protect the site from the nature of impact.	To avoid direct impacts on sites of identified archaeological significance.	Outline Written Scheme of Investigation (WSI)							✓			To be secured within a Marine Licence condition	P
MM29	✓			Final cable routing, well drilling and platform construction to avoid any known archaeological constraints identified in pre-construction site investigation surveys through micro siting.		To avoid direct impacts on sites of identified archaeological significance.	Outline WSI							✓			To be secured within a Marine Licence condition	P

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MM30	✓	✓		The identification and implementation of Temporary Archaeological Exclusion Zones (TAEZs) based on all available information including the stated positional accuracy, the recorded size of the target and the potential archaeological significance around those records for wrecks, obstructions, debris and other sites of archaeological potential outside of the survey data coverage but within the Project boundary.	TAEZs are recommended in Table 11.15 of volume 2, chapter 11. Further details provided in the Outline WSI.	To avoid direct impacts on sites of identified archaeological significance.	Outline WSI							✓			To be secured within a Marine Licence condition	P
MM31	✓			Archaeological input into specifications for, and archaeological analysis of, any further pre-construction geophysical and geotechnical surveys.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the archaeological curators.	To offset the impacts of the Project on sediments of geoarchaeological / palaeoenvironmental importance and enhance knowledge of the offshore marine archaeological resource.	WSI and Protocol for Archaeological Discoveries (PAD)							✓			To be secured within a Marine Licence condition	P
MM32	✓			Project archaeologists to be consulted in the preparation of any pre-construction Remotely Operated Vehicle (ROV)/diver surveys and, if appropriate, in monitoring/ checking of data. Further details provided in the Outline WSI.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the archaeological curators.	To prevent damage occurring to unidentified archaeological finds. To record archaeological remains that may be affected by pre-construction clearance operation.	WSI and PAD							✓			To be secured within a Marine Licence condition.	P
MM33		✓		Operational awareness of the location of those archaeological anomalies identified as having a low potential. Reporting through the agreed protocol (PAD) will be undertaken should material of potential archaeological interest be encountered. Further details provided in the Outline WSI.	To identify any sites of archaeological importance that may require further investigation, avoidance or engagement with the archaeological curators.		WSI and PAD							✓			To be secured within a Marine Licence condition	P
MM34	✓	✓	✓	Implementation of a protocol for recording finds of archaeological interest, following the guidance for the PAD.	To identify any currently unknown sites of archaeological importance that may require further investigation, avoidance or engagement with the archaeological curators.		WSI and PAD							✓			To be secured within a Marine Licence condition	P
MM35	✓			Archaeologists to be consulted in the preparation of pre-construction cable route clearance or other pre-construction operations and, if appropriate, to carry out archaeological monitoring of such work. Further details provided in the Outline WSI.	To record archaeological remains that may be affected by pre-construction clearance operation.		WSI and PAD							✓			To be secured within a Marine Licence condition	P
MM36	✓	✓	✓	Mitigation of unavoidable direct impacts on known sites of archaeological significance: Options include i) preservation by record; ii) stabilisation; iii) detailed analysis and safeguarding of otherwise comparable sites elsewhere. Options include preservation by	Further details provided in the Outline WSI.	To mitigate direct impacts on sites of identified archaeological significance.	WSI and PAD							✓			To be secured within a Marine Licence condition.	P

Reference	Proposed Development Phase: Construction	Proposed Development Phase: Operation and maintenance	Proposed Development Phase: Decommissioning	Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance: Physical processes	Topics of Relevance: Marine Biodiversity	Topics of Relevance: Underwater noise	Topics of Relevance: Offshore ornithology	Topics of Relevance: Shipping and navigation	Topics of Relevance: Commercial fisheries	Topics of Relevance: Marine archaeology	Topics of Relevance: Infrastructure and Other Sea Users	Topics of Relevance: Climate change	Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
				record; stabilisation; and detailed analysis and safeguarding of otherwise comparable sites elsewhere.														
MM37	✓	✓	✓	Development and adherence to a WSI and PAD. Commitment to implementation of the Offshore WSI which is submitted with this application, prior to any post-consent works within the Eni Development Area and Area of Physical Project Works.	The Outline WSI is submitted alongside the application and contains a method statement for pre-construction surveys and details of monitoring requirements.	To ensure the protection and, if necessary, recording of previously unknown sites/objects of archaeological significance affected by the development.	WSI and PAD							✓			To be secured within a Marine Licence condition.	T
MM38	✓	✓		Where the Proposed Development cables/ pipelines will be required to cross an active cable, it is intended that a commercial ‘crossing agreement’ will be entered into with the cable operator. A crossing agreement based upon the International Cable Protection Committee (ICPC) Recommendation 3-10C ‘Telecommunications Cable and Oil Pipeline/Power Cables Crossing Criteria’ (ICPC, 2014) will be used for any cable crossings. Where a cable is inactive, the Applicant will consult with the cable operator to ascertain if such a crossing agreement is required.	This is a formal arrangement that establishes the responsibilities and obligations of both parties and allows operations to be managed safely.	To reduce potential conflict at cable crossing locations. This is a formal arrangement that establishes the responsibilities and obligations of both parties and allows operations to be managed safely.									✓		In line with standard industry practice crossing agreements would be negotiated and agreed with operators as required.	T
MM39	✓	✓	✓	Development of and adherence to a Navigational Safety Plan (NSP). The NSP will describe measures put in place by the Project related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Project activity to other sea users (e.g., via Notice to Mariners).	To ensure other marine users are aware of operations and infrastructure associated with the Proposed Development.										✓		Proposed to be secured within the marine licence.	T
MM40	✓	✓	✓	Consultation with oil and gas operators and other energy infrastructure operators to promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.	Licence blocks will be relinquished and acquired by different operators over the duration of the project life, and oil and gas operations will change according to the project phase. By continued consultation with the oil and gas operators both parties will keep informed of planned activities in order to minimise disruption to either party’s operations and to maximise coexistence.	To promote and maximise cooperation between parties and minimise spatial and temporal interactions between conflicting activities.									✓		Secured in the Marine Licence	T
MM41		✓		Development and adherence to a Pipeline Specification and Installation Plan which will include pipeline burial where possible and pipeline protection as necessary.	To ensure that the pipeline remains secure, is not a hazard to other sea users.	To manage risk that the pipeline becomes exposed and damaged by tidal currents.									✓		In line with standard industry practice.	T

Reference	Proposed Development Phase			Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance									Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
	Construction	Operation and maintenance	Decommissioning					Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change		
MM42	✓			Installation of infrastructure over or adjacent to existing cables or pipelines will be subject to crossing or proximity agreements between the two parties, prior to the start of the construction phase.	To reduce potential conflict at crossing locations. Cable and pipeline crossing/ proximity agreements will be based on previously referenced guidance from the ICPC and Oil and Gas UK.										✓		In line with standard industry practice crossing/proximity agreements would be negotiated and agreed with operators as required.	T
MM43			✓	At the end of the Proposed Development's lifetime, materials removed during decommissioning will be recycled where practicable.	The recycling of materials at the end of the Proposed Development's lifetime not only prevents materials from being sent to landfills, but also reduces the need for the extraction of primary materials, thereby reducing emissions associated with such processes.	To manage decommissioning, disassembly and waste.										✓		P
MM44		✓		During the operational phase fugitive emissions will be monitored through a Leak Detection and Repair (LDAR) programme as part of the preventative maintenance activities, to avoid or minimise their presence as low as reasonably practicable.	Fugitive emissions, such gas release. would result in the increased concentration of GHGs in the atmosphere, further contributing to the effects of climate change.	To manage fugitive emissions that may take place during the operational phase of the Proposed Development.										✓		T
MM45	✓	✓		During the construction and operational phases vessel fuel consumption will be minimised by optimising vessel scheduling, with consideration given to the co-ordination of activities and material delivery. Activities will be limited on the speed of vessels, and fuel used will have a low sulphur component (0.1%). Vessels older than 20 years will not be used.	During the construction and operational phase emissions resultant from fuel consumption by vessel movements will be minimised by ensuring the use of lower sulphur content fuel, providing an efficient and optimised vessel schedule to reduce the number of journeys, and avoiding the use of older vessels.											✓		T
MM46		✓		During the operational phase, energy demand associated with the OPs will be reduced through energy efficiency opportunities. These include the use of efficient low loss transformers, variable frequency drives (VFDs) on CO_2 compressors, LED light bulbs, low voltage electrical installations, compressor efficiency specification and optimisation, efficient air coolers, energy monitoring systems (to comply with ISO 50001 certification), and Real Time Monitoring and Advanced Process Control (a computer-based algorithm that automatically optimises the process parameters and promotes a reduction in energy consumption from approximately 3% to 7%).	The implementation of energy efficiency opportunities on the OPs results in the reduced consumption of energy during the operation of the Proposed Development, thereby reducing emissions of GHGs to the atmosphere associated with such energy consumption.											✓		T
MM47	✓			Where operationally practical, nearshore works will be undertaken outside of the Bathing Season (15th	To reduce the risk to bathers from contaminant release.										✓			S

Reference	Proposed Development Phase			Mitigation and monitoring commitment	Justification (specific)	Justification (Generic)	Outline plan commitment	Topics of Relevance									Means of implementation	Mitigation category (primary (P), secondary (S) or tertiary (T))
	Construction	Operation and maintenance	Decommissioning					Physical processes	Marine Biodiversity	Underwater noise	Offshore ornithology	Shipping and navigation	Commercial fisheries	Marine archaeology	Infrastructure and Other Sea Users	Climate change		
				May to 30th September) to reduce risks to bathers associated with contaminant releases.														
MM48	✓			Development and adherence to a Waste Management Plan (WMP).	A WMP is required by all Contractors and Subcontractors setting out details of all waste management procedures for their activities, details of expected waste arisings and procedures for waste management. The following aspects are expected to be a minimum requirement for the WMP: • analysis of the waste arisings/material surpluses; • specific waste management objectives for the Proposed Development; • methods proposed for prevention, reuse and recycling of wastes; • material handling procedures; and • proposals for education of workforce and plan dissemination programme.				✓			✓			✓			T
MM49		✓		Geophysical surveys undertaken during the operational and maintenance phase will adopt similar measures as for piling operations, including the implementation of an approved MMMP and Vessel Code of Conduct. Measures include the use of a mitigation zone around operations, within which MMObs and PAM will ensure that no marine megafauna are present in the vicinity of the geophysical survey vessel, and the use of a soft-start to survey operation, where possible	The implementation of an approved MMMP will mitigate for the risk of physical or permanent auditory injury to marine mammals within a 500 m radial mitigation zone as determined by JNCC guidance (JNCC, 2017). The soft-start will use a lower-energy output, increasing over a 20-minute period to the maximum data-acquisition energy output to provide an audible cue to allow marine mammals and megafauna to flee the area before geophysical surveying commences.	The MMMP will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals.			✓									S

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Liverpool Bay CCS Ltd
HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Environmental Statement
Volume 3: Navigational Risk Assessment Technical Report

EHE7228B
Liverpool Bay CCS Limited
Version Final
February 2024
Offshore ES
Navigation Risk
Assessment Technical
Report

rpsgroup.com

Document status

Version	Purpose of document	Authored by	Reviewed by	Approved by	Date
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Prepared by:

Anatec

Prepared for:

Liverpool Bay CCS Limited

HyNet Carbon Capture and Storage Navigational Risk Assessment

Prepared by	Anatec Limited
Presented to	RPS Group on behalf of Eni UK Limited
Date	21 September 2023
Revision Number	03
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Revision Number	Date	Summary of Change
00	25 July 2023	First Issue
01	2 August 2023	Updated based on RPS comments
02	24 August 2023	Updated based on Eni UK Ltd comments
03	21 September 2023	Includes vessel movements associated with repurpose of existing assets

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Abbreviations Table

Abbreviation	Definition
AHTS	Anchor Handling Tug Supply
AIS	Automatic Identification System
ALARP	As Low As Reasonably Practicable
ALB	All-Weather Lifeboat
ATBA	Area to be Avoided
AtoN	Aid to Navigation
CAA	Civil Aviation Authority
CBA	Cost Benefit Analysis
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture and Storage
CD	Chart Datum
CEA	Cumulative Effects Assessment
CLV	Cable Lay Vessel
CO_2	Carbon Dioxide
COLREGs	Convention on the International Regulations for Preventing Collisions at Sea
CSIP	Cable Specification and Installation Plan
CTV	Crew Transfer Vessel
DECC	Department of Energy & Climate Change
DfT	Department for Transport
DSV	Dive Support Vessel
DWT	Deadweight Tonnage
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ES	Environmental Statement
EU	European Union

Abbreviation	Definition
FLCP	Fisheries Liaison and Coexistence Plan
FLO	Fisheries Liaison Officer
FSA	Formal Safety Assessment
GPS	Global Positioning System
GT	Gross Tonnage
HLV	Heavy Lift Vessel
HMCG	His Majesty's Coastguard
HVDC	High Voltage Direct Current
ILB	Inshore Lifeboat
IMO	International Maritime Organization
INNS	Invasive Non-Native Species
JRCC	Joint Rescue Coordination Centre
km	Kilometre(s)
kV	Kilovolt(s)
LAT	Lowest Astronomical Tide
LCV	Light Construction Vessel
m	Metre(s)
MAIB	Marine Accident and Investigation Branch
MARPOL	International Convention for the Prevention of Pollution from Ships
MCA	Maritime and Coastguard Agency
MDS	Maximum Design Scenario
MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MMV	Monitoring, Measurement and Verification
MPCP	Marine Pollution Contingency Plan
MRCC	Maritime Rescue Coordination Centre
NAVTEX	Navigational Telex
nm	Nautical Mile(s)
NRA	Navigational Risk Assessment

Abbreviation	Definition
NtM	Notice to Mariners
NUI	Normally Unmanned Installation
OP	Offshore Platform
OREIs	Offshore Renewable Energy Installations
OWF	Offshore Wind Farm
PDE	Project Design Envelope
PINS	Planning Inspectorate
PLL	Potential Loss of Life
PoA	Point of Ayr
RAM	Restricted in Ability to Manoeuvre
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAR	Search and Rescue
SOLAS	Safety of Life at Sea
TSS	Traffic Separation Scheme
UK	United Kingdom
UKC	Under Keel Clearance
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on Law of the Sea
VMP	Vessel Management Plan
VMS	Vessel Monitoring System

1 Introduction

1.1 Background

Anatec was commissioned by RPS Group on behalf of Liverpool Bay CCS Ltd to undertake a Navigational Risk Assessment (NRA) for the proposed Carbon Capture and Storage (CCS) development.

The proposed development consists of newly installed subsea cables, a new CCS platform located close to the existing platform at the Douglas Complex, as well as repurposing of existing platforms and pipelines at the Hamilton, Hamilton North and Lennox fields.

This NRA presents information on the proposed development relevant to existing and estimated future navigational activity and forms the technical appendix to volume 2, chapter 9 of the ES of the Environmental Statement (ES).

1.2 Navigational Risk Assessment

An Environmental Impact Assessment (EIA) is a process which identifies the environmental effects of a proposed development, both negative and positive. One requirement of the EIA for offshore projects is the NRA. Following Marine Guidance Note (MGN) 654 (Ref. i), this NRA includes:

- outline of methodology applied in the NRA;
- summary of consultation undertaken with shipping and navigation stakeholders to date;
- lessons learnt from previous offshore developments;
- summary of the project description relevant to shipping and navigation;
- baseline characterisation of the existing environment;
- discussion of potential impacts on navigation, communication and position fixing equipment;
- cumulative and transboundary overview;
- future case marine traffic characterisation;
- assessment of navigational risk (following the Formal Safety Assessment (FSA) process); and
- outline of embedded mitigation measures.

It is noted that the MGN 654 guidance is intended to apply to renewable energy installations rather than CCS developments, however it is considered that much of the guidance is applicable to the Proposed Development.

Potential hazards are considered for each phase of the development as follows:

- Construction;
- Operation and maintenance; and
- Decommissioning.

The assessment of the Project is based on a parameter-based Project Design Envelope (PDE) approach, which is recognised in the Overarching National Policy Statement for Energy (EN-1) (Ref. ii), the NPS for Renewable Energy Infrastructure (EN-3) (Ref. iii) and Planning Inspectorate Advice Note Nine: Rochdale Envelope (Ref. iv). The PDE includes conservative assumptions to form a Maximum Design Scenario (MDS) which is considered and assessed for all risks. Further details on the design envelope are provided in volume 1, chapter 3.

The shipping and navigation baseline and risk assessment has been undertaken based upon the information available and responses received at the time of preparation, including the MDS as discussed above.

2 Project Description Relevant to Shipping and Navigation

This section outlines the details of the project design envelope of relevance to shipping and navigation. An overview of the existing and proposed infrastructure included within the Proposed Development is presented in Figure 2.1.

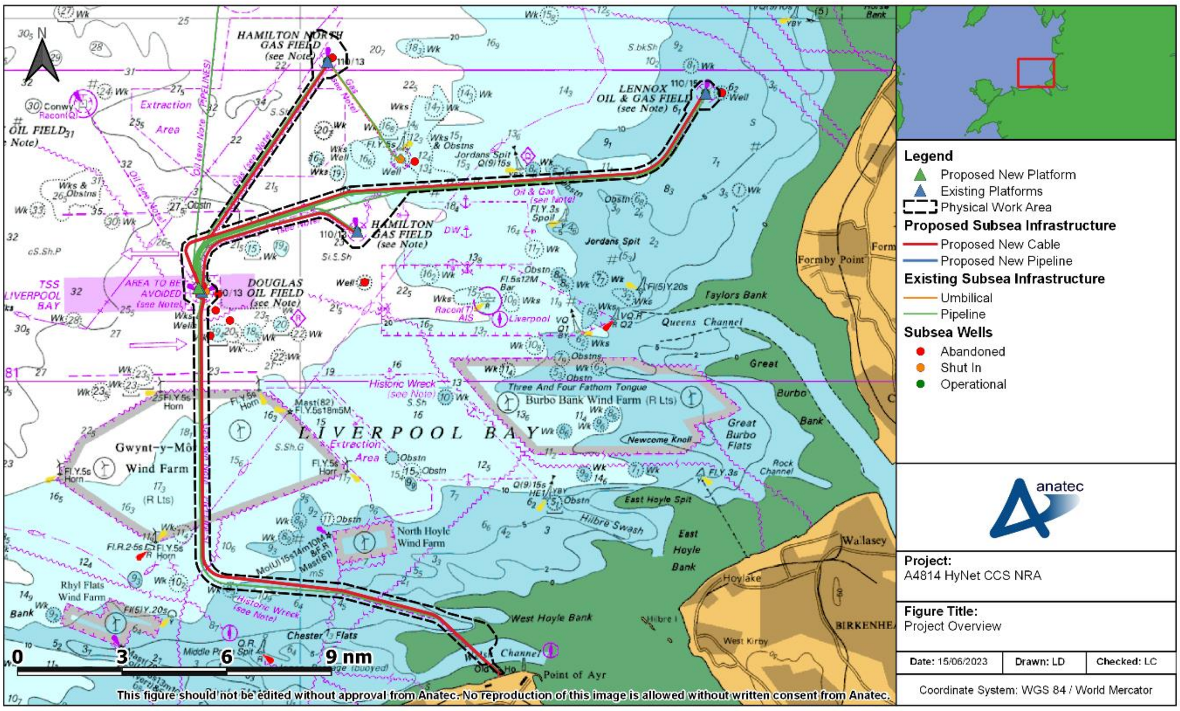

Figure 2.1: Project Overview

The Proposed Development will include:

- installation of a new Douglas CCS platform to replace the existing Douglas Process platform to receive carbon dioxide (CO_2) from the onshore Point of Ayr (PoA) Terminal and distribute CO_2 to the Hamilton Main, Hamilton North, and Lennox wellhead platforms and when necessary, provide heating;
- installation of new topsides on the Hamilton Main, Hamilton North, and Lennox wellhead platforms to receive and inject CO_2 into the depleted hydrocarbon reservoirs;
- repurposing of the existing subsea natural gas pipelines for their change of use from hydrocarbon to CO_2 service;
- installation of new sections of pipeline to connect the new Douglas CCS platform to the existing subsea natural gas pipelines;
- development of the Hamilton Main, Hamilton North, and Lennox reservoirs for CO_2 storage through up to eight injection wells created by side tracking of existing production wells. This includes drilling and recompletion operations, all of which will be within the existing footprint (template) of each platform;

- implementation of a programme of Monitoring, Measurement and Verification (MMV) activities. This includes the drilling of two new monitoring wells, one at Hamilton North and one at Hamilton Main. Additional monitoring wells will be created from the recompletion of existing wells within the existing footprint (template) of each platform: one monitoring well created by side-tracking an existing well in Lennox; and two sentinel wells, one in Hamilton North and one in Lennox;
- installation, including trenching, and some dredging, of two submarine 33kV armoured cables, with integrated fibre-optic cable connections (35 km from PoA Terminal onshore to the new Douglas CCS platform, including within the intertidal/foreshore area up to Mean High Water Springs (MHWS), within Welsh waters only);
- installation, including trenching, of new power cables with integrated fibre-optic connecting the new Douglas CCS platform with the Hamilton Main (12 km; 33 kV), Hamilton North (15 km; 33 kV) and Lennox (35 km; 33 kV) platforms; and
- installation of concrete mattresses and external cable protection, at crossings of existing cables, and in areas where cable burial is not deemed feasible, or as a remedial secondary protection measure if the target cable depth of lowering cannot be achieved.

The locations of the platforms involved in the project are presented in Table 2.1.

Table 2.1: Project Platform Locations

Platform	Geographical Coordinates (ED50 UTM Zone 30N)	
	Easting	Northing
Proposed Douglas CCS Platform	461607.79 m	5932596.10 m
Existing Douglas Complex	461779.86 m	5932406.84 m
Hamilton North	468497.05 m	5944501.07 m
Hamilton	470012.16 m	5935548.50 m
Lennox	488435.99 m	5942739.87 m

The proposed CCS Project consists of a new platform located within the 500m safety zone at the existing Douglas Complex, with existing pipelines repurposed for CO_2 transport. New power cables are also planned to follow the existing pipeline routes, details of which are presented in Section 2.2.

The focus of the NRA is on the construction and operation of the new Douglas CCS platform and the new cables that will be installed, as well as vessel movements to and from the sites for activities associated with installation of new topsides at the existing platforms, repurposing of existing assets (e.g. pipelines) and drilling of wells within the existing footprint of the Hamilton Main, Hamilton North and Lennox platforms. However, works carried out within the existing Safety Zones are not covered in the NRA.

2.1 Platform Details

Figure 2.2 presents the location of the proposed Douglas CCS platform.

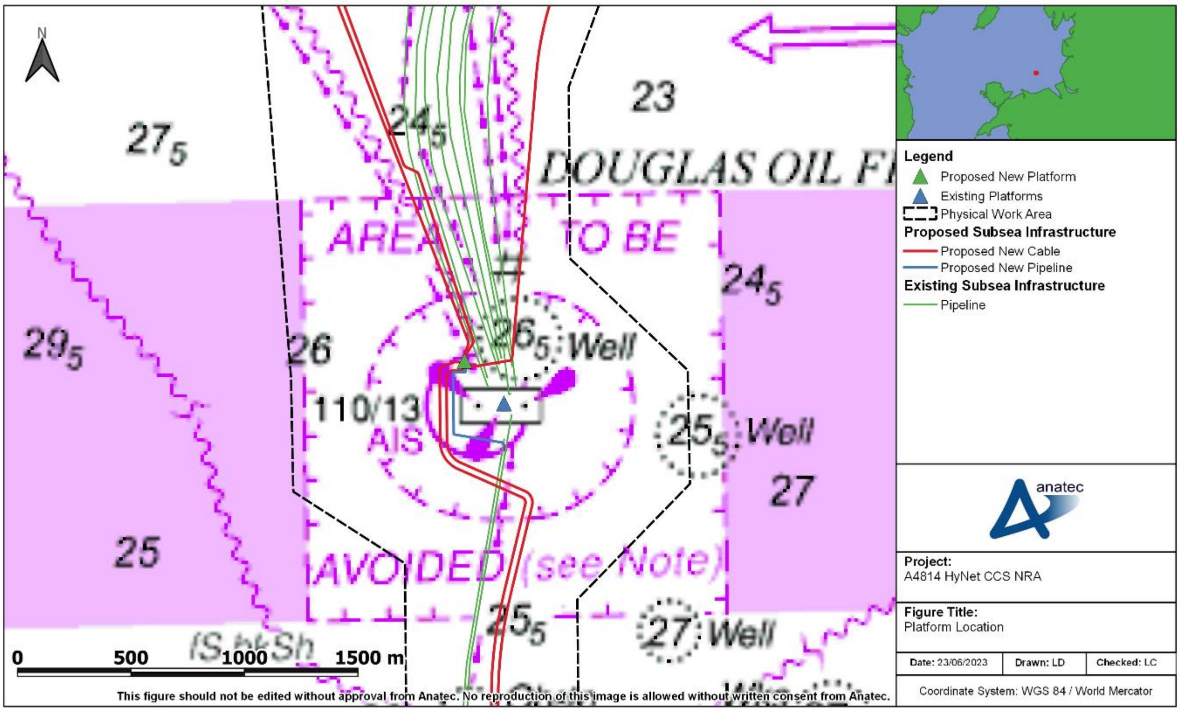

Figure 2.2: Proposed Douglas CCS Platform Location

The proposed location of the platform is approximately 200 m to the north of the existing Douglas accommodation platform, within the 500 m safety zone at the existing Douglas complex, which sits between the lanes of the Liverpool Bay Traffic Separation Scheme (TSS). There is a charted area to be avoided around the Douglas complex, lining up with the traffic separation zone.

The existing Douglas Complex consists of three linked platforms: a wellhead platform, a production platform and an accommodation platform. The Douglas platform is typically manned, while the other platforms which form part of the project are normally unmanned installations (NUI).

Table 2.2: Douglas CCS Platform Details

Parameter	Douglas CCS Platform
Height of weather deck (above LAT) (m)	35.5
Topside length (m)	33

Parameter	Douglas CCS Platform
Topside width (m)	30

2.2 Cables

It is expected that there will be two power cables from the proposed Douglas CCS platform to the landfall at the Point of Ayr, following approximately the same route as the existing pipeline from the Douglas platform to land. The cables are expected to be installed in two separate trenches with a minimum separation distance of 30m.

In addition to the Point of Ayr to Douglas cables, three further cables are proposed to connect the proposed Douglas CCS platform to the Hamilton, Hamilton North and Lennox platforms. These cables also approximately follow the routes of existing pipelines running between the platforms.

2.2.1 Cable Design and Protection

There are expected to be up to five cables installed as part of the proposed development. These will be 3-core power cables armoured with bundled fibre optic cables, rated up to 33kV. Cables will range between 10.87km and 33.99km in length, with a diameter of 152.4mm.

Target burial depths are anticipated to be between 2m and 3m, with the entirety of both Point of Ayr – Douglas cables expected to be buried. Cable burial is expected to be carried out via ploughing. It is assumed that suitable burial depths or additional protection methods against external hazards will be informed by a Cable Burial Risk Assessment (CBRA).

External cable protection may be required at cable crossings. There are 42 identified possible cable crossings associated with the 5 cables. Freshly quarried rock is anticipated to be used to protect the cable crossings for the Point of Ayr – Douglas cables, while concrete mattresses are also considered for the cables to the three satellite platforms. A maximum height of 0.8m is anticipated for any cable crossings.

The length and number of expected crossings for each of the cables are presented in Table 2.3.

Table 2.3: Proposed Cable Details

Parameter	Point of Ayr to Douglas (Cable 1)	Point of Ayr to Douglas (Cable 2)	Douglas to Hamilton	Douglas to Hamilton North	Douglas to Lennox
Cable length	33.99 km	33.95 km	10.87 km	14.89 km	32.34 km
Cable Crossings	10	10	8	8	6

2.3 Installation Activities

This section describes the vessels involved in installation activities and provides an indicative programme for the works.

The maximum number of return trips for the installation of the new Douglas CCS platform and the proposed new cables, and repurposing of existing assets are presented in Table 2.4.

Table 2.4: Vessels Involved in Installation Activities

Vessel Type	Maximum on Site at One Time					Maximum Number of Return Trips				
	Douglas CCS	Cables	Douglas Re-Use	Repurpose	Total	Douglas CCS	Cables	Douglas Re-Use	Repurpose	Total
Heavy Lift Vessel (HLV)	1			1	2	2			2	4
Jack Up		1		1	2		1		3	4
Anchor Handling Tug Supply (AHTS)	4		7	6	17	4		10	8	22
Cargo Barge	3		5	4	12	3		9	5	17
Dive Support Vessel (DSV)/Light Construction Vessel (LCV)	1	1 (shared)		2	3	1	1 (shared)		2	3
Survey Vessel		1 (shared)	1	1	2		1 (shared)	3	1 (shared)	3
Crew Transfer Vessel	1	1	2	2	6	28	4	76	108	216
Cable Installation Vessel		1			1		1			1
Support Vessel		3	2		5		3	80		83
Multicat		2			2		2			2

Vessel Type	Maximum on Site at One Time					Maximum Number of Return Trips				
	Douglas CCS	Cables	Douglas Re-Use	Repurpose	Total	Douglas CCS	Cables	Douglas Re-Use	Repurpose	Total
Working Boat		3			3		3			3
Support Vessel (for trenching)		1			1		1			1
Seabed Preparation Vessel		1 (shared)	1		1		1 (shared)	1		1
Cable Protection Installation		1			1		1			1
Cable Burial Installation		1			1		1			1
Pre-comm Vessel			1		1			2		2
Total	**10**	**38**	**17**	**17**	**63**	**19**	**181**	**17**	**128**	**364**

The installation of the proposed Douglas CCS platform and new cables are expected to be carried out in Q1-Q2 2026. Preparations for the shore approach of the power cables from Douglas to Point of Ayr are proposed to commence in Q2 2025. Installation works for the new platform are expected to take up to five months, while cable laying works are expected to take up to two months. There will also be additional vessel movements associated with works to repurpose existing assets at the Hamilton Main, Hamilton North and Lennox platforms between Q4 2024 and Q3 2028.

2.4 Maximum Design Scenario

The maximum design scenario considered within the impact assessment in Section 10 is presented in Table 2.5.

Table 2.5: Maximum Design Scenario

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
Vessel displacement leading to increased vessel to vessel collision risk between third-party vessels	✓	✓	✓	**Construction Phase** ▪ Cable installation expected to take up to two months ▪ Douglas CCS platform installation expected to take up to five months ▪ Maximum of 2 HLV on site making up to 4 return trips ▪ Maximum of 2 jack-up vessels on site making up to 4 return trips ▪ Maximum of 17 tug/anchor handlers making up to 22 return trips ▪ Maximum of 12 cargo barges making up to 17 return trips ▪ Maximum of 3 dive support/light construction vessels making up to 3 return trips ▪ Maximum of 2 survey vessels making up to 3 return trips ▪ Maximum of 6 crew transfer vessels making up to 216 return trips ▪ Maximum of one cable installation vessel making one return trip ▪ Maximum of 5 support vessels making up to 83 return trips ▪ Maximum of 2 multicats making up to 2 return trips	Greatest number of vessels associated with the Proposed Development and greatest duration, resulting in the maximum temporal effect and maximum displacement of third-party vessels, leading to the maximum effect on vessel to vessel collision risk

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ Maximum of 3 working boats making up to 3 return trips ▪ Maximum of one trench support vessel making one return trip ▪ Maximum of one seabed preparation vessel making one return trip ▪ Maximum of one cable protection installation vessel making one return trip ▪ 500m advisory safe passing distances around cable installation vessels ▪ 500m safety zone around the Douglas platform **Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ Maximum of one jack-up vessel on site at one time, making up to 15 return trips ▪ Maximum of 3 other vessels (multi-purpose support/Inspection, maintenance and repair vessels (IMR)) on site at one time making up to 15 return trips ▪ 500 m safety zone around the Douglas CCS platform ▪ 500 m advisory safe passing distance around cable maintenance vessels during periods of major maintenance	

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				Decommissioning Phase It is anticipated that decommissioning works will be similar in terms of the maximum design scenario to the construction phase.	
Increased vessel to vessel collision risk between third-party vessels and project vessels	✓	✓	✓	**Construction Phase** ▪ Cable installation expected to take up to two months ▪ Douglas CCS platform installation expected to take up to five months ▪ Overall programme of works at existing platforms expected to take up to four years ▪ Maximum of 2 HLV on site making up to 4 return trips ▪ Maximum of 2 jack-up vessels on site making up to 4 return trips ▪ Maximum of 17 tug/anchor handlers making up to 22 return trips ▪ Maximum of 12 cargo barges making up to 17 return trips ▪ Maximum of 3 dive support/light construction vessels making up to 3 return trips ▪ Maximum of 2 survey vessels making up to 3 return trips ▪ Maximum of 6 crew transfer vessels making up to 216 return trips	Greatest number of vessels associated with the Proposed Development and greatest duration, resulting in the maximum temporal effect, on vessel to vessel collision risk involving a project vessel and third-party vessel.

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ Maximum of one cable installation vessel making one return trip ▪ Maximum of 5 support vessels making up to 83 return trips ▪ Maximum of 2 multicats making up to 2 return trips ▪ Maximum of 3 working boats making up to 3 return trips ▪ Maximum of one trench support vessel making one return trip ▪ Maximum of one seabed preparation vessel making one return trip ▪ Maximum of one cable protection installation vessel making one return trip ▪ 500 m advisory safe passing distances around cable installation vessels ▪ 500 m safety zone around the Douglas platform **Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ Maximum of one jack-up vessel on site at one time making up to 15 return trips	

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ Maximum of 3 other vessels (multi-purpose support/IMR vessels) on site at one time making up to 15 return trips ▪ One mobile offshore drilling unit (MODU) anticipated on site for well operations every 10 years **Decommissioning Phase** ▪ It is anticipated that decommissioning works will be similar in terms of the maximum design scenario to the construction phase.	
Vessel to platform allision risk	×	✓	×	**Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ Platform topside dimensions of 33 m x 30 m	Maximum dimensions and operational lifetime of the project resulting in the maximum temporal effect on vessel to platform allision risk.
Reduced access to local ports	✓	✓	✓	**Construction Phase** ▪ Cable installation expected to take up to two months ▪ Douglas CCS platform installation expected to take up to 5 months ▪ Overall programme of works at existing platforms expected to take up to 4 years ▪ Maximum of 2 HLV on site making up to 4 return trips ▪ Maximum of 2 jack-up vessels on site making up to 4 return trips	Maximum duration of the installation works and operational lifetime of the Proposed Development, utilising the maximum number of project vessels, resulting in the maximum effect on access to local ports.

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ Maximum of 17 tug/anchor handlers making up to 22 return trips ▪ Maximum of 12 cargo barges making up to 17 return trips ▪ Maximum of 3 dive support/light construction vessels making up to 3 return trips ▪ Maximum of 2 survey vessels making up to 3 return trips ▪ Maximum of 6 crew transfer vessels making up to 216 return trips ▪ Maximum of one cable installation vessel making one return trip ▪ Maximum of 5 support vessels making up to 83 return trips ▪ Maximum of 2 multicats making up to 2 return trips ▪ Maximum of 3 working boats making up to 3 return trips ▪ Maximum of 1 trench support vessel making one return trip ▪ Maximum of one seabed preparation vessel making 1 return trip ▪ Maximum of one cable protection installation vessel making 1 return trip	

<table>
<tr><th rowspan="2">Potential Impact</th><th colspan="3">Phase</th><th rowspan="2">Maximum Design Scenario</th><th rowspan="2">Potential Impact</th></tr>
<tr><th>C</th><th>O&M</th><th>D</th></tr>
<tr><td></td><td></td><td></td><td></td><td>▪ 500 m advisory safe passing distances around cable installation vessels
▪ 500 m safety zone around the Douglas platform

Operation and Maintenance Phase
▪ Anticipated operation and maintenance phase lasting 25 years.
▪ 500 m safety zone around the Douglas CCS platform
▪ 500 m advisory safe passing distance around cable maintenance vessels during periods of major maintenance
▪ One mobile offshore drilling unit (MODU) anticipated on site for well operations every 10 years
Decommissioning Phase
▪ It is anticipated that decommissioning works will be similar in terms of the maximum design scenario to the construction phase.</td><td></td></tr>
<tr><td>Anchor interaction with subsea cable</td><td>✗</td><td>✓</td><td>✗</td><td>Operation and Maintenance Phase
▪ Anticipated operation and maintenance phase lasting 25 years.
▪ 5 subsea cables with a total length of 126 km
▪ Target burial depth of 2-3 m</td><td>Greatest length of subsea cables and maximum number of cable crossings with external protection giving the maximum potential for anchor interaction.</td></tr>
</table>

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ 42 potential cable crossings with a total cable length of 8.4 km ▪ External rock protection at cable crossings with a maximum height of 0.8 m.	
Fishing gear interaction with subsea cable	×	✓	×	**Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ 5 subsea cables with a total length of 126 km ▪ Target burial depth of 2-3 m ▪ 42 potential cable crossings with a total cable length of 8.4 km ▪ External rock protection at cable crossings with a maximum height of 0.8 m.	Greatest length of subsea cables and maximum number of cable crossings with external protection giving the maximum potential for fishing interaction.
Vessel grounding due to reduced under keel clearance	×	✓	×	**Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ 5 subsea cables with a total length of 126 km ▪ Target burial depth of 2-3 m ▪ 42 potential cable crossings with a total cable length of 8.4 km ▪ External rock protection at cable crossings with a maximum height of 0.8 m.	Greatest length of subsea cables and maximum number of cable crossings with external protection giving the maximum potential for reduced under keel clearance.

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
Interference with magnetic compasses	✗	✓	✗	**Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ 5 subsea cables with a total length of 126 km ▪ Target burial depth of 2-3 m	Greatest length of subsea cables and maximum temporal impact on magnetic compasses
Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources	✓	✓	✓	**Construction Phase** ▪ Cable installation expected to take up to two months ▪ Douglas CCS platform installation expected to take up to five months ▪ Overall programme of works at existing platforms expected to take up to four years ▪ Maximum of 2 HLV on site making up to 4 return trips ▪ Maximum of 2 jack-up vessels on site making up to 4 return trips ▪ Maximum of 17 tug/anchor handlers making up to 22 return trips ▪ Maximum of 12 cargo barges making up to 17 return trips ▪ Maximum of 3 dive support/light construction vessels making up to 3 return trips ▪ Maximum of 2 survey vessels making up to 3 return trips	Greatest length of subsea cables and maximum project vessels on site giving the maximum potential for reduction SAR capability

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ Maximum of 6 crew transfer vessels making up to 216 return trips ▪ Maximum of one cable installation vessel making one return trip ▪ Maximum of 5 support vessels making up to 83 return trips ▪ Maximum of 2 multicats making up to 2 return trips ▪ Maximum of 3 working boats making up to 3 return trips ▪ Maximum of 1 trench support vessel making one return trip ▪ Maximum of 1 seabed preparation vessel making one return trip ▪ Maximum of 1 cable protection installation vessel making one return trip ▪ 500 m advisory safe passing distances around cable installation vessels ▪ 500 m safety zone around the Douglas platform **Operation and Maintenance Phase** ▪ Anticipated operation and maintenance phase lasting 25 years. ▪ 500m safety zone around the Douglas CCS platform	

Potential Impact	Phase			Maximum Design Scenario	Potential Impact
	C	O&M	D		
				▪ 500 m advisory safe passing distance around cable maintenance vessels during periods of major maintenance ▪ One mobile offshore drilling unit (MODU) anticipated on site for well operations every 10 years. **Decommissioning Phase** ▪ It is anticipated that decommissioning works will be similar in terms of the maximum design scenario to the construction phase.	

3 Guidance and Legislation

3.1 Policy

The relevant marine policy for shipping and navigation in relation to the Proposed Development are set out in volume 2, chapter 9. The following relevant policy documents have been considered in the ES chapter and throughout the NRA:

- UK Marine Policy Statement (Ref. v)
- North West Marine Plan (Ref. vi)
- Welsh National Marine Plan (Ref. vii)

3.2 Legislation

The following legislation is considered relevant to the assessment:

- United Nations Convention on the Law of the Sea (UNCLOS) (Ref. viii);
- Submarine Telegraph Act (1885) (Ref. ix) ;
- International Regulations for Preventing Collisions at Sea (COLREGS) (Ref. x); and
- Chapter V, Safety of Navigation, of the Annex to the International Convention for the Safety of Life at Sea (SOLAS) (Ref. xi).

3.3 Primary Guidance

The primary guidance documents used during the assessment are the following:

- *MGN 654 (Merchant and Fishing) Safety of Navigation: Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response* and its annexes (Ref. i); and
- *Revised Guidelines for FSA for Use in the IMO (International Maritime Organization) Rule-Making Process* (Ref. xii).

MGN 654 highlights issues that shall be considered when assessing the effect on navigational safety from offshore renewable energy developments proposed in United Kingdom (UK) internal waters, UK territorial sea or the UK Exclusive Economic Zone (EEZ), including any offshore transmission infrastructure, i.e. offshore cables. It is noted that while CCS projects are not considered renewable energy developments, much of the guidance is considered to be applicable to the Proposed Development.

The MCA methodology is centred on risk management and requires a submission that shows that sufficient controls are, or will be, in place for the assessed risk to be judged as broadly acceptable or tolerable with mitigation (see Section 10). Across volume 2, chapter 9 of the ES and the NRA both base and future case levels of risk have been identified, along with what measures are required to ensure the future case remains broadly acceptable or tolerable with mitigation.

3.4 Other Guidance

Other guidance documents used during the assessment are as follows:

- MGN 661 (Merchant and Fishing) Navigation – Safe and Responsible Anchoring and Fishing Practices (Ref. xiii).

4 Navigational Risk Assessment Methodology

4.1 FSA Methodology

A shipping and navigation user can only be exposed to a risk caused by a hazard if there is a pathway through which a risk can be transmitted between the source activity and the user. In cases where a user is exposed to a risk, the overall significance of risk to the user is determined. This process incorporates a degree of subjectivity. The assessments presented herein for shipping and navigation users have considered the following criteria:

- baseline data and assessment;
- expert opinion;
- level of stakeholder concern;
- time and/or distance of any deviation;
- number of transits of specific vessels and/or vessel types; and
- lessons learnt from existing offshore developments.

4.2 FSA Process

The IMO FSA process as approved by the IMO in 2018 under Maritime Safety Committee – Marine Environment Protection Committee (MEPC).2/circ. 12/Rev.2 will be applied to the risk assessment within this NRA, and volume 2, chapter 9 of the ES.

The FSA process is a structured and systematic methodology based upon risk analysis and Cost Benefit Analysis (CBA) (if applicable) to reduce impacts to As Low as Reasonably Practicable (ALARP). There are five basic steps within this process as illustrated by Figure 4.1 and summarised in the following list:

- step 1 – Identification of hazards (a list is produced of hazards prioritised by risk level specific to the problem under review);
- step 2 – Risk assessment (investigation of the causes and initiating events and risks of the more important hazards identified in step 1);
- step 3 – Risk control options (identification of measures to control and reduce the identified risks);
- step 4 – CBA (identification and comparison of the benefits and costs associated with the risk control options identified in step 3); and
- step 5 – Recommendations for decision-making (defining of recommendations based upon the outputs of steps 1 to 4).

Figure 4.1: Flow chart of the FSA methodology

It is noted that hazards of a commercial nature are considered outside the remit of the NRA but have been assessed using the FSA process in volume 2, chapter 9 of the ES, where appropriate.

The FSA assigns each impact a "severity of consequence" and "frequency of occurrence" to evaluate the significance during the construction, operation and maintenance and decommissioning phases of the proposed development.

Table 4.1 and Table 3.2 identify how the severity of consequence and the frequency of occurrence has been defined, respectively.

Table 4.1: Severity of Consequence Ranking Definitions

Rank	Description	Definition			
		People	Property	Environment	Business
1	Negligible	No perceptible risk	No perceptible risk	No perceptible risk	No perceptible risk
2	Minor	Slight injury(ies)	Minor damage to property, i.e. superficial damage	Tier 1[1] local assistance required	Minor reputational risks – limited to users

[1] Tier 1 – Local (within the capability of one local authority, offshore installation operator or harbour authority

Rank	Description	Definition			
		People	Property	Environment	Business
3	Moderate	Multiple minor or single serious injury	Damage not critical to operations	Tier 2[2] limited external assistance required	Local reputational risks
4	Serious	Multiple serious injuries or single fatality	Damage resulting in critical risk to operations	Tier 2 regional assistance required	National reputational risks
5	Major	More than one fatality	Total loss of property	Tier 3[3] national assistance required	International reputational risks

Table 4.2: Frequency of Occurrence Ranking Definitions

Rank	Description	Definition
1	Negligible	Less than 1 occurrence per 10,000 years
2	Extremely unlikely	1 per 100 to 10,000 years
3	Remote	1 per 10 to 100 years
4	Reasonably probable	1 per 1 to 10 years
5	Frequent	Yearly

The severity of consequence and frequency of occurrence are then used to define the significance of risk via a tolerability matrix approach as shown in Table 4.3. The significance of risk is defined as Broadly Acceptable (low risk), Tolerable (intermediate risk) or Unacceptable (high risk).

[2] Tier 2 – Regional (beyond the capability of one local authority or requires additional contracted response from offshore operator or from ports or harbours
[3] Tier 3 – National (requires national resources coordinated by the MCA for a shipping incident and the operator for an offshore installation incident)

Table 4.3: Tolerability Matrix and Risk Rankings

Severity of Consequence	5					
	4					
	3					
	2					
	1					
		1	2	3	4	5
		Frequency of occurrence				

	Unacceptable (high risk)
	Tolerable (intermediate risk)
	Broadly Acceptable (low risk)

Once identified, the significance of risk will be assessed to ensure it is ALARP. Further risk control measures may be required to further mitigate a hazard in accordance with the ALARP principles. Unacceptable risks are not considered to be ALARP.

4.3 Cumulative Impact Assessment Methodology

The hazards identified in the FSA are also assessed for cumulative risks with the inclusion of other projects and proposed developments. The developments selected as relevant to the cumulative impact assessment are based upon the results of a screening exercise and the development of a 'long list' of cumulative developments relevant to the Proposed Development.

4.4 Study Area

The proposed development is located within the Liverpool Bay off the north coast of Wales, and comprises a single newly installed platform, inside the existing Safety Zone of the Douglas Complex, as well as subsea cables connecting to the nearby Lennox, Hamilton and Hamilton North Platforms. An additional cable is planned connecting the landfall at Point of Ayr on the north coast of Wales.

For the baseline traffic analysis, a study area was defined to cover a bounding box encompassing a minimum 5nm buffer of the cable routes and a 10nm buffer on the proposed new platform location. The study area is presented in Figure 4.2.

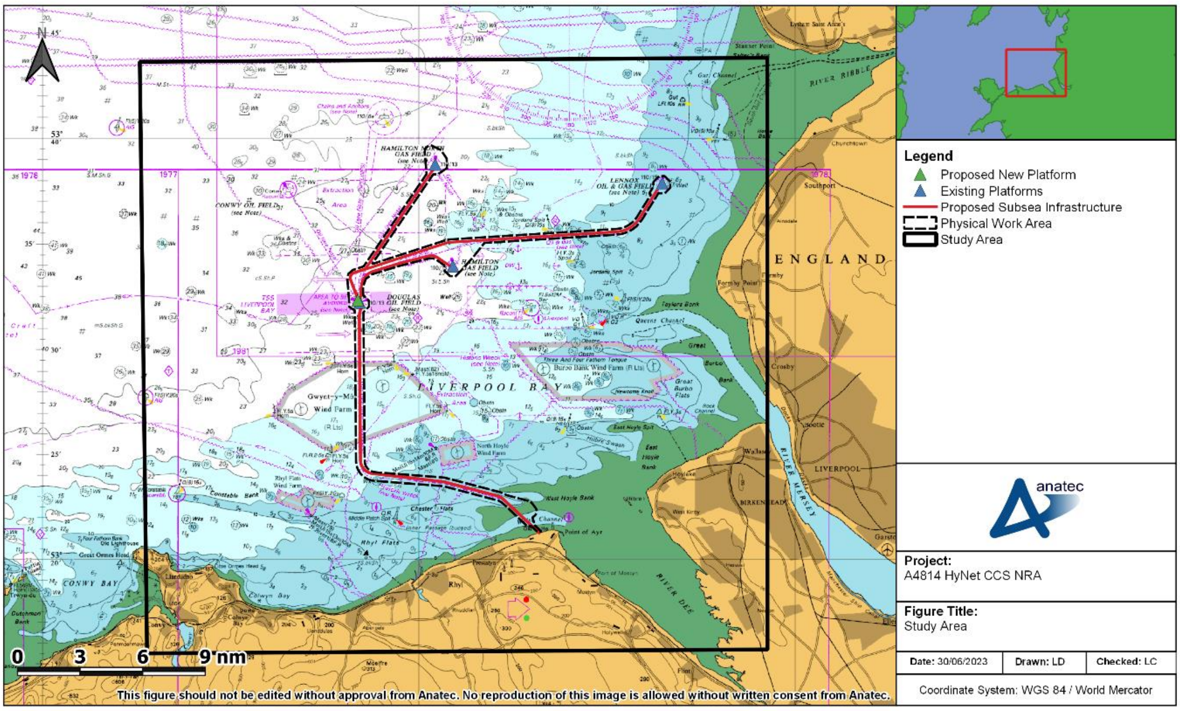

Figure 4.2: Study Area

The study area is considered sufficient to characterise the shipping activity and navigational features of relevance to the Proposed Development to encompass any vessel traffic that may be impacted by the Proposed Development. In addition to the study area, a Physical Work Area is defined around the cable route and platform location, which captures all areas in which work involved in the Project may take place.

The study area was presented to key stakeholders during consultation, including the MCA and Trinity House, as part of discussions on the NRA methodology.

5 Consultation

5.1 Stakeholders

The following shipping and navigation stakeholders have been consulted as part of the NRA process:

- MCA;
- Trinity House;
- Royal Yachting Association (RYA);
- UK Chamber of Shipping;
- Port of Liverpool; and
- Port of Mostyn.

5.2 Consultation Responses

Responses were received from stakeholders during consultation undertaken in the NRA process, either during virtual meetings, or through the Scoping Opinion. The key points and where they have been addressed in the NRA are presented in Table 5.1.

Table 5.1: Summary of Key Points Raised during Consultation

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in the NRA
27/01/2023	OPRED – Scoping Opinion	Section 3.5: Offshore Construction Phase - Offshore Power and Fibre Optic (FO) Cables. Clarification regarding the target cable burial depth is requested. It is advised that, if a minimum cable burial depth cannot be met due to ground condition, the cable should (generally) be protected by rock armouring in order to reduce the risk of navigational hazards.	Cables are anticipated to be buried to a target depth of between 2-3m, as per Section 2. Where burial is not possible, such as at cable crossings, external protection is to be deployed in line with the findings of a CBRA (see Section 13).
		The development area for the Project carries a significant amount of through traffic to major ports, with a number of important international shipping routes in close proximity. The Developer is required to take into consideration any changes in vessel routing, particularly in heavy weather, to ensure shipping can continue to make safe passage without large-scale deviations. Any reduction in navigable depth should be referenced to chart data.	The vessel traffic baseline has been characterised in Section 9. Vessel displacement has been considered and local port access assessed in Section 10. Due to the project largely coinciding with existing infrastructure, it is not anticipated that significant deviation will be required, with deviations mostly being temporary, localised deviations during the construction phase.
		The Navigational Risk Assessment should establish how the phases of the Project are managed to a point where risks are reduced and considered to be 'as low as reasonably practicable' (ALARP).	The FSA methodology is described in Section 4, with embedded mitigation measures used to reduce the risks to ALARP outlined in Section 13.
		It noted that the ES will consider the potential impacts of the construction, operation and maintenance and decommissioning phases of the Project and will follow the IMO Formal Safety Assessment methodology. The ES should provide details on the possible impacts of navigational issues for both commercial and recreational craft specifically: i. Collision Risk; ii. Navigational Safety; iii. Risk Management and Emergency response including potential impacts to search and rescue (SAR) and emergency response in the area to ensure there are no impacts on SAR operations;	The listed impacts have been assessed within Section 10, with impacts assessed for all three phases of the Proposed Development. Impacts have been assessed following the IMO FSA as outlined in Section 4.

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in the NRA
		iv. Marking and lighting of site and information to mariners; v. Effect on small craft navigational and communication equipment; vi. The risk to drifting recreational craft in adverse weather or tidal conditions; and vii. The likely squeeze of small craft into the routes of larger commercial vessels."	
		A safe realistic under keel clearance (UKC) assessment should be undertaken for the maximum drafts of vessels, both observed and anticipated. A link to The Maritime and Coastguard Agency (MCA) Under Keel Clearance Policy is provided in Annex 2.	Under keel clearance has been assessed within the impact assessment presented in Section 10. If areas are identified where water depth reduction may exceed 5%, a detailed draught assessment will be carried out post-consent to determine any safety risk to navigation.
		The Developer should ensure that any cables which need to be buried meet the appropriate burial depth and that evidence of this is provided by completing a Burial Protection Index study.	Cables are expected to be buried to a target depth of 2-3m. Cable burial and protection will be informed by CBRA (see Section 13).
		Subject to the traffic volumes, the Developer should note that an anchor penetration study may also be necessary. If cable protection measures are required (rock bags or mattresses), the MCA is willing to accept a 5% reduction in surrounding reference depths referenced to Chart Datum. This will be particularly relevant where depths are decreasing towards shore and potential impacts on navigable water increase. Where this is not achievable, the Developer must discuss this further with the MCA and Trinity House.	Suitable cable burial and/or external protection will be informed by a CBRA as noted in Section 13. Following surveys, if it is identified that additional protection is required and the MCA condition of no more than 5% reduction in water depth is exceeded, a review of impacts on shipping local to the affected area will be carried out. Consultation with the MCA and Trinity House will also be carried out as per MGN 654.
		It is advised that no effects are scoped out of the ES assessment with regards to shipping and navigation pending the outcome of the Navigational Risk Assessment (NRA) and further stakeholder consultation.	No effects were scoped out of the assessment with regards to shipping and navigation, which is presented in Section 10.

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in the NRA
26/06/2023	RYA – Consultation meeting	RYA are content with the NRA methodology, impacts, consultees, and mitigation measures presented.	Noted that RYA are content with the approach.
		It was noted that the local recreational users are unlikely to have any issues with the Proposed Development.	Noted that the Proposed Development is unlikely to cause issues for recreational users in the area.
27/06/2023	Port of Liverpool – Consultation meeting	It was noted that the baseline presented aligned with the experience of the Port of Liverpool in the area, noting that wind farm vessels cross the Rock Channel out of the Mersey broadcasting as passenger vessels.	Wind farms vessels are represented appropriately within the baseline assessment in Section 9. Noted that the data recorded is in agreement with local experience.
		It was noted that ferry operators may be a useful consultee. The Port of Liverpool offered to disseminate information to ferry operators.	Noted. Ferry operators will be informed of the works via the Port of Liverpool and local Notices to Mariners (Section 13).
		It was noted that dredging takes place constantly within the Queen's Channel, however the TSS lies outside the port limits and is not dredged.	Dredging activity has been noted in the traffic baseline presented in Section 9.
		It was recommended that use of Liverpool pilots could be considered for the project vessels as they form a liaison with vessel traffic. Local notices to mariners can also be issued by the port.	Liaison with local ports and harbours and promulgation of information via local notices to mariners are noted as embedded mitigation as listed in Section 13.
		Part of the Proposed Development lies within the Port of Liverpool limits and will require liaison with the port.	Liaison with local ports and harbours is noted as an embedded mitigation as listed in Section 13.
		No concerns were raised with the Proposed Development or the proposed methodology for the assessment, noting that much of the infrastructure coincides or replaces existing infrastructure.	Noted that no concerns were raised with the methodology presented.
29/06/2023	MCA – Consultation meeting	The RYA Coastal Atlas was recommended as a data source to inform on recreational traffic.	Consultation was undertaken with the RYA to inform the NRA, with no concerns raised regarding recreational vessels in the area. Therefore Automatic Identification System (AIS) was considered sufficient to inform on recreational activity in the area.

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in the NRA
		The MCA queried whether decommissioning works at the existing Douglas complex were included within the scope of the assessment.	Douglas decommissioning works are subject to a separate permit process and are not included within the scope of the NRA. Consideration has been given to the overlapping timescales, with the existing Douglas complex and the proposed Douglas CCS platform expected to be on site at the same time for a period of time.
		The MCA raised no concerns with the NRA methodology, impacts or mitigation measures presented.	Noted that the MCA accept the methodology, impacts and mitigation measures presented.
29/06/2023	Trinity House – Consultation meeting	Trinity House noted that the platform lighting and marking falls under the remit of the Standard Marking Schedule as opposed to IALA guidance.	Suitable lighting and marking will be in place on the Douglas CCS platform in accordance with the Standard Marking Schedule and in agreement with Trinity House, as noted in Section 13.
		Trinity House raised no concerns with the NRA methodology, impacts or mitigation measures presented.	Noted that Trinity House accept the methodology, impacts and mitigation measures presented.
29/06/2023	Port of Mostyn – Consultation meeting	Port of Mostyn raised no concerns with the NRA methodology, impacts or mitigation measures presented.	Noted that the Port of Mostyn accept the methodology, impacts and mitigation measures presented.
		It was noted that there are several wind farm projects being developed in the area and the Port of Mostyn may see an increase in the vessels associated with these, including potentially construction vessels.	Future wind farm developments and potential resultant changes to the vessel traffic baseline are noted in Section 9.9 and considered in the cumulative assessment (Section 11).
29/06/2023	UK Chamber of Shipping – Consultation meeting	It was noted that the project boundaries for offshore wind farms in the planning phase may differ from the as-built footprint of arrays.	Possible changes to planned wind farm boundaries are noted in the discussion of the future traffic baseline detailed in Section 9.9.
		It was noted that the construction of wind farms in the area may lead to significant traffic deviations and alter the existing traffic baseline.	Noted in the future traffic baseline presented in Section 9.9 that traffic patterns may change in response to the construction of offshore wind farms. Traffic deviations considered in the cumulative assessment (Section 11)

Date	Consultee and type of response	Issue raised	Response to issue raised and/or where considered in the NRA
		The Chamber queried whether the proposed Douglas CCS platform would qualify for an automatic 500m safety zone, but noted that they would support.	It is assumed that a new 500m safety zone will be established around the new Douglas platform as part of the embedded mitigation measures listed in Section 13.
		Disruption to the Liverpool Bay TSS during the construction phase was noted to be the primary concern for the Chamber, given that the as-built project would have minimal differences to existing infrastructure.	Vessel deviations and reduced access to local ports and harbours has been assessed within the impact assessment presented in Section 10 Disruption to the Liverpool Bay TSS is expected to be very short-term and localised due to the speed of the cable-lay activities.
		The Chamber raised no concerns with the NRA methodology, impacts or mitigation measures presented.	Noted that the Chamber accept the methodology, impacts and mitigation measures presented.

6 Data Sources

The main data sources used to characterise the shipping and navigation baseline relative to the proposed development and inform the impact assessment are presented in Table 6.1.

Table 6.1: Data Sources used to inform the Shipping and Navigation Baseline

Title	Source	Purpose
Vessel traffic	Twelve months of AIS data – 2022	Characterising vessel traffic movements within the study area
Navigational features	Admiralty nautical charts 1978 & 1826 (Ref. xiv)	Characterising other navigational features in the proximity to the proposed development
	Admiralty Sailing Directions NP37 "*West Coasts of England and Wales Pilot"* (Ref. xv)	
Wind farm boundaries and agreements	GIS for wind farms within England and Wales, The Crown Estate (TCE) 2022	Characterising wind farm boundaries and agreements in proximity to the proposed development
Maritime incidents	Marine Accident and Investigation Branch (MAIB) incident data, 2012-2021	Review of maritime incidents in proximity to the proposed development
	Royal National Lifeboat Institution (RNLI) incident data, 2013-2022	
	Department for Transport (DfT) UK civilian Search And Rescue (SAR) helicopter taskings (April 2015 – 2022)	
Additional fishing data	Vessel Monitoring System (VMS) satellite fishing data 2020, Marine Management Organisation (MMO)	Provide further information on fishing activities in proximity to the proposed development

6.1 AIS Data

The baseline shipping analysis is based on an up-to-date data set consisting of twelve months of AIS data collected for the study area. The data covers the entirety of 2022, and therefore captures the full range of seasonal variation.

AIS equipment is required to be fitted on all vessels of 300 gross tonnes (GT) and upwards engaged on international voyages, cargo vessels of 500 GT and upwards not engaged on international voyages, and passenger vessels irrespective of size, built on or after 1 July 2002. Under the Merchant Shipping (Vessel Traffic Monitoring and Reporting Requirements) Regulations 2004 (as amended in 2011), fishing vessels of 15 m or more in length overall, UK registered or operating in UK waters, must be fitted with an approved (Class A) AIS (regulation 8A). In addition, all UK and European Union (EU) registered fishing vessels of length 15 m and above are required to carry AIS equipment. Smaller fishing vessels (below 15 m) as well as recreational craft are not required to carry AIS but a proportion does so voluntarily. It is also noted that military vessels are not obligated to broadcast on AIS at all times. Therefore, these vessels (e.g. fishing, recreational and military vessels) will be under-reported within the AIS data.

The reporting interval between position reports for a given vessel typically ranges between a few seconds and up to three minutes, depending on its speed and navigational status (less frequent for anchored and moored vessels).

6.2 Data Limitations

6.2.1 AIS Data

It is assumed that vessels under an obligation to broadcast information via AIS have done so, across all vessel traffic datasets. It has also been assumed that the details broadcast via AIS (such as vessel type and dimensions) are accurate unless clear evidence to the contrary was identified. There may be occasional range limitations in tracking certain vessels, especially smaller (Class B AIS) vessels in winter. However, it is not considered that the comprehensiveness of the AIS data compromises confidence in the assessment.

Since the vessel traffic data for the study area consists of AIS only, the data has limitations associated with non-AIS targets. Therefore, additional data sources such as VMS data and consultation feedback have been considered when assessing the baseline environment.

Military vessels are not required to broadcast on AIS and may therefore be under-represented. It is assumed that the Ministry of Defence will be consulted as part of the consenting programme.

6.2.2 Historical Incident Data

Although all UK commercial vessels are required to report incidents to the MAIB, this is not mandatory for non-UK vessels unless they are in a UK port, within territorial waters or carrying passengers to a UK port. There are also no requirements for non-commercial recreational craft to report incidents to the MAIB. Nevertheless, the MAIB incident database is considered to be a suitable source for the characterisation of historical incidents and adequate for the assessment.

The RNLI incident data cannot be considered comprehensive of all incidents in the study area. Although hoax and false alarms are excluded, any incident to which an RNLI resource was not mobilised has not been accounted for in this dataset. Nevertheless, the RNLI incident data is still considered to be an appropriate resource for the characterisation of historical incidents and adequate for the assessment.

6.2.3 Admiralty Charts

The Admiralty Charts published by the United Kingdom Hydrographic Office (UKHO) are updated periodically, and therefore the information shown may not reflect the real-time features within the area with total accuracy. Taking into account the consultation which has been undertaken, Admiralty Charts are considered to be a suitably comprehensive and adequate resource for the assessment of navigational features within the area. For aids to navigation, only those charted and considered key to establishing the shipping and navigation baseline are shown.

7 Navigational Features

7.1 Overview

An overview of the key navigational features in proximity to the proposed development is presented in Figure 7.1. Following this, navigational features are discussed individually in more detail in the following subsections.

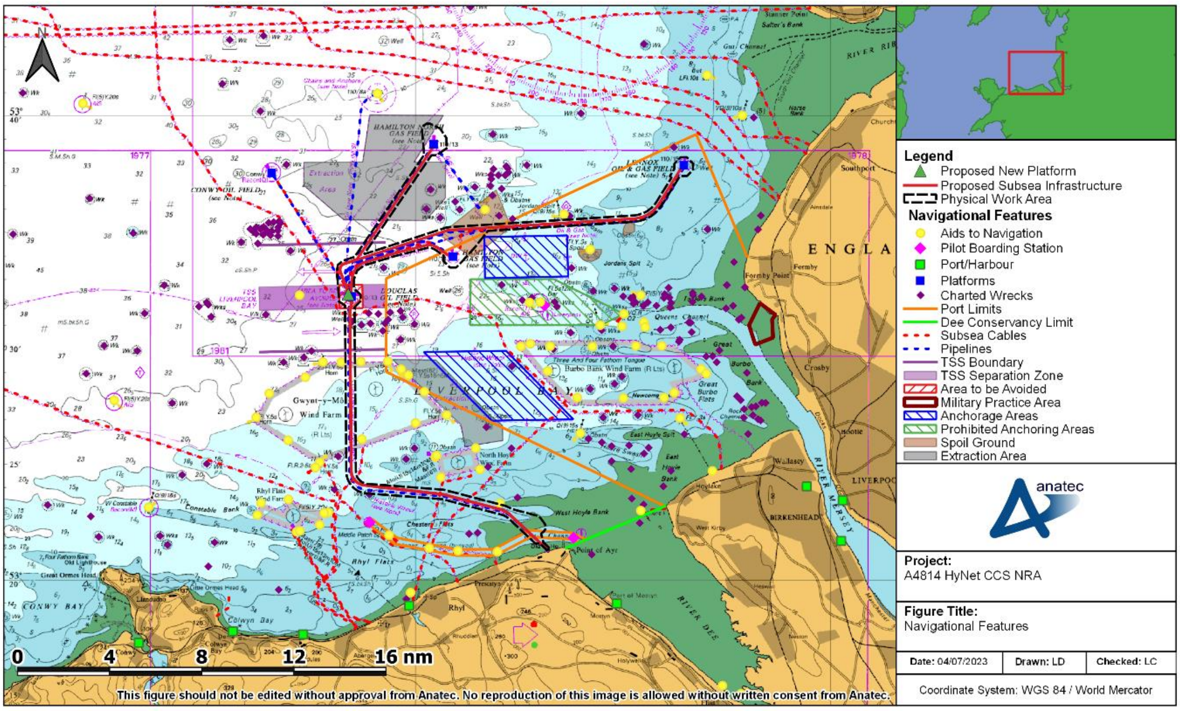

Figure 7.1: Navigational Features

7.2 Subsea Cables and Pipelines

Figure 7.2 presents the subsea cables and pipelines in proximity to the proposed development.

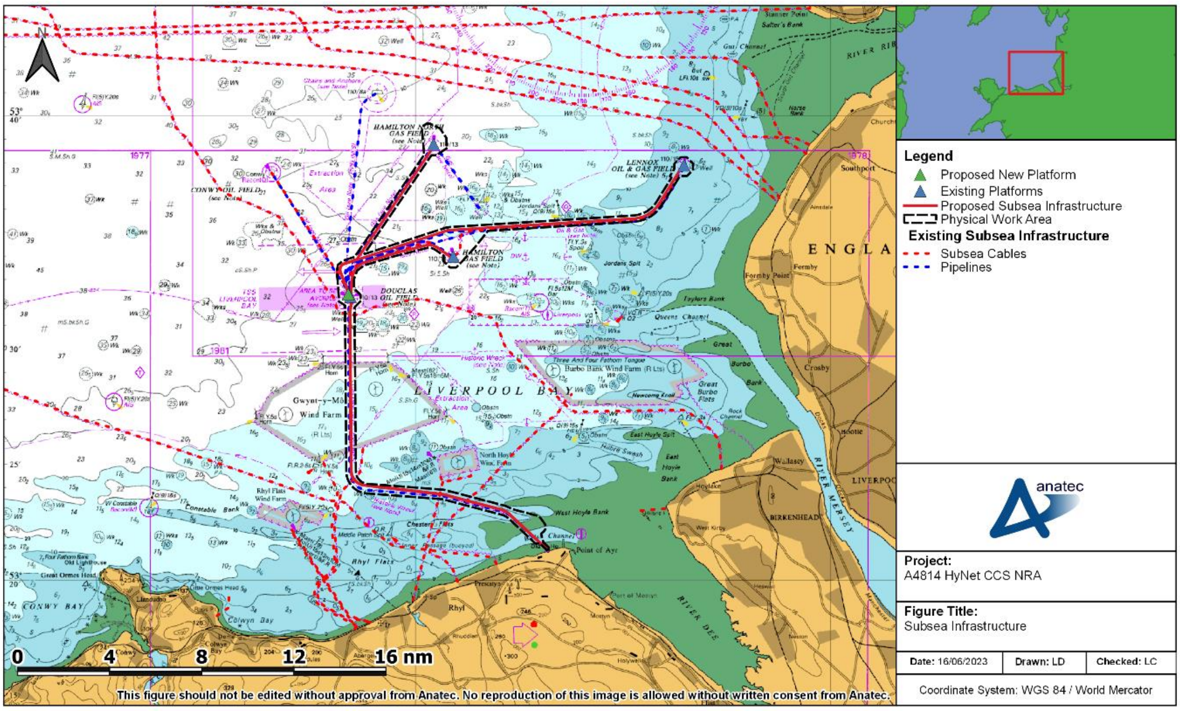

Figure 7.2: Subsea Infrastructure

There are several subsea cables in the area associated with the offshore wind farms, cables connecting to Ireland and the Isle of Man, as well as existing pipelines connecting to the oil and gas infrastructure. Several cables cross the proposed development, including the export cables to the Burbo Bank, North Hoyle and Gwynt-y-Môr wind farms, as well as the Western Link power cable which links Hoylake on the English coast to Ireland, and crosses the proposed development 0.8nm south of the proposed Douglas CCS platform. To the north of the proposed development, there are several subsea cables running between the English coast and both the Isle of Man and Ireland. In addition to existing cables, the proposed MaresConnect interconnector is expected to make landfall to the west of the Proposed Development, on the north coast of Wales.

As noted in Section 2, several of the existing pipelines in the area are anticipated to be repurposed as part of the proposed development.

7.3 Offshore Wind Farms

Figure 7.3 presents the locations of existing and planned offshore wind farms in proximity to the development, colour-coded by the status of the wind farm.

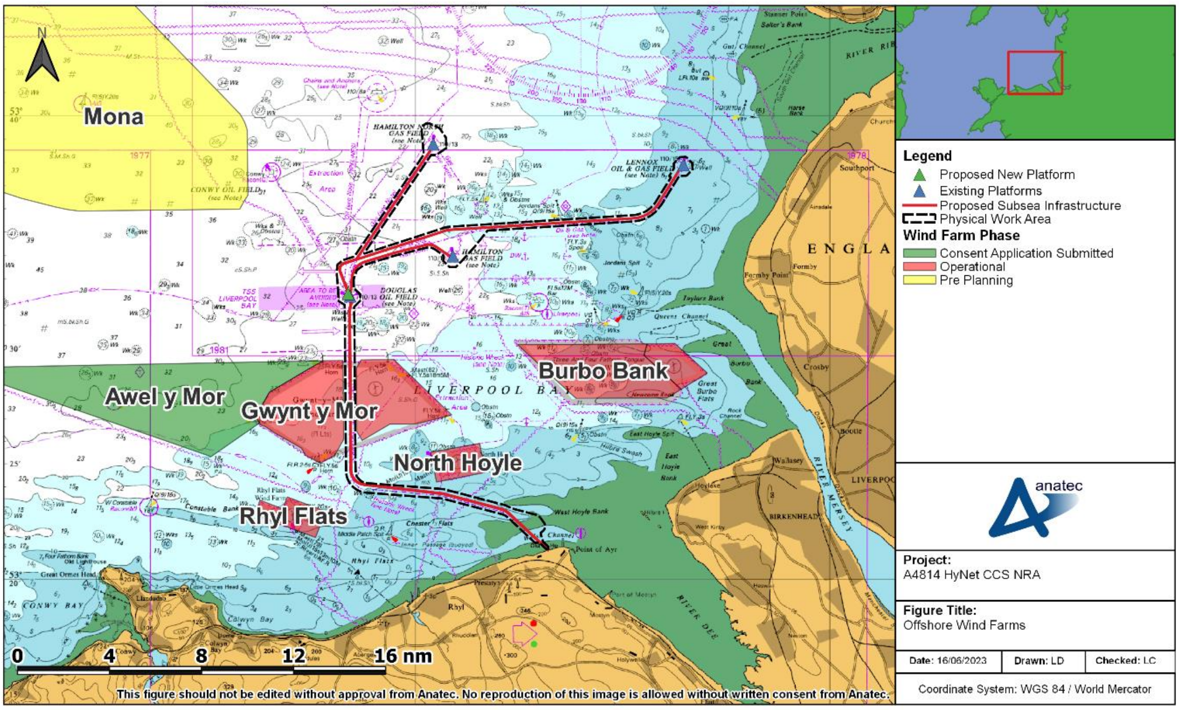

Figure 7.3: Offshore Wind Farms

There are six offshore wind farm projects in proximity to the proposed development, at various stages of development. Four of the wind farms are operational. The proposed cable route passes through the Gwynt y Môr site, following the same corridor as existing pipelines. The cable route to Point of Ayr also passes close to the Rhyl Flats and North Hoyle wind farms, which lie 1.8nm to the west and 0.5nm to the north of the cable route, respectively. Burbo Bank, including the Burbo Bank Extension, lies approximately 4.7nm southeast of the existing Hamilton platform which forms part of the proposed development.

In addition to the existing operational wind farms, the Awel y Môr offshore wind farm is planned to adjoin the Gwynt y Môr site to the west of the cable route, and is awaiting a decision on its consent application. To the northwest of the cable, the Mona offshore wind farm is in a pre-planning stage. It was noted in consultation that given the stage of the Awel-y-Mor and Mona projects, it is likely that the site boundaries presented may differ significantly from the as-built boundaries if consent is obtained.

7.4 Ports and Harbours

Figure 7.4 presents the ports and harbours in proximity to the proposed developments.

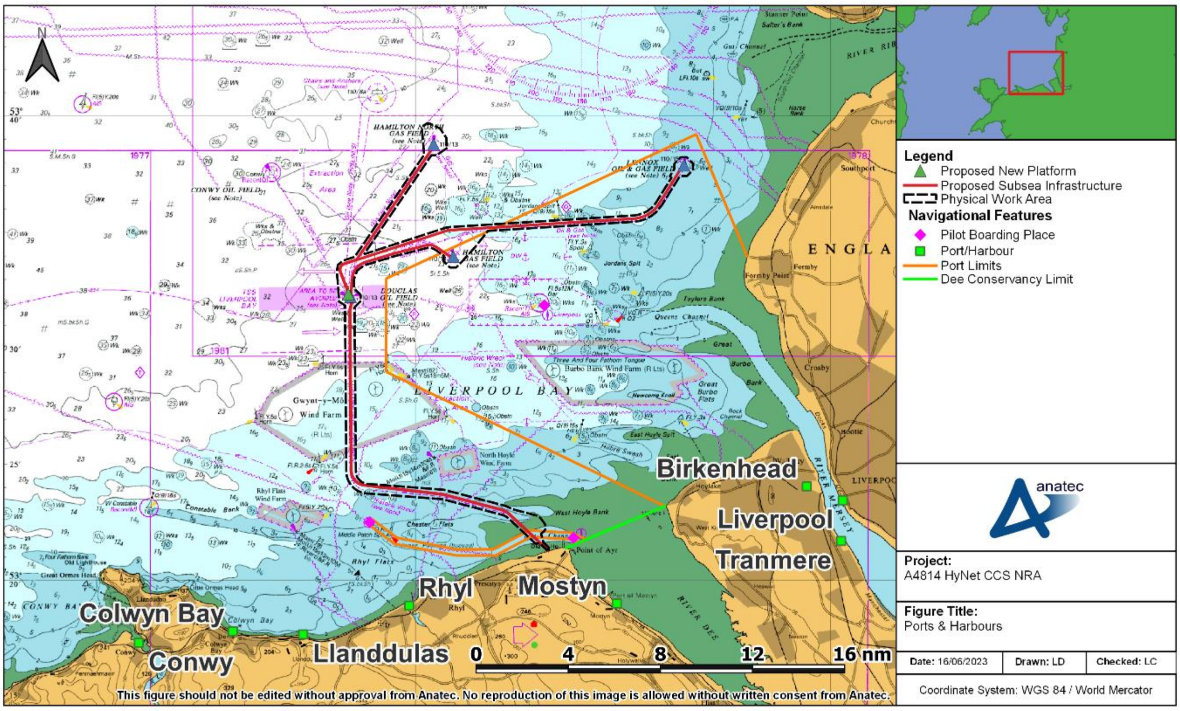

Figure 7.4: Ports and Harbours

The most significant ports in the vicinity of the proposed development are the Port of Liverpool in the River Mersey, and the Port of Mostyn in the River Dee. The River Mersey is accessed via the Queen's Channel, the entrance to which is located approximately 13.2 nm east of the proposed Douglas CCS platform. The Mersey also houses Birkenhead ferry terminal, and Tranmere oil terminal, as well as the entrance to the Manchester Ship Canal.

The limits of the Port of Liverpool extend into Liverpool Bay. The existing platforms at both Lennox and Hamilton are within the port limits, as is a section of the proposed cable to the Lennox field. The Port of Liverpool operates a VTS with an information service and operates radar surveillance. Pilotage for the Port of Liverpool is compulsory for all vessels of length greater than 82 m, and for all vessels carrying hazardous cargoes, or 12 or more passengers. The pilot boarding station is located at the entrance to the Queen's Channel, though it is noted that in adverse weather, pilots may board further west off Point Lynas.

The Port of Mostyn is located within the River Dee, to the south of the proposed development. Entrance to the Dee is via the Welsh Channel, which the port limits of Mostyn extend to cover. The Welsh Channel is approximately 500 m wide, and is crossed by the proposed cable route close to the landfall at Point of Ayr. The Port of Mostyn lies within the Dee Conservancy, with the port authority being the Dee Conservancy Harbour Authority, which is part of Natural Resources Wales. Pilotage to the Port of Mostyn or the River Dee is compulsory for all vessels over 20 m.

Other ports and harbours in the area include Rhyl, Colwyn Bay, Llanddulas and Conwy.

7.5 IMO Routeing Measures

Figure 7.5 presents the IMO routeing measures in place in proximity to the Proposed Development.

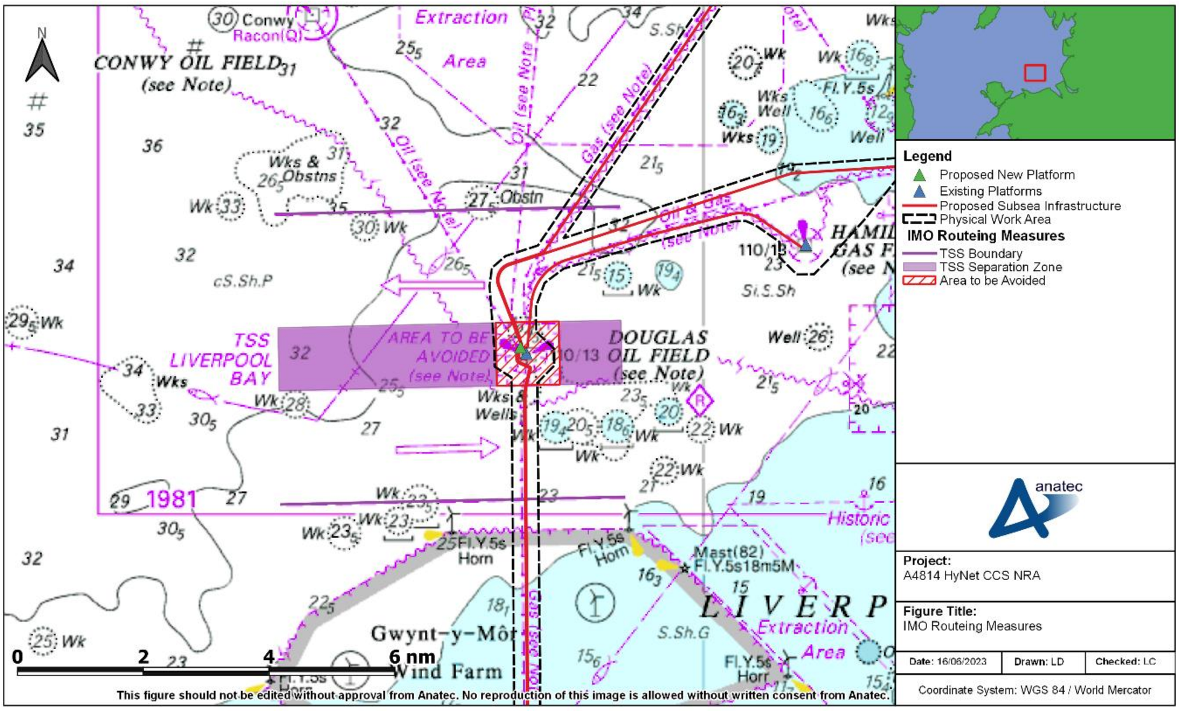

Figure 7.5: IMO Routeing Measures

The most significant routeing measure in the area is the Liverpool Bay TSS, which the proposed cable route intersects, as the existing Douglas complex is located in between the two lanes of the TSS. In addition to a 500m safety zone, the Douglas complex is also surrounded with an Area to be Avoided (ATBA) which fills the gap in the separation zone of the TSS.

7.6 Anchoring Areas

Figure 7.6 presents an overview of the designated anchoring areas within the study area.

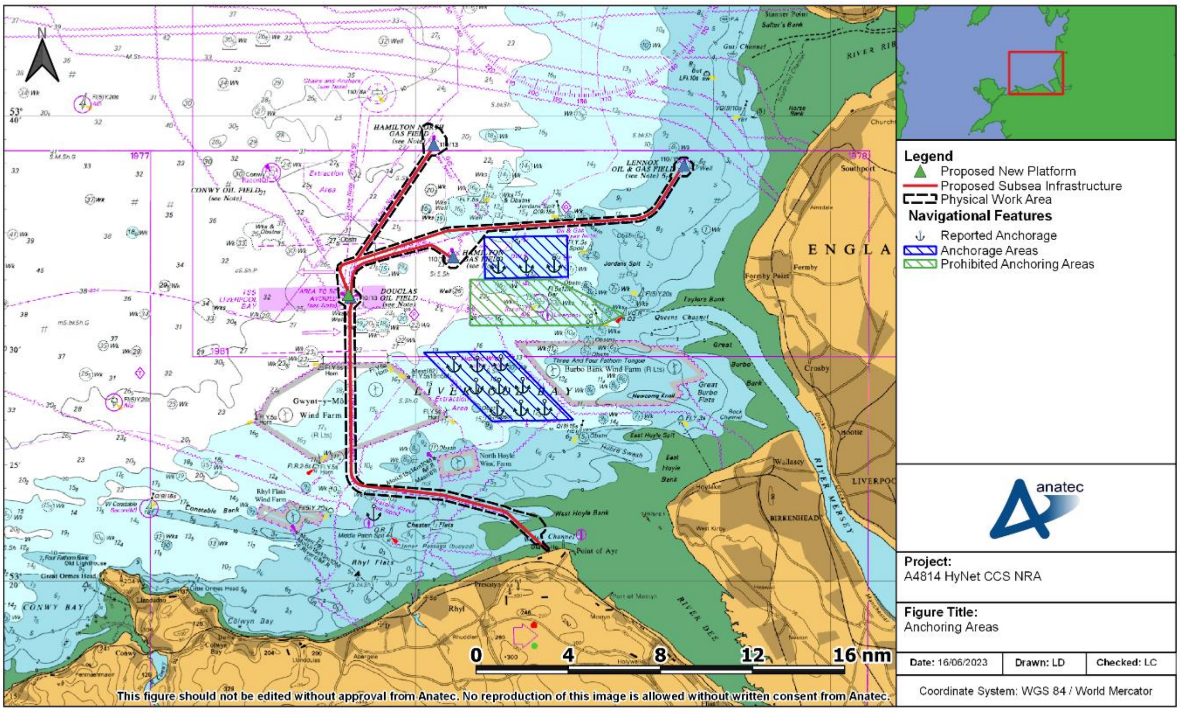

Figure 7.6: Anchoring Areas

There are three notable anchorage areas in proximity to the Proposed Development. The northernmost of these is located approximately 0.5 nm south of the cable route to Lennox, with this noted as a deep water anchorage, containing three anchor berths. A prohibited anchoring area borders this area to the south.

Further south, between the Burbo Bank and Gwynt y Môr wind farms, an anchorage area with nine anchor berths is located. A further reported anchorage is located south of the Douglas – Point of Ayr cable route, close to the outer pilot boarding area for the Port of Mostyn.

7.7 Aids to Navigation and Charted Wrecks

Figure 7.7 presents the charted wrecks and aids to navigation (AtoN) in the vicinity of the proposed development.

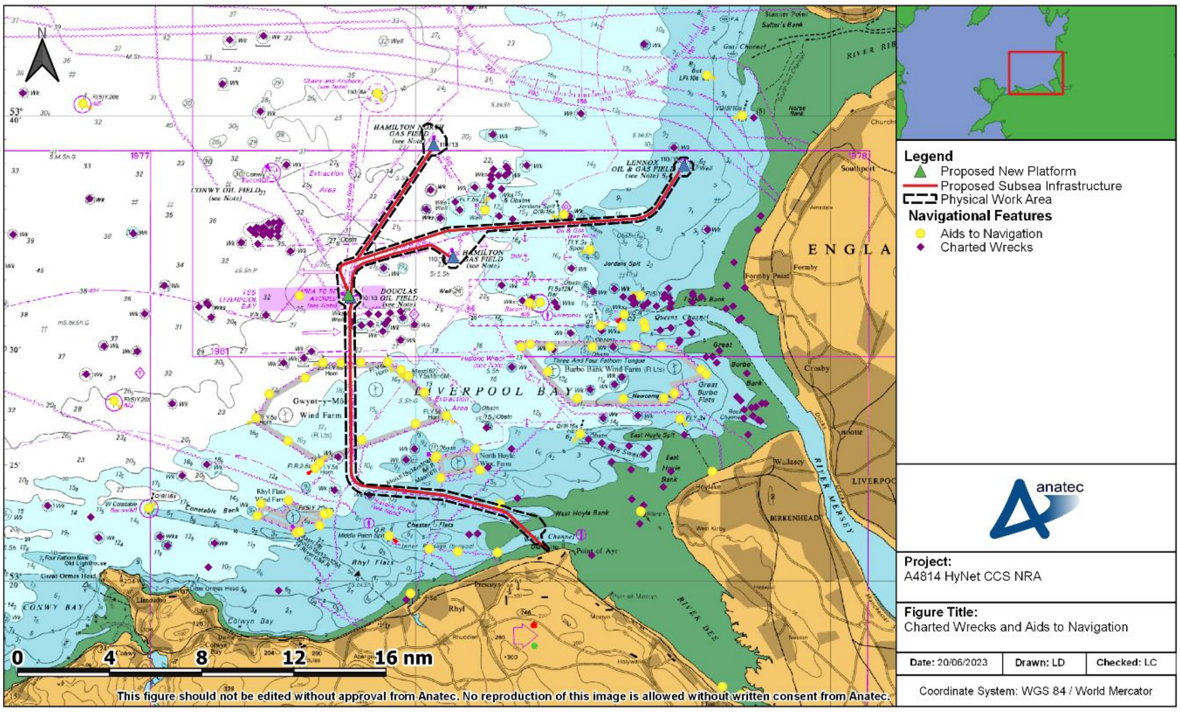

Figure 7.7: Charted Wrecks and Aids to Navigation

There are a number of AtoNs throughout the study area, including buoys marking various channels, such as the Queen's Channel and the Welsh Channel, which serve as the main entrances to the ports of Liverpool and Mostyn respectively. The various wind farms within the study area have peripheral turbines marked and lit as significant peripheral structures, serving as AtoN.

There are several charted wrecks in the area, with notable clusters around the Douglas field, to the southeast and northwest. There are also a large number on the banks and shallow waters close to shore. There is one wreck within the Physical Work Area, located approximately 1.2 nm south of the proposed Douglas platform. There is also a historic wreck located on the edge of the physical work area, approximately 600 m to the south of the cable route.

8 Emergency Response Overview

This section summarises the existing emergency response resources (including SAR) and reviews historical maritime incident data to establish baseline incident rates in proximity to the proposed development.

8.1 SAR Helicopters

In July 2022, the Bristow Group were awarded a new 10 year contract by the MCA (as an executive agency of the DfT) commencing in September 2024 to provide helicopter SAR operations in the UK. Bristow have been operating the service since April 2015.

There are currently ten base locations for the SAR helicopter service. The most relevant station to the proposed development is at Caernarfon, located approximately 32 nm to the southwest of the proposed development. The base houses two Sikorsky S-92 helicopters, with an operational range of 458 nm. Other bases which were recorded responding to incidents in the study area were Humberside, located 100 nm to the east of the proposed development, St Athan, approximately 120 nm to the south and Lee on Solent, 174 nm to the southeast. Figure 8.1 presents the location of Caernarfon helicopter base relative to the study area, as well as the SAR helicopter taskings recorded within the study area between April 2015 and March 2022.

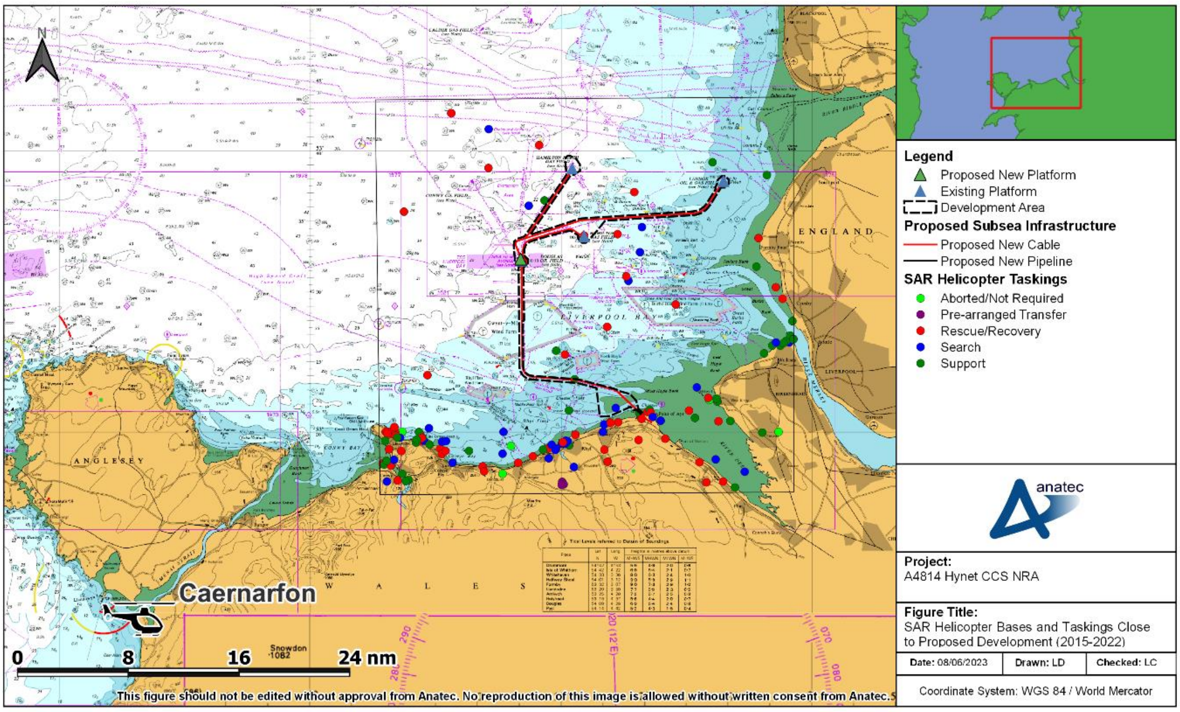

Figure 8.1: SAR Helicopter Bases and Taskings Close to Proposed Development (2015-2022)

Between April 2015 and March 2022, 153 helicopter taskings were recorded within the study area. The majority of these were concentrated in coastal areas, primarily on the Welsh coast south of the proposed development. There were several taskings in close proximity to the landfall of the cable at Point of Ayr. There were 15 taskings recorded within the development area, with 12 of these being rescue/recovery operations, two support operations and one search operation. Twelve taskings were recorded in close proximity to the Douglas complex. Rescue/recovery operations were the most common type within the study area, accounting for 46% of taskings, followed by support operations (25%) and search operations (24%). Caernarfon responded to 95% of taskings within the study area.

8.2 RNLI

The RNLI operate a fleet of more than 350 lifeboats based out of more than 230 stations across the UK and Ireland, including both all-weather lifeboats (ALBs) and inshore lifeboats (ILBs). There are numerous RNLI stations in proximity to the proposed development, which are presented in Figure 8.2.

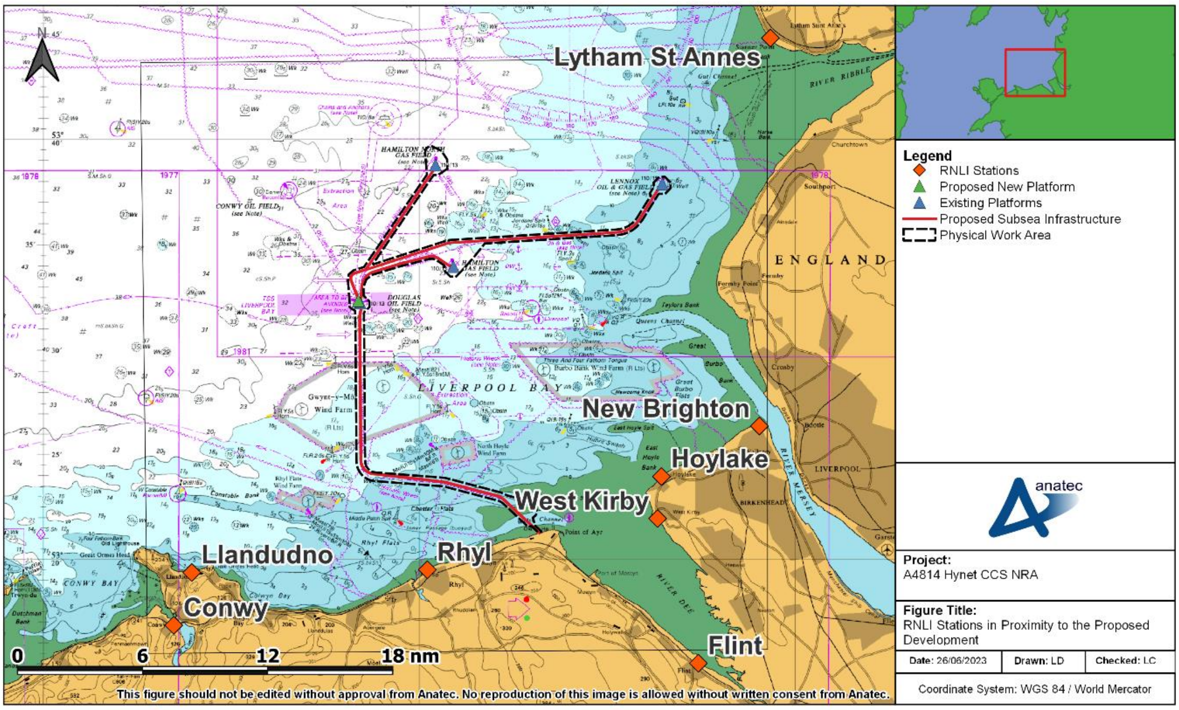

Figure 8.2: RNLI Stations in Proximity to the Proposed Development

RNLI incident data covering 2013-2022 has also been analysed to establish the types and frequency of incidents occurring in the study area. Rhyl responded to 34% of incidents within the study area, with New Brighton (14%), Llandudno (13%), Conwy (13%) and Hoylake (11%) also responding to a significant proportion of incidents. RNLI incidents within the study area, colour-coded by incident type, are presented in Figure 8.3.

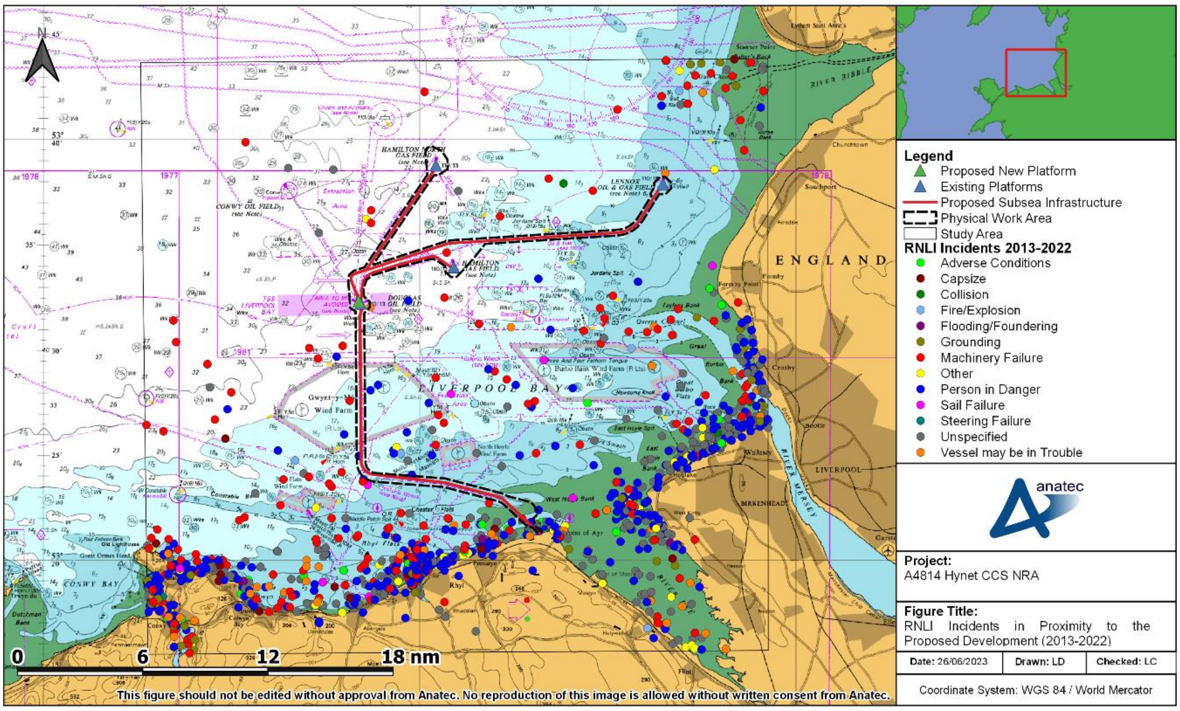

Figure 8.3: RNLI Incidents in Proximity to the Proposed Development (2013-2022)

Over the ten year period between 2013 and 2022, there were an average of 158 RNLI callouts per year within the study area, with these generally concentrated in coastal areas. Figure 8.4 presents the distribution of incident types reported by the RNLI.

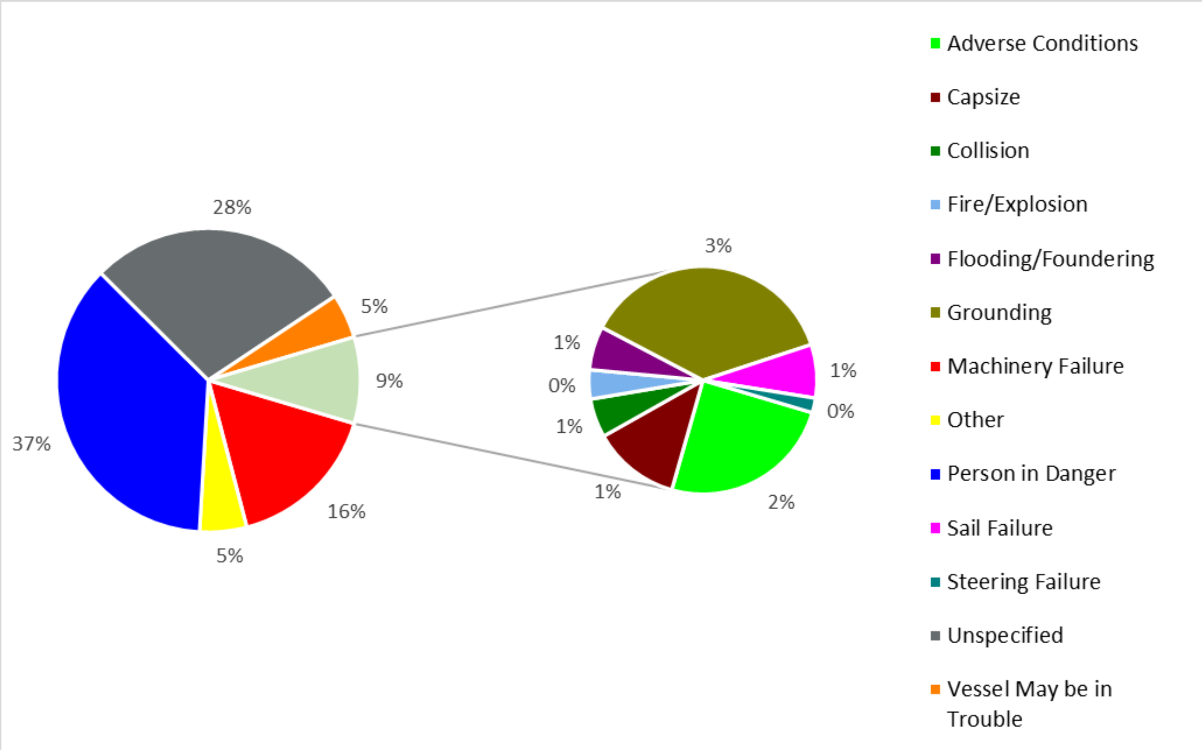

Figure 8.4 : RNLI Incident Type Distribution (2013-2022)

The most common type of incident recorded was "Person in Danger", accounting for 37% of incidents, followed by machinery failures (16%). A significant number of incidents were of unspecified type, with these generally located in coastal areas.

After "Person in Danger" incidents, the most common casualty types were recreational vessels (25%) and personal craft (10%). Again a significant proportion of incidents were classed as having unspecified casualties. Incidents involving fishing vessels, wind farm vessels and oil and gas vessels were recorded within the study area.

Within the Physical Work Area, there were a total of six incidents recorded in the 10 year period, with three machinery failures and three "person in danger" incidents.

8.3 Marine Rescue Coordination Centres and Joint Rescue Coordination Centres

His Majesty's Coastguard (HMCG), a division of the MCA, is responsible for requesting and tasking SAR resources made available to other authorities and for coordinating the subsequent SAR operations (unless they fall within military jurisdiction).

The HMCG coordinates SAR operations through a network of 11 Maritime Rescue Coordination Centres (MRCC), including a Joint Rescue Coordination Centre (JRCC) based in Hampshire.

All of the MCA's operations, including SAR, are divided into 18 geographical regions. The proposed development is within Area 15: "Great Orme to West Scottish Border including the Lakes". The closest MRCC to the proposed development is at Holyhead, located approximately 40nm to the west. It is noted that incident response is not necessarily coordinated by the nearest MRCC, as operators may be unavailable and calls re-routed to another MRCC.

8.4 MAIB

All UK flagged vessels and non-UK flagged vessels in UK territorial waters (12nm), a UK port or carrying passengers to a UK port are required to report incidents to the MAIB. Data arising from these reports are assessed within this section, covering the ten-year period between 2012 and 2021. Figure 8.5 presents the locations of incidents recorded within the study area, colour-coded by incident type.

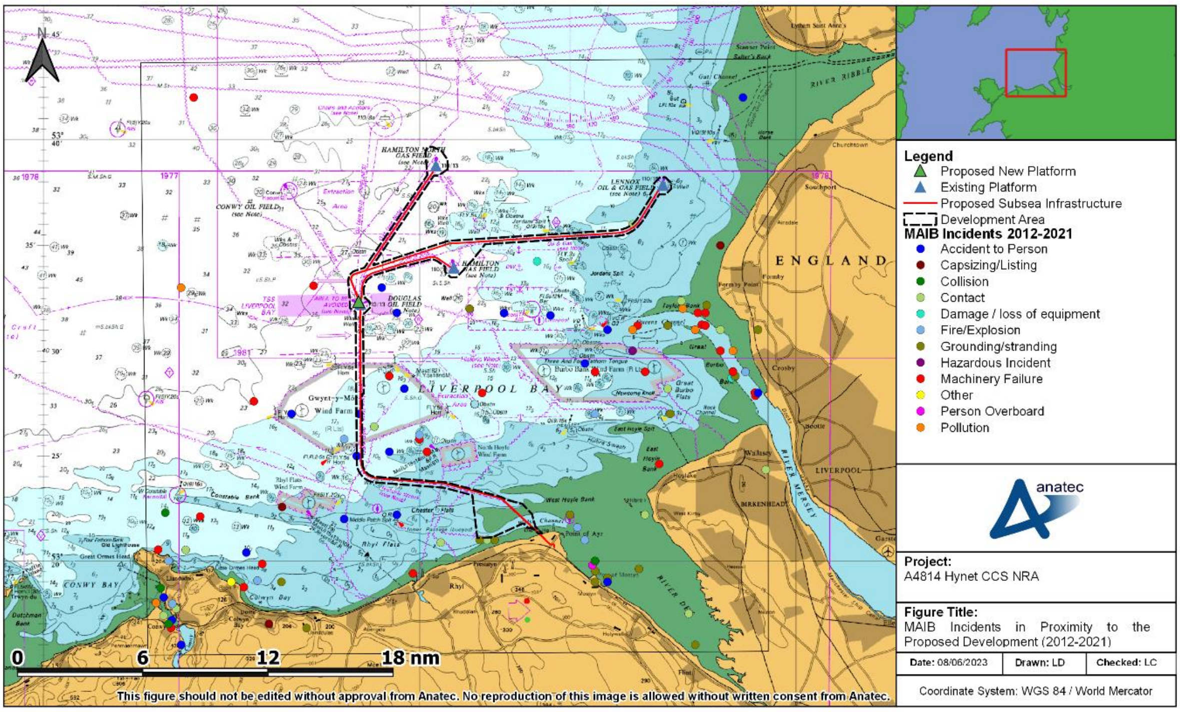

Figure 8.5: MAIB Incidents in Proximity to the Proposed Development (2012-2021)

Over the ten year period, there was an average of 12 to 13 incidents per year recorded within the study area. The most common incident types were machinery failures (22%), "Accident to Person" (19%) and grounding/stranding incidents (18%). The most common type of vessel involved in incidents was "other commercial", which includes vessels such as workboats, dredgers, SAR craft and tugs, and accounted for 36% of incidents recorded by the MAIB. Cargo vessels (22%), service ships (15%) and recreational craft (11%) also accounted for a significant number of incidents within the study area. The distribution of the vessel type impacted by incidents as reported by the MAIB is presented in Figure 8.6.

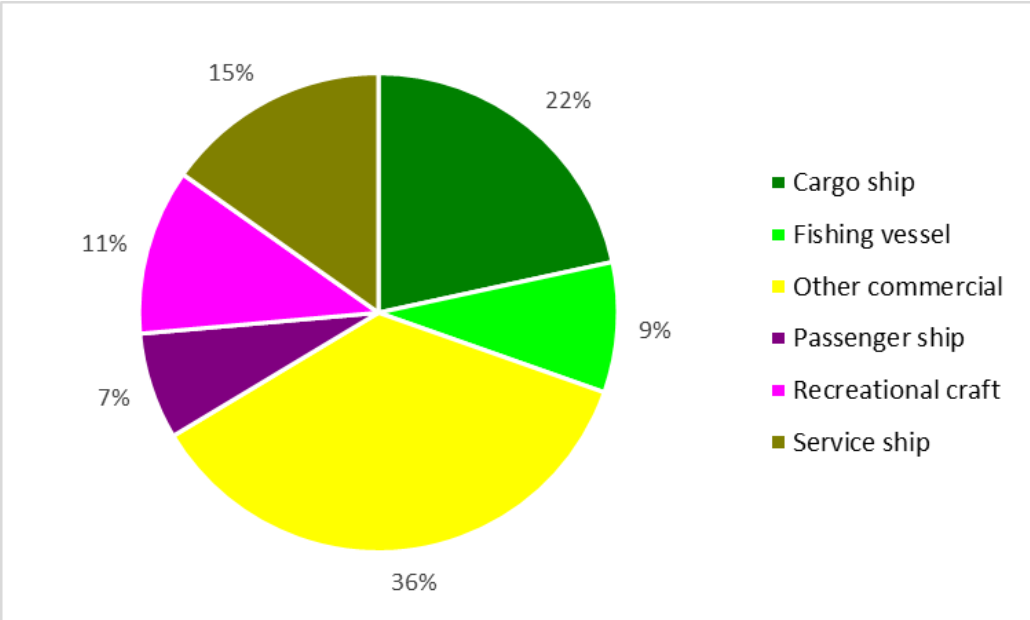

Figure 8.6: MAIB Incident Distribution by Vessel Type (2012 – 2021)

9 Vessel Traffic Movements

9.1 Introduction

This section presents an overview of vessel traffic movements within the study area, identified from the 12 months of AIS data from 1 January to 31 December 2022.

A number of the vessel tracks recorded were classified as temporary (non-routine), such as the tracks of vessel undertaking surveys. These have therefore been excluded to ensure the analysis is not skewed and gives a fair representation of normal vessel traffic movements in the area.

9.2 Vessel Numbers

Figure 9.1 presents the average daily unique vessel count within the study area and within the Physical Work Area per month.

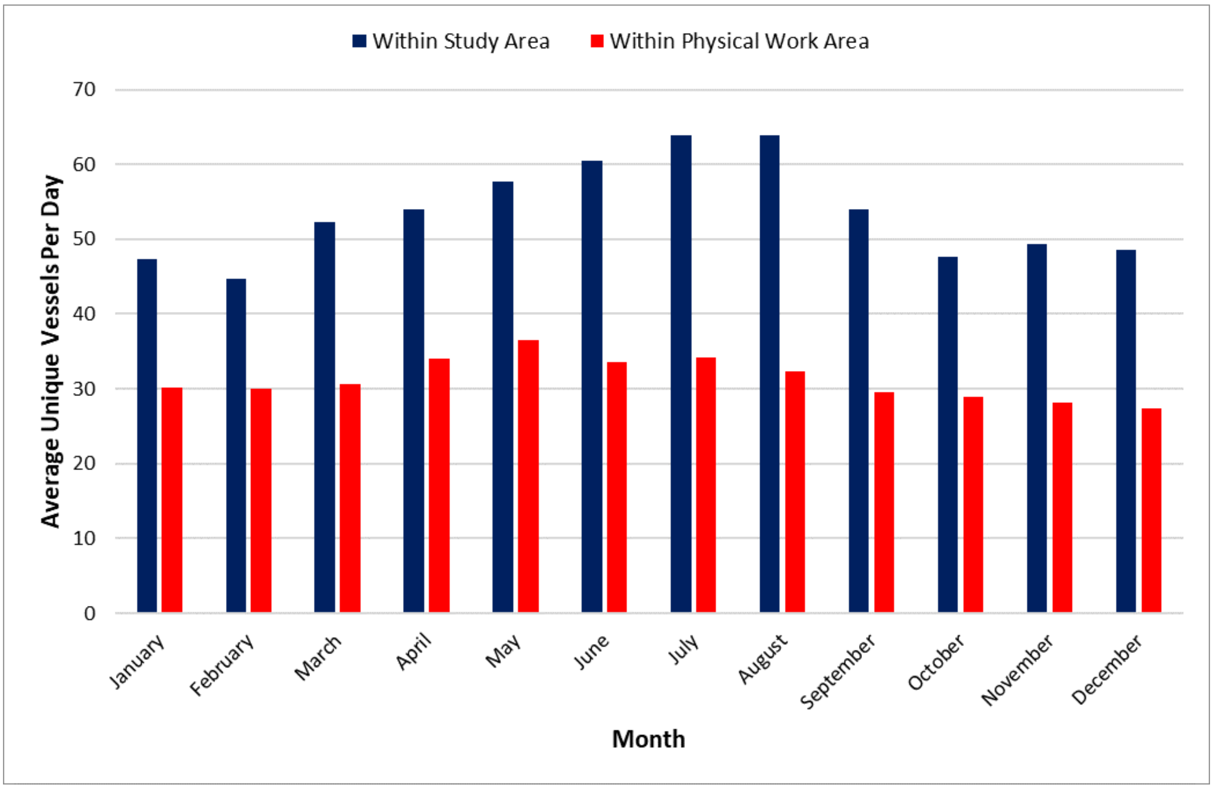

Figure 9.1: Average Daily Vessel Count per Month

There was an average of 54 unique vessels per day[4] within the study area during 2022. July was the busiest month of the year, with an average of 64 vessels per day, while the quietest month was February, with an average of 45 vessels per day. The difference between the summer and winter months can be attributed to an increase in passenger, recreational and

[4] Unique vessels per day is preferred to AIS track counts in order to avoid the over-counting of vessels due to multiple transits or broken AIS tracks.

wind farm support activity during the summer months. Within the Physical Work Area, there were an average of 31 vessels per day, with the most vessels recorded in May with 36 vessels per day, compared with a low of 27 per day in December.

9.3 Vessel Type

Figure 9.2 presents the AIS tracks colour-coded by vessel type.

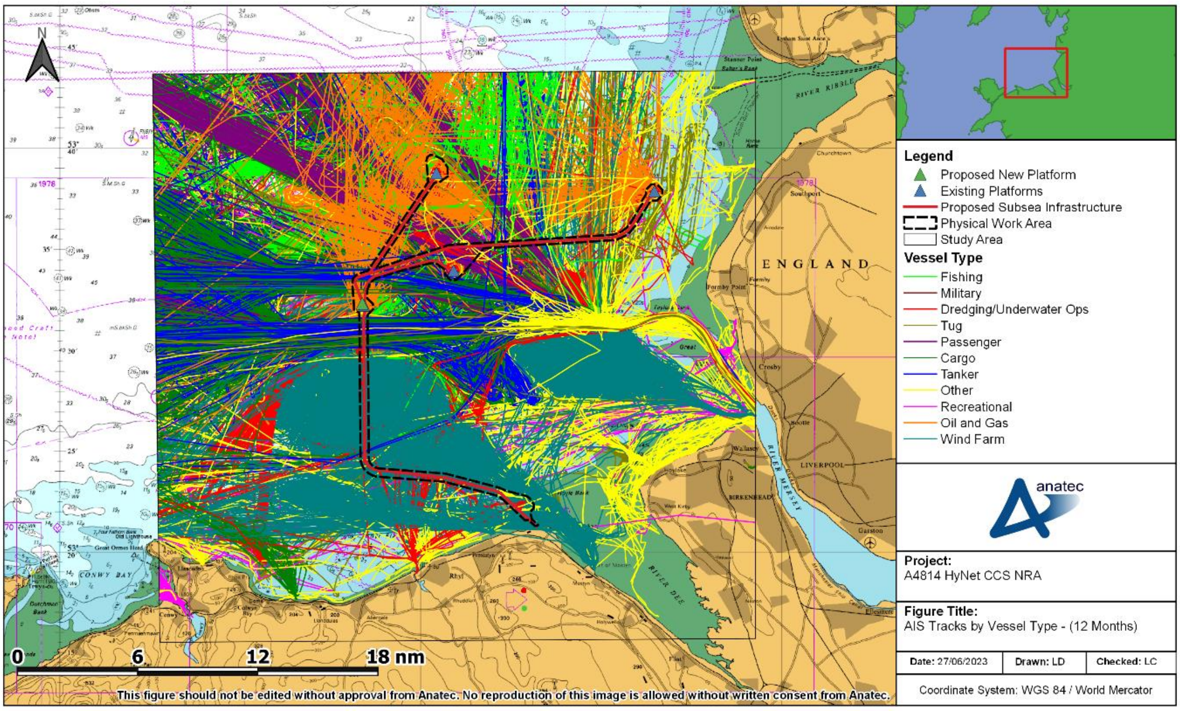

Figure 9.2: AIS Tracks by Vessel Type – (12 Months)

Wind farm support vessels were mostly recorded within and on passage to the various wind farms in the study area, with ports such as Mostyn and Liverpool serving as operation ports for wind farm support vessels. Vessels transiting to Mostyn utilise the Welsh Channel, which is intersected by the cable route between Douglas and Point of Ayr. Wind farm support vessels were also recorded transiting to Bangor, west of the study area. Oil and gas support vessels were typically recorded in the northern extent of the study area, in proximity to the Liverpool Bay fields such as Hamilton, Douglas and Lennox. Vessels were also recorded on passage to the Morecambe and Calder fields, north of the study area, with Liverpool acting as a key port for the oil and gas industry in the Irish Sea. Vessels were recorded throughout the Physical Work Area, particularly crossing it in the Liverpool Bay TSS, and in the near shore area. Oil and gas vessels and fishing vessels were also recorded operating in the north of the study area close to the cable routes.

Routeing of the main vessel types is discussed in Sections 9.3.1 to 9.3.4, while fishing vessel activity is described in Section 9.8. Figure 9.3 presents the vessel type distribution within the study area, based on unique vessels per day.

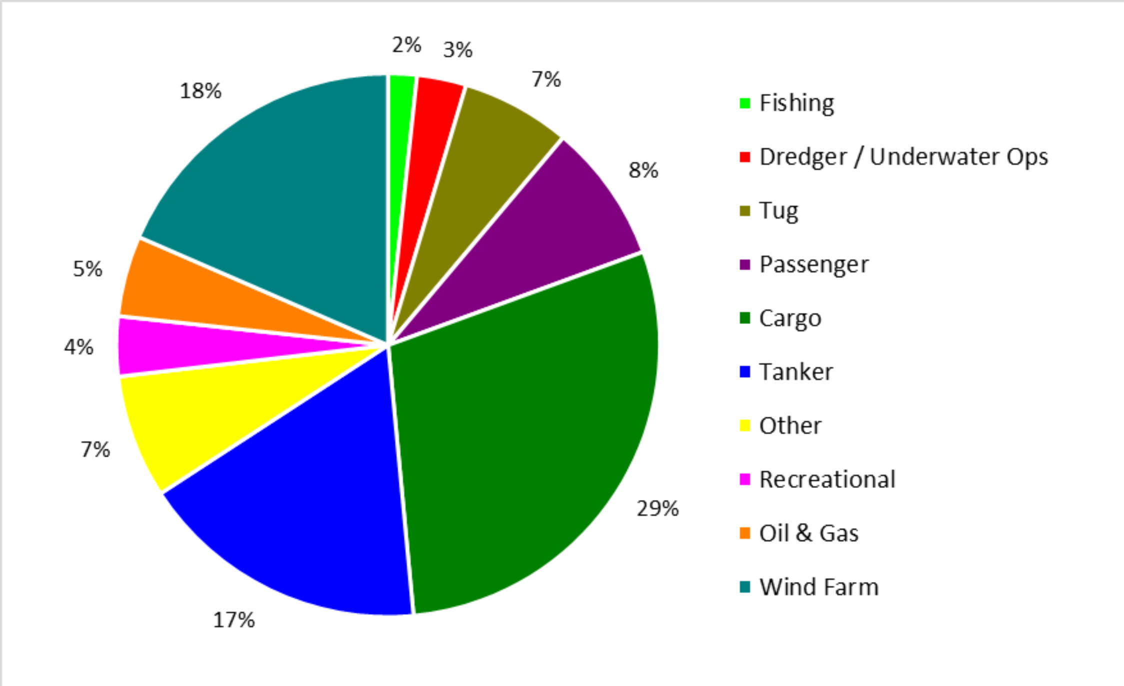

Figure 9.3: Vessel Type Distribution

The most common vessel type within the study area was cargo vessels, accounting for 29% of vessels. This was followed by wind farm vessels (18%) and tankers (17%). Vessels in the 'other' category, which accounted for 7% of traffic, included pilot vessels, research/survey vessels in transit and RNLI lifeboats.

9.3.1 Cargo Vessels and Tankers

The tracks of cargo vessels and tankers are presented in Figure 9.4 to provide a clearer overview of the routes followed by these vessels.

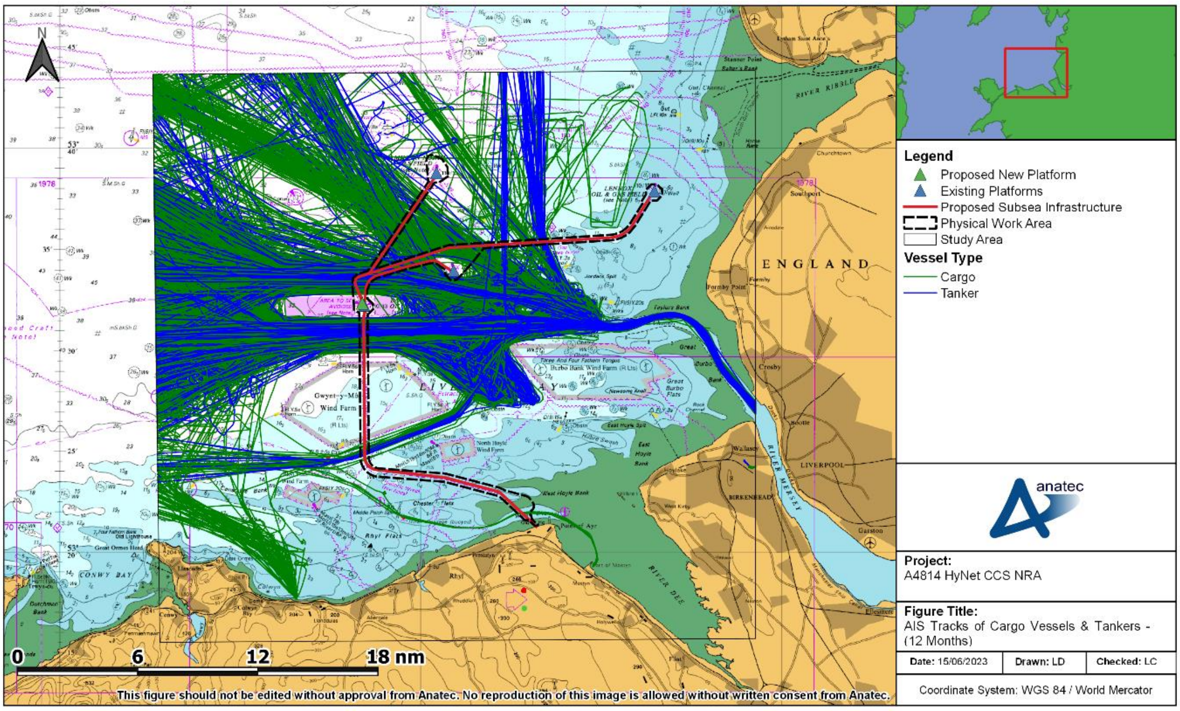

Figure 9.4: AIS Tracks of Cargo Vessels and Tankers – (12 Months)

There was an average of 16 cargo vessels and 9 tankers per day[5] within the study area. It can be seen that the cargo vessel and tanker traffic within the area is primarily related to vessels visiting Liverpool, with a high volume of these vessels recorded using the Queen's Channel. Vessels of these types were frequently recorded using the two lanes of the Liverpool Bay TSS, which crosses the cable routes, heading east-west through the study area, while transits heading northwest to southeast were also common. Further vessel routes were recorded crossing the cable route heading north-south and NW-SE through the study area on passage to destinations such as Ireland. Vessels were also frequently recorded at anchor in the anchorages within Liverpool Bay, which is further discussed in Section 9.7.

9.3.2 Passenger Vessels

Figure 9.5 presents the tracks of passenger vessels recorded within the study area.

[5] Based on unique vessels per day

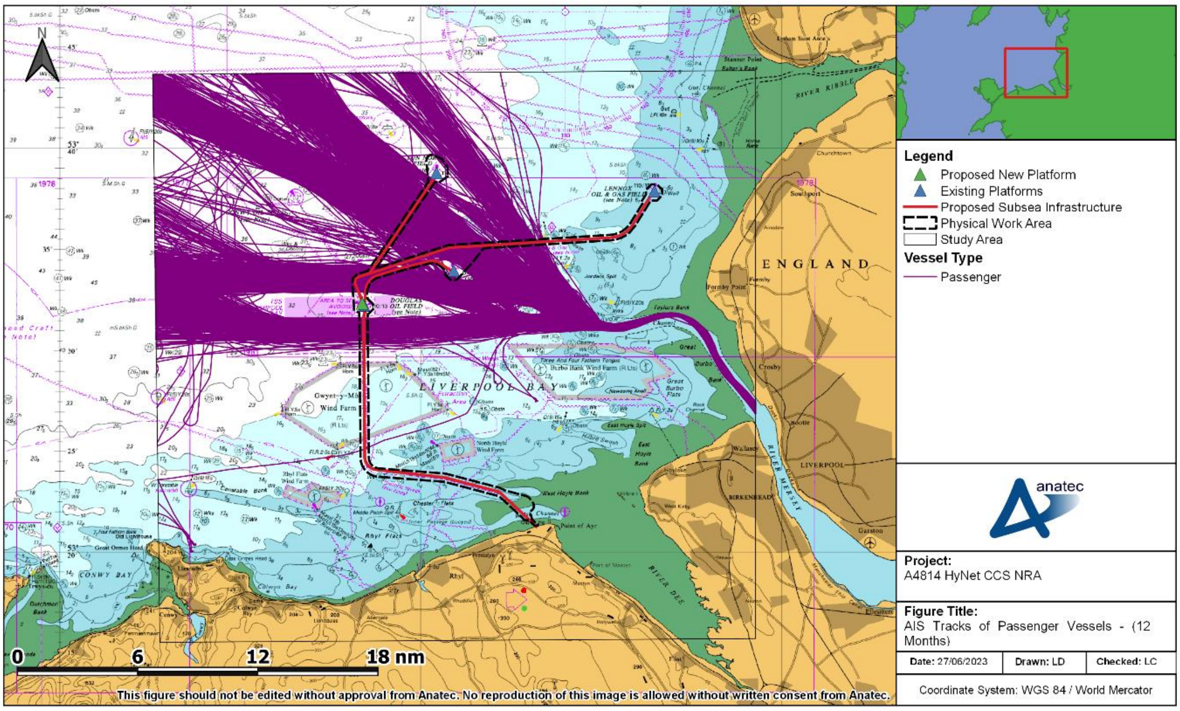

Figure 9.5: AIS Tracks of Passenger Vessels – (12 Months)

There was an average of four to five passenger vessels per day[6] recorded within the study area during 2022. Passenger vessels recorded within the study area included both cruise ships visiting the Port of Liverpool, as well as regular ferries on routes to destinations including the Isle of Man, Dublin and Belfast. The majority of passenger vessels were recorded either entering or leaving Liverpool, with main routes passing to the northwest of the study area (typically routes to Belfast), while the majority of the largest passenger vessels were recorded utilising the Liverpool Bay TSS.

Cruise ships were recorded frequently within the study area, with destinations such as Ireland, Iceland and Spain frequently reported, while the Port of Liverpool hosts an active cruise terminal. The largest cruise ship was 326 m in length, recorded both entering and exiting the Port of Liverpool via the Queen's Channel and the Liverpool Bay TSS in May 2022.

9.3.3 Wind Farm Vessels

Figure 9.5 presents the tracks of wind farm vessels recorded within the study area.

[6] Based on unique vessels per day

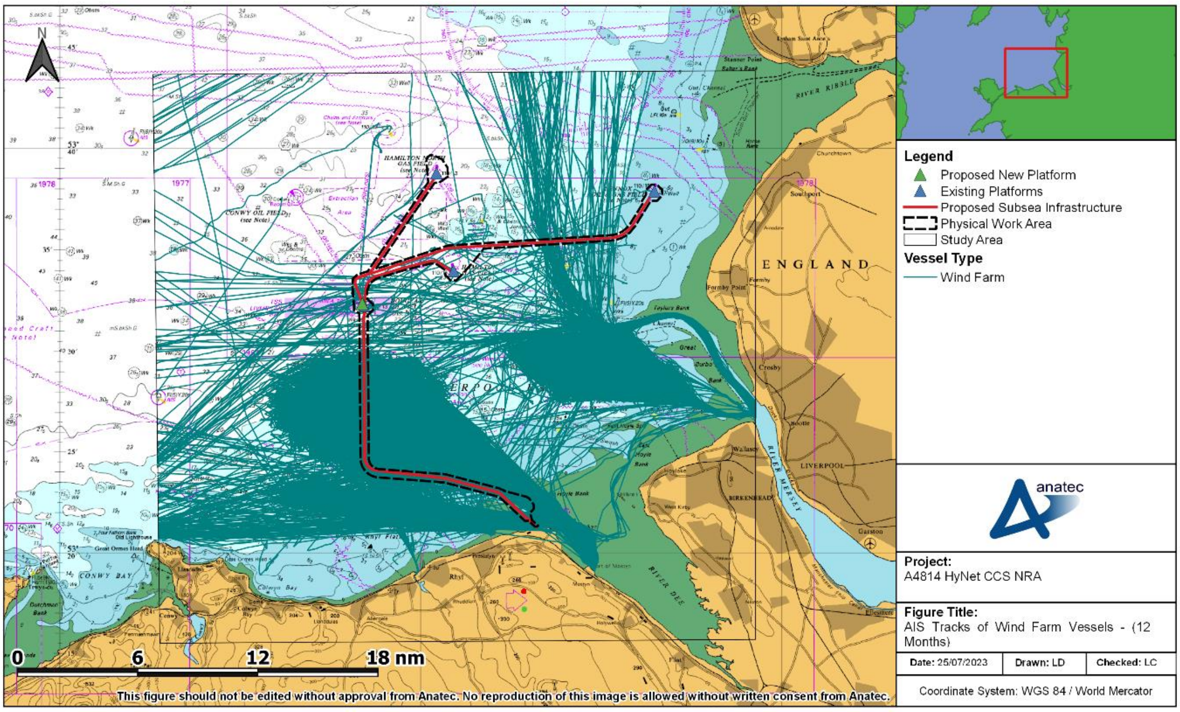

Figure 9.6: AIS Tracks of Wind Farm Vessels – (12 Months)

There were an average of 10 wind farm vessels recorded per day[7]. Wind farm vessels were primarily recorded working at the wind farms within the study area such as Burbo Bank, Gwynt y Môr, North Hoyle and Rhyl Flats. The main ports used by wind farm vessels were Mostyn, which was recorded serving all four wind farms, and the Port of Liverpool, which primarily served Burbo Bank. Wind farms vessels were recorded crossing the Proposed Development within the Welsh Channel, when entering or exiting Mostyn, and while working at Gwynt y Môr. Vessels were also recorded passing close to the Douglas location and crossing the cable route to Lennox while on passage to the north.

9.3.4 Recreational Vessels

Figure 9.7 presents the tracks of recreational vessels recorded in the study area, colour-coded by vessel length.

[7] Based on unique vessels per day

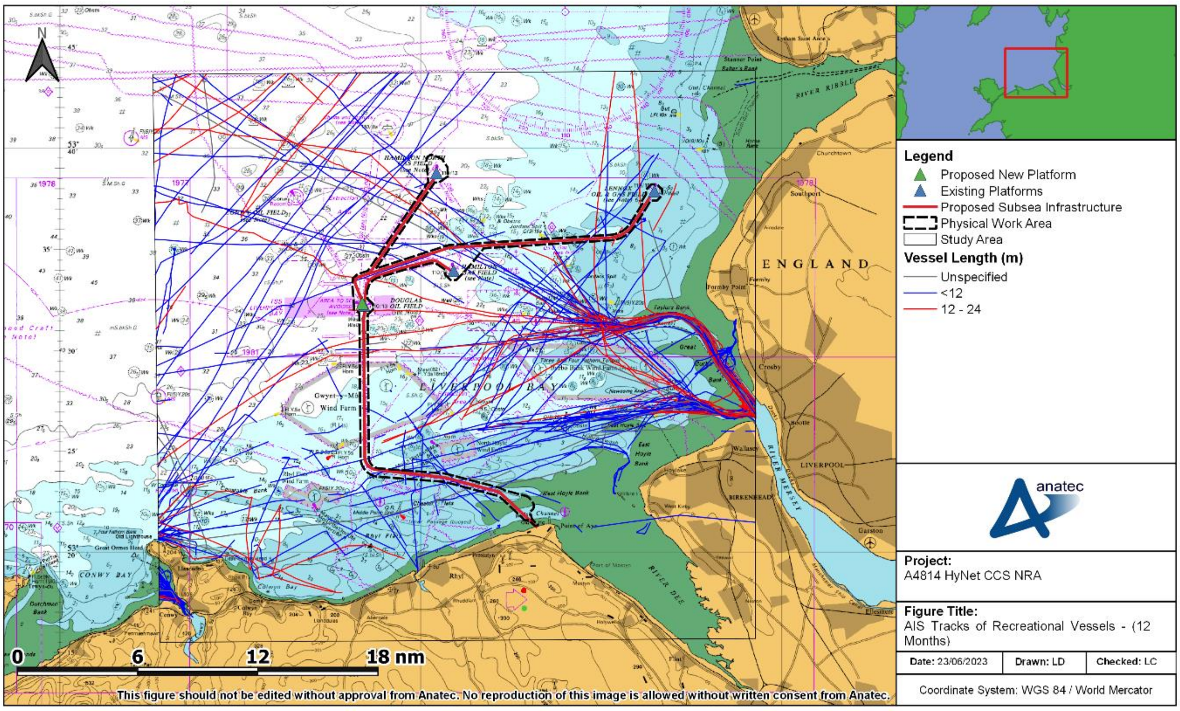

Figure 9.7: Recreational Vessels – (12 Months)

Recreational activity was recorded on AIS throughout the study area, with the smallest recreational vessels (less than 9m in length) typically recorded close to the shore, particularly heading east-west along the Welsh coastline. The majority of recreational activity was recorded emerging from the River Mersey via both the Queen's Channel and the Rock Channel, with vessels also recorded visiting Formby, just to the north of the Mersey. A number of recreational vessels were also recorded further offshore, passing to the northwest of the Proposed Development and the other fields within Liverpool Bay. Recreational vessels were recorded crossing the Proposed Development across the extent of the cable routes.

Figure 9.8 presents the number of recreational vessels recorded within the study area per month[8]. It is noted that recreational activity is likely to be under-represented as recreational craft are not required to broadcast on AIS.

[8] Based on unique vessels per day

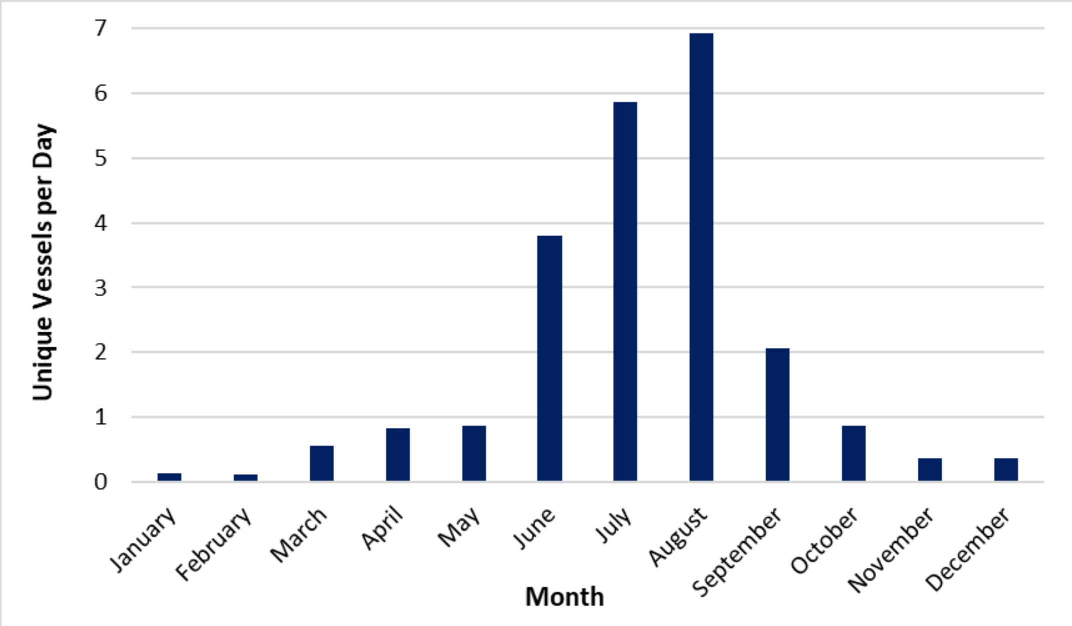

Figure 9.8: Daily Recreational Vessel Count per Month

It can be seen that recreational vessels were predominantly recorded within the study in the summer months (June to August), peaking at an average of approximately seven recreational vessels per day in August. Recreational activity was low outside of the summer period, with less than one recreational vessel recorded per day on average from January to May and from October to December.

9.4 Vessel Density

Figure 9.9 presents the vessel density for all AIS vessel tracks based on the number of tracks intersecting each cell of a 500 m x 500 m grid covering the study area. The cells are colour-coded such that approximately 20% of cells fall into each category.

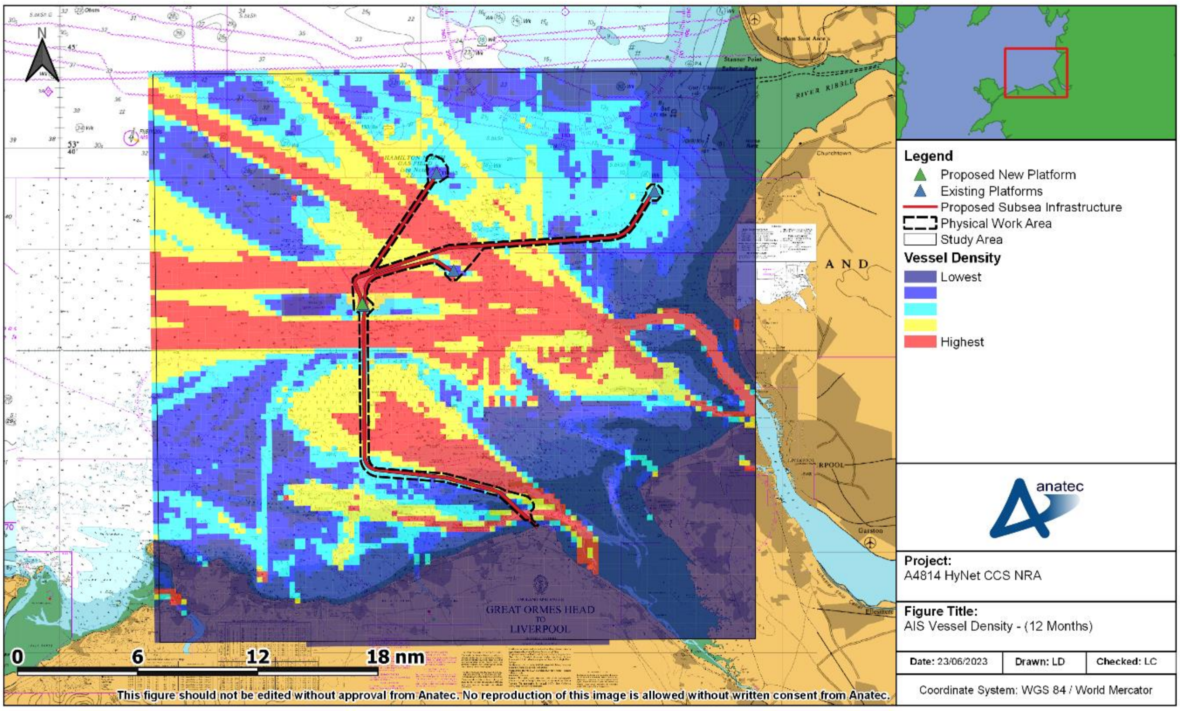

Figure 9.9: AIS Vessel Density – (12 Months)

High-density cells within the study are associated with busy vessel routes, such as those using the Queen's Channel which serves as an entrance to Liverpool, as well as other ports within the study area. Wind farm vessels transiting to/from and working within the various wind farms within the study area also correspond to regions of high density, as do the two lanes of the Liverpool Bay TSS passing north and south of the Douglas complex. Further high-density is observed on the NW-SE routes used by the regular ferries running from Liverpool to Ireland.

Lower density areas tend to be around the coastal waters, and in the NE corner of the study area. The proposed cable routes pass through a number of high density regions of the study area, including the Gwynt-y- Môr wind farm, both lanes of the Liverpool Bay TSS, as well as the routes passing to the NW corner of the study area and the wind farm traffic associated with the Port of Mostyn and the Rhyl Flats wind farm. Density in proximity to the proposed Douglas CCS platform is elevated due to traffic visiting the existing Douglas complex.

9.5 Vessel Sizes

9.5.1 Vessel Length

Figure 9.10 presents the AIS tracks colour-coded by vessel length. The vessel length distribution is then presented in Figure 9.11, based on unique vessels per day. It is noted that the distribution shown excludes vessels of unspecified length, which made up less than 1% of vessels recorded within the study area.

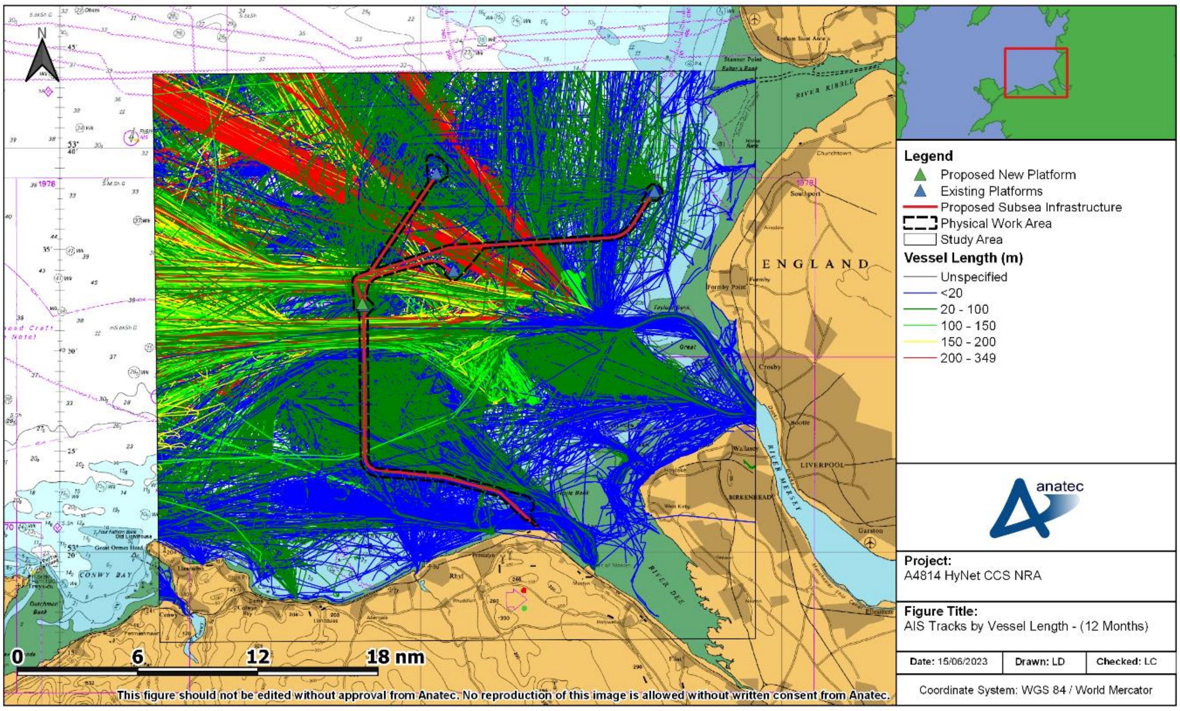

Figure 9.10: AIS Tracks by Vessel Length – (12 Months)

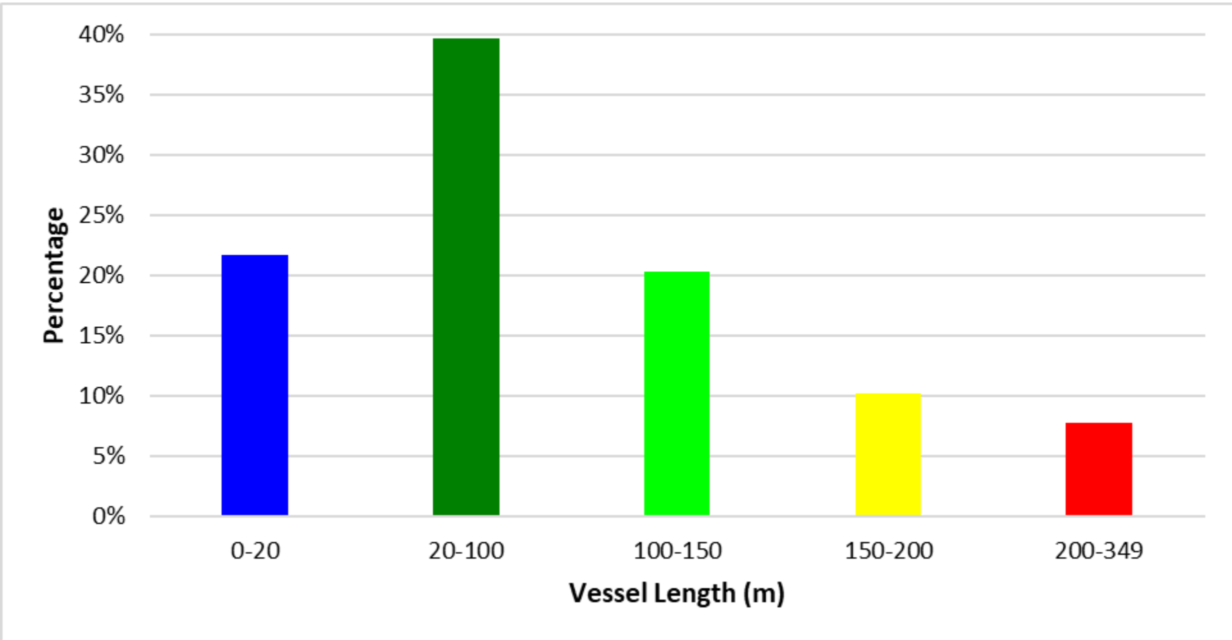

Figure 9.11: AIS Vessel Length Distribution

The largest vessels in the study area tended to be cargo vessels, tankers and passenger vessels, which were generally recorded using the Queen's Channel while visiting Liverpool, or within the Liverpool Bay TSS. Vessels of greater than 200 m were also recorded on the ferry routes passing between Liverpool and Belfast. Smaller vessels in the study area included wind farm support vessels, pilot vessels, lifeboats and fishing vessels, and were most frequently recorded in coastal areas and on routes to the wind farms. Fishing vessels were frequently recorded close to the various oil and gas fields within the study area. Due to the location of the TSS, the largest vessels therefore tended to cross the Proposed Development to the north and south of the Douglas location, while on approach or departure for Liverpool.

The average vessel length recorded within the study area was 91m. The largest vessel recorded within the study area was a 349 m container ship, recorded utilising the Liverpool Bay TSS on passage between Liverpool and Antwerp. The vessel was recorded transiting both in and out of Liverpool. Vessels were most commonly in the 20 to 100 m range, with only 8% of vessel greater than 200 m.

9.5.2 Vessel Draught

Figure 9.12 presents the AIS tracks colour-coded by vessel draught.

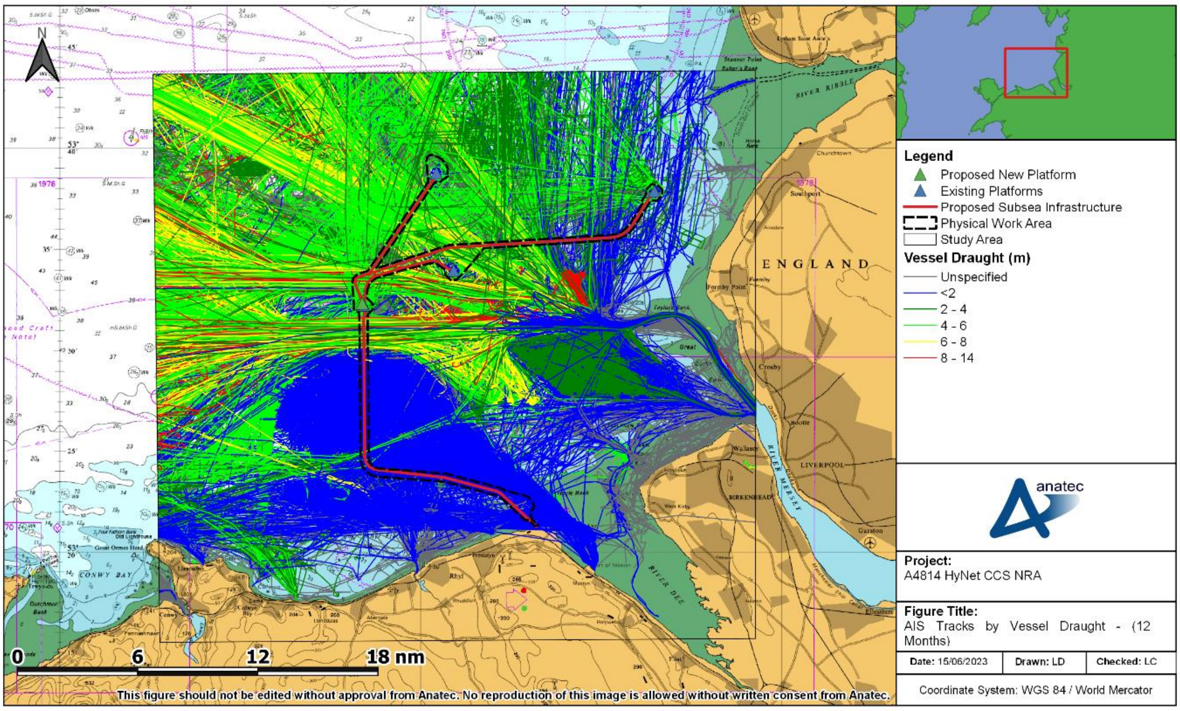

Figure 9.12: AIS Tracks by Vessel Draught – (12 Months)

The deepest draught vessels were typically recorded using the Liverpool Bay TSS, and were generally cargo vessels and tankers. Dredgers with draughts of greater than 8 m were also recorded working to the north of the Burbo Bank offshore wind farm. Shallower draught vessels included crew transfer vessels heading to the various wind farms within the study area, as well as pilot vessels and lifeboats working in coastal areas. Similar to vessel length, the deepest draught vessels crossing the Proposed Development were recorded using the Liverpool Bay TSS, with vessels crossing in the nearshore areas (such as wind farm vessels) tending to have shallower draughts.

Figure 9.13 presents the distribution of vessel draughts recorded within the study area.

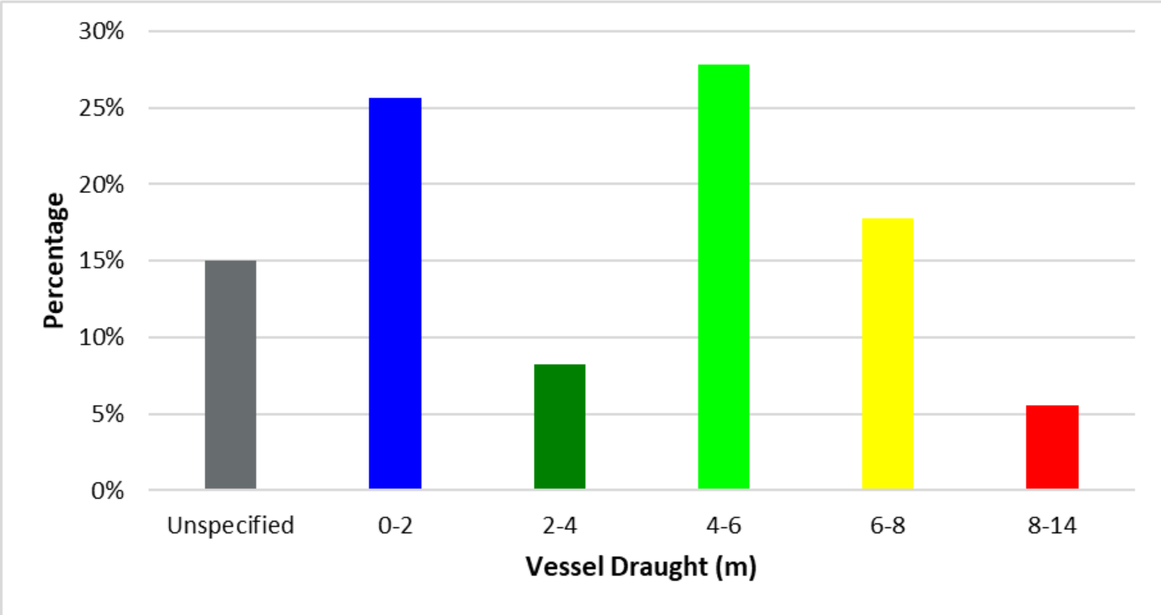

Figure 9.13: AIS Vessel Draught Distribution

The average draught of vessels recorded within the study area is 4.5 m, with the largest draught recorded being 14m. This largest draught was recorded by a crude oil tanker recorded using the Liverpool Bay TSS and the Queen's Channel heading to Tranmere from Algeria. It is noted that draught information was unavailable for approximately 15% of vessels on AIS.

9.5.3 Vessel Deadweight Tonnage

Figure 9.14 presents the tracks of vessels recorded within the study area during 2022, colour-coded by vessel deadweight tonnage (DWT). It is noted that DWT is not broadcast on AIS, and therefore has been researched separately by Anatec where possible, based on the ship identity information. In some cases, approximations were based on the vessel type and dimensions (mainly for small fishing vessels and recreational craft estimated to be less than 100 DWT). Figure 9.15 presents the distribution of vessel DWT within the study area.

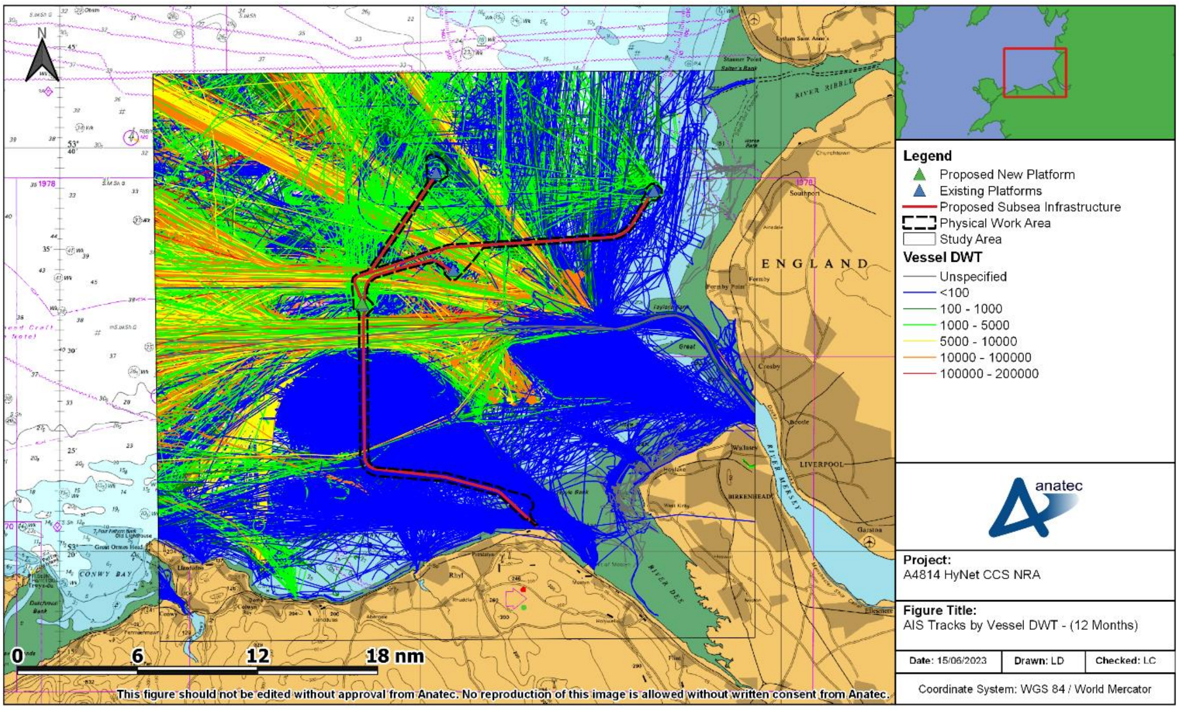

Figure 9.14: AIS Tracks by Vessel DWT – (12 Months)

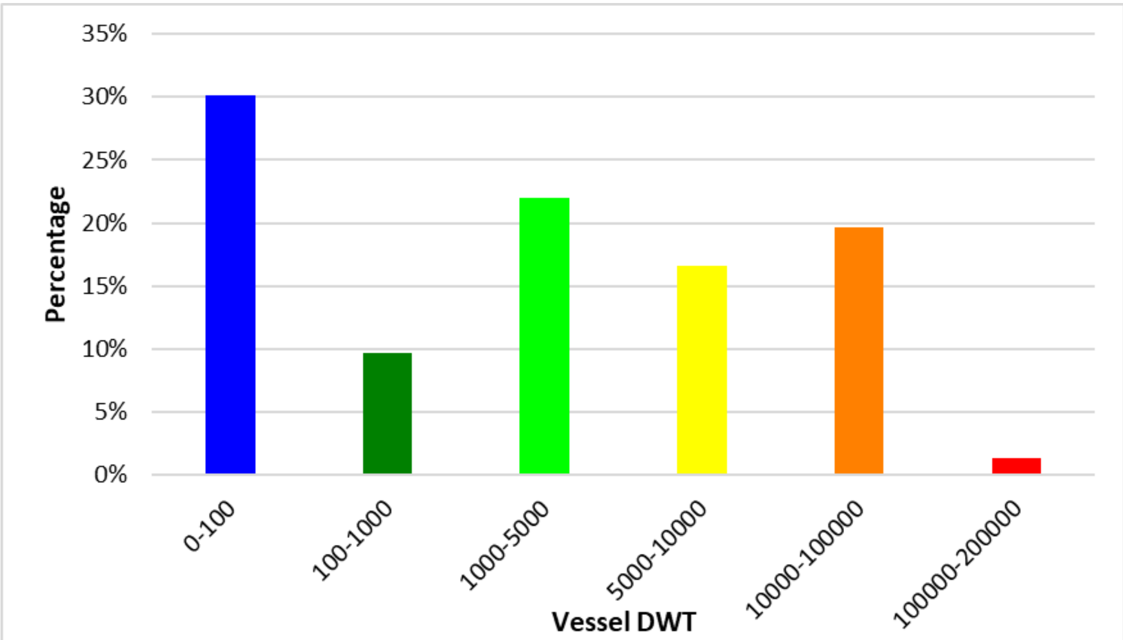

Figure 9.15: Vessel DWT Distribution

Vessel patterns in DWT follow a similar trend to length and draught, with the largest vessels typically being cargo vessels and tankers recorded transiting the Liverpool Bay TSS, or within the anchorages in Liverpool Bay. Smaller vessels tended to be associated with the wind farms in the area.

The average DWT of vessels recorded within the study area was 8644 DWT, with the largest vessel being a crude oil tanker with 164,608 DWT recorded visiting Tranmere via the Liverpool Bay TSS. Only 1% of vessels had a DWT greater than 100,000, with 30% of vessels falling under 100 DWT.

9.6 Vessel Speed

Figure 9.16 presents AIS tracks colour-coded by vessel speed.

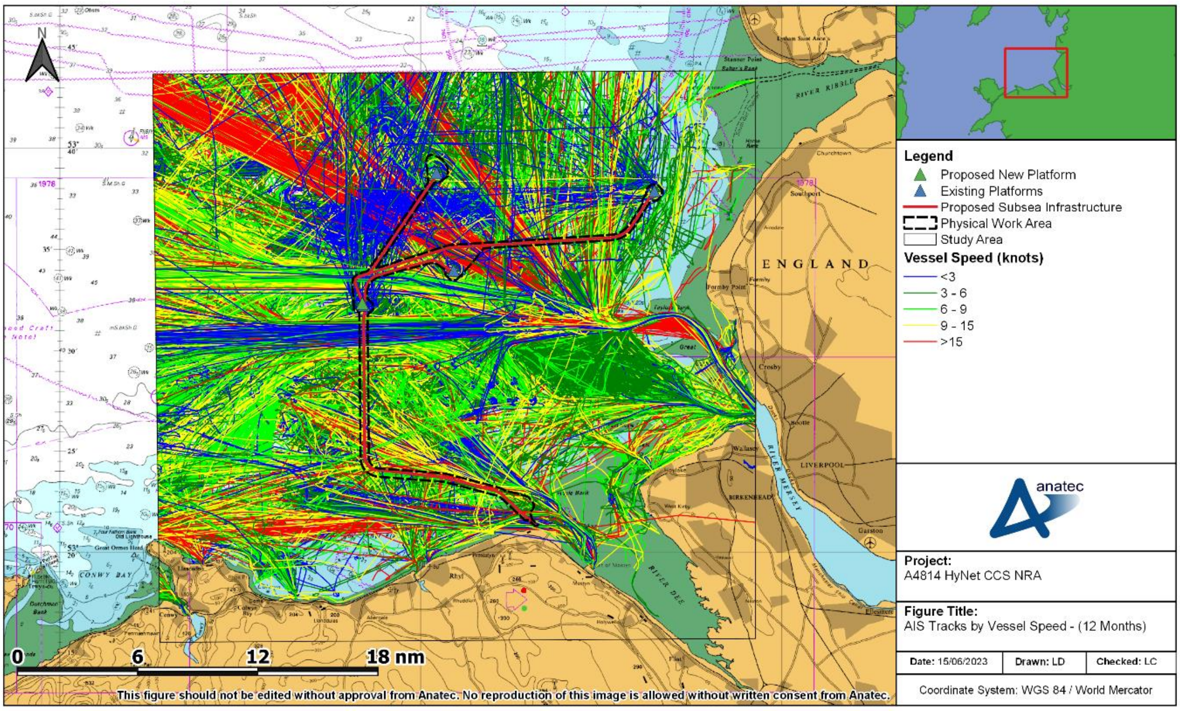

Figure 9.16: AIS Tracks by Vessel Speed – (12 Months)

The fastest vessels tended to be wind farm support vessels on passage to or from the various wind farms within the study area, as well as passenger vessels on regular ferry routes. Several fast moving wind farm vessels were recorded crossing the cable routes close to the landfall and in proximity to the Gwynt-y- Môr wind farm. The regular ferries were recorded on routes between Liverpool and destinations such as Belfast, Dublin and the Isle of Man, with these routes typically crossing the cable routes to the north of the Douglas CCS platform. Slower moving vessels tended to be fishing vessels, potentially engaged in active fishing in the vicinity of the oil and gas installations within Liverpool Bay, as well as vessels slowing on approach to anchorages or within the Queen's Channel. It is noted that the speeds shown are the average speed of the entire track, and do not indicate instantaneous speed at a particular point in a vessel's voyage.

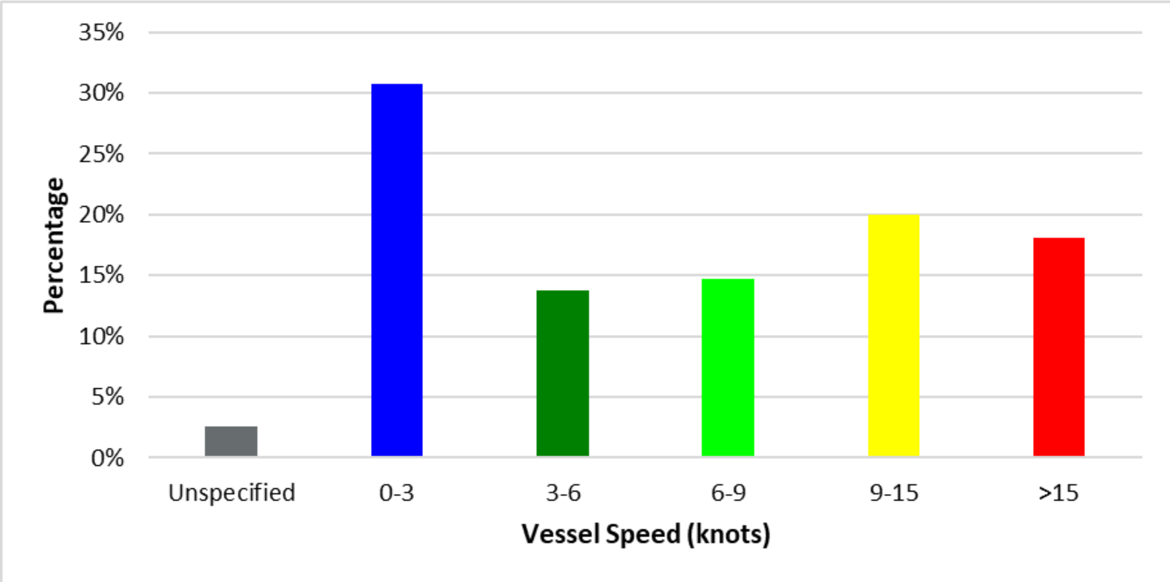

Figure 9.17: AIS Vessel Speed Distribution

The average of vessels recorded in the study area was 8.0 knots. The fastest vessel recorded within the study area was a lifeboat recorded travelling at an average speed of 35.8 knots.

9.7 Anchored Vessels

Figure 9.18 presents the locations of anchored vessels within the study area, colour-coded by vessel type.

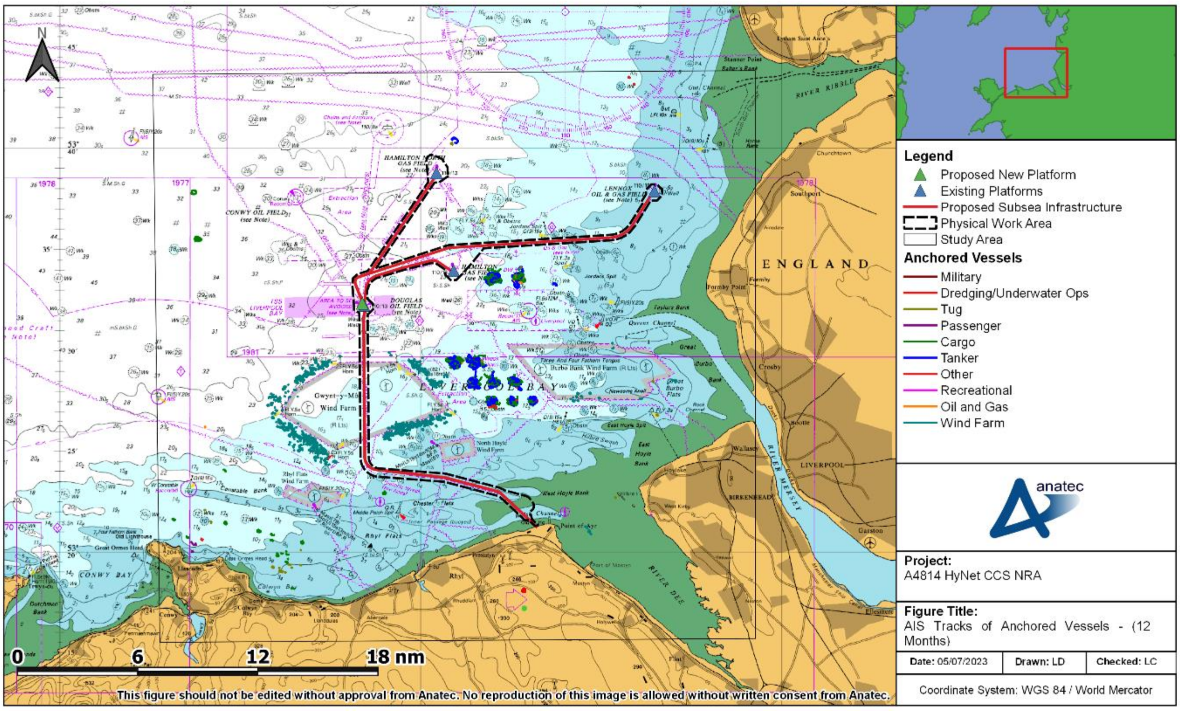

Figure 9.18: AIS Tracks of Anchored Vessels – (12 Months)

It can be seen that a significant proportion of the anchored vessels within the study area were concentrated within the charted anchorage area located between the Gwynt y Môr and Burbo Bank wind farms. A large number of wind farm vessels were also recorded at anchor around the boundaries of the two wind farms, particularly at Gwynt-y- Môr. The distribution of vessel type among anchored vessels is presented in Figure 9.19. The most common type of vessels at anchor were tankers (45%), followed by cargo vessels (29%) and wind farm vessels (22%).

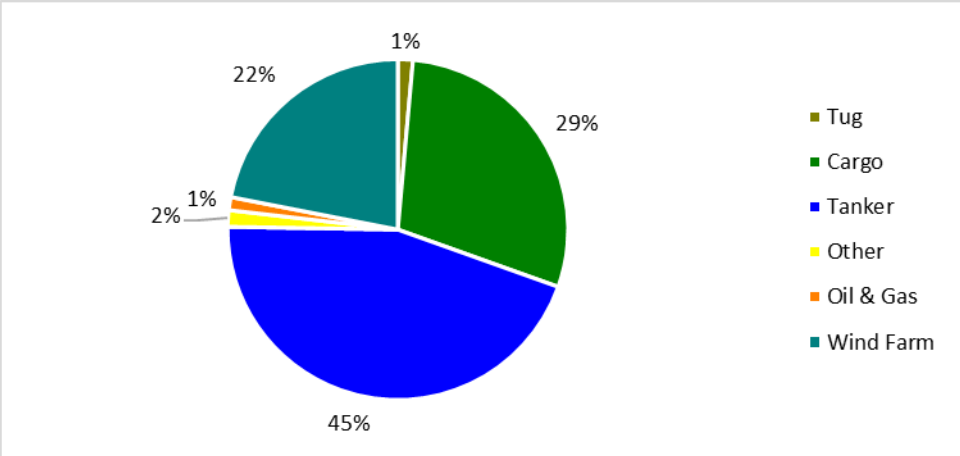

Figure 9.19: Anchored Vessel Type Distribution

9.8 Baseline Fishing Analysis

This section presents an analysis of fishing vessel activity in the study area using the results of the twelve months AIS analysis and additional Vessel Monitoring System (VMS) satellite data. Both AIS and VMS datasets cover fishing vessels 15 m and above in length.

Smaller vessels are therefore under-represented, particularly within the 6nm fisheries limit.

9.8.1 AIS Analysis

9.8.1.1 Vessel Numbers

Figure 9.20 presents the average number of fishing vessels per day[9] each month during 2022.

[9] Based on unique vessels per day within the study area

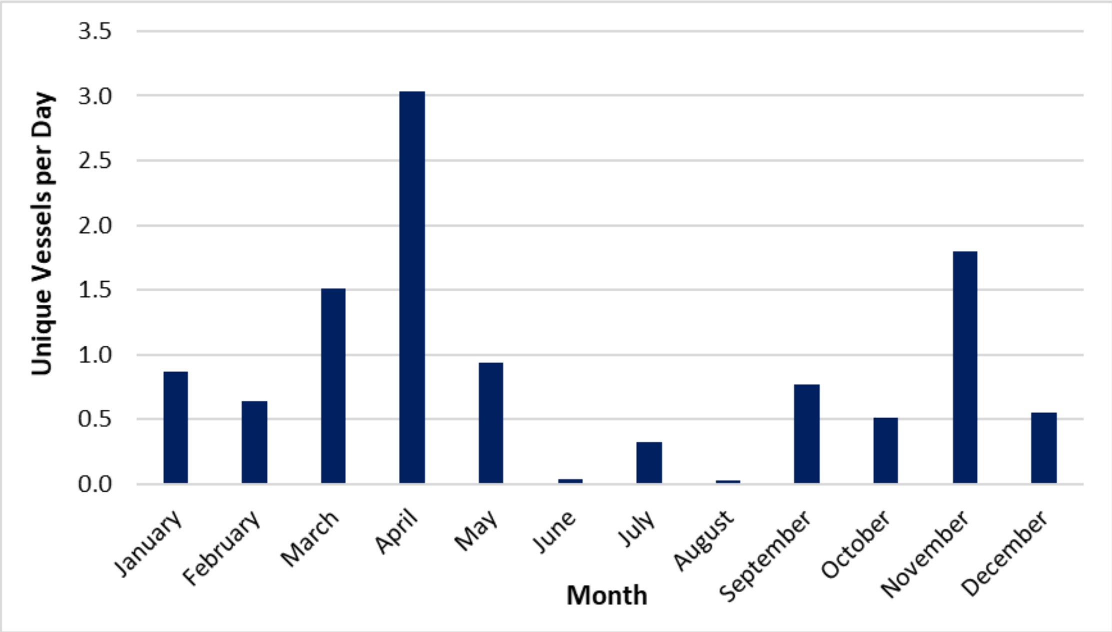

Figure 9.20: Daily Fishing Vessel Count per Month

The busiest month was April, with approximately three vessels per day, with the quietest being June and August, with a fishing vessel recorded once in each month. Over the course of the year, there was an average of one fishing vessel per day recorded within the study area.

9.8.1.2 Gear Type

Figure 9.21 presents the tracks of fishing vessels, colour-coded by gear type. Following this, Figure 9.22 presents the distribution of gear types recorded within the study area.

The majority of fishing vessel activity was recorded in the northwest of the study area, particularly in proximity to the oil and gas fields in the study area. Significant dredging activity was recorded in this area, while potters/whelkers were particularly active around the Gwynt y Môr wind farm site. Fishing activity close to the Proposed Development primarily included dredgers working to the north of the Douglas CCS platform, intersecting the cable route to the satellite platforms.

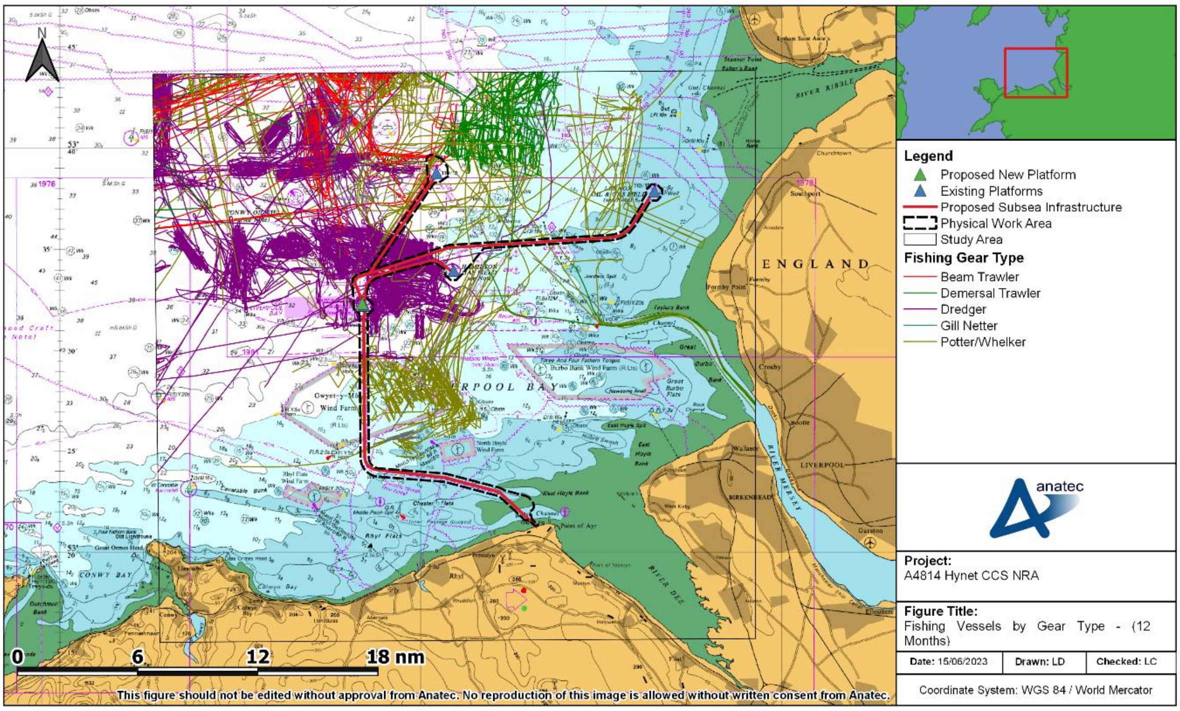

Figure 9.21: Fishing Vessels by Gear Type - (12 Months)

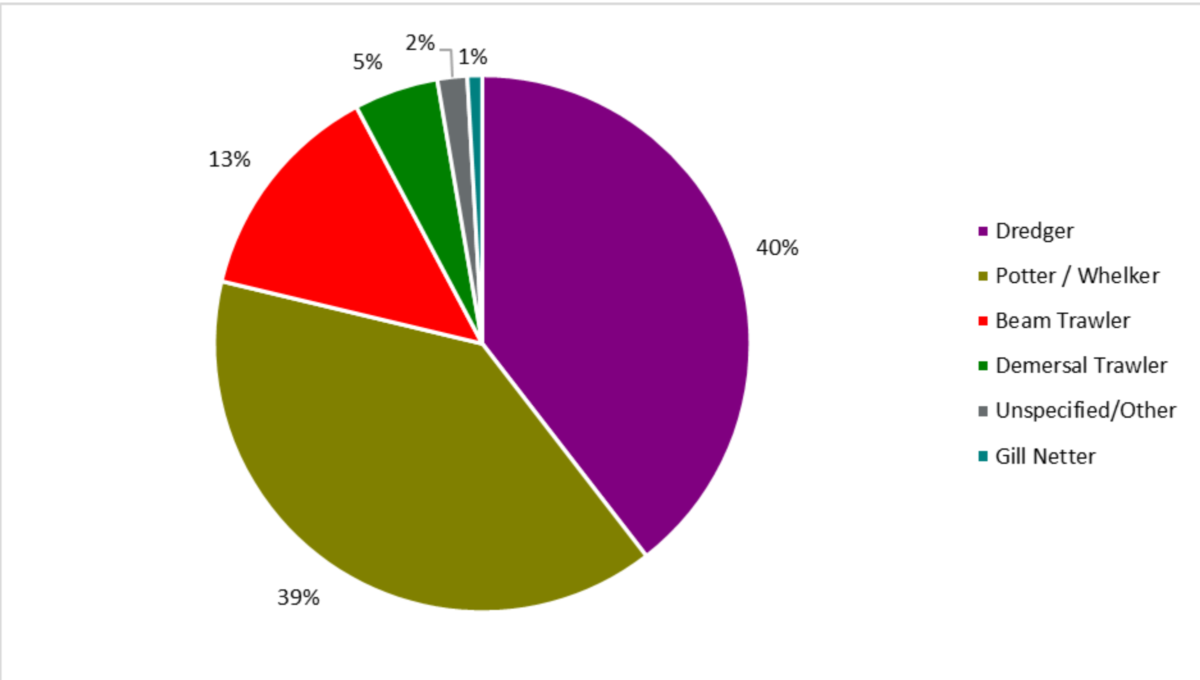

Figure 9.22: Fishing Gear Type Distribution

The most common gear types recorded in the study area were dredgers (40%) and potters (39%). Fishing vessels carrying demersal gear (i.e. dredgers, beam trawlers and demersal trawlers), which have the greatest chance of interacting with subsea cables, contributed 58% of fishing gear types recorded in the area.

9.8.2 VMS Analysis

Fishing vessel intensity is presented in Figure 9.23, based on VMS data from the MMO. VMS is a satellite tracking system in which fishing vessels broadcast positions once every one to two hours for vessels of length 12 m and above , noting that the available data from the MMO covers only vessels of length 15 m and above. New legislation requiring all fishing vessels to be fitted with VMS will be in place prior to the beginning of the construction period. The data is comprehensive for UK vessels globally, and fishing vessels from EC countries within British Fishery limits and certain other countries, e.g., Norway. The cells are colour-coded based on active fishing vessel time recorded within the cell.

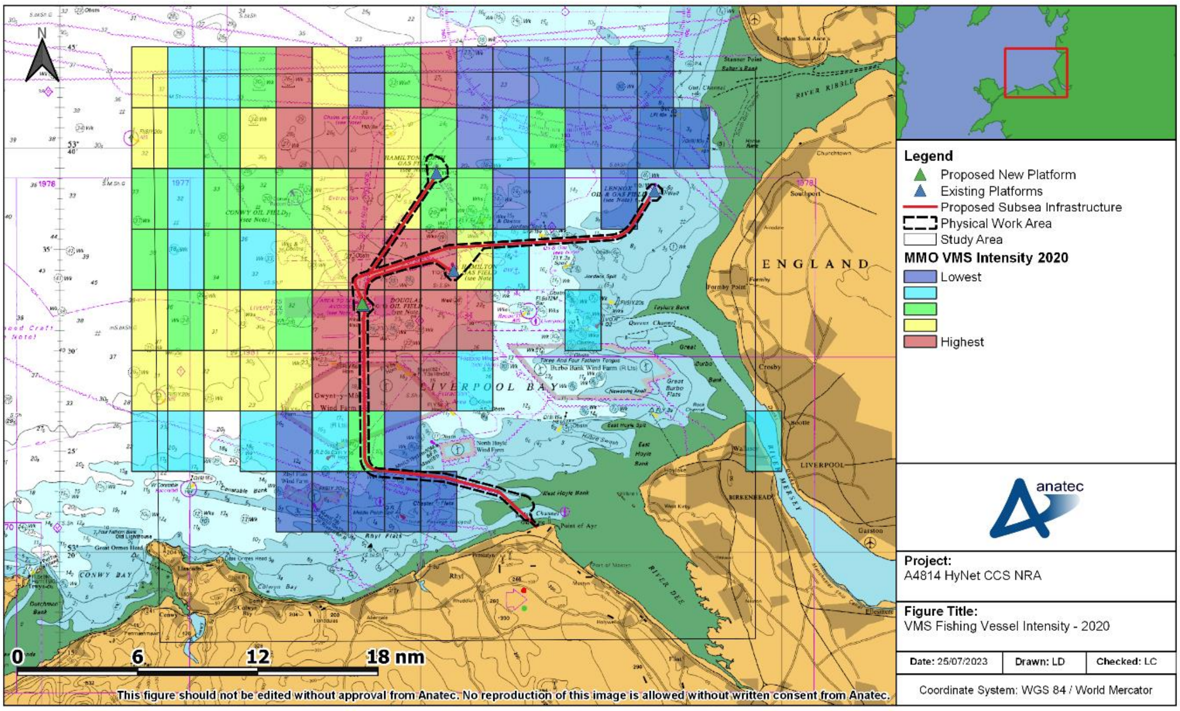

Figure 9.23: Fishing Vessel Intensity – 2020

It can be seen that the VMS corelates well with the activity patterns recorded on AIS, with the majority of fishing vessel activity concentrated in the centre and northwest of the study area. The highest levels of activity were recorded close to the Douglas field and the Gwynt y Môr wind farm, with very little activity recorded inshore of the oil and gas fields within the Liverpool Bay. Areas of high fishing activity in proximity to the Douglas field were mainly associated with dredging activity. Potting was also recorded throughout the study area.

9.9 Future Baseline

The key impact on vessel routeing in the area is expected to be the construction of a number of wind farms in the area. In particular, Mona, Morgan and Morecambe wind farms, if consented, have the potential to significantly alter routes visiting the Mersey ports, particularly routes (including ferry routes) to Ireland. It is noted that all of these wind farms are in the pre-planning phase and will be subject to their own consenting process and boundaries therefore have the potential to differ significantly from any finally constructed projects. The Awel y Môr wind farm, located to the west of the Gwynt y Môr, may also displace existing traffic into the Liverpool Bay TSS. It was noted during consultation that these may also lead to an increase in wind farm vessels utilising the Port of Mostyn, including construction vessels. In line with industry experience, commercial vessels are expected to maintain a minimum mean distance of 1nm from wind farm structures. There is potential for smaller vessels, such as fishing vessels and recreational vessels to pass within wind farms.

Decommissioning of existing oil and gas infrastructure may also lead to changes to traffic patterns. As part of the Project, the existing Douglas complex will be decommissioned, while a number of other assets within the study area, are likely to be decommissioned during the lifetime of the Project. Therefore oil and gas support traffic may reduce or change significantly, while additional sea room may be available to all vessels as installations and related safety zones.

Port arrival statistics from the Department for Transport (DfT, 2022) covering the period from 2017 to 2021 for key ports within or accessed via the Mersey (Liverpool, Manchester and Garston) to determine trends in shipping in the recent years. Vessel arrivals for the three ports are shown in Figure 9.24.

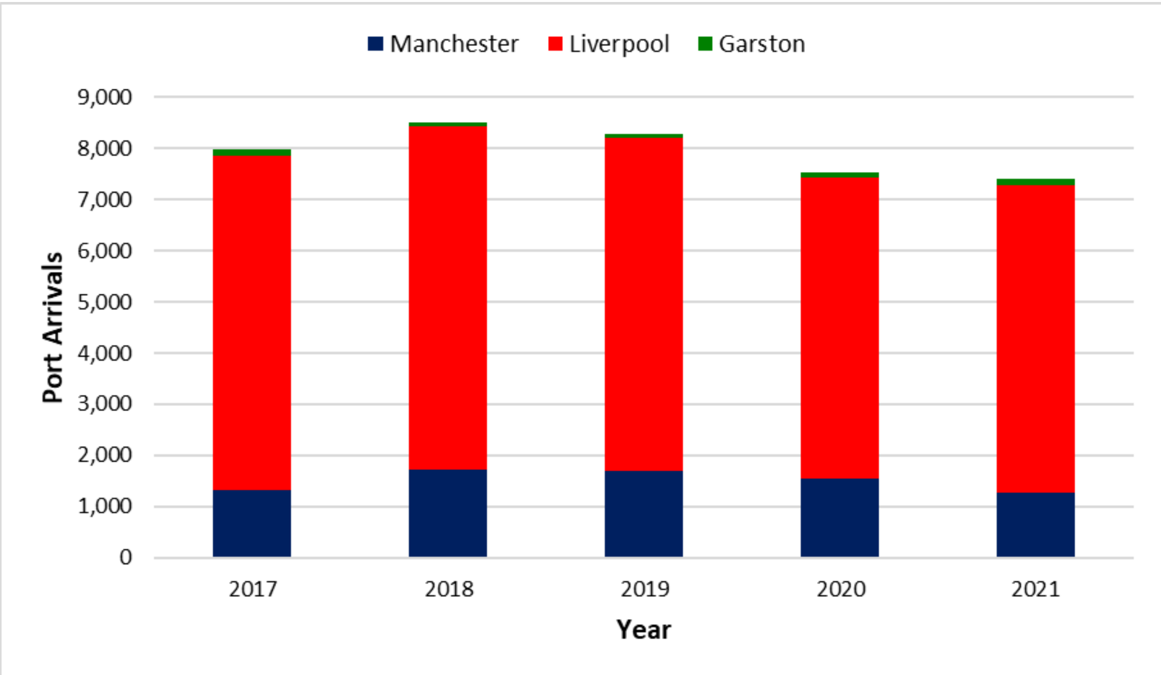

Figure 9.24: Port Arrivals 2017 – 2021

Port arrivals at all three ports has declined by 8% since 2017, noting that there is potential for this to have bene impacted by Brexit and the COVID-19 pandemic. Manchester arrivals have declined by 3%, with Liverpool and Garston seeing a 9% and 16% decline respectively. Overall, this decline equates to approximately 600 fewer arrivals in 2021 compared with 2017. Vessel arrivals peaked in 2018, with approximately 8,500 arrivals between the three ports.

The Port of Liverpool and the Manchester Ship Canal are operated by Peel Ports, who have plans to invest £200m in sustainable port infrastructure projects by Summer 2024 (Ref. xvi). There are currently no detailed plans on expansion at either of the Liverpool or Manchester. In 2016, Liverpool saw the completion of the Liverpool2 container terminal, which increased the port's ability to handle the largest container ships. Garston is operated by Associated British Ports, and recently underwent enhancement to the dry bulk storage offering at the port.

Fishing trends are difficult to project into the future, noting that trends are dependent on numerous factors including fish stocks and quotas. Changes to legislation following Brexit may also impact the size and make-up of the fishing fleet in UK waters.

Recreational activity can be similarly difficult to predict, but is assumed to remain similar or slightly increase in future years. Similarly the make-up of recreational traffic may vary, with sail and electric-powered vessels expected to become more prominent in place of diesel-fuelled craft. The locations of recreational activity may also vary, while volume of activity may be dependent on other factors such as the weather, climate change and the economy.

10 Impact Assessment

10.1 Introduction

This section provides a qualitative and quantitative risk assessment (using FSA) for the hazards identified due to the proposed development, based on baseline data, expert opinion, stakeholder concerns and lessons learnt from existing offshore developments. The hazards assessed are as follows:

- deviations to commercial routes leading to increased vessel to vessel collision risk between third-party vessels;
- increased vessel to vessel collision risk between a third-party vessel and a project vessel;
- creation of vessel to structure allision risk;
- reduced access to local ports;
- anchor interaction with subsea cable;
- fishing gear interaction with subsea cable;
- vessel grounding due to reduced under keel clearance; and
- interference with magnetic position fixing equipment; and
- reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources.

Within each component of an overarching hazard, embedded mitigation measures which have been identified as relevant to reducing risk are listed, with full descriptions provided in Section 13 This is followed by statements defining the frequency of occurrence and severity of consequence for each component of the hazard in **bold** text, as defined in Section 4.2.

At the end of the assessment of each hazard, these frequency of occurrence and severity of consequence rankings are summarised in tabular form (if there are multiple components), with the resulting significance of risk given in **highlighted bold** text, as defined in Section 4.2.

The risk control log (see Section 12) summarises the risk assessment and a concluding risk statement is provided (see Section 15.4).

10.2 Assessment of Impacts

10.2.1 Vessel Displacement Leading to Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

10.2.1.1 Construction Phase

Installation of the offshore Douglas CCS platform and cables may cause displacement of vessels around the areas of installation, which could lead to an increased risk of a collision between two third-party vessels during the construction phase. In particular vessels may be required to deviate around cable installation vessels, which are large, slow moving vessels which will be Restricted in Manoeuvrability (RAM). In addition, jack up vessels used for landfall works may also lead to vessel displacement close to the shore. As the offshore platform is located within the existing Safety Zone for the Douglas Complex and an Area To Be Avoided (ATBA), and Liverpool Bay TSS lanes pass at least 0.4nm from the proposed location, there is not expected to be any additional displacement associated with the construction of the new Douglas CCS platform within the existing Safety Zone. Works within the existing Hamilton, Hamilton North and Lennox Safety Zones are not covered in this NRA.

Vessel displacement will be more likely in busier areas of shipping. From the baseline assessment, passing vessel activity was significant across the Proposed Development, with higher density associated with the Liverpool Bay TSS lanes, vessels working at the Gwynt y Môr Offshore Wind Farm (OWF) and NW-SE routes used by the regular ferries running from Liverpool to Ireland.

Regular fishing and recreational activity was observed within the vicinity of the Proposed Development. Construction vessels may therefore cause a disruption to both local fishers and recreational boaters. Fishing activity was mostly recorded further offshore and was frequently recorded in the vicinity of the Physical Work Area to the north west of the proposed Douglas CCS platform. Recreational activity was recorded throughout the shipping and navigation study area, mainly passing out of the Queen's Channel, and are recorded crossing the Physical Work Area at various locations, including in near shore areas. It is noted that recreational craft and small fishing vessels close to shore will be under-represented by the AIS data.

The installation of the proposed Douglas CCS platform and new cables are expected to be carried out in Q1 to Q2 2026. Preparations for the shore approach of the power cables from Douglas to Point of Ayr are proposed to commence in Q2 2025. Installation works for the new platform are expected to take up to five months, while cable laying works are expected to take up to two months. The spatial extent of construction areas where vessels may be required to deviate around vessels which are RAM is expected to be small at any given time.

Details of construction activities, including any advisory safe passing zones, will be suitably promulgated via NtMs, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing construction activities. Guard vessels will be used where required to raise awareness of construction works to passing vessels and communication with the Ports of Liverpool and Mostyn will help to minimise collision risk associated with vessels using the port.

The appointment of a Fisheries Liaison Office (FLO) will aid in ensuring local fishers are made aware of construction works. Local Notices to Mariners will help to inform recreational users. All vessels will be expected to comply with international marine legislation, including the COLREGs and SOLAS.

Severity of Consequence

In the event of a collision incident between third-party vessels, the most likely consequences are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. The maximum adverse scenario could involve one of the vessels foundering resulting in potential loss of life (PLL) and the environmental consequence of pollution. Such a scenario would be more likely if one of the vessels involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the construction phase which will last for up to six months. Given that third-party vessels are expected to be compliant with relevant Flag State regulations including the COLREGs, collision avoidance action ensure that the likelihood of an encounter developing into a collision incident is low. This is furthered by the promulgation of information which will maximise awareness of ongoing construction activities, thus allowing third-party vessels to passage plan in advance, if considered appropriate.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.1.2 Operation and maintenance phase

Once the Proposed Development is operational, vessel displacement associated with the new cables is limited to any repair or maintenance work required, which is expected to be minimal and localised in nature. As the new Douglas CCS platform will be located within an existing Safety Zone and ATBA, there is not expected to be any additional displacement associated with the platform during the operational phase.

10.2.1.3 Decommissioning phase

There may also be a risk of vessel displacement leading to increased vessel to vessel collision risk between third-party vessels created during the decommissioning phase.

Severity of Consequence

Since the numbers and types of vessel used to remove the cables and platform are expected to be similar to those used for installation, this impact is expected to be similar in nature to the equivalent construction phase impact.

Therefore, the most likely consequences associated with the maximum adverse scenario are as per the equivalent construction phase impact.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. Given that third-party vessels are expected to be compliant with Flag State regulations including the COLREGs, the likes of collision avoidance action ensure that the likelihood of an encounter developing into a collision incident is low. This is furthered by the promulgation of information which will maximise awareness of ongoing decommissioning activities, thus allowing third-party vessels to passage plan in advance.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

10.2.2.1 Construction Phase

There is an increased collision risk created during the construction phase for all passing traffic due to the presence of vessels associated with the construction of the offshore platform and cables, and decommissioning and repurposing of the existing Hamilton Main, Hamilton North and Lennox satellite platforms. This includes vessels involved in surveys, seabed preparation, cable installation, platform installation, topside removal and installation, cable burial and/or protection installation, drilling of wells, commissioning of CO_2 pipelines and Landfall works. The nature of certain construction works, such as cable installation and other activities, requires large, slow moving vessels which will be RAM. Therefore, these vessels may have limited capability in taking avoidance action from a passing vessel on a collision course, should such a situation arise. In addition, there may be an increased collision risk between third-party vessels and jack ups used during Landfall works, and between third-party vessels and HLVs used for the platform installation. Due to their reduced size and increased mobility in comparison, smaller vessels associated with the construction phase, e.g. tugs, guard vessels, support vessels, Crew Transfer Vessels (CTVs), are considered to pose a lesser risk of collision than that of the larger cable installation vessels, jack ups or HLVs.

The collision risk is likely to be greater in higher density shipping areas. Passing vessel activity was significant across the Proposed Development, with higher density associated with the Liverpool Bay TSS lanes, vessels working at the Gwynt y Môr OWF and NW-SE routes used by the regular ferries running from Liverpool to Ireland.

Up to four cable installation vessels which are RAM will be on site at any one time and a jack up vessel is expected to be used for Landfall works. Additional support vessels include one seabed preparation vessel, one trench support vessel, one cable protection installation vessel and one cable burial installation vessel, as well as survey vessels, crew/work boats and multicats. For the new Douglas CCS platform, there will be one HLV vessel and additional support vessels including tugs, cargo barges, survey vessels and crew boats. The installation of the proposed Douglas CCS platform and new cables are expected to be carried out in Q1 and Q2 2026. Preparations for the shore approach of the power cables from Douglas to Point of Ayr are proposed to commence in Q2 2025. Installation works for the new platform are expected to take up to five months, while cable laying works are expected to take up to two months. The spatial extent of construction areas where vessels which are RAM are working is expected to be small at any given time. There will also be additional vessel movements associated with works to repurpose existing assets at the Hamilton Main, Hamilton North and Lennox platforms between Q4 2024 and Q3 2028, although these vessels are not expected to be RAM. Up to 128 return trips are anticipated during this time, the majority of which are associated with CTVs.

Project vessels will be managed by marine coordination, will display suitable marks and lights, will broadcast on AIS (where appropriate) and will be compliant with relevant Flag State regulations including the COLREGs and SOLAS.

Details of construction activities, including any advisory safe passing distances will be suitably promulgated via NtM, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing construction activities. Communication with the Ports of Liverpool and Mostyn about the construction work activities and appointment of an FLO will also help to raise awareness of the works and minimise collision risk. Where required, guard vessels and/or temporary AtoNs will be used to raise awareness of construction work to passing vessels and to guide vessels around any areas of construction activities, and platform installation works will be located within the existing Safety Zone and ATBA at the Douglas Complex.

Severity of Consequence

The most likely consequences in the event of a collision incident between a project vessel and third-party vessel are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. The maximum adverse scenario could involve one of the vessels foundering resulting in Potential Loss of Life (PLL) and the environmental consequence of pollution. Such a scenario would be more likely if the third-party vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the construction phase which will last for up to four years, with cable laying works anticipated to take up to two months. The number of vessel movements to and from the Douglas Complex and satellite platforms is relatively low, the majority of which are associated with CTVs. With the mitigation measures noted above implemented, it is considered unlikely that a close encounter between a third-party vessel and a project vessel will occur. In the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per the COLREGs, including Rule 18 which governs responsibilities between vessels if one is RAM, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The frequency of occurrence is therefore considered to be **extremely unlikely.**

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.2.2 Operation and Maintenance phase

During the operation and maintenance phase, there will be up to 15 return trips by jack-up vessels and 15 return trips by other vessels visiting the new Douglas CCS platform, which is significantly fewer visits than currently received by the Douglas Complex. There is therefore not expected to be any additional vessel to vessel collision risk associated with vessels visiting the new Douglas CCS platform.

There will be a requirement to undertake inspection surveys as well as the potential for unplanned repair works on the proposed cables, which could result in an increased collision risk between a third-party vessel and a survey/maintenance vessel.

This risk is described under the construction phase, however maintenance/monitoring work is expected to be less disruptive and span a shorter period than cable construction works.

Routine inspections of the subsea structures are planned to two yearly and five years, with annual surveys on a seven year rolling programme also planned. There may also be requirements for cable repair and/or burial as required. Cable repairs/reburials may include vessels which are RAM. As per the construction phase, project vessels will be managed by marine coordination, will display suitable marks and lights, will broadcast on AIS and be compliant with relevant Flag State and international regulations including the COLREGs and SOLAS.

Similarly to the construction phase, details of major maintenance activities including any advisory clearance zones, as defined by risk assessment, will be suitably promulgated via NtM, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing major maintenance activities.

Severity of Consequence

The most likely consequences in the event of a collision incident between a project vessel and third-party vessel are as per the equivalent construction phase impact, namely minor contact and damage to property and minor reputational effects on business, but no perceptible effect on people. The maximum adverse scenario could involve one of the vessels foundering resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if the third-party vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the operation and maintenance phase which will last for up to 25 years. With implementation of the embedded mitigation measures outlined in Section 13 it is considered unlikely that an encounter between a third-party vessel and a Project vessel will occur. In the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per COLREGs, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The likelihood of an encounter is decreased compared to the construction phase given the smaller scale of maintenance activities, although this is somewhat balanced by the much longer duration of the operation and maintenance phase.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.2.3 Decommissioning Phase

There may also be an increased collision risk created during the decommissioning phase for all passing traffic due to the presence of vessels associated with decommissioning works.

Severity of Consequence

Since the numbers and types of vessel used to remove the cables and CCS platform are expected to be similar to those used for installation, this impact is expected to be similar in nature to the equivalent construction phase impact.

Therefore, the most likely consequences associated with the maximum adverse scenario are as per the equivalent construction phase impact.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. With the embedded mitigation measures previously noted implemented, it is considered unlikely that an encounter between a third-party vessel and a project vessel will occur. As per the equivalent construction phase impact, in the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per the COLREGs, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.3 Vessel to Platform Allision Risk

10.2.3.1 Operation and Maintenance Phase

Once the new Douglas CCS platform has been installed, there may be a risk of vessel to structure allision. This could be a powered allision (i.e. vessels under power alliding with the platform due to watchkeeper failure) or a drifting allision (i.e. due to machinery or engine failure, causing the vessel to drift into the platform).

Should an allision occur, the consequences will depend on multiple factors including the energy of the impact, structural integrity of the vessel and sea state at the time of the impact. In general powered allisions are expected to generate higher impact energies than drifting allisions. The most likely consequences will be minor damage with the vessel able to resume passage and undertake a full inspection at the next port. As an unlikely worst case, the vessel could founder resulting in a PLL and pollution.

Additionally, commercial vessels are expected to comply with international and flag state regulations (including the COLREGs and SOLAS) and will be able to passage plan in advance given the promulgation of information relating to the Proposed Development.

This risk is mitigated by the location of the proposed new Douglas CCS platform within an existing Area to be Avoided, which restricts vessels from transiting close to the platform. It is also assumed that a 500m Safety Zone will be in place and that the platform has suitable operational lighting and marking in accordance with the Standard Marking Schedule for offshore installations.

Severity of Consequence

The most likely consequences in the event of an allision incident between a third-party vessel and the new Douglas CCS platform are minor contact and damage to property and minor reputational effects on business, but no perceptible effect on people. The maximum adverse scenario could involve the vessel foundering resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if the vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the operation and maintenance phase which will last for up to 25 years. With implementation of the embedded mitigation measures outlined in Section 13, including the 500 m Safety Zone and ATBA, and the familiarity of vessels with the existing structures in the Douglas Complex, an allision incident is considered to be unlikely.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.4 Reduced Access to Local Ports

10.2.4.1 Construction Phase

There is the potential for reduced access to local ports due to construction works associated with the cable construction works, in particular close to the Landfall. Vessels visiting the Port of Mostyn access this port via the Welsh Channel, which is intersected by the proposed cable routes from Douglas to Point of Ayr.

The majority of vessels using the Welsh Channel to enter the Port of Mostyn are wind farm support vessels transiting to the Gwynt-y-Môr, North Hoyle and Rhyl Flats OWFs.

The installation of the proposed new cables are expected to be carried out in Q1 and Q2 2026. Preparations for the shore approach of the power cables from Douglas to Point of Ayr are proposed to commence in Q2 2025. Cable laying works are expected to take up to two months. The spatial extent of construction areas where vessels may be required to deviate around vessels which are RAM is expected to be small at any given time.

Project vessels will be managed by marine coordination, will display appropriate marks and lights, broadcast on AIS and will be compliant with relevant Flag State regulations including the COLREGs, including rule 18 which applies to vessels which are RAM. Liaison with the Port of Mostyn will help to manage disruption. This impact was discussed during consultation with the Harbour Master of the Port of Mostyn and no issues were raised.

Severity of Consequence

Cable installation and Landfall construction works may result in some disruption to vessels using the Port of Mostyn, due to the presence of vessels which may be RAM, such as a cable laying vessel.

The severity of consequence is considered to be **minor**.

Frequency of Occurrence

The impact will be present during installation of the cables within the Welsh Channel. Cable laying is estimated to take up to two months, with works in the Welsh Channel lasting for a small proportion of this period.

An average of 6 vessels per day accessed the Port of Mostyn based on the AIS data, the majority of which were wind farm support vessels. It is noted that there may be additional small craft not broadcasting on AIS also requiring access to the Port of Mostyn.

However, due to the localised and temporary nature of cable installation works in the Welsh Channel, the disruption to port access is reduced. This impact will be mitigated by good communication with the Port of Mostyn during the construction phase.

The frequency of occurrence is therefore considered to be **remote**.

Significance of Risk

The severity of consequence is deemed to be minor and the frequency of occurrence in is considered to be remote. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.4.2 Operation and maintenance phase

There is the potential for reduced access to local ports due to cable maintenance and repair works.

Severity of Consequence

The overall timescale for any maintenance/repair works is expected to be less than for construction works. Similarly to the construction phase, details of major maintenance activities including any advisory clearance zones, as defined by risk assessment, will be suitably promulgated to maximise awareness of ongoing major maintenance activities.

Such works may result in limited disruption to vessels accessing the Port of Mostyn via the Welsh Channel. However, any required maintenance in this area is expected to be temporary in nature.

In addition, maintenance vessels will be managed by marine coordination, will display appropriate marks and lights, broadcast on AIS and will be compliant with relevant Flag State regulations including the COLREGs, including rule 18 which applies to vessels which are RAM. Liaison with the Port of Mostyn will help to manage disruption.

The severity of consequence is therefore considered to be **negligible**.

Frequency of Occurrence

The reduction in access is decreased compared to the construction phase given the smaller scale of maintenance activities, although this is somewhat balanced by the much longer duration of the operation and maintenance phase.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be negligible and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.4.3 Decommissioning phase

There may be potential for reduced access to local ports due to decommissioning works.

Severity of Consequence

Since the numbers and types of vessels used to remove the cables are expected to be similar to those used for installation, this impact is expected to be similar in nature to the equivalent construction phase impact.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. Since the anticipated reduction in access to local ports and the volumes of vessel traffic accessing the ports are assumed to be the same as for the equivalent construction phase impact, and the appropriate embedded mitigation measures are in place, it is anticipated that the frequency of occurrence is similar to the construction phase.

The frequency of occurrence is therefore considered to be **remote**.

Significance of Risk

The severity of consequence is deemed to be minor and the frequency of occurrence is considered to be remote. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.5 Anchor Interaction with Subsea Cable

10.2.5.1 Construction Phase

The preferred approach for cable burial is that the cable is laid on the seabed and then buried using a plough. Therefore, there may be a period of time after laying when the cables are exposed and not protected through burial or other means such as rock placement. This period represents a potentially higher risk of interaction from vessel anchors with the surface-laid cables.

There is a risk that a nearby anchored vessel will lose its holding ground and subsequently drag anchor over the cables. Vessels at anchor were mainly located within the charted anchorage areas located between the Gwynt y Môr and Burbo Bank wind farms, and around the boundaries of the two wind farms.

If a passing vessel suffers engine failure, there is a possibility that it may drop anchor to avoid drifting into an emergency situation such as a collision, allision or grounding. This is more likely to occur in areas closer to the coast or to other hazards (e.g. offshore developments). In open waters where depths are deeper and anchoring may not be feasible, the vessel is more likely to attempt to either fix the problem or await assistance.

Severity of Consequence

While exposed any vessel anchor could interact with the cables. If an anchor becomes snagged on the cable, there could be a risk of injury in trying to free it. If the anchor cannot be freed the safest action is to slip it, and not attempt to raise or cut the cable.

The most likely consequences are limited damage to property (anchoring vessel or subsea cable). The maximum adverse scenario may include damage to property including to the vessel's anchor or subsea cable.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

From the vessel traffic survey data, the majority of anchoring activity took place within the charted anchorage areas located between the Gwynt y Môr and Burbo Bank wind farms, and around the boundaries of the two wind farms. The deep water anchorage east of the Hamilton Gas Field is located 0.4nm to the south of the Douglas to Lennox cable and may pose a higher risk from a vessel dragging anchor.

Areas where emergency anchoring risk is expected to be higher are where vessel density was highest, e.g. within the TSS lanes, within the Gwynt y Môr wind farm and where there were high densities of traffic associated with ferry route. The maritime incident data showed that the most frequent incident type to be recorded was machinery failure, which could lead to emergency anchoring.

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of occurrence is considered to be **extremely unlikely.**

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.5.2 Operation and maintenance phase

There is a risk that a vessel anchor interacts with the cables due to an anchor dragging or emergency anchoring incident during the operation and maintenance phase.

High risk areas for an anchor dragging incident are where vessels routinely anchor close to the cable, e.g. within the charted anchorage areas located between the Gwynt y Môr and Burbo Bank wind farms, and around the boundaries of the two wind farms. The deep water anchorage east of the Hamilton Gas Field is located 0.4 nm to the south of the Douglas to Lennox cable and may pose a higher risk from a vessel dragging anchor.

For emergency anchoring, higher risk areas include areas where the density of vessels crossing the cables is higher and areas closer to the coast or to other hazards (e.g. offshore developments), which increases the likelihood of dropping anchor in an emergency. From the baseline assessment, passing vessel activity was significant across the Proposed Development, with higher density associated with the Liverpool Bay TSS lanes, vessels working at the Gwynt y Môr wind farm and NW-SE routes used by the regular ferries running from Liverpool to Ireland.

During the operation and maintenance phase the cables will be marked on UKHO Admiralty Charts with associated note/warning about anchoring, trawling or seabed operations.

A CBRA will be undertaken to identify high risk areas along the cable routes and to determine suitable burial depths for the cables during the operation and maintenance phase. Burial is the preferred method for protecting the cables from vessel anchors. The cables are anticipated to be buried to between 2m and 3m for the whole length of the route, with external protection, i.e. freshly quarried rock and concrete mattresses, used at the ten crossings. Target burial depths will be confirmed by the CBRA. Cable protection will be regularly monitored to confirm its integrity.

Severity of Consequence

Once the cables are protected, either through burial and/or other protection measures, larger vessels (e.g. cargo vessels and tankers) are more likely to threaten the cables as their anchors are able to penetrate deeper into the seabed and can cause greater damage than smaller anchors (fishing and recreational vessels) if contact is made. The anchors of smaller vessels (e.g. fishing and recreational craft) are unlikely to penetrate as deeply. Suitable target burial depths, defined in a CBRA, will mitigate the risk from vessel anchors. Periodic monitoring will be undertaken to confirm cable protection remains suitable.

The most likely consequences are limited damage to property (anchoring vessel or subsea cable). The maximum adverse scenario may include damage to property including to the vessel's anchor or subsea cable.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Protection of the cables via burial and/or external protection will reduce the frequency of occurrence of anchor interaction.

Although there may be limited decision-making time if a vessel is drifting towards a hazard, it is anticipated that the charting of infrastructure including all subsea cables will inform any decision to anchor, as per Regulation 34 of SOLAS.

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.6 Fishing Gear Interaction with Subsea Cable

10.2.6.1 Construction Phase

Similar to the impact associated with vessel anchors, there is the potential for risk of interaction from fishing gear with surface-laid cables prior to burial by plough, as this may result in a period of time during which the cables are exposed (prior to burial or placement of external protection).

Severity of Consequence

Although fishers are advised to follow the current maritime industry guidance (MGN 661, the Mariner's and all Admiralty charts) and avoid demersal trawling (and anchoring) in the immediate vicinity of the cables, it is acknowledged that fishing may still occur over the cables either inadvertently, or at the discretion of fishing vessel operators.

There is higher risk of snagging from demersal gear if the cable is exposed. The response from the crew includes reducing/reversing the propulsive force, attempting to unfasten the equipment, or releasing the gear and therefore in the majority of snagging incidents, it should be possible to recover the situation without any serious consequences (e.g. injury or fatality to crew members). However, accident data from the MAIB indicates that safe recovery from a snagging incident is not always the outcome. Consequences of snagging therefore range from damage to gear and the cable, loss of stability due to lines being put under strain and in the worst case, capsize of the vessel, men overboard and risk of injury or fatality. For example, a risk of capsize could occur if the vessel attempted to free its gear by raising the cable rather than releasing the gear.

The severity of consequence is therefore considered to be **serious**.

Frequency of Occurrence

Fishing vessels carrying demersal gear that interacts with the seabed when deployed present the greatest risk of snagging on subsea cables. Static gear types (e.g. potters/whelkers and gill netters) are not considered to present a safety risk from snagging as they are able to carefully select the position of their gear, avoiding any subsea cables. Demersal gear types identified in the baseline assessment relative to the Proposed Development were mainly dredgers, which contributed 40% of gear types recorded on AIS in the area. The highest risk area of snagging is where vessels engaged in fishing with demersal gears are most active, mainly to the east and north of the Douglas Field. It is also noted that there is likely to be significant activity from small fishing vessels in coastal waters, which may be under-represented in the AIS data, although these are most likely to be using static gear which has lower snagging risk.

It is expected that mitigation including having a FLO in place and circulation of information (e.g. via Kingfisher and local communications) will help ensure fishers are aware of the exposed cable and avoid fishing directly over it. In addition, guard vessels will be used in any areas where cable exposures are considered to present significant risk to fishing gear snagging.

The frequency of occurrence during the period that the cables are surface-laid is considered to be **remote**.

Significance of Risk

Overall, the severity of consequence is deemed to be serious and the frequency of occurrence is considered to be remote. The effect will, therefore, be of **tolerable** adverse significance, which is not significant in EIA terms.

Additional mitigation to reduce this impact to ALARP is to minimise the amount of time between cable lying and installation of cable protection, e.g. burial.

10.2.6.2 Operation and maintenance phase

There is a risk of fishing gear interaction with the cables due to fishing activity, which has been described previously under the description of this impact during the construction phase. High intensity areas for demersal fishing activity occurred mainly to the east and north of the Douglas Field.

During the operation and maintenance phase the cables will be marked on UKHO Admiralty Charts and KIS-ORCA with associated note/warning about anchoring, trawling or seabed operations.

A CBRA will be undertaken to provide a detailed assessment of fishing activity along the proposed cables and fishing gear penetration depths for the various soil conditions in order to determine suitable burial depths for the cables during the operation and maintenance phase. Burial is the preferred method for protecting the cables from fishing gear. The cables are anticipated to be buried to between 2 m and 3 m for the whole length of the route, with external protection, i.e. freshly quarried rock and concrete mattresses, used at the ten crossings. Target burial depths will be confirmed by the CBRA. Cable protection will be regularly monitored to confirm its integrity.

Severity of Consequence

The planned cable protection is assumed to provide effective mitigation from fishing gear snagging, reducing the risk of serious consequences such as snagging, capsize of the vessel and potential loss of life (PLL).

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Once the cables are installed, the depiction of the cables on nautical and Kingfisher charts may discourage fishing in the vicinity of the cables; however evidence shows this is not always the case with installed cables as often it is assumed they are adequately protected against fishing gear interaction. The planned cable protection (through burial) is assumed to provide effective mitigation against the risk of demersal gear making contact with the installed cables. As discussed, it is the responsibility of the fishers to dynamically risk assess whether it is safe to undertake fishing activities in proximity to subsea cables and to make a decision as to whether or not to fish. Fishing activity is considered further in volume 2, chapter 10 of the ES.

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.7 Vessel Grounding Due to Reduced Under Keel Clearance

10.2.7.1 Operation and Maintenance Phase

This impact refers to a vessel grounding due to reduced under keel clearance associated with external protection measures such as rock berms, in areas where cable burial is not feasible (e.g. due to cable crossings). This could lead to subsequent capsize, injury, loss of life, oil spill, etc. In general, the higher risk areas are coastal waters where existing water depths are shallower.

Cable burial is the preferred option of safeguarding the cables, and no external protection is planned, with the exception of the 42 anticipated cable crossings as outlined in Section 2.

Severity of Consequence

Should a vessel grounding occur, the most likely consequences are minor damage to property and minor reputational effects on business but no perceptible effect on people. The maximum adverse scenario may include the vessel foundering resulting in PLL and the environmental consequence of pollution.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The likelihood of a grounding is greater for large commercial vessels with deeper draughts, noting that only a minority of vessels recorded in the vessel traffic survey data were deep draught. Areas where water depth is shallower, e.g., close to the Landfall, also present a higher risk of vessels grounding.

The maximum height of cable protection will be 0.8 m. The average draught of vessels crossing the Physical Work Area was 5.1 m, with a maximum draught of 14 m, recorded crossing the cable route within the Liverpool Bay TSS in approximately 25 m of water depth.

Cable protection is expected to be implemented only at the cable crossings. Water depth at crossings located in shallow water (less than 10 m) are most likely to be significantly altered, with these typically associated with the wind farm export cables crossing the Douglas to Point of Ayr cable route. Vessels crossing the cable route in these areas tended to be shallower draught vessels such as wind farm crew transfer vessels, while deep draught vessels were typically recorded further offshore using the Liverpool Bay TSS.

AS part of the Scoping Opinion, the MCA noted the requirements of MGN 654 (Ref. i). Where possible, the Applicant intends to follow the guidance provided in MGN 654, and in particular cable protection will not change the charted water depth by more than 5%. If rock protection at crossings are likely to lead to a water depth reduction exceeding 5%, a detailed draught assessment will be carried out post-consent to determine any safety risk to navigation, which will be discussed and agreed with the MCA and Trinity House post consent and prior to cable installation as per MGN 654.

When considered with the embedded mitigation of compliance with the requirements in MGN 654 and any change to water depth of more than 5% chart datum requiring further consultation and agreement with the MCA, the frequency is considered to be reduced to low for all vessel types.

The frequency of occurrence is therefore considered to be **remote**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be remote. The effect will, therefore, be of **tolerable** adverse significance, which is not significant in EIA terms.

10.2.8 Interference with Magnetic Compasses

10.2.8.1 Operation and Maintenance Phase

A magnetic compass is a navigational instrument for determining direction relative to the earth's magnetic poles. It consists of a magnetised pointer (usually marked on the north end) free to align itself with the earth's magnetic field. Like any magnetic device, compasses are affected by nearby ferrous materials as well as by local electromagnetic forces, such as magnetic fields emitted from power cables. The majority of commercial vessels use a non-magnetic gyrocompass as the primary means of navigation, which is unaffected by the earth's magnetic field. However, as the magnetic compass still serves as an essential means of navigation in the event of power loss or as a secondary source, it must not be affected to the extent that safe navigation is threatened.

The proposed cables will consist of an HVDC power cable with a bundled fibre optic cable. The HVDC cable may result in localised static Electromagnetic Fields (EMF), with the potential to affect magnetic compasses.

The important mitigating factors to reduce EMF effects on magnetic compasses are listed below:

- Cable spacing;
- Water depth; and
- Burial depth.

The cables will be laid at approximately 30 m spacing and approximately 72% of the cables will be located in water depths greater than 10 m below Chart Datum (CD). Therefore, there will be significant vertical distance between the cables and surface vessels along the majority of the cables. The strength of the magnetic fields decreases exponentially with distance from the cables, and as such compass deviation will reduce with increasing water depth. Similarly, increasing burial depth also increases the vertical separation between a surface vessel and the cables in a given water depth.

Severity of Consequence

The majority of commercial vessel traffic uses non-magnetic gyrocompasses as the primary means of navigation, which are unaffected by EMF. Therefore, in general it is considered unlikely that any EMF interference created by the proposed cables will have a significant impact on vessel navigation near the Proposed Development. Nevertheless, since magnetic compasses can still serve as an essential means of navigation in the event of power loss, as a secondary source, or as some smaller craft (fishing or leisure) may rely on it as their sole means of navigation (noting that many smaller craft may use Global Positioning System (GPS), chart plotters, etc. as a further source), it has been assessed within this ES chapter. Vessels in shallower water should also be able to navigate visually using coastal features when conditions are suitable.

The most likely consequences associated with the maximum adverse scenario are anticipated to be limited, noting that 72% of the proposed cables are anticipated to be in water depths greater than 20 m.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Along the proposed cable routes vessel traffic is assumed to mainly transit perpendicular to the direction of the cables. For vessels transiting over the cables, time spent directly above the cables will be limited given the limited width of the cable corridor.

Given HVDC cables produce static magnetic fields which decrease with the horizontal distance from the cables, magnetic compass interference should only be experienced directly above or in direct proximity to the cables, noting again that effects decrease quickly with horizontal distance as the vessel moves away from the location of the cables.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of the Effect

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

10.2.9 Reduction of Emergency Response Capability Due to Increased Incident Rates for SAR Responders and Increased Demand on the Available Resources

10.2.9.1 All Phases

Increased vessel activity during the construction phase may reduce emergency response capability by increasing the number of incidents, or reducing access for the responders. As an unlikely worst case, the consequences of such a situation could include a failure of emergency response to an incident, resulting in a PLL and pollution.

However, with project vessels to be managed through marine coordination and compliant with Flag State regulations, the likelihood of an incident is minimised. Additionally, should an incident occur, project vessels will be well equipped to assist, either through self-help capability or, for an incident involving a nearby third-party vessel, through SOLAS obligations (IMO, 1974), all in liaison with the MCA.

During the operation and maintenance phase, there is not expected to be a notable increase in vessel numbers, however there may be a period of time when the new Douglas CCS platform and the existing Douglas Complex are in operation simultaneously, which could increase the likelihood of an incident occurring at the Douglas Complex. As the new Douglas CCS platform will be unmanned, any impact is considered to be minimal.

Severity of Consequence

The severity of consequence is considered to be **moderate**.

Frequency of Occurrence

Due to the limited number of vessels involved and temporary nature of the construction phase works, and given that the proposed new Douglas CCS platform will be unmanned and within the existing Douglas Complex, the frequency of occurrence is considered to be **negligible.**

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11 Cumulative Impacts

11.1 Methodology

The Cumulative Impact Assessment takes into account the impact associated with the Proposed Development, together with other relevant projects. Cumulative impacts are therefore the impacts arising from the Proposed Development together with the impacts from a number of different developments, on the same receptor or resource. Further detail on the cumulative effects assessment (CEA) methodology is presented in volume 3, Cumulative Effects Assessment – Screening Report (Ref. xvii).

The developments selected as relevant to the cumulative impact assessment presented within this assessment are based upon the results of a screening exercise and the development of a 'long list' of cumulative developments relevant to the Proposed Development (Ref. xvii). Each development has been considered on a case-by-case basis for screening in or out of the cumulative assessment for shipping and navigation based upon data confidence, effect-receptor pathways and the spatial/temporal scales involved, to create a short list of considered impacts, summarised in Table 11.1.

Table 11.1: Cumulative Projects considered within the CEA for shipping and navigation

Development	Status	Distance from Proposed Development (km)	Spatial/temporal overlap with Proposed Development			Start date	End date
			Spatial	Temporal (construction)	Temporal (Operation)		
Morecambe Offshore Windfarm Generation Assets	Pre-application	12	x	✓	✓	01/01/2026	Unknown
Morgan and Morecambe Offshore Windfarms Transmission Assets	Pre-application	3	x	✓	✓	Unknown	Unknown
Morgan Offshore Wind Project Generation Assets	Pre-application	39	x	✓	✓	Unknown	Unknown
Awel y Môr	Application submitted	2.1	✓	✓	✓	01/01/2020	01/01/2055
Mona Offshore Wind Farm	Pre-application	9.3	x	✓	✓	01/01/2028	31/12/2065
Prestatyn Coastal Defence	Consented/ licensed	2	x	✓	x	31/07/2021	31/05/2025
Central Rhyl Coastal Defence Scheme	Consented/ licensed	4	x	✓	x	31/03/2023	30/03/2024

Development	Status	Distance from Proposed Development (km)	Spatial/temporal overlap with Proposed Development			Start date	End date
			Spatial	Temporal (construction)	Temporal (Operation)		
Removal of Met Mast at Gwynt y Môr	Unknown	0	✓	✓	x	21/11/2022	30/11/2027
MaresConnect Interconnector	Permitted	0	✓	Unknown	✓	Unknown	Unknown

11.2 Cumulative Impacts Assessment

An assessment of the likely significance of the cumulative impacts of the Proposed Development together with other projects upon shipping and navigation receptors arising from each identified impact is given in this section.

11.2.1 Vessel Displacement Leading to Increased Vessel to Vessel Collision Risk Between Third-Party Vessels

11.2.1.1 Construction Phase

There is the potential for increased collision risk if cumulative developments encourage third party vessels to deviate towards the areas of construction for the Proposed Development. Vessel movements in the area are expected to be impacted by the construction of the Mona, Morgan and Morecambe OWFs, however given the location of the Proposed Development relative to the OWFs, and the current vessel routeing in the area, any change in vessel routeing relative to the Proposed Development is expected to be minimal. Additional vessel movements in the area due to the construction of the OWFs or transmission assets may cause an increase in vessel to vessel collision risk, depending on the location of the transmission assets and routes taken by construction vessels and whether there is an overlap in construction phases.

There may also be an increase in vessel to vessel collision risk due to construction vessel movements associated with Awel y Môr OWF and construction of the MaresConnect interconnector if construction periods were to overlap and works were to take place in a similar geographical area at a similar time.

Details of construction activities, including any advisory safe passing distances, as defined by risk assessment, will be suitably promulgated via NtM, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing construction activities. Guard vessels and temporary aids to navigation will be used to raise awareness of construction work to passing vessels (if required) to guide vessels around any areas of construction activities.

The appointment of an FLO will aid in ensuring local fishermen are made aware of construction works. Local Notices to Mariners as well as notifying local marinas and sailing clubs of the works will help to inform recreational users. All vessels will be expected to comply with international marine legislation, including the COLREGs and SOLAS.

Collision incidents are local in nature, occurring only when two (or more) vessels pass within a small distance of each other within the same sea area. Accounting for the distance between the Proposed Development and the cumulative developments, the temporary nature of the construction works and noting that there is a low likelihood that construction works for the Proposed Development and cumulative developments will be required within the same geographical area at the same time, the impact is as per the equivalent construction phase impact for the Proposed Development in isolation.

Severity of Consequence

The most likely consequences in the event of a collision incident between a Project vessel and third-party vessel are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. The worst case scenario could involve one of the vessels foundering resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if the third-party vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the construction phase which will last up to six months. Given that third-party vessels are expected to be compliant with relevant Flag State regulations including the COLREGs, collision avoidance action ensure that the likelihood of an encounter developing into a collision incident is low. This is furthered by the promulgation of information which will maximise awareness of ongoing construction activities, thus allowing third-party vessels to passage plan in advance, if considered appropriate.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.1.2 Decommissioning phase

There may also be a risk of vessel displacement leading to increased vessel to vessel collision risk between third-party vessels created during the decommissioning phase if cumulative developments lead to further displacement of vessels around the developments.

Severity of consequence

Since the numbers and types of vessel used to remove the platform and cables are expected to be similar to those used for construction, this impact is expected to be similar in nature to the equivalent construction phase impact.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. Given that third-party vessels are expected to be compliant with Flag State regulations including the COLREGs, the likes of collision avoidance action ensure that the likelihood of an encounter developing into a collision incident is low. This is furthered by the promulgation of information which will maximise awareness of ongoing decommissioning activities, thus allowing third-party vessels to passage plan in advance.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of the effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance for the Proposed Development, which is not significant in EIA terms.

11.2.2 Increased Vessel to Vessel Collision Risk Between a Third-Party Vessel and a Project Vessel

11.2.2.1 Construction phase

There is the potential for increased collision risk if cumulative developments encourage third party vessels to deviate towards the project vessels. Vessel movements in the area are expected to be impacted by the construction of the Mona, Morgan and Morecambe OWFs, however given the location of the Proposed Development relative to the OWFs, and the current vessel routeing in the area, any change in vessel routeing relative to the Proposed Development is expected to be minimal. Additional vessel movements in the area due to the construction of the OWFs or transmission assets may cause an increase in vessel to vessel collision risk, depending on the location of the transmission assets and routes taken by construction vessels and whether there is an overlap in construction phases.

There may also be an increase in vessel to vessel collision risk between a third-party vessel and a project vessel due to construction vessel movements associated with Awel y Môr OWF and construction of the MaresConnect interconnector if construction periods were to overlap and works were to take place in a similar geographical area at a similar time.

Project vessels, as managed by marine coordination, will display suitable marks and lights, will broadcast on AIS (where appropriate) and will be compliant with relevant Flag State regulations including the COLREGs and SOLAS.

Details of construction activities, including any advisory safe passing distances, as defined by risk assessment, will be suitably promulgated via NtM, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing construction activities. Communication with the Port of Liverpool and Port of Mostyn about the construction work activities and appointment of an FLO will also help to raise awareness of the works and minimise collision risk. Guard vessels and temporary aids to navigation will be used to raise awareness of construction work to passing vessels (if required) to guide vessels around any areas of construction activities.

Collision incidents are local in nature, occurring only when two (or more) vessels pass within a small distance of each other within the same sea area. Accounting for the distance between the Proposed Development and the cumulative developments, the temporary nature of the construction works and noting that there is a low likelihood that construction works for the Proposed Development and cumulative developments will be required within the same geographical area at the same time, the impact is as per the equivalent construction phase impact for the Proposed Development in isolation.

Severity of Consequence

In the event of a collision incident between third-party vessels, the most likely consequences are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. The worst case scenario could involve one of the vessels foundering resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if one of the vessels involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the construction phase which will last up to four years, with cable laying works anticipated to take up to two months. The number of vessels movements to and from the Douglas Complex and satellite platforms is relatively low, the majority of which are associated with CTVs. With the embedded mitigation measures noted above implemented, it is considered unlikely that an encounter between a third-party vessel and a project vessel will occur. In the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per the COLREGs, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.2.2 Operation and maintenance phase

As per the equivalent construction phase impact, there is the potential for increased collision risk if cumulative developments encourage third party vessels to deviate towards project vessels. During the operation and maintenance phase, there will be up to 15 return trips by jack-up vessels and 15 return trips by other vessels visiting the new Douglas CCS platform, which is significantly fewer visits than currently received by the Douglas Complex. There is therefore not expected to be any additional vessel to vessel collision risk associated with vessels visiting the new Douglas CCS platform.

There will be a requirement to undertake inspection surveys as well as the potential for unplanned repair works on the proposed cables, which could result in an increased collision risk between a third-party vessel and a survey/maintenance vessel. Similar to the construction phase, if inspection or maintenance works were to coincide with construction works on cumulative projects, there could be an increase in vessel to vessel collision risk with survey/maintenance vessels, however any inspection or maintenance works are expected to be smaller in scale than construction works.

As per the construction phase, project vessels will be managed by marine coordination, will display suitable marks and lights, will broadcast on AIS and be compliant with relevant Flag State and international regulations including the COLREGs and SOLAS.

Similar to the construction phase, details of major maintenance activities including any advisory safe passing distances, as defined by risk assessment, will be suitably promulgated via NtM, Kingfisher, Radio Navigational Warnings, NAVTEX and/or broadcast warnings to maximise awareness of ongoing major maintenance activities.

As per the equivalent construction phase impact, collision incidents are local in nature, occurring only when two (or more) vessels pass within a small distance of each other within the same sea area.

Severity of Consequence

The most likely consequences in the event of a collision incident between a Project vessel and third-party vessel are minor contact between the vessels resulting in minor damage to property and minor reputational effects on business but no perceptible effect on people. The maximum adverse scenario could involve one of the vessels foundering resulting in Potential Loss of Life (PLL) and the environmental consequence of pollution. Such a scenario would be more likely if the third-party vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the operation and maintenance phase which will last for up to 25 years. With implementation of the embedded measures noted above, it is considered unlikely that an encounter between a third-party vessel and a Project vessel will occur. In the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per COLREGs, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The likelihood of an encounter is decreased compared to the construction phase given the smaller scale of maintenance activities, although this is somewhat balanced by the much longer duration of the operation and maintenance phase.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.2.3 Decommissioning phase

There may also be an increased collision risk created during the decommissioning phase if decommissioning works were to overlap temporally with maintenance or decommissioning works associated with the cumulative developments.

Severity of Consequence

Since the numbers and types of vessel used to remove the platform and cables are expected to be similar to those used for construction, this impact is expected to be similar in nature to the equivalent construction phase impact.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. With the embedded mitigation measures previously noted implemented, it is considered unlikely that an encounter between a third-party vessel and a project vessel will occur. As per the equivalent construction phase impact, in the event that such an encounter does occur, collision avoidance action would be implemented by the vessels as per the COLREGs, thus ensuring that the likelihood of the encounter developing into a collision incident is very low.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of the effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance for the Proposed Development, which is not significant in EIA terms.

11.2.3 Vessel to Platform Allision Risk

11.2.3.1 Operation and Maintenance Phase

There is the potential for increased vessel to structure allision risk if cumulative developments encourage third party vessels to deviate towards the new Douglas CCS platform. Vessel movements in the area are expected to be impacted by the construction of the Mona, Morgan and Morecambe OWFs, however given the location of the Proposed Development relative to the OWFs, and the current vessel routeing in the area, any change in vessel routeing relative to the new Douglas CCS platform is expected to be minimal. Additional vessel movements in the area due to the construction of the OWFs or transmission assets may cause an increase in vessel to vessel collision risk, depending on the location of the transmission assets and routes taken by construction vessels and whether there is an overlap in construction phases.

However, due to the location of the platform within a 500 m Safety Zone and ATBA, any deviated vessels are expected to maintain a minimum distance from the new platform and therefore the impact is as per the equivalent operation and maintenance phase impact for the Proposed Development in isolation.

Severity of Consequence

The most likely consequences in the event of an allision incident between a third-party vessel and the new Douglas CCS platform are minor contact and damage to property and minor reputational effects on business, but no perceptible effect on people. The maximum adverse scenario could involve the vessel foundering resulting in PLL and the environmental consequence of pollution. Such a scenario would be more likely if the vessel involved was a small craft which may have weaker structural integrity than a commercial vessel.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

The impact will be present throughout the operation and maintenance phase which will last for up to 25 years. With implementation of the embedded mitigation measures outlined in Section 13, including the 500m Safety Zone and ATBA, and the familiarity of vessels with the existing structures in the Douglas Complex, an allision incident is considered to be unlikely.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be **of broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.4 Reduced Access to Local Ports

11.2.4.1 Construction Phase

There is the potential for increased disruption to port access due to cumulative developments, particularly if the coastal defence works at Prestatyn and Rhyl were to overlap temporally with the construction works on the cables or if any of the cumulative developments were to increase vessels movements in and out of the Port of Mostyn.

Project vessels will be managed by marine coordination, will display appropriate marks and lights, broadcast on AIS and will be compliant with relevant Flag State regulations including the COLREGs, including rule 18 which applies to vessels which are RAM. Liaison with the Port of Mostyn and wind farm operators will help to manage disruption.

With the designed in measures listed above, the effect due to the presence of cumulative developments is anticipated to be manageable.

Severity of Consequence

Construction of the cables within the Welsh Channel may result in some disruption to vessels accessing the Port of Mostyn, due to the presence of vessels which may be RAM, such as a cable laying vessel. Cable installation is estimated to take up to two months, with works in the Welsh Channel lasting for a small proportion of this period.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

The impact will be present throughout the construction phase which will last for up to two months, with works in the Welsh Channel lasting for a small proportion of this period. An average of 6 vessels per day accessed the Port of Mostyn based on the AIS data, the majority of which were wind farm support vessels. It is noted that there may be additional small craft not broadcasting on AIS also requiring access to the Port of Mostyn. Cumulative developments may lead to an increase in the number of vessels accessing the Port of Mostyn.

However, due to the localised and temporary nature of cable installation works in the Welsh Channel, the disruption to port access is reduced. This impact will be mitigated by good communication with the Port of Mostyn during the construction phase.

The frequency of occurrence is therefore considered to be **remote**.

Significance of effect

The severity of consequence is deemed to be minor and the frequency of occurrence is considered to be remote. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.4.2 Operation and maintenance phase

There is the potential for increased disruption to port access during the operational phase due to cumulative developments, for example if surveys or repairs within the Welsh Channel overlap temporally with other cumulative developments.

Similar to the construction phase, details of major maintenance activities including any advisory safe passing distances, as defined by risk assessment, will be suitably promulgated to maximise awareness of ongoing major maintenance activities.

Maintenance/repair vessels will be managed by marine coordination, will display appropriate marks and lights, broadcast on AIS and will be compliant with relevant Flag State regulations including the COLREGs, including rule 18 which applies to vessels which are RAM. Liaison with the Port of Mostyn and FLO will help to manage disruption. Therefore the impact is as per the equivalent operation and maintenance phase impact for the Proposed Development in isolation.

Severity of Consequence

The overall timescale for any maintenance/repair works is expected to be less than for construction works. Such works may result in limited disruption to vessels crossing the offshore cables within the Welsh Channel to access the Port of Mostyn. Any required maintenance is expected to be localised in one area of the Proposed Development and temporary in nature.

The severity of consequence is therefore considered to be **negligible**.

Frequency of Occurrence

The reduction in access is decreased compared to the construction phase given the smaller scale of maintenance activities, although this is somewhat balanced by the much longer duration of the operation and maintenance phase.

The frequency of occurrence is therefore considered to be **extremely unlikely**.

Significance of the effect

Overall, the severity of consequence is deemed to be negligible and the frequency of occurrence is considered to be extremely unlikely. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.4.3 Decommissioning phase

There may be potential for further reduced access to local ports during the decommissioning phase if maintenance or decommissioning works associated with cumulative developments were to overlap temporally with the decommissioning of the Proposed Development.

Project vessels will be managed by marine coordination, will display appropriate marks and lights, broadcast on AIS (where available) and will be compliant with relevant Flag State regulations including the COLREGs, including rule 18 which applies to vessels which are RAM. Liaison with the Port of Mostyn and FLO will help to manage disruption.

With the embedded mitigation measures listed above, the effect due to the presence of cumulative developments is anticipated to be manageable.

Severity of Consequence

Since the numbers and types of vessels used to remove the platform and cables are expected to be similar to those used for construction, this impact is expected to be similar in nature to the equivalent construction phase impact.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

The impact will be present throughout the decommissioning phase which is assumed to last for a similar timeframe as the construction period. Cumulative developments may lead to an increase in the number of vessels crossing the offshore cables within the Welsh Channel.

However, due to the localised and temporary nature of decommissioning works, the disruption to port access is reduced.

The frequency of occurrence is therefore considered to be **remote**.

Significance of the effect

The severity of consequence is deemed to be minor and the frequency of occurrence is considered to be remote. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.5 Anchor Interaction with Subsea Cable

11.2.5.1 Construction Phase

The risk of anchor interaction with the proposed cables during the construction phase could be increased if cumulative developments are expected to lead to increased traffic across the cables. Vessel movements in the area are expected to be impacted by the construction of the Mona, Morgan and Morecambe OWFs, which could lead to a change in traffic across the cables if the construction periods were to overlap. However, given the location of the offshore cables relative to the OWFs, and the current vessel routeing in the area, any change in vessel routeing across the cables is expected to be minimal. Depending on the ports utilised by construction vessels, there may also be a slight increase in vessel numbers if construction phases were to overlap, however the overall impact is expected to be similar.

Severity of Consequence

While exposed any vessel anchor could interact with the cables. If an anchor becomes snagged on the cables, there could be a risk of injury in trying to free it. If the anchor cannot be freed the safest action is to slip it, and not attempt to raise or cut the cable.

The most likely consequences are limited damage to property (anchoring vessel or subsea cable). The maximum adverse scenario may include damage to property including to the vessel’s anchor or subsea cable.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

Mitigation includes circulation of information to make mariners aware of the exposed cable and use of guard vessels where cable exposures are considered to present significant risk to navigation.

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.5.2 Operation and maintenance phase

The risk of anchor interaction with the proposed cables during the operational phase could be increased if cumulative developments are expected to lead to increased traffic across the cables. In particular, there may be deviations in vessel movements and increase in vessel numbers caused by the construction of the mona, Morgan and Morecambe OWFs, depending on the preferred ports used during the construction and/or operational phases of these OWFs.

During the operation and maintenance phase the cables will be marked on UKHO Admiralty Charts with associated note/warning about anchoring, trawling or seabed operations.

Severity of Consequence

Once the cables are protected, either through burial and/or other protection measures, larger vessels (e.g. cargo vessels and tankers) are more likely to threaten the cables as their anchors are able to penetrate deeper into the seabed and can cause greater damage than smaller anchors (fishing and recreational vessels) if contact is made. The anchors of smaller vessels (e.g. fishing and recreational craft) are unlikely to penetrate as deeply. Suitable target burial depths, defined in a CBRA, will mitigate the risk from vessel anchors. Periodic monitoring will be undertaken to confirm cable protection remains suitable.

The most likely consequences are limited damage to property (anchoring vessel or subsea cable). The maximum adverse scenario may include damage to property including to the vessel's anchor or subsea cable.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

Protection of the cables via burial will reduce the frequency of occurrence of anchor interaction.

Although there may be limited decision-making time if a vessel is drifting towards a hazard, it is anticipated that the charting of infrastructure including all subsea cables will inform any decision to anchor, as per Regulation 34 of SOLAS (IMO, 1974).

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.6 Fishing Gear Interaction with Subsea Cable

11.2.6.1 Construction Phase

The risk of fishing gear interaction with the cables during the construction phase could be increased if cumulative developments are expected to lead to increased fishing activity across the cables. Construction of the Mona OWF could cause vessels to be displaced towards the proposed cables, however any displacement is expected to be minimal compared to the current fishing levels across the cables.

Therefore, the impact is as per the equivalent construction phase impact for the Proposed Development in isolation.

Mitigation measures including having an FLO in place and circulation of information (e.g. via Kingfisher and local communications) will help ensure any displaced fishermen are aware of the exposed cable and avoid fishing directly over it. In addition, guard vessels will be used in any areas where cable exposures are considered to present significant risk to fishing gear snagging.

Severity of Consequence

The most likely consequences are as per the equivalent impact for the Proposed Development in isolation.

The severity of consequence is therefore considered to be **serious**.

Frequency of Occurrence

The frequency of occurrence during the period that the cables are surface-laid is considered to be **remote**.

Significance of effect

Overall, the severity of consequence is deemed to be serious and the frequency of occurrence is considered to be remote. The cumulative effect will, therefore, be of **tolerable** adverse significance, which is not significant in EIA terms.

Additional mitigation to reduce this impact to ALARP is to minimise the amount of time between cable lying and installation of cable protection, e.g. burial.

11.2.6.2 Operation and maintenance phase

The risk of fishing gear interaction with the proposed cables during the operational phase could be increased if cumulative developments are expected to lead to increased fishing activity across the cables. Any displacement is expected to be minimal compared to the current fishing levels across the cables.

Therefore, the impact is as per the equivalent operational phase impact for the Proposed Development in isolation.

During the operation and maintenance phase the cables will be marked on UKHO Admiralty Charts and KIS-ORCA charts with associated note/warning about anchoring, trawling or seabed operations.

A CBRA will be undertaken to provide a detailed assessment of fishing activity along the Proposed Development and fishing gear penetration depths for the various soil conditions in order to determine suitable protection measures for the cables during the operation and maintenance phase.

Severity of Consequence

The planned cable protection is assumed to provide effective mitigation from fishing gear snagging, reducing the risk of serious consequences such as snagging, capsize of the vessel and PLL.

The severity of consequence is therefore considered to be **minor**.

Frequency of Occurrence

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of effect

Overall, the severity of consequence is deemed to be minor and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.7 Vessel Grounding Due to Reduced Under Keel Clearance

11.2.7.1 Operation and Maintenance Phase

There could be an increased risk of vessel grounding due to reduced under keel clearance if cumulative projects were to lead to additional vessel movements over the proposed cables, particularly in areas where water depths are shallow.

This is particularly relevant if there is an increase in wind farm crew transfer vessels using the Port of Mostyn.

Severity of Consequence

Should a vessel grounding occur, the most likely consequences are minor damage to property and minor reputational effects on business but no perceptible effect on people. The maximum adverse scenario may include the vessel foundering resulting in PLL and the environmental consequence of pollution.

The severity of consequence is therefore considered to be **moderate**.

Frequency of Occurrence

When considered with the embedded mitigation of compliance with the requirements in MGN 654 and any change to water depth of more than 5% chart datum requiring further consultation and agreement with the MCA, the frequency is considered to be reduced to low for all vessel types.

The frequency of occurrence is therefore considered to be **remote**.

Significance of the Effect

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be remote. The cumulative effect will, therefore, be of **tolerable** adverse significance, which is not significant in EIA terms.

11.2.8 Interference with Magnetic Compasses

Interference with magnetic position fixing equipment is local in nature, occurring only when a vessel is located in proximity to a subsea cable. Accounting for the distance between the proposed cables and the cumulative developments, it is not anticipated that the presence of the cumulative developments will result in any change to this impact.

Severity of Consequence

The severity of consequence is considered to be **minor**.

Frequency of Occurrence

The frequency of occurrence is considered to be **extremely unlikely**.

Significance of the Effect

Overall, the severity of consequence is deemed to be minor, and the frequency of occurrence is considered to be extremely unlikely. The cumulative effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

11.2.9 Reduction of Emergency Response Capability Due to Increased Incident Rates for SAR Responders and Increased Demand on the Available Resources

11.2.9.1 All Phases

If construction works for the Proposed Development were to overlap with construction or operational phases of the cumulative developments, there could be increased reduction in emergency response capability. However, due to the temporary nature of the construction works, this impact is expected to be minimised.

Project vessels will be managed through marine coordination and compliant with Flag State regulations. Additionally, should an incident occur, project vessels will be well equipped to assist, either through self-help capability or – for an incident involving a nearby third-party vessel – through SOLAS obligations (Ref. xi), all in liaison with the MCA.

During the operation and maintenance phase of the Proposed Development, there is not expected to be a notable increase in vessel numbers, however there may be a period of time when the new Douglas CCS platform and the existing Douglas Complex are in operation simultaneously. If this coincides with the construction or operational phases of cumulative projects, this could further reduce emergency response capability. As the new Douglas CCS platform will be unmanned, any impact is considered to be minimal.

Severity of Consequence

The severity of consequence is considered to be **moderate**.

Frequency of Occurrence

Due to the limited number of vessels involved and temporary nature of the construction phase works, and given that the proposed new Douglas CCS platform will be unmanned and within the existing Douglas Complex, the frequency of occurrence is considered to be **negligible.**

Significance of Risk

Overall, the severity of consequence is deemed to be moderate and the frequency of occurrence is considered to be negligible. The effect will, therefore, be of **broadly acceptable** adverse significance, which is not significant in EIA terms.

12 Risk Control Log

This section presents a summary of the assessment of shipping and navigation impacts scoped into the risk assessment. The impacts, together with proposed mitigation measures, frequency of occurrence, severity of consequence and significance of risk, are presented in Table 12.1.

Table 12.1: Risk Control Log

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
Construction	Vessel displacement leading to increased vessel to vessel collision risk between third-party vessels	Promulgation of Information Advisory safe passing distances and safety zones Guard vessels and/or temporary AtoNs Liaison with ports and harbours Fishing liaison Compliance with COLREGs and SOLAS	Extremely Unlikely	Moderate	Broadly Acceptable
	Increased vessel to vessel collision risk between third-party vessels and project vessels	Promulgation of Information Lighting and marking of project vessels Advisory safe passing distances and safety zones Guard vessels and/or temporary AtoNs Marine coordination	Extremely Unlikely	Moderate	Broadly Acceptable

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		Compliance with COLREGs and SOLAS Liaison with ports and harbours Fishing liaison			
	Reduced access to local ports	Promulgation of Information Marine coordination Lighting and marking of project vessels Compliance with COLREGs and SOLAS Liaison with ports and harbours Fishing liaison	Remote	Minor	Broadly Acceptable
	Anchor interaction with subsea cable	Promulgation of information Guard vessels and/or temporary AtoNs	Extremely Unlikely	Moderate	Broadly Acceptable
	Fishing gear interaction with subsea cable	Promulgation of information	Remote	Serious	Tolerable

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		Guard vessels and/or temporary AtoNs			
	Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources	Promulgation of Information	Negligible	Moderate	Broadly Acceptable
		Marine coordination			
		Compliance with COLREGs and SOLAS			
Operation and Maintenance	Increased vessel to vessel collision risk between third-party vessels and project vessels	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable
		Lighting and marking of project vessels			
		Advisory safe passing distances and safety zones			
		Guard vessels and/or temporary AtoNs			
		Marine coordination			
		Compliance with COLREGs and SOLAS			
		Liaison with ports and harbours			
	Vessel to platform allision risk	Promulgation of Information	Extremely Unlikely	Moderate	Broadly Acceptable

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		Lighting and marking			
		Advisory safe passing distances and safety zones			
		Marine coordination			
		Compliance with COLREGs and SOLAS			
	Reduced access to local ports	Promulgation of Information	Extremely Unlikely	Negligible	Broadly Acceptable
		Marine coordination			
		Lighting and marking of project vessels			
		Compliance with COLREGs and SOLAS			
		Liaison with ports and harbours			
	Anchor interaction with subsea cable	Cable Protection	Extremely Unlikely	Minor	Broadly Acceptable
		Lighting and marking			
	Fishing gear interaction with subsea cable	Cable Protection	Extremely Unlikely	Minor	Broadly Acceptable
		Lighting and marking			
	Vessel grounding due to reduced under keel clearance	Compliance with MGN 654	Remote	Moderate	Tolerable

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	Interference with magnetic compasses		Extremely Unlikely	Minor	Broadly Acceptable
	Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources	Promulgation of Information Marine coordination Compliance with COLREGs and SOLAS	Negligible	Moderate	Broadly Acceptable
Decommissioning	Vessel displacement leading to increased vessel to vessel collision risk between third-party vessels	Promulgation of Information Advisory safe passing distances and safety zones Guard vessels and/or temporary AtoNs Liaison with ports and harbours Fishing liaison Compliance with COLREGs and SOLAS	Extremely Unlikely	Moderate	Broadly Acceptable
Decommissioning	Increased vessel to vessel collision risk between third-party vessels and project vessels	Promulgation of Information Lighting and marking of project vessels	Extremely Unlikely	Moderate	Broadly Acceptable

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
		Advisory safe passing distances and safety zones			
		Guard vessels and/or temporary AtoNs			
		Marine coordination			
		Compliance with COLREGs and SOLAS			
		Liaison with ports and harbours			
		Fishing liaison			
	Reduced access to local ports	Promulgation of Information	Remote	Minor	Broadly Acceptable
		Marine coordination			
		Lighting and marking of project vessels			
		Compliance with COLREGs and SOLAS			
		Liaison with ports and harbours			
		Fishing liaison			

Phase	Impact	Relevant Mitigation Measure	Frequency of Occurrence	Severity of Consequence	Significance of Risk
	Reduction of emergency response capability due to increased incident rates for SAR responders and increased demand on the available resources	Promulgation of Information Marine coordination Compliance with COLREGs and SOLAS	Negligible	Moderate	Broadly Acceptable

13 Embedded Mitigation Measures

As part of the Proposed Development design process, a number of embedded mitigation measures have been adopted to reduce the potential for risk to shipping and navigation. These measures have and will continue to evolve over the development process as the EIA progresses and in response to consultation.

These measures typically include those that have been identified as good or standard practice and include actions that would be undertaken to meet existing legislation requirements. As there is a commitment to implementing these measures, and also to various standard sectoral practices and procedures, they are considered inherently part of the design of the Proposed Development.

The embedded mitigation measures relevant to shipping and navigation are outlined in Table 13.1.

Table 13.1: Embedded Mitigation Measures

Embedded Mitigation Measure	Description
Promulgation of information advising on the nature, timing and location of activities, Safety Zones and advisory safe passing distances, including through Notices to Mariners	Timely circulation of information via Notices to Mariners (NtM), Kingfisher/KIS-ORCA notifications, Radio Navigational Warnings, Navigational Telex (NAVTEX), and/or other navigational broadcast warnings as soon as reasonably practicable in advance of and during the works.
Lighting and marking of project vessels	Cable Lay Vessels (CLVs) and other vessels involved in cable installation will display appropriate marks and lights, and broadcast their status on AIS at all times, to indicate the nature of the work in progress, and highlight their restricted manoeuvrability.
Guard vessel and/or temporary AtoNs	Where required based on risk assessment, guard vessels and/or temporary AtoNs may be deployed to guide vessels around any areas of construction activity.

Embedded Mitigation Measure	Description
Use of guard vessels at cable exposures	Where cable exposures exist that would result in significant risk (e.g. if cable burial is carried out post cable lay), guard vessels will be used where appropriate until the risk has been mitigated by burial and/or other protection methods.
Advisory safe passing distances and safety zones	Passing vessels will be requested to maintain an advisory safe passing distance around project vessels (e.g. cable installation vessels) restricted in manoeuvrability. It is assumed that a 500m Safety Zone for the new Douglas CCS platform will be in place.
Marine coordination	Marine coordination and communication to manage project vessel movements.
Vessel Management Plan	A Vessel Management Plan (VMP) will be developed which will determine vessel routeing to and from construction areas and ports to avoid areas of high risk to marine mammals.
Development of and adherence to an Environmental Management Plan (EMP) that will be prepared and implemented during the construction, operational and maintenance and decommissioning phases of the Project. The EMP will include appendices detailing actions to minimise Invasive Non-Native Species (INNS) (the INNSMP), and a Marine Pollution Contingency Plan (MPCP) will be developed which will include planning for accidental spills, address all potential contaminant releases and include key emergency contact details (e.g. Environmental Protection Agency (EPA)).	Measures will be adopted to ensure that the potential for release of pollutants from construction, operational and maintenance and decommissioning plant is minimised. These will likely include: designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and takes containing hazardous substances, and storage of these substances in impenetrable bunds. All vessels will be required to comply with the standards set out in the International Convention for the Prevention of Pollution from Ships (MARPOL).

Embedded Mitigation Measure	Description
Compliance with COLREGs and SOLAS	Compliance of all project vessels with international marine regulations as adopted by the Flag State, notably the COLREGs (IMO, 1972/78) and SOLAS (IMO, 1974).
Liaison with ports and harbours	Liaison with local ports and harbours, particularly the Port of Mostyn, during the construction phase.
Fishing liaison	Ongoing liaison with fishing fleets will be maintained via an appointed FLO and Fishing Industry Representative. Prior to construction, a Fisheries Liaison and Coexistence Plan (FLCP) will be developed, setting out in detail the planned approach to fisheries liaison and means of delivering any other relevant mitigation measures.
The Applicant is committed to marking and lighting the project in accordance with relevant industry guidance and as advised by relevant stakeholders including the MCA, Civil Aviation Authority (CAA) and Trinity House. This will include appropriate lighting and marking of Offshore Platforms (OPs). The Applicant will also ensure the project is adequately marked on nautical charts. A lighting and marking plan will be secured.	The new CCS platform will exhibit lights, marks, sounds, signals and other aids to navigation as required by the Standard Marking Schedule, and in consultation with Trinity House. The platform and cables will be suitably marked on Admiralty Charts, with associated note.
Scour Protection	Scour protection (e.g. rock berms) will only be used at third-party cable crossings and monitored as per below.
Suitable Implementation and Monitoring of Cable Protection	Suitable implementation and monitoring of cable protection informed by a CBRA. Cables will be buried to a target depth of 2-3m and only be protected using external protection (e.g., rock berms) at third-party crossings.
Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent which will include cable burial where possible (in accordance with the specific policies set out in the North West	The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in

Embedded Mitigation Measure	Description
Inshore and North West Offshore Coast Marine Plans (Ref. vi) and cable protection, as necessary.	advance of CSIP submission. The CSIP will include a detailed CBRA to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. Measures will seek to reduce the amount of EMF which benthic and fish and shellfish receptors are exposed to during the operations and maintenance phase by increasing the distance between the seabed surface and the surface of the cables.
Where practicable any requirements for cable protection will be compliant with MGN 654	Following further survey and detailed engineering, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out and additional mitigations agreed as required.

14 Proposed Mitigation and Monitoring

14.1 Additional Mitigation

Proposed additional mitigation measures to ensure tolerable risks are ALARP are as follows:

- The period during which the cables are surface laid and not yet buried or protected should be reduced so far as practicable. This reduces the risk of vessel anchors and fishing gear snagging on surface-laid cables.

14.2 Monitoring

14.2.1 Cable Protection

The subsea cable routes will be subject to periodic inspection post-construction to monitor the cable protection, including burial depths. Maintenance of the protection will be undertaken as necessary.

If exposed cables or ineffective protection measures are identified during post-construction monitoring, these would be promulgated to relevant sea users including via Notices to Mariners and Kingfisher bulletins. Where immediate risk was observed, the Applicant would also employ additional temporary measures where appropriate (such as guard vessels or temporary buoyage) until such a time as the risk was permanently mitigated.

14.2.2 Compass Deviation

A compass deviation study will be undertaken post-consent, once the detailed design and cable configuration is available. This will determine whether the compass deviation limits set by the MCA can be met. If it cannot be demonstrated that MCA deviation requirements can be met pre-construction, a post-construction compass deviation survey of the 'as laid' cables will be undertaken.

15 Summary

Using baseline data, expert opinion and the outputs of consultation, impacts relating to shipping and navigation have been identified for the Proposed Development for all phases of the development (construction, operation and maintenance and decommissioning). This has been fed into the FSA undertaken in Section 10.

15.1 Consultation

Throughout the NRA process, consultation has been undertaken with key shipping and navigation including:

- MCA;
- Trinity House;
- RYA;
- UK Chamber of Shipping;
- Port of Liverpool; and
- Port of Mostyn.

15.2 Baseline Environment

15.2.1 Navigational Features

The proposed Douglas CCS platform which forms part of the Proposed Development is located within the existing safety zone at the existing Douglas complex, which lies within an Area to be Avoided inside the separation zone of the Liverpool Bay TSS.

Ports in the area include the Port of Liverpool, located within the River Mersey, which houses a number of smaller ports and harbours as well as the entrance to the Manchester Ship Canal. The Welsh Channel, used to access the Port of Mostyn in the River Dee, is crossed by the cable routes associated with the Proposed Development.

There are charted anchorages, including deep water berths located within the Port of Liverpool limits, as well as a prohibited anchoring zone.

Operational wind farms in the area include the Gwynt y Môr wind farm, which is intersected by the Proposed Development, as well as the North Hoyle, Rhyl Flats and Burbo Bank wind farms. Awel y Môr and Mona wind farms are also proposed to be constructed in proximity to the Proposed Development.

The Proposed Development crosses the export cables for the Gwynt y Môr, Burbo Bank and North Hoyle wind farms, as well as the inter-array cables for Gwynt-y- Môr. The Proposed Development also crosses the Western Link power cable. The cable route coincides with the pipelines which are intended to be repurposed as part of the Proposed Development. In addition to existing cables, the proposed MaresConnect interconnector is expected to make landfall to the west of the Proposed Development, on the north coast of Wales.

15.2.2 Maritime Incidents

Between 2013 and 2022, there were an average of 158 RNLI callouts per year within the shipping and navigation study area, with these largely concentrated along the coastline. The most common incident type responded to by the RNLI was "Person in Danger", which accounted for 37%, followed by machinery failures (16%). Common casualty types, alongside "Person in Danger" incidents, were recreational vessels (25%) and personal craft (10%). Six incidents were recorded within the Physical Work Area, with three "person in danger" incidents and three machinery failures.

Over the ten year period, there was an average of 12 to 13 incidents per year recorded within the study area. The most common incident types were machinery failures (22%), "Accident to Person" (19%) and grounding/stranding incidents (18%). The most common type of vessel involved in incidents was "other commercial", which includes vessels such as workboats, dredgers, SAR craft and tugs, and accounted for 35% of incidents recorded by the MAIB. Cargo vessels (22%), service ships (15%) and recreational craft (11%) also accounted for a significant number of incidents within the study area.

15.2.3 Vessel Traffic Movements

Based on a year of AIS vessel traffic data, there was an average of 54 unique vessels per day within the study area and 31 per day within the Physical Work Area. The most common vessel types recorded were cargo vessels, wind farm vessels and tankers. Cargo vessels and tankers were generally recorded utilising the Liverpool Bay TSS and the Queen's Channel while visiting Liverpool, while wind farm vessels were recorded visiting the various wind farms in the area, with operational bases at Liverpool and Mostyn. Vessels utilising the TSS cross the cable routes associated with the Proposed Development to the north and south of the Douglas CCS platform, while vessels entering Mostyn cross the cable route close to the landfall at Point of Ayr.

The largest vessels recorded were the cargo vessels and tankers using the TSS, while large passenger ferries and cruise ships were also present. The smallest vessels in the study area tended to be those associated with the wind farms and pilot vessels, generally recorded close to shore and on routes to and from the wind farms. Fishing vessels and recreational vessels were also recorded throughout the study area, with fishing activity generally concentrated in the north of the study area, with many recorded fishing around the cable route to the north of the proposed Douglas CCS platform.

The majority of anchoring activity took place within the charted anchorages in the Port of Liverpool limits, inshore of the cable routes connecting the Douglas CCS platform to the satellite platforms. Anchoring was also recorded on the periphery of the wind farms, particularly Gwynt y Môr. Vessels anchoring around Gwynt y Môr may anchor in close proximity to the Proposed Development cable route, which passes through the wind farm.

15.3 Future Case Vessel Traffic

There are a number of wind farms projects in the area, including those outside the study area, which are anticipated to alter traffic patterns within the area. These include the Awel y Môr, Mona, Morgan and Morecambe sites. There is potential for significant displacement of traffic, including alterations to ferry routes, due to the presence of these sites in the future. The projects may also lead to an increase in the number of wind farm support vessels in the area, particularly using the ports of Mostyn and Liverpool.

Port arrival statistics show a slight decrease in traffic arriving at the local ports of Liverpool, Manchester and Garston since 2017. It is noted that significant investment is expected in the future to support sustainable port infrastructure at both Manchester and Liverpool.

Fishing trends are difficult to project into the future, noting that trends are dependent on numerous factors including fish stocks and quotas. Changes to legislation following Brexit may also impact the size and make-up of the fishing fleet in UK waters.

Recreational activity can be similarly difficult to predict, but is assumed to remain similar or slightly increase in future years. Similarly the make-up of recreational traffic may vary, with sail and electric-powered vessels expected to become more prominent in place of diesel-fuelled craft. The locations of recreational activity may also vary, while volume of activity may be dependent on other factors such as the weather, climate change and the economy.

15.4 Risk Statement

Using the baseline data, expert opinion, stakeholder concerns and lessons learnt from existing offshore developments, various shipping and navigation hazards have been risk assessed in line with the FSA approach. The full risk control log including details of hazards, proposed embedded mitigation measures and significance of risk is presented in Section 12.

The significance of risk has been determined as either **Broadly Acceptable** or **Tolerable** for all hazards assessed. Proposed additional mitigation measures to ensure tolerable risks are ALARP are as follows:

- The period during which the subsea cables are surface laid and not yet buried or protected, and thus exposed to the impact, should be reduced so far as practicable. This reduces the risk of vessel anchors and fishing gear snagging on surface-laid cable should there be a period of time between cable lay and protection when the cable is surface-laid.

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Liverpool Bay CCS LTD
HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Volume 3: Habitats Regulations Assessment Stage 2 Report to Inform Appropriate Assessment

EHE7228B
Liverpool Bay CCS Limited
Final
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RPS

Prepared for:

Liverpool Bay CCS Limited

Glossary

Term	Meaning
Annex I Habitat	A natural habitat type of community interest, defined in Annex I of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (Habitats Directive), whose conservation requires the designation of Special Areas of Conservation (SAC).
Annex II Species	Animal or plant species of community interest, defined in Annex II of the Council Directive 92/43/EEC on the Conservation of natural habitats and of wild fauna and flora (Habitats Directive), whose conservation requires the designation of Special Areas of Conservation (SAC).
Applicant	Liverpool Bay CCS Limited
Appropriate Assessment	A step-wise procedure undertaken in accordance with Article 6(3) of the Habitats Directive, to determine the implications of a plan or project on a European site in view of the site's conservation objectives, where the plan or project is not directly connected with or necessary to the management of a European site but likely to have a significant effect thereon, either individually or in-combination with other plans or projects.
Benthic Ecology	Benthic ecology encompasses the study of the organisms living in and on the sea floor, the interactions between them and impacts on the surrounding environment.
Biotope	The combination of physical environment (habitat) and its distinctive assemblage of conspicuous species.
Bio-season	Bird behaviour and abundance is recognised to differ across a calendar year, with particular months recognised as being part of different seasons. The biologically defined minimum population scales (BDMPS) bio-seasons used in this report are based on those in Furness (2015), hereafter referred to as bio-seasons. Separate bio-seasons are recognised in this technical report in order to establish the level of importance any seabird species has within the study area during any particular period of time.
Breeding season	For birds. This is dependent upon the species and for this report is taken on a species by species basis as taken from Furness (2015).
Competent Authority	The term derives from the Habitats Regulations and relates to the duties which the Regulations impose on public bodies and individuals. Regulation 6(1) defines competent authorities as "any Minister, government department, public or statutory undertaker, public body of any description or person holding a public office".
Conservation Objectives	In its most general sense, a conservation objective is the specification of the overall target for the species and/or habitat types for which a site is designated in order for it to contribute to maintaining or reaching favourable conservation status of the habitats and species concerned, at the national, the biogeographical or the European level.
Cumulative Effects	Changes to the environment caused by a combination of present and future projects, plans or activities.
Displacement	Refers to the effect of birds/animals being pushed out of an area by disturbance or habitat loss
Disturbance sensitivity	Disturbance by wind farm structures, ship and helicopter traffic factor used scores from 1 (limited escape behaviour and a very short flight distance when approached), to 5 (strong escape behaviour, at a large response distance).
Environmental Statement	The document presenting the results of the Environmental Impact Assessment (EIA) process for the HyNet Carbon Dioxide Transportation and Storage Project – Offshore.
European Commission	The executive body of the European Union responsible for proposing legislation, enforcing European law, setting objectives and priorities for action, negotiating trade agreements and managing implementing European Union policies and the budget.

Term	Meaning
European site	A Special Area of Conservation (SAC), possible SAC (pSAC), or candidate SAC, (cSAC), a Special Protection Area (SPA) or potential SPA (pSPA), a site listed as a site of community importance (SCI).
Habitat	The environment that a plant or animal lives in.
Habitats Directive	The Habitats Directive is the short name for European Union Council Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora. The Directive led to the establishing of European sites and setting out how they should be protected, it also extends to other topics such as European protected species.
Habitats Regulations	The Conservation (Natural Habitats, &c.) Regulations 1994, the Conservation of Habitats and Species Regulations 2017 and the Conservation of Offshore Marine Habitats and Species 2017.
Habitats Regulations Assessment	A process required by the Habitats Regulations of identifying likely significant effects of a plan or project on a European site and (where likely significant effects are predicted or cannot be discounted) carrying out an appropriate assessment to ascertain whether the plan or project will adversely affect the integrity of the European site. If adverse effects on integrity cannot be ruled out, the latter stages of the process require consideration of the derogation provisions in the Habitats Regulations.
Habitat specialisation	The habitat specialisation factor represents the range of habitats species are able to use and whether they use these as specialists or generalists. This score classifies species into categories from 1 (tend to forage over large marine areas with little known association with particular marine features) to 5 (tend to feed on very specific habitat features, such as shallow banks with bivalve communities, or kelp beds).
Hydromorphology	Hydromorphology is the study of physical form, condition and processes within a surface water body, that create and maintain habitat.
In-combination Effects	The combined effect of the Proposed Development in-combination with the effects from a number of different projects on the same feature/receptor.
Intertidal Area	The area between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS).
Likely Significant Effect	Any effect that may reasonably be predicted as a consequence of a plan or project that may affect the conservation objectives of the features for which the European site was designated, but excluding trivial or inconsequential effects. A likely effect is one that cannot be ruled out on the basis of objective information. A 'significant' effect is a test of whether a plan or project could undermine the site's conservation objectives.
Littoral	Residing within the littoral zone which extends from the high water mark, which is rarely inundated, to shoreline areas that are permanently submerged.
Marine Licence	The Marine and Coastal Access Act 2009 requires a marine licence to be obtained for licensable marine activities. Section 149A of the Planning Act 2008 allows an applicant for a DCO to apply for 'deemed marine licences' as part of the DCO process. In addition, licensable activities within 12 nm of the Welsh coast require a separate marine licence from NRW. A separate marine licence is required for the offshore export cables and related works located within and between the Mona Array Area and the landfall at MHWS.
Maximum Design Scenario (MDS)	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.
Non-breeding season	For birds. This is dependent upon the species and for this report is taken on a species by species basis as taken from Furness (2015).
Passage seasons	For birds. The spring passage (also known as the return migration period) season runs from Apr – Jun and the autumn passage (also known as the post-breeding migration period) runs from Jul – Oct (Stroud, *et. al*., 2013).
Peak count	Used to refer to the maximum number of birds counted within an area at any one time

Term	Meaning
Relevant Local Planning Authority	The Relevant Local Planning Authority is the Local Authority in respect of an area within which a project is situated, as set out in Section 173 of the Planning Act 2008. Relevant Local Planning Authorities may have responsibility for discharging requirements and some functions pursuant to the Development Consent Order, once made.
Riparian	A complex assemblage of plants and other organisms living or located on the bank of a natural watercourse (such as a river) or sometimes of a lake or tidewater.
Special Area of Conservation	Special Areas of Conservation (SACs) are areas designated under the European Union (EU) Habitat's Directive to help conserve certain plant and animal species listed in the Directive. Article 3 of the Habitats Directive requires the establishment of a European network of important high-quality conservation sites that will make a significant contribution to conserving the 189 habitat types and 788 species identified in Annexes I and II of the Directive (as amended). The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).
Special Protection Area	Special Protection Areas (SPAs) are sites classified under the EU Birds Directive (Directive 2009/147/EC of the European Parliament and of the Council on the conservation of wild birds) to protect rare or vulnerable birds (as listed on Annex I of the Directive), as well as regularly occurring migratory species.
Species	A group of living organisms consisting of similar individuals capable of exchanging genes or interbreeding.
Statutory Consultee	Organisations that are required to be consulted by an applicant pursuant to the Planning Act 2008 in relation to an application for development consent. Not all consultees will be statutory consultees (see non-statutory consultee definition).
Suspended sediment concentration	Suspended sediment concentration is defined as the total value of both mineral and organic material carried in suspension by a volume of water.
Tidal Excursion	The horizontal distance over which a water particle may move during one cycle of flood and ebb.
Wind Turbines	The wind turbine generators, including the tower, nacelle and rotor.
Winter season	For birds. The core wintering season runs from November to March (Stroud, *et. al*., 2013)

Acronyms

Acronym	Description
ADD	Acoustic Deterrent Device
AEoI	Adverse Effects on the Integrity
AfL	Agreement for Lease
CBRA	Cable Burial Risk Assessment
CCS	Carbon Capture and Storage
CJEU	The Court of Justice of the European Union
CMS	Construction Method Statement
CO_2	Carbon Dioxide
cSAC	Candidate Special Areas of Conservation
CSIP	Cable Specification and Installation Plan
EDR	Effective Deterrence Range
EEZ	Exclusive Economic Zone

Acronym	Description
EIA	Environmental Impact Assessment
EMF	Electromagnetic Fields
EMP	Environmental Management Plan
ES	Environmental Statement
EU	European Union
FCS	Favourable Conservation Status
FO	Fibre Optic
HDD	Horizontal Directional Drilling
HRA	Habitat Regulations Assessment
IMO	International Maritime Organisation
INNS	Invasive Non Native Species
IROPI	Imperative Reasons of Overriding Public Interest
JNCC	Joint Nature Conservation Committee
KM	Kilometres
MBES	Multibeam Echosounder
MCAA	Marine and Coastal Access Act
MCZ	Marine Conservation Zone
MDS	Maximum Design Scenario
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MMO	Marine Management Organisation
MMOb	Marine Mammal Observers
MMV	Monitoring, Measurement and Verification
MPCP	Marine Pollution Contingency Plan
MU	Management Unit
NEQ	Net Explosive Quantity
NPWS	National Parks and Wildlife Service
NRW-MLT	Natural Resources Wales Marine Licencing Team
ODPM	Office of Deputy Prime Minister
OP	Offshore Platform
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
PAM	Passive Acoustic Monitoring
PINS	The Planning Inspectorate for England
PoA	Point of Ayr
pSAC	Possible Special Areas of Conservation
pSPA	Possible Special Protection Area
PTS	Permanent Threshold Shift
RMS	Root Mean Square
SAC	Special Areas of Conservation
SBP	Sub-bottom Profiler
SCANS	Small Cetacean Abundance in the North Sea
SCI	Sites of Community Importance
SEL	Sound Exposure Level

Acronym	Description
SNCB	Statutory Nature Conservation Bodies
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
TTS	Temporary Threshold Shift
UK	United Kingdom
UXO	Unexploded ordnance
VSP	Vertical Seismic Profiler
WFD	Water Framework Directive

Units

Units	Description
dB	Decibel
Ha	Hectare
Hz	Hertz
kHz	Kilohertz
kJ	Kilojoule
Km	Kilometre
km^2	Kilometres squared
kV	Kilovolt
m	Metre
nm	Nautical miles
μPa	Micro Pascal (10^{-6})

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1.1 Introduction

1.1.1 Overview

Eni UK Limited intends to develop, through their Eni group affiliate Liverpool Bay Carbon Capture and Storage (CCS) Limited (hereafter 'the Applicant'), the HyNet Carbon Dioxide Transportation and Storage Project, which includes the carbon dioxide (CO_2) onshore pipeline network, the repurposing of the existing Point of Ayr (PoA) natural gas terminal for CO_2 service, the CO_2 storage offshore and associated transportation and injection facilities, including pipelines and wells. The HyNet Carbon Dioxide Transportation and Storage Project has both onshore and offshore elements. The onshore elements, infrastructure landwards of Mean Low Water Springs (MLWS), of the HyNet Carbon Dioxide Transportation and Storage Project are outside the scope of this report and do not form part of this Habitat Regulations Assessment (HRA) Stage 2 Appropriate Assessment.

This HRA Stage 2 Appropriate Assessment has been prepared for the HyNet Carbon Dioxide Transportation and Storage Project – Offshore (hereinafter referred to as 'Proposed Development'). The key offshore infrastructure of the Proposed Development will include:

- Installation of a new Douglas CCS platform to replace the existing Douglas Process platform to receive CO_2 from the onshore PoA Terminal and distribute CO_2 to the Hamilton Main, Hamilton North, and Lennox wellhead platforms and when necessary, provide heating to the CO_2 stream. Installation of the new Douglas CCS platform will include up to eight driven piles to secure the platform to the seabed.
- Installation of new sections of pipeline to connect the new Douglas CCS platform and the existing subsea natural gas pipelines.
- Installation of new topsides on the Hamilton Main, Hamilton North, and Lennox wellhead platforms to receive and inject CO_2 into the depleted hydrocarbon reservoirs.
- Repurposing of the existing subsea natural gas pipelines for their change of use from hydrocarbon to CO_2 service.
- Development of the Hamilton Main, Hamilton North, and Lennox reservoirs for CO_2 storage through the drilling and recompletion of injection wells by side tracking existing production wells. This includes drilling and recompletion operations, all of which will be within the existing footprint (template) of each platform.
- Implementation of a programme of Monitoring, Measurement and Verification (MMV) activities. This includes the drilling of two new monitoring wells, one at Hamilton North and one at Hamilton Main. Additional monitoring wells will be created from the recompletion of existing wells within the existing footprint (template) of each platform: one monitoring well created by side tracking an existing well in Lennox; and two sentinel wells, one in Hamilton North and one in Lennox.
- Installation of two submarine 33 kV power cables, with integrated fibre-optic cable connections (35 kilometres (km) from PoA Terminal onshore to the modified Douglas platform, including within the intertidal/foreshore area up to Mean High Water Springs (MHWS), within Welsh waters only).
- Installation of new submarine 33 kV power cables with integrated fibre optic connecting the modified Douglas platform with the Hamilton Main (12 km; 33 kV), Hamilton North (15 km; 33 kV) and Lennox (35 km; 33 kV) platforms.

- Installation of concrete mattresses and external cable protection, at crossings of existing cables, and in areas where cable burial is not deemed feasible, or as a remedial secondary protection measure if the target cable depth of lowering cannot be achieved.

All of the above infrastructure will be confined within the Proposed Development shown in Figure 1.1.

The consents, licences, and permissions that will be sought by the Applicant for the Proposed Development include:

- A marine licence(s) under the Marine and Coastal Access Act (MCAA) 2009 (administered by Natural Resources Wales Marine Licencing Team (NRW-MLT)) for licensable activities in Welsh Waters (between 0 nautical miles (nm) and 12 nm from MHWS (i.e. all licensable activities associated with installation of the new Douglas CCS platform, associated pipeline connections, new electrical and fibre optic cables, and related works within Territorial Waters).
- A Storage Permit from Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), in accordance with the Storage of Carbon Dioxide (Licensing etc.) Regulations 2010 (SI 2010/2221) for the storage of carbon dioxide at a storage site in the licensed area.

This HRA Stage 2 Appropriate Assessment has been prepared in support of both the Storage Permit and marine license applications alongside the Environmental Statement (ES).

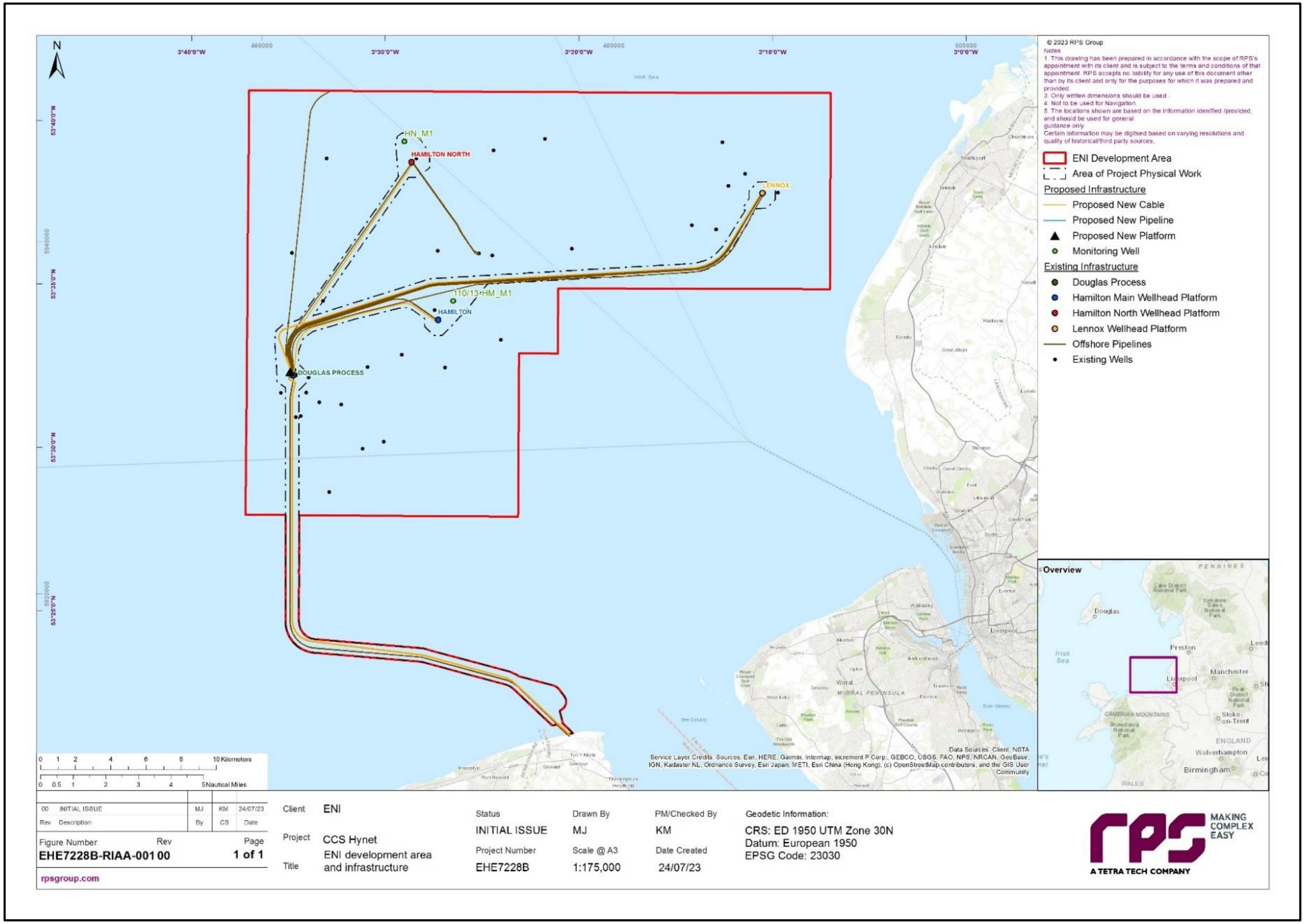

Figure 1.1: Proposed Development

1.1.2 Project summary

An overview of the Proposed Development is outlined in the paragraphs below and the full project description is provided in volume 1, chapter 3 of the Offshore ES.

The Proposed Development will be located in the Irish Sea, with the pipeline and cables approaching the shore in Wales. It will comprise the new and existing Offshore Platforms (OPs) which are connected by submarine pipelines, and electrical cables:

- new Douglas CCS platform; and
- exsisting satellite platforms - Hamilton Main, Hamilton North and Lennox.

CO_2 will be transported from PoA to Douglas via the existing 20" pipeline, approximately 600 m of which will be rerouted to the new Douglas CCS platform. Four pipelines will then convey CO_2 from the Douglas CCS Platform to the satellites as follows:

- PL1039, existing 20" gas export from Hamilton Main (approximately 175 m;
- PL 1041, existing 14" gas export from Hamilton North (approximately 68 m);
- PL1035, existing 16" gas export from Lennox (approximately 128 m); and
- PL1036A, existing 12" gas injection to Lennox (approximately 195 m).

The end sections of each pipeline at Douglas would be rerouted to the new Douglas CCS platform.

New inter platform power cables will be installed as part of the Proposed Development. In addition, the Proposed Development will require the electrification of Douglas OP from the onshore PoA Terminal, the existing gas fuelled turbine on Douglas OP being dismissed at the end of its current use. There is planned to be 35,000 m (35 km) of Offshore power and fibre optic (FO) cables (35 km each, for the two parallel cables) which would lead from PoA Terminal to Douglas OP. There is an additional requirement of 72,000 m (72 km) of inter platform cabling. Each of the cables will have to cross a number of existing pipelines and cables.

1.1.3 Habitat Regulations Assessment

The United Kingdom (UK) left the EU on 31 January 2020 (European Union (EU) Exit) and, as such, is no longer an EU Member State. The Habitats Regulations, however, continue to provide the legislative context for HRA in the UK. The 2019 (EU Exit) Regulations, including the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 ("2019 Regulations"), implemented minor changes to the HRA regime which currently have no material implication on the requirement or process for a HRA for the Proposed Development.

Under the Habitats Regulations, an Appropriate Assessment must be carried out on all plans and projects that are likely to have a significant effect on a European site. European sites include Special Areas of Conservation (SACs), candidate SACs (cSACs), Sites of Community Importance (SCIs), Special Protection Areas (SPAs), and as a matter of policy (Defra, 2021), possible SACs (pSACs) and potential SPAs (pSPAs). In the UK, the requirements of the Habitats Regulations are also extended to consider the effects on Ramsar sites (listed under the Ramsar Convention on Wetlands of International Importance). These sites in the UK now form part of the National Site Network but the term "European site" has been retained for sites protected in European Member States, England and Wales and the rest of the UK in accordance with guidance issued by the UK Government on the 2019 (EU Exit) Regulations (Defra, 2021).

Defra (2021) guidance outlines that the HRA process can have up the three stages, as outlined below, where the outcome of each successive stage determines whether a further stage in the process is required:

1. Screening - to check if the proposal is likely to have a significant effect on the site's conservation objectives.

2. Appropriate Assessment - to assess the likely significant effects of the proposal on the integrity of the site and its conservation objectives and to consider ways to avoid or minimise any effects.
3. Derogation - to consider if proposals that would have an adverse effect on a European site qualify for an exemption, subject to three legal tests being satisfied (i.e. alternative solutions, imperative reasons of overriding public interest and compensatory measures).

Further information on HRA methods, guidance and case law is provided in section 1.2.4.

1.1.4 Purpose of this report

This document presents the Appropriate Assessment under Section 63 of the Conservation of Habitats and Species Regulations 2017 and Section 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 for the Proposed Development.

This report has been prepared by RPS on behalf of the Applicant to support the HRA of the Proposed Development in the determination of the implications for European sites. The HRA Stage 2 Appropriate Assessment builds upon the HRA Stage 1 Screening Report and considers the likely significant environmental effects of the Proposed Development as they relate to relevant European site integrity. This report will provide the Competent Authority with the information required to undertake an HRA Stage 2 Appropriate Assessment (see section 1.2.3 for more detail on the HRA process).

The scope of this document covers all relevant European sites and designated features where LSEs have been identified due to the potential impacts arising from the Proposed Development in the HRA Stage 1 Screening Report.

1.1.5 Progress to date

HRA Stage 1 Screening Report for the Proposed Development has been produced to determine whether the Proposed Development could result in an LSE on a European site. The screening exercise determined that the potential for LSEs to result from component elements of the Proposed Development could not be discounted.

The HRA Stage 1 Screening Report presents the screening exercise, the purpose of which is summarised below:

- identification of the relevant European sites which may include features (Annex I habitats, Annex II species as well as Annex I birds) which may be sensitive or vulnerable to potential impacts arising from the construction, operations and maintenance and decommissioning of the Proposed Development;
- consideration of the features of the relevant European sites and identification of those which are **not** considered likely to be at risk of significant effects arising from the Proposed Development, either alone or in combination with other plans or projects, so that they can be eliminated from further consideration within the process;
- consideration of the features of the relevant European sites and identification of those which are considered likely to be at risk of significant effects arising from the Proposed Development, either alone or in combination with other plans or projects, so that they can be taken forward for appropriate assessment; and
- consideration of the potential impacts arising from the Proposed Development which are considered likely to result in LSEs to features of European sites and those impacts, which can be eliminated from consideration in further stages of the HRA.

1.1.6 Structure of the report

This Appropriate Assessment is structured as follows:

- Section 1.1: Introduction – this section describes the Proposed Development and establishes the need for, the purpose and structure of the Appropriate Assessment.
- Section 1.2: Habitats Regulations Assessment – this section sets out the process, principles, tests, (including those established by case law) and guidance applied to the Appropriate Assessment.
- Section 1.3: Consultation – this section provides a summary of the consultation undertaken to date of relevance to the Appropriate Assessment, responses provided, and how these have been addressed.
- Section 1.4: Summary of the Stage 1 HRA LSE Screening – this section presents the European sites potentially at risk of LSE and the features and pathways for which HRA Stage 2 Appropriate Assessment is required, both alone and in-combination.

Information to support the HRA Stage 2 Appropriate Assessment is provided in:

- Section 1.5: Information to support the Appropriate Assessments, including MDS, measures adopted as part of the Proposed Development, an outline of the approach taken to baseline data, conservation objectives, and the in-combination assessment;
- Section 1.6: Assessment of potential Adverse Effects on the Integrity (AEoI) of European sites designated for Annex I habitats, alone and in-combination;
- Section 1.7: Assessment of potential AEoI of European sites designated for Annex II diadromous fish species, alone and in-combination;
- Section 1.8: Assessment of potential AEoI of European sites designated for Annex II marine mammals, alone and in-combination;
- Section 1.9: Assessment of potential AEoI of European sites designated for offshore ornithological features (Annex I birds), alone and in-combination; and
- Section 1.10: Conclusions of the assessment and the overall finding of the Appropriate Assessment.

1.2 Habitat Regulations Assessment

1.2.1 Legislative context

The Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora, protects habitats and species of European nature conservation importance. Together with Council Directive (2009/147/EC) on the conservation of wild birds (the 'Birds Directive'), the Habitats Directive provide the EU's legal framework for the protection of wild fauna and flora and birds and establishes a network of internationally important sites, known as Natura 2000 sites or European sites, designated for their ecological status. This network of designated sites includes:

1. SACs which are designated under the Habitats Directive and promote the protection of flora, fauna and habitats; and
2. SPAs which are designated under the Birds Directive in order to protect rare, vulnerable and migratory birds.

These Directives are transposed into UK law by the Conservation of Habitats and Species Regulations 2017 (as amended) in inshore/territorial waters (onshore and out to 12 nm and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in offshore waters (12 nm to Exclusive Economic Zone (EEZ) boundary). Collectively, these are known as the Habitats Regulations.

The UK is no longer an EU Member State, but the Habitats Directive as implemented by the Habitats Regulations, continues to provide the legislative framework for HRA in the UK. The HRA process implemented under the Habitats Regulations continues to apply (subject to minor changes effected by the 2019 Regulations) and the UK is bound by HRA judgments handed down by The Court of Justice of the European Union (CJEU) prior to 31 to December 2020[1].

The objective of the Habitats Regulations is to conserve, at a Favourable Conservation Status (FCS), those qualifying habitats and species and supporting habitats of qualifying species listed under the Habitats Directive and Birds Directive. Post EU Exit, the Habitats Regulations continue to refer to Annexes I and II of the Habitats Directive and Annex I of the Birds Directive and as such, reference is made to the annexes of the Habitats and Birds Directives in this report.

In addition to sites formally defined as European sites in the Habitats Regulations, UK Government policy (Office of Deputy Prime Minister (ODPM) Circular 06/2005) states that Wetlands of International Importance listed and proposed under the Ramsar Convention 1971 (Ramsar sites) are afforded the same protection. As a matter of policy, the UK Government also affords sites going through the formal designation process (i.e. pSPAs, cSACs and pSACs), SCIs and potential Ramsar sites, the same level of protection.

Under the Habitats Regulations, before granting approval (i.e. planning permissions, licenses and consents) for a development likely to have a significant effect on an SAC or SPA/Ramsar site, an Appropriate Assessment must be made by the competent authority, of the proposed plan or project's potential for AEoI of the site in view of that site's conservation objectives.

1.2.2 European sites (post EU exit)

European sites (SACs and SPAs) in the UK no longer form part of the EU's Natura 2000 ecological network. The 2019 Regulations have created a National Site Network on land and at sea, including both the inshore and offshore marine areas in the UK. The National Site Network comprises of European sites (SACs and SPAs) in the UK that already existed (i.e. were established under the Habitats or Birds Directives) on 31 December 2020 (or proposed to the European Commission (EC) before that date) and any new sites designated under the Habitats Regulations under an amended designation process.

Ramsar sites do not form part of the National Site Network. Many Ramsar sites overlap with SACs and SPAs and all Ramsar sites remain protected in the same way as SACs and SPAs.

1.2.3 The HRA process

Regulation 28 of the Conservation of Offshore Marine Habitats and Species Regulations 2017 and Regulation 63 of the Conservation of Habitats and Species Regulations 2017, require that wherever a plan or project that is not directly connected to, or necessary for, the management of a European site is likely to have a significant effect on the conservation objectives of the site (directly, indirectly, alone or in-combination with other plans or projects), an 'Appropriate Assessment' of the implications of the plan or project for that site in view of that site's conservation objectives must be undertaken by the Competent Authority before consent or authorisation can be given for the plan or project.

The Habitats Regulations make it clear that the person applying for the consent of the plan or project must provide such information as the competent authority may reasonably require for the purposes of the assessment. This Appropriate Assessment provides this information.

HRA is a multistage process which helps to determine LSE, assesses adverse impact on the integrity of a European site, examines alternative solutions and provides justification of Imperative Reasons of Overriding Public Interest (IROPI), as required. Defra (2021) guidance describes that the process can have up to three stages as outlined below and shown in Figure 1.2:

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[1] The UK Supreme Court may depart from binding pre-EU Exit case law if they consider it 'right to do so' and the Inner House of the Court of Session may depart from such case law in certain circumstances

- Screening - the first stage involves a screening for LSE which is a simple assessment to check or screen if, in the absence of mitigation, a proposal:
  - is directly connected with or necessary for the conservation management of a European site; and
  - risks having a significant effect on a European site on its own or in-combination with other proposals.
- Appropriate Assessment - the second stage is an Appropriate Assessment, which must be carried out if it is decided that there is a risk of a LSE on a European site or if there is not enough evidence to rule out a risk (as required by Article 6(3) of the Habitats Directive). The Appropriate Assessment should assess the likely significant effects of a proposal on the integrity of the site and its conservation objectives and consider ways to avoid or reduce (mitigate) any potential for an ‘adverse effect on the integrity of the site’.
- Derogations - the third stage is known as a derogation (as outlined in Article 6(4) of the Habitats Directive) where, in certain circumstances, a proposal that has failed the integrity test may be allowed to go ahead. To decide if the proposal qualifies for a derogation, three legal tests must be applied. All three tests must be passed in sequence for a derogation to be granted:
  - there are no feasible alternative solutions that would be less damaging or avoid damage to the site;
  - the proposal needs to be carried out for imperative reasons of overriding public interest; and
  - the necessary compensatory measures can be secured.

This report considers the second stage ‘Appropriate Assessment’ in the HRA process in Figure 1.2.

The 2019 Regulations establish management objectives for the National Site Network. These are called the network objectives. The objectives in relation to the National Site Network are to:

- maintain or restore certain habitats and species listed in the Habitats Directive to favourable conservation status; and
- contribute to ensuring the survival and reproduction of certain species of wild bird in their area of distribution and to maintaining their populations at levels which correspond to ecological, scientific and cultural requirements, while taking account of economic and recreational requirements.

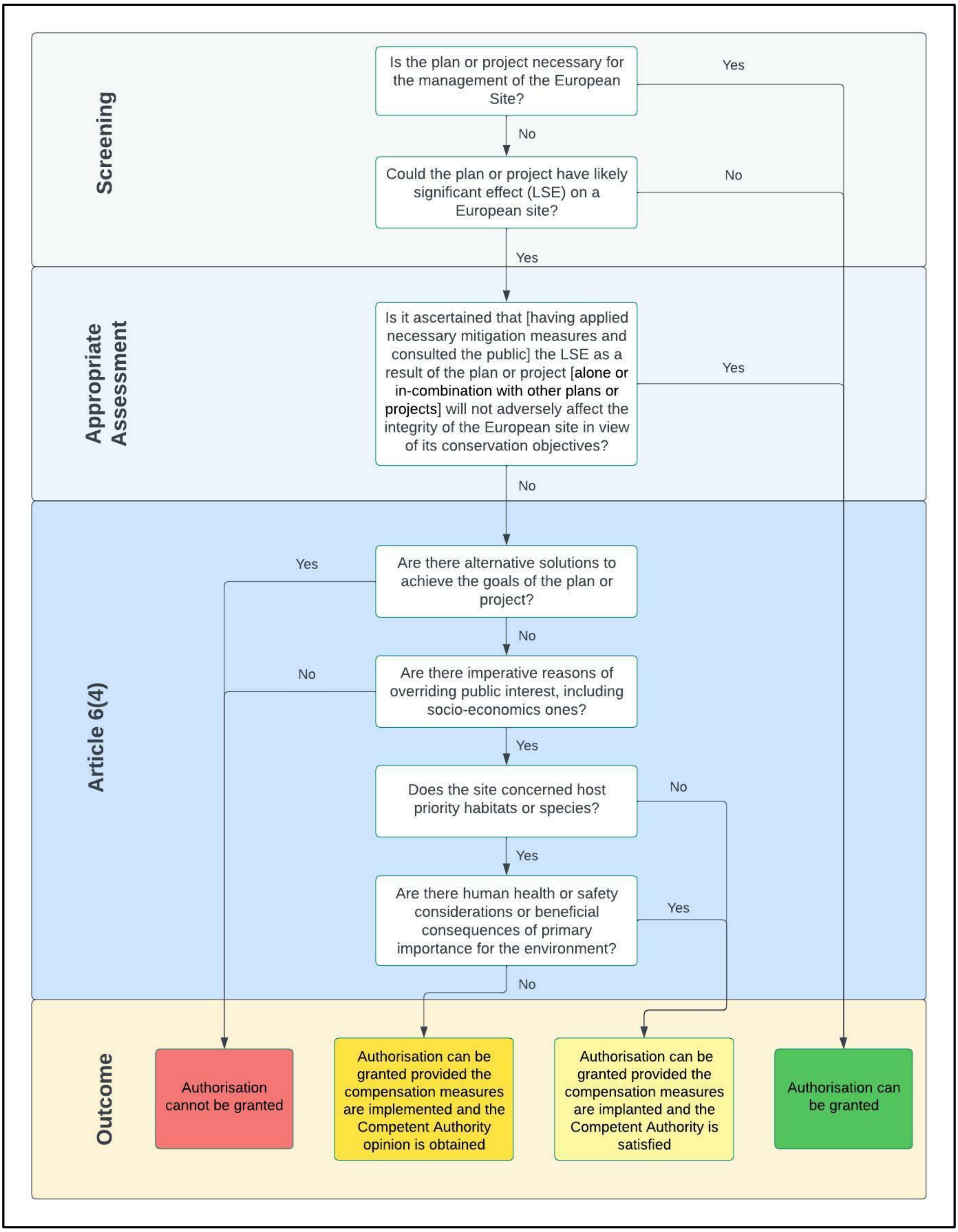

Figure 1.2: Stages In The Habitats Regulations Appraisal Process (Based On PINS (2022))

1.2.4 Guidance

This HRA Stage 2 Appropriate Assessment has drawn upon a number of information sources, HRA principles, regulations and guidance documents, including:

- The Conservation of Habitats and Species Regulations 2017 and The Conservation of Offshore Marine Habitats and Species Regulations 2017;
- EC (2006) Nature and Biodiversity Cases Ruling of the European Court of Justice;
- EC (2007) Guidance document on Article 6(4) of the 'Habitats Directive' 92/43/EE. Clarification on the Concepts of: Alternative Solutions, Imperative Reasons of Overriding Public Interest, Compensatory Measures, Overall Coherence, Opinion of the Commission;
- EC (2018) Managing Natura 2000 sites. The provisions of Article 6 of the 'Habitats' Directive 92/43/EEC';
- EC (2021) Assessment of plans and projects in relation to Natura 2000 sites - Methodological guidance on Article 6(3) and (4) of the Habitats Directive 92/43/EEC. European Commission Notice Brussels C(2021) 6913 final;
- The Planning Inspectorate Advice Note ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects (PINS, 2022);
- Joint Defra, Welsh Government, Natural England and Natural Resources Wales guidance - 'Habitats regulations assessments: protecting a European site' (Defra *et al.*, 2021) ; and
- The Habitats Regulations Assessment Handbook (DTA Publications, 2018).

1.3 Consultation

A summary of the key consultation undertaken to date is presented in Table 1.1.

Table 1.1: Summary Of Key Consultation On HRA For The Proposed Development

Date	Consultee	Type of Consultation	Summary of Consultation	Where Addressed
Overarching				
27/01/2023	OPRED	Scoping Opinion	The assessment should include direct and indirect effects on the features of all important nature conservation sites.	The assessment presented in sections 1.6 to 1.9 consider direct and indirect impacts of the Proposed Development with regard to the qualifying features of the protected sites and relevant conservation objectives.
Diadromous Fish				
27/01/2023	OPRED	Scoping Opinion	The assessment should include direct and indirect effects on the features of the following sites designated for Annex II species: • Dee Estuary SAC • River Dee and Bala Lake SAC • Afon Gwyrfai a Llyn Cwellyn SAC • Afon Eden- Cors Goch Trawsfynydd SAC • River Teifi/Afon Teifi SAC	Direct and indirect impacts of the Proposed Development on Dee Estuary/Aber Dyfrdwy SAC, River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC, Afon Gwyrfai a Llyn Cwellyn SAC, Afon Eden – Cors Goch Trawsfynydd SAC and River Teifi/Afon Teifi SAC are considered in section 1.7.

Date	Consultee	Type of Consultation	Summary of Consultation	Where Addressed
27/01/2023	OPRED	Scoping Opinion	Key protected sites for diadromous fish in Wales have been omitted.	Direct and indirect impacts of the Proposed Development on Dee Estuary/Aber Dyfrdwy SAC, River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC, Afon Gwyrfai a Llyn Cwellyn SAC, Afon Eden – Cors Goch Trawsfynydd SAC and River Teifi/Afon Teifi SAC are considered in section 1.7.
27/01/2023	OPRED	Scoping Opinion	The Dee Estuary SAC is also designated for sea and river lamprey.	Dee Estuary/Aber Dyfrdwy SAC designated for sea and river lamprey is considered in section 1.7.
30/11/2023	NRW	Fitness check of marine licence application consultation	The Cardigan Bay/Bae Ceredigion SAC is also designated for sea and river lamprey.	The Cardigan Bay/Bae Ceredigion SAC designated for sea and river lamprey is considered in section 1.7
Marine Mammals				
27/01/2023	OPRED	Scoping Opinion	The rationale of using a regional study area for scoping of SACs is not considered to be appropriate because the Annex II marine mammal SAC features are mobile and wide ranging. The Marine Mammal Management Unit (MU) is the appropriate scale for consideration of offsite impacts for marine mammals.	Marine mammal MUs are considered as relevant populations against which to assess impacts in the Environmental Impact Assessment (EIA). To account for mobile nature of marine mammals and relatively small scale of the Proposed Development, protected sites with relevant Annex II marine mammal features across the Irish and Celtic Seas are considered in the assessment (section 1.8).
Offshore Ornithology				
27/01/2023	OPRED	Scoping Opinion	The use of Woodward *et al.* 2019 mean max plus 1 standard deviation foraging ranges is welcomed.	This has been noted and used where appropriate.
27/01/2023	OPRED	Scoping Opinion	Consideration should be given as to whether seabird surveys of the platform will be required to ascertain if nesting and/or roosting seabirds are (or have been) using the structures. JNCC have generated an advice note on Seabird Survey Methods for Offshore Installations: Consideration should also be given to the anthropogenic disturbance and displacement of red-throated diver and Common Scoter which are features of Liverpool Bay SPA, and which are also included as a priority species in Section 7 of the Environment (Wales) Act 2016.	Nesting bird surveys of the offshore platforms have already been undertaken by RSK Biocensus (RSK) between 8th and 13th June 2022. The effects of anthropogenic disturbance and displacement on red-throated diver and common scoter have also been considered in the Offshore Ornithology Displacement Technical Report and both species

Date	Consultee	Type of Consultation	Summary of Consultation	Where Addressed
			Both species are sensitive to anthropogenic disturbance and displacement	have been carried forward for assessment
27/01/2023	OPRED	Scoping Opinion	Impacts Proposed to be Scoped into the Assessment for Offshore Ornithology. In addition to the vessel movements in the construction and decommissioning phases of the Project, the maintenance and repair vessel movements also have the potential to impact on ornithology receptors during the operational phase and so should be factored into the assessment.	This has been scoped in.
27/01/2023	OPRED	Scoping Opinion	Should work be undertaken during the non breeding season, this would be likely to coincide with the presence of red-throated diver and common scoter in the Liverpool Bay SPA. The number of boat movements associated with the works should therefore be included.	The number of vessels has been included in the MDS.

1.4 Summary of HRA Stage 1 Screening Report conclusions

This section summarises all pathways identified for potential LSE (arising alone and/or in-combination) and defines the scope of the assessment within this HRA Stage 2 Appropriate Assessment.

1.4.1 Screening outcomes for the Proposed Development Alone

The potential for LSE as a result of the Proposed Development alone has been identified following HRA Stage 1 Screening Report with respect to 20 SACs and nine SPAs.

1.4.1.1 Annex I habitats (offshore and coastal)

In relation to European sites designated for Annex I habitats, one SAC for which the potential for LSE could not be discounted (Dee Estuary/Aber Dyfrdwy SAC, hereinafter referred to as Dee Estuary SAC) was advanced to the HRA Stage 2 Appropriate Assessment.

1.4.1.2 Annex II diadromous fish

The following five European sites designated for Annex II diadromous fish were advanced to the HRA Stage 2 Appropriate Assessment:

- Dee Estuary SAC;
- River Dee and Bala Lake/Afon Dyfrdwy a Llyn Tegid SAC (hereinafter referred to as River Dee and Bala Lake SAC);
- Afon Gwyrfai a Llyn Cwellyn SAC;
- Afon Eden - Cors Goch Trawsfynydd SAC;
- River Teifi/Afon Teifi SAC (hereinafter referred to as River Teifi SAC); and
- Cardigan Bay/Bae Ceredigion SAC (hereinafter referred to as Cardigan Bay SAC).

1.4.1.3 Annex II marine mammals

With respect to Annex II marine mammals, fourteen European sites were advanced to the HRA Stage 2 Appropriate Assessment. These sites are listed below, broken down by country:

- Eleven sites in the UK:
  - North Anglesey Marine/Gogledd Môn Forol SAC (hereinafter referred to as North Anglesey Marine SAC);
  - North Channel SAC;
  - Lleyn Peninsula and the Sarnau SAC;
  - West Wales Marine SAC;
  - Strangford Lough SAC;
  - Murlough SAC;
  - Cardigan Bay SAC;
  - The Maidens SAC;
  - Pembrokeshire Marine/Sir Benfro Forol SAC (hereinafter referred to as Pembrokeshire Marine SAC);
  - Bristol Channel Approaches/Dynesfeydd Môr Hafren SAC (hereinafter referred to as Bristol Channel Approaches SAC); and
  - Lundy SAC.
- Three sites in Ireland:
  - Rockabill to Dalkey Island SAC;
  - Saltee Islands SAC; and
  - Roaringwater Bay and Islands SAC.

1.4.1.4 Offshore ornithological features

In relation to offshore ornithology interest features of the SPAs, a total of nine sites were advanced to the HRA Stage 2 Appropriate Assessment:

- Liverpool Bay/Bae Lerpwl SPA (hereinafter referred to as Liverpool Bay SPA);
- Dee Estuary SPA;
- Ribble and Alt Estuaries SPA;
- Anglesey Terns/Morwenoliaid Ynys Môn SPA (hereinafter referred to as Anglesey Terns SPA);
- Morecambe Bay and Duddon Estuary SPA;
- Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA (hereinafter referred to as Aberdaron Coast and Bardsey Island SPA);
- Ailsa Craig SPA;
- Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA (hereinafter referred to as Skomer, Skokholm and the Seas off Pembrokeshire SPA);
- Grassholm SPA; and
- Saltee Islands SPA.

1.4.2 Screening outcomes for LSE in-combination

1.4.2.1 Annex I habitats (offshore and coastal)

The designated sites as listed in section 1.4.1.1 for the Proposed Development alone were taken forward to the in-combination appropriate assessment.

1.4.2.2 Annex II diadromous fish

The designated sites as listed in section 1.4.1.2 for the Proposed Development alone were taken forward to the in-combination appropriate assessment.

1.4.2.3 Annex II marine mammals

The designated sites as listed in section 1.4.1.3 for the Proposed Development alone were taken forward to the in-combination appropriate assessment.

1.4.2.4 Offshore ornithological features

The designated sites as listed in 1.4.1.4 for the Proposed Development alone were taken forward to the in-combination appropriate assessment.

1.4.3 Summary table of LSE screening outcomes

Table 1.2 presents a summary of the European sites and relevant qualifying features for which LSE could not be ruled out and therefore an Appropriate Assessment is required to be undertaken.

Table 1.2: A Summary Of European Sites For Which Potential For LSE Could Not Be Discounted At HRA Stage 1 Screening And For Which Appropriate Assessment Is Required

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
Dee Estuary SAC	0.00 km	Estuaries	Construction	Temporary habitat loss and/or disturbance (along cable connection only[2])
				Impacts resulting from the release of sediment bound benthic contaminants
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased temperature impacting benthic and marine communities (along pipeline only[2])
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)
		Mudflats and sandflats not covered by seawater at low tide; Intertidal mudflats and sandflats	Construction	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased SSC and associated deposition (along cable connection only[2])
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only[2])
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased temperature impacting benthic and marine communities (along pipeline only)
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)

[2] The impacts such as temporary habitat loss and/or disturbance, increased temperature impacting benthic and marine communities, increased SSC and associated deposition and impacts as a result of the release of sediment bound benthic contaminants have the potential to result in localised effects. Due to the spatial overlap, the HRA Stage 1 LSE Screening has identified one European site, Dee Estuary SAC, to be taken forward to the Appropriate Assessment. This Appropriate Assessment will focus on the part of the Eni Development Area where the potential for the AEoI of the Dee Estuary exsist, (e.g. the intertidal and subtidal part of the cable/pipiline as it approaches the connection to the PoA Terminal onshore.

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
				Increased SSC and associated deposition (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)
		Salicornia and other annuals colonising mud and sand; Glasswort and other annuals colonising mud and sand	Construction	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased SSC and associated deposition (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased SSC and associated deposition (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)
		Atlantic salt meadows	Construction	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased SSC and associated deposition (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)
				Increased SSC and associated deposition (along cable connection only)
				Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
		Sea lamprey	Construction	Temporary habitat loss and/or disturbance (along cable connection only)
				Underwater noise impacting fish receptors
				Increased SSC and associated deposition (along cable connection only)
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)
				Underwater noise impacting fish receptors
				Increased SSC and associated deposition (along cable connection only)
		River lamprey	Construction	Temporary habitat loss and/or disturbance (along cable connection only)
				Underwater noise impacting fish receptors
				Increased SSC and associated deposition (along cable connection only)
			Operation and Maintenance	Temporary habitat loss and/or disturbance (along cable connection only)
			Decommissioning	Temporary habitat loss and/or disturbance (along cable connection only)
				Underwater noise impacting fish receptors
				Increased SSC and associated deposition (along cable connection only)
River Dee and Bala Lake SAC	22.53 km	Sea lamprey	Construction	Underwater noise impacting fish receptors
		River lamprey	Construction	Underwater noise impacting fish receptors
		Atlantic salmon	Construction	Underwater noise impacting fish receptors
Afon Gwyrfai a Llyn Cwellyn SAC	113.40 km	Atlantic salmon	Construction	Underwater noise impacting fish receptors
Afon Eden – Cors Goch Trawsfynydd SAC	197.35 km	Atlantic salmon	Construction	Underwater noise impacting fish receptors
		Freshwater pearl mussel	Construction	Underwater noise impacting fish receptors

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
Afon Teifi/River Teifi SAC	211.80 km	Atlantic salmon	Construction	Underwater noise impacting fish receptors
		Sea lamprey	Construction	Underwater noise impacting fish receptors
		River lamprey	Construction	Underwater noise impacting fish receptors
North Anglesey Marine SAC	39.60 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during Unexploded Ordnance (UXO) detonation
				Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
				Effects on marine mammals due to changes in prey availability
			Operation and Maintenance	Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Decommissioning	Injury and disturbance from vessel activity and other noise producing activities
				Effects on marine mammals due to changes in prey availability
North Channel SAC	91.40 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
				Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Operation and Maintenance	Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
			Decommissioning	Injury and disturbance from vessel activity and other noise producing activities
Lleyn Peninsula and the Sarnau SAC	115.39 km	Bottlenose dolphin	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
		Grey seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
West Wales Marine SAC	116.68 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Strangford Lough SAC	142.70 km	Harbour seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
				Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Operation and Maintenance	Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Decommissioning	Injury and disturbance from vessel activity and other noise producing activities
Murlough SAC	146.97 km	Harbour seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
				Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Operation and Maintenance	Injury and disturbance from underwater noise generated during geophysical and seismic surveys
				Injury and disturbance from vessel activity and other noise producing activities
			Decommissioning	Injury and disturbance from vessel activity and other noise producing activities
Cardigan Bay SAC	183.99 km	Bottlenose dolphin	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Maidens SAC	190.72 km	Grey seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Pembrokeshire Marine SAC	233.18 km	Grey seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Bristol Channel Approaches SAC	296.20 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Lundy SAC	330.73 km	Grey seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Rockabill to Dalkey Island SAC	155.10 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
				Injury and disturbance from underwater noise generated during UXO detonation
Saltee Islands SAC	239.28 km	Grey seal	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Roaringwater Bay and Islands SAC	445.50 km	Harbour porpoise	Construction	Injury and disturbance from underwater noise generated from piling
				Injury and disturbance from underwater noise generated during UXO detonation
Liverpool Bay SPA	0.00 km	Red-throated diver	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Little gull	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Common scoter	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
		Little tern	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
		Common tern	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
		Waterbirds assemblages	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
Dee Estuary SPA	0.00 km	Sandwich tern	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
		Common tern	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
		Little tern	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
		Pintail	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Teal		Temporary habitat displacement and disturbance

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
			Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Dunlin	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Knot	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Oystercatcher	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Bar-tailed godwit	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Black-tailed godwit	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Curlew	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Grey plover	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Shelduck	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Redshank	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
		Waterbird assemblage species in addition to those above: Sanderling, Cormorant, Great crested grebe, Lapwing	Construction/ Decommissioning	Temporary habitat displacement and disturbance
				Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
				Accidental pollution in the surrounding area
			Operation and Maintenance	Changes in prey availability
				Accidental pollution in the surrounding area
Ribble and Alt Estuaries SPA	1.00 km	Lesser black-backed gull	Construction/ Decommissioning	Changes in prey availability
			Operation and Maintenance	Collision with offshore infrastructure
				Changes in prey availability
				Creation of roosting and nesting habitats among project infrastructure
		Common tern	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
Anglesey Terns SPA	30.00 km	Sandwich tern	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
Morecambe Bay and Duddon Estuary SPA	22.00 km	Lesser black-backed gull	Construction/ Decommissioning	Changes in prey availability
			Operation and Maintenance	Collision with offshore infrastructure
				Changes in prey availability
				Creation of roosting and nesting habitats among project infrastructure
Aberdaron Coast and Bardsey Island SPA	98.00 km	Manx shearwater	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Collision with offshore infrastructure
Ailsa Craig SPA	196.00 km	Gannet	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
Skomer, Skokholm and the Seas off Pembrokeshire SPA	213.00 km	Storm petrel	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Collision with offshore infrastructure
				Changes in prey availability

European Site	Distance to the Proposed Development	Relevant Qualifying Feature	Project Phase	Impact
		Manx shearwater	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Collision with offshore infrastructure
Grassholm SPA	224.00 km	Gannet	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
Saltee Islands SPA	246.00 km	Fulmar	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Collision with offshore infrastructure
		Gannet	Construction/ Decommissioning	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability
			Operation and Maintenance	Disturbance and displacement from airborne sound, and presence of vessels and infrastructure
				Changes in prey availability

1.5 Information to support Appropriate Assessment

1.5.1 Maximum design scenarios

For all European sites considered in this Appropriate Assessment, the assessments have been based on a realistic Maximum Design Scenario (MDS). MDS for each receptor (e.g. marine mammals) has been derived from the design envelope for the Proposed Development. Volume 1, chapter 3 the Offshore ES describes the Proposed Development design and identifies the range of potential parameters for all relevant components.

The MDS for each receptor group is impact specific, presented in tabulated format in each of the receptor sections of this Appropriate Assessment. The assessment scenarios are consistent with those used for assessment in relevant chapters of the Offshore ES.

1.5.2 Embedded mitigation

A number of embedded mitigation measures have been included in the Proposed Development. Embedded mitigation measures are integrated into the project description for the Proposed Development and are not considered as mitigation measures intended to specifically avoid or reduce effects on European sites. Designed in measures include two types of mitigation:

- Primary inherent mitigation- modifications to the location or design of the development made during the preapplication phase that are an inherent part of the Proposed Development and do not require additional action to be taken.
- Tertiary inexorable mitigation – actions that would occur with or without input from the EIA feeding into the design process, (e.g. to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects).

The measures of relevance to the assessment of potential impacts are tabulated separately in each of the receptor sections (see sections 1.6, 1.7, 1.8, and 1.9), according to the effect pathway under consideration.

Secondary mitigation may be proposed to reduce significance of impact. These include actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the consents and licences, or through inclusion in the Offshore ES. Such secondary measures were not considered during the HRA Stage 1 Screening but are included within the HRA Stage 2 Appropriate Assessment for determination of AEoI. The Appropriate Assessment will indicate whether adverse impacts on European sites are likely and if so, whether those effects can be avoided through the introduction of mitigation measures that avoid or reduce the impact.

1.5.3 Baseline information

Baseline information on the European sites identified for further assessment within the HRA Stage 2 Appropriate Assessment has been gathered through a comprehensive desktop review of existing studies and datasets. The key data sources are summarised in each of the receptor group sections below and presented in detail within topic sections of the volume 2, chapter 7 of the Offshore ES. Any additional sources of information used in the HRA Stage Two Appropriate Assessment are references within the text and populated in section 1.11. The key baseline data sources, for each receptor, are outlined below:

- Annex I habitats – informed by data from site specific surveys presented in volume 2, chapter 7 of the Offshore ES.
- Annex II diadromous fish – informed by volume 2, chapter 7 of the Offshore ES.
- Annex II marine mammals – informed by volume 2, chapter 7 of the Offshore ES.
- Offshore ornithology – informed by volume 2, chapter 8 of the Offshore ES.

1.5.4 Conservation objectives

Conservation objectives set the framework for establishing appropriate conservation measures for each feature of the site and provide a benchmark against which plans or projects can be assessed. The conservation objectives set out the essential elements needed to ensure that a qualifying habitat or species is maintained or restored at a site. If all the conservation objectives are met, then the integrity of the site will be maintained, and deterioration or significant disturbance of the qualifying features avoided.

The Statutory Nature Conservation Bodies (SNCBs) have produced conservation advice for European sites under their statutory remit. This conservation advice provides supplementary information on sites and features, and although the content provided is similar, the format of the advice provided varies between the different SNCBs. This document refers to the most up to date conservation objectives and conservation advice available. It is recognised that in the conservation advice documents, if any feature of the SAC is in unfavourable condition, the integrity of the site is deemed to be compromised and the overarching objective is therefore to restore site integrity.

Given that the assessment presented in HRA Stage 1 Screening was highly precautionary and considered large potential ranges of effects, European sites with the potential to be impacted fall variously under the remit of NRW, Natural England, NatureScot, National Parks and Wildlife Service (NPWS) and the Joint Nature Conservation Committee (JNCC).

For European sites which fall within both Welsh and English or English and Scottish territorial waters the two relevant governing SNCBs can publish separate conservation objectives for the same European site. For example, both Natural England and NRW have published conservation objectives for the River Dee and Bala Lake SAC. Where this is the case for European sites assessed within this HRA Stage 2 Appropriate Assessment, the most recently published conservation objectives have been used.

1.5.5 Approach to the in-combination assessment

The Habitats Regulations require the consideration of the potential effects of a project on European sites both alone and in-combination with other plans or projects. When undertaking an in-combination assessment projects, plans or activities with which the Proposed Development may interact to produce an in-combination effect must be identified. These interactions may arise within the construction, operations and maintenance, or decommissioning phases. The process of identifying those projects, plans or activities for which there is the potential for an interaction to occur is referred to as 'screening'.

A specialised process has been developed in order to methodically and transparently screen the large number of projects, plans and activities that may be considered in-combination with the Proposed Development. This involves a staged process that considers the level of detail available for projects, plans and activities, as well as the potential for interactions on a conceptual, physical and temporal basis.

For the Proposed Development in-combination assessment a tiered approach has been adopted. This approach provides a framework for placing relative weight on the potential for each project/plan to be included in the in-combination assessment to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the project's parameters. The allocation of each project, plan and activity into tiers is not affected by the screening process but is merely a categorisation applied to all projects, plans and activities that have been screened in for assessment.

The tiered approach uses the following categorisations:

- Tier 1 assessment – Proposed Development;
- Tier 2 assessment – All plans/projects assessed under tier 1, plus projects which are operational, under construction, those with consent and those submitted but not yet determined;
- Tier 3 assessment – All plans/projects assessed under tier 2, plus those projects with a Scoping Report; and

- Tier 4 assessment – All plans/projects assessed under tier 3, plus those projects likely to come forward where a Crown Estate Agreement for Lease (AfL) has been granted.

An overview of the projects or activities considered for each receptor group are tabulated separately in each of the receptor chapters according to the effect pathway under consideration.

1.6 Assessment of potential AEoI: Annex I habitats

As listed in section 1.4.1.1, the HRA Stage 1 Screening Report identified the potential for LSEs on the following European site designated for Annex I habitat features (Figure 1.3):

- Dee Estuary SAC.

LSEs on this European site were identified for the following potential impacts:

- during the construction and decommissioning phase:
  - temporary habitat loss and/or disturbance (along cable connection only);
  - increased Suspended Sediment Concentration (SSC) and associated deposition (along cable connection only); and
  - impacts resulting from the release of sediment bound benthic contaminants (along cable connection only).
- During the operations and maintenance phase
  - temporary habitat loss and/or disturbance (along cable connection only); and
  - increased temperature impacting benthic and marine communities (along pipeline only).

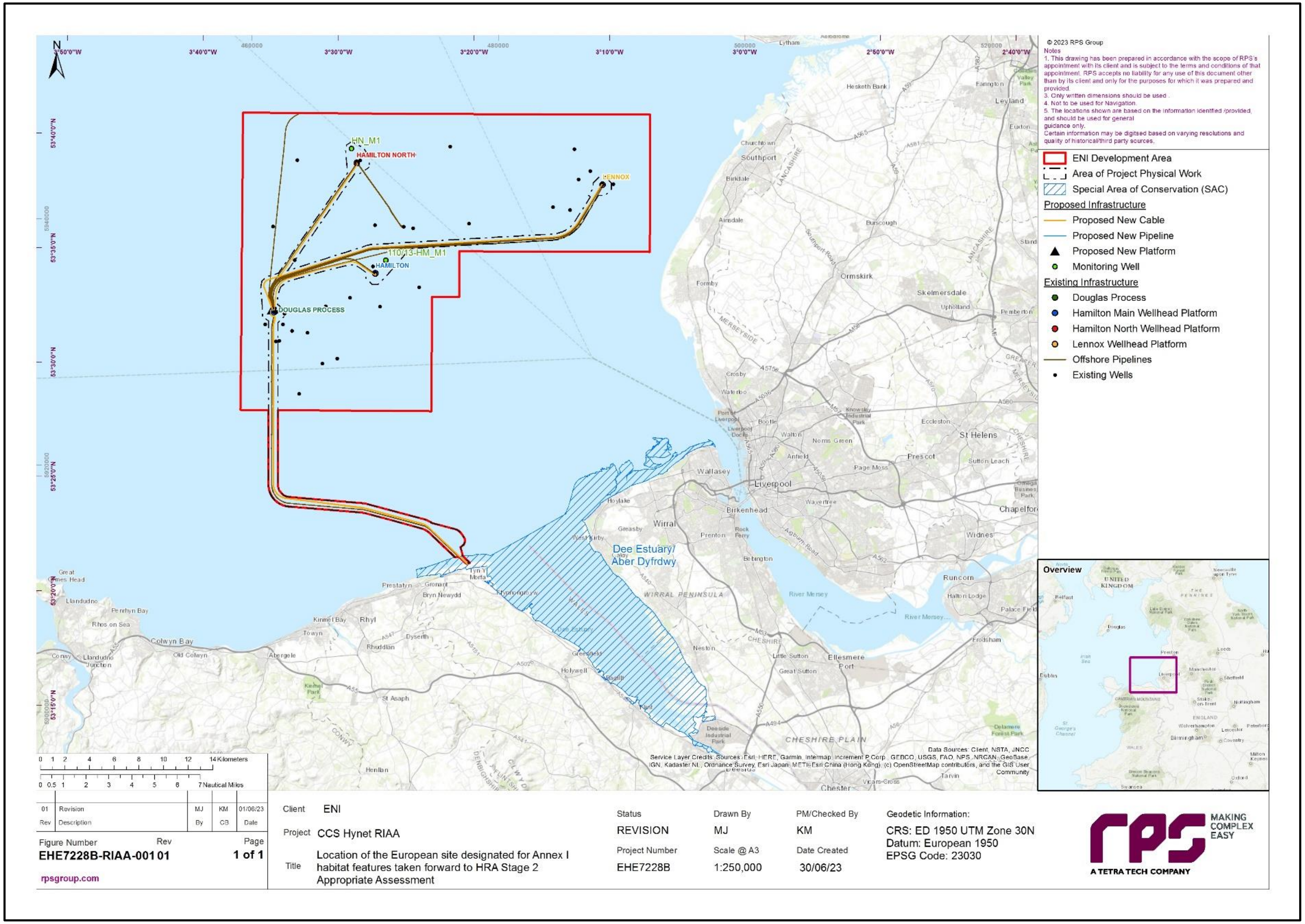

Figure 1.3: Location Of The European Site With Annex I Habitat Features For Which An Appropriate Assessment Is Required

1.6.1 Baseline Information

Baseline information on the Annex I habitat features of the European site identified for further assessment within the HRA process has been gathered through a comprehensive desktop study of existing studies and datasets, full details of which are presented within volume 2, chapter 7 of the Offshore ES. Two site specific benthic surveys were undertaken in 2022, the results of which were used to benthic subtidal and intertidal ecology baseline.

1.6.1.1 Dee Estuary SAC

The Dee Estuary SAC is located within the Dee Estuary, which is one of the largest estuaries in the UK, with an intertidal area primarily comprising of extensive mudflat and sandflat areas and some saltmarsh habitat. It overlaps with the Proposed Development where the offshore cable connects to the shore. The estuary is hypertidal giving rise to a mean tidal range of 7.7 m. The intertidal mud flats of the sheltered inner estuary in particular support populations of marine worms, molluscs, and other invertebrates, which often occur at high densities and with high biomass.

The Dee is also used as a migratory passage for migratory fish species including river lamprey *Lampetra fluviatilis*, sea lamprey *Petromyzon marinus*, Atlantic salmon, sea trout *Salmo trutta*, twaite shad *Alosa fallax*, smelt *Osmerus eperlanus*, and European eels *Anguilla anguilla* to and from their spawning and nursery grounds in the River Dee upstream of the estuary or open sea (Natural England and NRW, 2010).

The estuary supports internationally important numbers of waterfowl and waders. On the upper shore salt marsh transitions into brackish freshwater swamp vegetation. Coastal fields provide important foraging habitat for wintering waders and freshwater lagoons and reedbeds support the largest common tern *Sterna hirundo* breeding colony in Wales (Natural England and NRW, 2010).

Feature accounts

The Annex I habitat qualifying features of the Dee Estuary SAC are outlined below.

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

- mudflats and sandflats not covered by seawater at low tide;
- *Salicornia* and other annuals colonizing mud and sand; and
- Atlantic salt meadows Glauco – Puccinellietalia maritimae.

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

- estuaries.

The sections below provide information on the range, extent and associated species of the relevant Annex I habitat features of the Dee Estuary SAC which have been taken forward to Appropriate Assessment (i.e. estuaries, mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonising mud and sand, as well as glasswort and other annuals colonising mud and sand). The distribution of the features within the SAC are shown in Figure 1.4.

Estuaries

The Dee estuary is a funnel shaped coastal plain estuary and covers an area of 14,000 ha making it the sixth largest estuary in the UK (Natural England and NRW, 2010). The estuary is characteristic of a coastal plain estuary with a large width to depth ratio, although the presence of a spit at the estuary mouth is unusual and usually a feature of bar built estuaries. Given that the Dee Estuary is hyper tidal with a tidal range of 7.7m at the mouth, the intertidal habitats which frame the estuary therefore dry out at low tide (Natural England and NRW, 2010). Only 10% of the intertidal habitat stays underwater at low water on spring tides. In the outer areas of the estuary the environment is highly dynamic and sand bars and beaches are exposed to wave action and tidal currents, whereas in the upper estuary the sheltered environment gives rise to areas of mudflats (Natural England and NRW, 2010).

Estuaries often comprise an interdependent mosaic of subtidal and intertidal habitats, which are closely associated with surrounding terrestrial habitats. Many habitats that are associated with estuaries are identified as Annex I habitat types in their own right, including mudflats and sandflats not covered by sea water at low tide, saltmarshes, sandbanks which are slightly covered by sea water all the time and reefs.

Mudflats and sandflats not covered by seawater at low tide

The mudflats and sandflats feature of the Dee Estuary SAC span a total area of over 10,000 ha and contribute to approximately 3% of the total UK resource of this habitat type (Natural England and NRW, 2010). The mudflats and sandflats change in shape from one year to the next owing to the highly dynamic nature of the estuary. The intertidal flats of the Dee estuary range from sand, muddy sand and mud biotopes although are considered to be sandier than other coastal plain estuaries in the north eastern Irish Sea, which may be attributed to the shortening of the estuary following canalisation.

The upper estuary shores of the Dee Estuary are often dominated by amphipods *Bathyporeia pilosa* and *Corophium arenarium*. Whereas, the inner section of the estuary, are dominated by species such as the ragworm *Hediste diversicolor* and the Baltic tellin *Macoma balthica* (Natural England and NRW, 2010). Sheltered areas of intertidal muddy sediments are often characterised by high numbers of invertebrates including the ragworm *H. diversicolor*, the peppery furrow shell *Scrobicularia plana* and polychaete worms such as *Eteone longa* (Natural England and NRW, 2010). The outer section of the estuary also has dense cockle beds present on both the English and Welsh shores. Amphipods and polychaetes dominate the sandy areas to the sides of the estuary mouth, between Prestatyn and the Point of Ayr and off the north Wirral coast (Natural England and NRW, 2010).

Salicornia and other annuals colonising mud and sand

Pioneer saltmarsh vegetation develops at the lower reaches of the saltmarshes where the vegetation is frequently flooded by the tide as well as disturbed areas of upper saltmarsh. It colonises intertidal mud and sand flats in areas protected from strong wave action as well as open creek sides, depressions or pans within a saltmarsh. It is an important precursor to the development of more stable saltmarsh vegetation (Natural England and NRW, 2010).

The Dee Estuary supports around 4% of the national UK resource for this feature based on figures obtained in 2000 (Natural England and NRW, 2010).

The Annex I habitat '*Salicornia* and other annuals colonising mud and sand (pioneer saltmarsh)' is divided into two main types of vegetation:

- The first type consists of communities which include open stands of perennial glasswort *Sarcocornia perennis*, annual glassworts *Salicornia* spp., or annual sea-blite *Suaeda maritima*; other species that may be found include common saltmarsh-grass *Puccinellia maritima*, common cord grass *Spartina anglica* and sea aster *Aster tripolium*.
- The second type consists of ephemeral communities colonising open pans in upper saltmarshes; characteristic plants of this vegetation type include sea pearlwort *Sagina maritima* and knotted pearlwort *S. nodosa*.

Condition assessments

Table 1.3 outlines the indicative condition assessments of the relevant qualifying features of the Dee Estuary SAC which have been taken forward for detailed consideration in the Appropriate Assessment (as detailed in (NRW, 2018c)). Overall, the condition assessment deemed that all features of the SAC are in a favourable condition, except for the Estuaries feature, this is considered to be the result of water quality issues within the estuary (NRW, 2018c).

Table 1.3: Feature Condition Assessment And Associated Confidence Levels For Annex I Habitats Within The Dee Estuary SAC

Component of habitat feature assessed	Indicative assessment of component	Overall indicative assessment of feature	Key evidence type used	Level of agreement between assessors	Confidence in evidence used to make the assessment	Component confidence level
Estuaries						
Distribution and extent within site	Favourable	Unfavourable	Monitoring data, casework monitoring, expert judgement	High	Medium	Medium
Structure and function	Unfavourable		Casework monitoring, expert judgement	Low	Medium	Low
Typical species	Favourable		Cockle fishery, Water Framework Directive (WFD) assessments	High	Low	Low
Atlantic salt meadows						
Distribution and extent within site	Favourable	Favourable	Monitoring reports, WFD assessments, expert judgement	High	Medium	Medium
Structure and function	Favourable		Monitoring reports, WFD assessments, expert judgement	High	Medium	Medium
Typical species	Favourable		Monitoring reports, WFD assessments, expert judgement	High	Medium	Medium
Mudflats and sandflats not covered by seawater at low tide						
Distribution and extent within site	Favourable	Favourable	Casework monitoring, expert judgement	High	Low	Low
Structure and function	Favourable		Casework monitoring, expert judgement	High	Low	Low
Typical species	Favourable		Casework monitoring, expert judgement	High	Low	Low
Salicornia and other annuals colonising mud and sand						
Distribution and extent within site	Favourable	Favourable	Expert judgement	High	Medium	Medium
Structure and function	Favourable		WFD assessments, expert judgement	High	Medium	Medium
Typical species	Favourable		WFD assessments	High	Medium	Medium

Conservation objectives

The most recent conservation objectives for the Dee Estuary SAC have been developed by Natural England (Natural England, 2018a) and apply to the site and the individual species and/or assemblage of species for which the site has been classified.

The high level objectives for the Dee Estuary SAC are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the favourable conservation status of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of qualifying species;
- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of qualifying species;
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- the populations of qualifying species; and
- the distribution of qualifying species within the site.

Only conservation objectives relevant to the qualifying habitats (Annex I habitats) and habitats of qualifying species (Annex II diadromous fish qualifying features) of the SAC will be assessed in section 1.6.3; conservation objectives relating to the qualifying species of the SAC will not be considered.

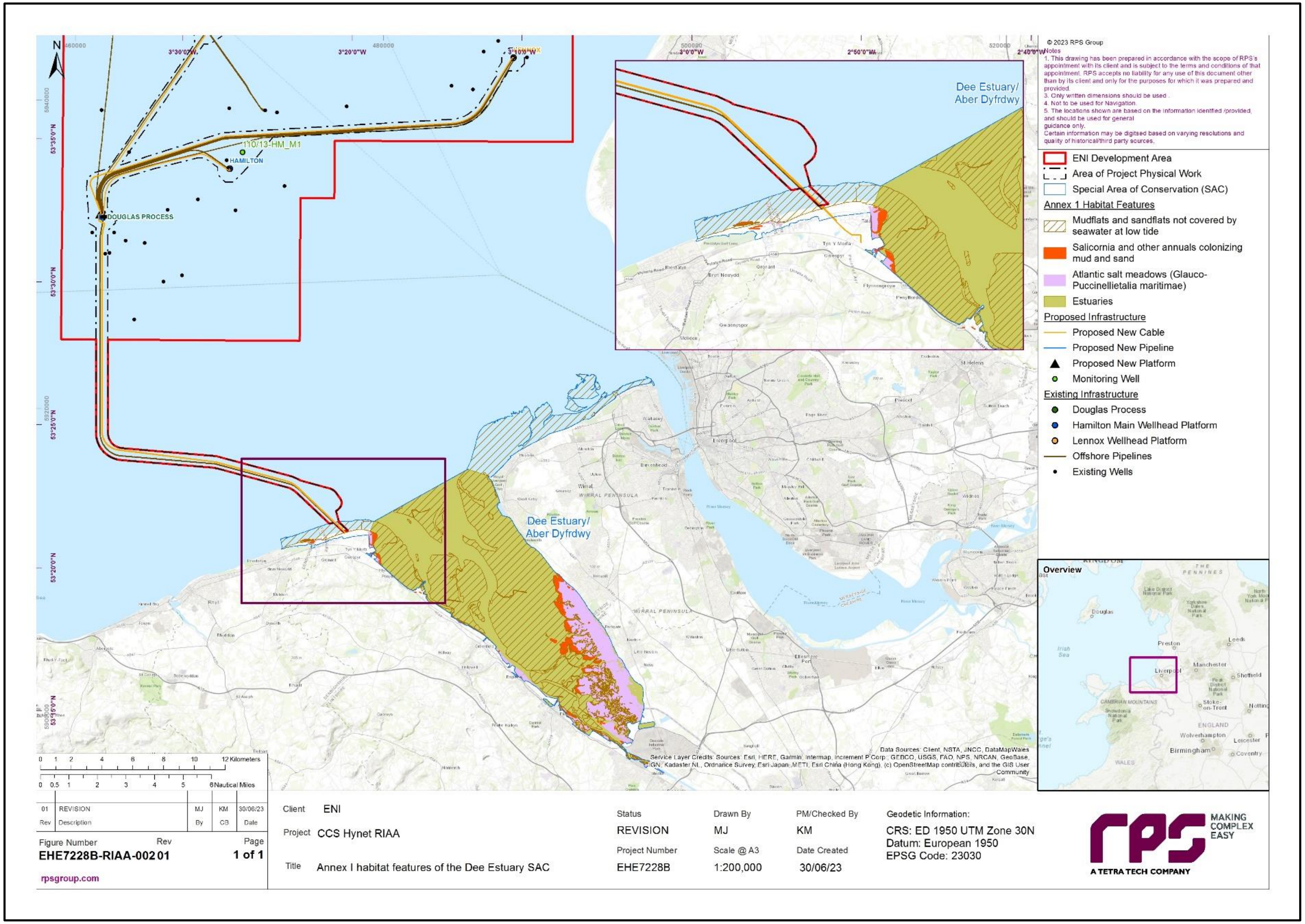

Figure 1.4: Annex I Habitat Distribution Within The Dee Estuary SAC

1.6.2 Information to inform the assessment

1.6.2.1 Proposed Development alone

Maximum design scenario

The design parameters identified in Table 1.4 have been selected as those having the potential to result in the greatest effect on Annex I habitats and habitats of qualifying species and therefore represent the MDS. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Description (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 1.4: Maximum Design Scenario Considered For The Assessment Of Impacts On Annex I Habitats And Habitats Of Qualifying Species

Potential impact	Phase C	Phase O	Phase D	Project Design Parameters	Justification
Temporary subtidal habitat loss and/or disturbance (along cable connection only)	✓	✓	✓	**Construction phase** Up to 39,000 m² of subtidal habitat loss along the cable connection due to: • Up to 18,000 m² of disturbance from the installation of up to 1,200 m of subsea power cables within the intertidal zone (between MHWS and MLWS) (MDS assumes 100% will be buried). • Up to 21,000 m² of disturbance due to dredging at West Hoyle Bank for the installation of subsea power cables between the PoA terminal and the new Douglas platform. A dredged channel with a length of 1,000 m, width of 21 m, and height of 7 m is to be excavated using a backhoe dredger. • A channel cleared through a length of 115 m of sand waves, with a width of 10 m and height of 3 m, using a max flow excavator. **Operation and Maintenance Phase** Up to 72,000 m² of subtidal habitat loss across the entire Proposed Development due to: • Footprints of jack up vessels for routine maintenance works. Up to 15 events per year over the 25 year lifecycle of the Proposed Development, resulting in a total value of 34,500 m² over the lifecycle. Values for maintenance works along the cable connection are not available, so this value of 34,500 m² for the entire Proposed Development is a considerable overestimation. • Up to 37,500 m² due to the reburial of up to 500 m of cable every 5 to 10 years, over the 25 year lifecycle. Only a smaller portion of this (7,500 m² will occur at any one time). Values for cable reburial requirements along the cable connection are not available, so this value of 37,500 m² for the entire Proposed Development is a considerable overestimation. **Decommissioning Phase** Temporary subtidal habitat loss and/or disturbance due to: • Footprint of affected seabed from removal of infrastructure (such as cables).	The MDS represents the maximum footprint which would be affected during the construction, operations and maintenance and decommissioning phases. **Construction phase** For cable installation, the MDS assumes a trench width of 15 m. The MDS assumes that the width of disturbance for sand wave clearance also includes subsequent burial. The total footprint of seabed affected has been calculated, for the purposes of the MDS, assuming a mound of uniform thickness of 0.5 m height. The MDS assumes temporary loss of benthic habitat is beneath this. **Operations and maintenance phase** The MDS for this impact includes the use of jack up vessels for maintenance of offshore infrastructure and cable repair and reburial. Reburial of up to 500 m of cable every 5 to 10 years in anticipated (assuming 15 m width of seabed disturbance). **Decommissioning phase** Parameters for decommissioning will be lower or equal to that of the construction phase as sand wave clearance will not be required in advance of cable removal. The MDS assumes that cable removal in the intertidal will involve open cut trenching and that all cables would be removed.
Increased SSCs and associated deposition (along	✓	×	✓	**Construction phase** <u>Sand wave clearance:</u>	**Construction phase** Boulder and debris clearance activities will not be required. The MDS assumes that sand wave clearance will be limited and that the

Potential impact	Phase C	O	D	Project Design Parameters	Justification
cable connection only)				• A channel cleared through a length of 115 m of sand waves, with a width of 10 m and height of 3 m, using a max flow excavator • Dredging at 1,000 m channel at West Hoyle Bank for the installation of subsea power cables between the PoA terminal and the new Douglas platform. A dredged channel with a length of 1,000 m, width of 21 m, and height of 7 m is to be excavated using a backhoe dredger. Subsea power cable installation • Installation of up to 126.04 km of subsea power cables, with a trench width of 15 m and a depth of at least 2 m. This includes 1,200 m of cable within the intertidal zone (between MHWS and MLWS). **Decommissioning Phase** Increased SSCs and associated deposition due to: • Removal of up to 126.04 km of cables and 121.77 km pipelines (up to 1,200 m within the intertidal zone).	volume of material to be cleared from individual sand waves will vary according to the local dimensions of the sand wave (height, length and shape) and the level to which the sand wave must be reduced. Cable routes inevitably include a variety of seabed material and in some areas, 2 m depth may not be achieved or may be of a coarser nature which settles in the vicinity of the cable route. The assessment therefore considers the upper bound in terms of suspended sediment and dispersion potential. Cables are proposed to be buried by ploughing. The use of open trenching in the intertidal area releases the greatest volume of material into the water column and therefore provides the upper bound of impacts as compared with Horizontal Directional Drilling (HDD) installation. **Decommissioning phase** The removal of cables may be undertaken using similar techniques to those employed during installation, therefore the potential increases in SSC and deposition would be in line with the construction phase.
Increased temperature impacting benthic communities (along pipeline only)	×	✓	×	**Operation and Maintenance Phase** Subsea power cables: • Installation of up to 1,200 m of subsea power cables with a voltage of 33 kV, at a target depth of 2 to 3 m within the intertidal zone (between MHWS and MLWS). Subsea gas pipelines for CO_2 transport • Utilisation of up to 1,200 m of existing subsea gas pipelines within the intertidal zone for the transportation of liquid CO_2, which will be transported at a maximum temperature of up to 50 ºC and pressure of up to 72.3 bara. • These pipelines are buried at a target depth of 2 to 3 m.	The MDS is based on the maximum length of subsea gas pipelines and power cables.

Potential impact	Phase			Project Design Parameters	Justification
	C	O	D		
Impacts resulting from the release of sediment bound contaminants (along cable connection only)	✓	×	✓	**Construction Phase** The MDS is as described above for increased SSCs and associated deposition during the construction phase. **Decommissioning Phase** The MDS is as described above for increased SSCs and associated deposition during the decommissioning phase.	**Construction and Decommissioning Phases** The MDS for this impact is the same as presented for 'Increased SSC and associated deposition above', as the MDS of the latter results in the release of the largest volume of sediment and its associated contaminants.

Embedded mitigation measures

A number of embedded mitigation measures (primary and tertiary) have been adopted as part of Proposed Development to reduce the potential for impacts on Annex I habitats and habitats of qualifying features (Table 1.5). As there is a secured commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development. Therefore, these measures have been considered in the assessment of significance, presented in section 1.6.3 and 1.6.4. This means that the determination of AEoI assumes implementation of these measures.

Table 1.5: Embedded Mitigation Measures Adopted As A Part Of The Proposed Development Relevant To Annex I Habitats And Habitats Of Qualifying Species

Embedded Mitigation	Justification
Primary Mitigation: Measures Embedded into the Project Design	
Development of, and adherence to, a Cable Specification and Installation Plan (CSIP) which will include cable burial where possible and cable protection, as necessary.	The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in advance of CSIP submission. The CSIP will include a detailed Cable Burial Risk Assessment (CBRA) to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. Measures will seek to reduce the amount of Electromagnetic Fields (EMF) which benthic and fish and shellfish receptors are exposed to during the operations and maintenance phase by increasing the distance between the seabed surface and the surface of the cables.
Tertiary Mitigation: Measures Required to meet Legislative Requirements, or Adopted Standard Industry Practice	
Development of, and adherence to, a Construction Method Statement (CMS).	This measure will confirm the actual methodology that will be employed to construct the Proposed Development, provide details on aspects of the methodology not known at the application stage and confirm that the methodology falls within the parameters assessment in the ES.
Development of, and adherence to, an Environmental Management Plan (EMP), including actions to minimise Invasive Non-native Species (INNS), and a Marine Pollution Contingency Plan (MPCP) which will include planning for accidental spills, address all potential contaminant releases and include key emergency details.	The EMP will outline measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines. These measures will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as specific measures to be adopted in the event that a high alert species is recorded (e.g. carpet sea squirt *Didemnum vexillum*). Measures will also be adopted to ensure that the potential for release of pollutants from construction, operations and maintenance and decommissioning is reduced so far as reasonably practicable. These will likely include designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and tanks containing hazardous substances, and storage of these substances in impenetrable bunds.
Actions to minimise INNS, including a biosecurity plan to limit spread and introduction of INNS	These measures will aim to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable to best protect the biological integrity of the local natural environment and communities.
Development of, and adherence to, a Decommissioning Plan	The aim of this plan is to adhere to the relevant UK and international legislation and guidance in place at the time, with decommissioning industry practice applied to reduce the amount of long termdisturbance to the environment so far as reasonably practicable.

Temporary habitat loss/disturbance (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction, operations and maintenance and decommissioning phases, LSE could not be ruled out for the potential impact of temporary habitat loss and disturbance along the cable connection only. This relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - mudflats and sandflats not covered by seawater at low tide;
  - Salicornia and other annuals colonizing mud and sand;
  - Atlantic salt meadows; and
  - estuaries.

Temporary habitat loss and/or disturbance of intertidal habitats will occur during the construction, operations and maintenance, and decommissioning phases of the Proposed Development. A footprint of up to 39,000 m^2 of temporary habitat loss and/or disturbance may occur during the construction phase. As outlined in the MDS (Table 1.4) the installation of 1,200 m of subsea power cables within the intertidal area, via ploughing or cable trenching techniques, may result in temporary habitat loss and/or disturbance. The MDS assumes a trench width of 15 m. If using the cable trenching machine (which represents the worst-case scenario) and in the absence of any additional mitigation, an area of approximately 18,000 m^2 (1.8 ha) would be impacted. This includes the area of sediment directly disturbed by the installation of the cable and the area of sediment potentially compacted under the tracks of the machine. Sediment disturbed during the installation will be backfilled by the machine, subsequent infilling from deposited suspended sediments, as well as natural deposition, so disturbance would be temporary and localised.

Temporary disturbance to the Annex I habitat mudflats and sandflats not covered by seawater at low tide may also arise as a result of the movement of machinery, equipment, vehicles and personnel. These activities are likely to result in surface level abrasion and disturbance or compaction of sediments. The area of sediment potentially compacted under the tracks of the cable trenching machine is included within the 18,000 m^2 above. This includes the area of sediment directly disturbed by the installation of the cable and the area of sediment potentially crushed under the tracks of the machine. Based on this information, the area of habitat within the Eni Development Area with the potential to be temporarily disturbed is expected to be 18.40% of the total intertidal mudflats and sandflats habitat area, although only 0.017% of the extent of the Annex I mudflats and sandflats habitat within the Dee Estuary/Aber Dyfrdwy SAC.

Subsea power cable remedial burial may also contribute up to 37,500 m^2 of temporary habitat loss/disturbance during the 25 year operation and maintenance phase. This value accounts for up to reburial of up to 500 m of cable in one event every 5 to 10 years (assuming 15 m width seabed disturbance). Only a small proportion (7,500 m^2) of the total temporary habitat loss and/or disturbance is likely to occur at any one time, with the MDS for this impact spread over the 25 year lifetime of the Proposed Development. Therefore, individual maintenance activities will be small scale and intermittent events. The MDS also includes up to 34,500 m^2 of temporary habitat loss due to the footprints of jack up vessels for maintenance activities over the 25 year lifetime. However, both values are for the entire Proposed Development, as operation and maintenance requirements within the intertidal zone along the cable connection are not available. Therefore, these values of 37,500 m^2 and 34,500 m^2 are considerable overestimations of the temporary habitat loss and/or disturbance along the cable connection.

RPS (2019) reviewed the effects of cable installation on subtidal sediments and habitats, drawing on monitoring reports from over 20 UK offshore wind farms. Sandy sediments were shown to recover quickly following cable installation, with little or no evidence of disturbance in the years following cable installation. It also presented evidence that remnant cable trenches in coarse and mixed sediments were conspicuous for several years after installation. However, these shallow depressions were of limited depth (i.e. tens of centimetres) relative to the surrounding seabed, over a horizontal distance of several metres and therefore did not represent a large shift from the baseline environment (RPS, 2019). Remnant trenches (and anchor drag marks) were observed years following cable installation within areas of muddy sand sediments, although these were relatively shallow features (i.e. a few tens of centimetres).

Dredging will be undertaken at West Hoyle Bank, which is a sandbank situated off the coast of the PoA, to install subsea power cables between the new Douglas platform and the PoA terminal. This will require dredging a channel (most likely with the backhoe dredger) approximately 1,000 m in length, 21 m in width, and 7 m in depth (~3m to take bank down to LAT, then ~3m depth for cable burial). The excavated material will be side cast along the length of the trench, and then backfilled after cable installation. It would take approximately two to three weeks to excavate the trench. Even if the cable was routed further to the east of West Hoyle Bank, the water remains extremely shallow. It will, therefore, still require pre-lay dredging to allow for a self-beaching cable lay vessel to ground itself at low tide on a ‘flat’ area of sandbank. It would take approximately four to seven days to excavate the area depending on dredging technique applied. In total, dredging at West Hoyle Bank will result in 21,000 m^2 of disturbance. Physical processes modelling demonstrated that much of the material is deposited along the dredge path itself, supporting the fact the sediment will remain within the sediment cell and minimising loss to West Hoyle Bank. Taking into account the eastward migration of the existing channel through West Hoyle Bank, it is recommended as a mitigating measure that the placement of dredged material directly to the west of seabed preparation operations would aid in the recovery of morphological features, and further encourage the feature to naturally infill. The temporary change to the morphology of West Hoyle Bank will have minimal impact on the feature’s ability to act as a natural breakwater for waves propagating towards the Dee Estuary/Aber Dyfrdwy SAC. Given the location and orientation of the channel, cutting through the middle of the bank from its southern face to its northern face, there will be no change to the waves breaking on the west of the sand bank.

Increased SSCs and associated deposition (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact of increased SSCs and associated deposition along the cable connection only. This relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - Mudflats and sandflats not covered by seawater at low tide;
  - Salicornia and other annuals colonizing mud and sand; and
  - Atlantic salt meadows.

Increased SSCs and sediment deposition from construction and decommissioning activities related to cable installation may potentially result in indirect impacts on the benthic habitats and communities. The aspect of the construction phase which may result in the increase of SSC is installation of up to 126.04 km of power cables between platforms and the onshore terminal PoA (this includes 1,200 m of cable within the intertidal zone and Dee Estuary SAC).

For the PoA Terminal to Douglas cable, during peak concentrations over the course of trenching, the plume may extend up to 15 km to the west, however, it reaches background levels (<1 mg/l) at approximately 1 km from the cable trenching. Average SSC values were greatest around the cable route, particular over the shallow waters of West Hoyle Bank, where they may reach 1,000 mg/l in the shallowest water but are quickly reduced to background levels a short distance from the cable path. Average sedimentation was greatest at the location of the trenching and may be up to 160 mm in depth where the coarser material has settled within close proximity to the cable path. An analysis of sedimentation at slack water one day after the cessation of trenching, shows that some of the previously sedimented material has been re-suspended, only to settle again at slack water.

A large plume was also modelled for the trenching of the Douglas to Lennox platform cable. Average concentrations are <1,000 mg/l and are greatest in the direct vicinity of the cable path, and <10 mg/l at the extent of the Proposed Development benthic ecology study area. Average sedimentation is limited to <100 mm with peak values of 70 mm, however outside the area of project physical work, deposition is limited to negligible levels of <3 mm. Sedimentation one day after the cessation of trenching shows that fine sands and resuspended sediment settle during slack water. Overall, the largest SSC plumes are generated by cable installation activities given the magnitude of sediment disturbed and length of works. Due to the temporary nature and scale of cable laying works, combined with the cable laying works being located within a depositional area for sediment, any trenches will be quickly infilled over a short period of time. Furthermore, rapid recolonisation of disturbed sediment is expected within two years.

Based on this, disturbance due to increased SSCs and associated deposition is expected to affect only 0.017% of the extent of the Annex I mudflats and sandflats habitat within the Dee Estuary/Aber Dyfrdwy SAC. Further, it was noted in the physical processes assessment (volume 2, chapter 6) that the magnitude of impact upon West Hoyle Bank (not an Annex I habitat feature) and the Dee Estuary/Aber Dyfrdwy SAC IEF was considered to be low.

Increased temperature impacting benthic and marine communities (along pipeline only)

The assessment of LSE during the HRA screening process identified that during the operation and maintenance phase, LSE could not be ruled out for the potential impact of increased temperature impacting benthic and marine communities along the pipeline only. This relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - Mudflats and sandflats not covered by seawater at low tide; and
  - Estuaries.

There is potential for increased temperatures from the subsea pipeline and power cables to impact the immediate environment, in turn affecting the benthic species associated with the sediment. Natural gas currently flows into the PoA terminal from offshore production. As the natural gas reaches the foreshore pipeline, having travelled through the marine environment, it is at or near equilibrium with the sea temperature. With the Proposed Development, CO_2 will flow from the PoA terminal out through the foreshore pipeline to the Douglas Process OP. Compression at the PoA terminal could potentially increase the temperature of the gas. There will be up to 1,200 m of both pipelines and power cables within the intertidal zone and these subsea pipelines and power cables will be buried at a target depth of 2 to 3 m.

Soil and sand temperature modelling for the onshore pipeline has been conducted, the results of which are applicable to this impact (Wood, 2023). This study included onshore modelling alongside modelling in the intertidal zone at both high and low tide. It was therefore considered appropriate to represent the MDS for the offshore pipeline conditions, based on the modelled pipeline depth, water temperature, and external pipeline temperature. The results of this modelling concluded that pipeline temperature did not significantly impact sand temperature near the surface in either high or low tide conditions, due to the low thermal capacity of sand (Wood, 2023). Further, the presence of sea water at high tide resulted in a lower sand surface temperature, suggesting that the offshore pipeline would have similar results.

As presented in the ES for the Nord Stream 2 subsea gas pipeline, only unburied sections of the pipeline could create a difference in temperature between the pipeline and the surrounding seawater, of up to 0.5^{o}C (Ramboll, 2017). However, natural mixing of seawater ensures that the temperature will reach equilibrium with the surrounding water within 0.5 to 1 m after crossing the pipeline (Ramboll, 2017). The temperature of the subsea pipelines is expected to be lower than when the pipelines were used for natural gas transportation and impacts are predicted to be minimal. As such, it is anticipated that only deep burrowing species or sessile benthic species within centimetres from the pipelines could be impacted. However, due to the natural fluctuations in temperature throughout the year, it is also likely that benthic intertidal receptors will be tolerant to small temperature increases associated with this impact.

Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact resulting from the release of sediment bound benthic contaminants along the cable connection only. This relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - Mudflats and sandflats not covered by seawater at low tide;
  - Salicornia and other annuals colonizing mud and sand;
  - Atlantic salt meadows; and
  - Estuaries.

Seabed disturbances due to construction and decommissioning activities could potentially lead to the remobilisation of previously sediment bound contaminants which could impact the surrounding benthic communities. However, the assessment in the EIA, based on the site specific physical processes modelling, suggested that the nature of the construction activities is not likely to result in any remobilisation of previously sediment bound contaminants due to the already turbid and dynamic nature of the intertidal zone. Additionally, there were no sediment samples taken from the intertidal zone during the site specific benthic characterisation survey, and thus, there are no site specific sediment chemistry values available for the intertidal zone. It has been concluded that no assessment of the intertidal habitats and species is therefore required for this impact.

1.6.2.2 In-Combination with Other Plans and Projects

The other developments (projects/plans) that could result in in-combination effects associated with the Proposed Development on Annex I habitats of the designated sites identified have been summarised in Table 1.6 and shown in Figure 1.5. These projects and plans were identified using the in-combination effects assessment study area, which was informed by the Physical Processes study area (see volume 2, chapter 6 of the Offshore ES).

As outlined in the HRA Stage 1 Screening Report, where the potential for LSE has been concluded with respect to the Proposed Development alone, the potential for LSE has also been concluded in-combination. For impacts where LSE has been ruled out with respect to the Proposed Development alone, there is either no pathway to effect, or the Proposed Development would result in only negligible or inconsequential effects that would not contribute (even collectively) or materially to in-combination effects and therefore, no additional in-combination issues are identified.

On this basis, the potential impacts identified for assessment as part of the volume 2 chapter 7 of the Offshore ES, and which have been brought forward for consideration in the in-combination assessment of the Appropriate Assessment are:

- in-combination temporary habitat loss and/or disturbance (along cable connection only);
- in-combination increased suspended sediments and associated deposition (along cable connection only);
- in-combination increased temperature impacting benthic and marine communities (along pipeline only; and
- in-combination impacts resulting from the release of sediment bound benthic contaminants (along cable connection only).

Maximum design scenario

The design parameters identified in Table 1.7 have been selected as those having the potential to result in the greatest effect on Annex I habitats as a result of impacts in-combination with other plans and projects and therefore represent the MDS.

Table 1.6: List Of Other Projects And Plans With Potential For In-Combination Effects On Annex I Habitats

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
Tier 1						
Offshore Renewables						
Burbo Bank Extension Offshore Wind Farm (OWF) cable repair and remediation	Operational (with ongoing activities)	0.00	Export cable repair and remediation activities over the 25 year lifetime of the Burbo Bank Extension OWF.	N/a	2017–- 2042	These activities overlap spatially with the Proposed Development and temporally with the construction and operation and maintenance phases of the Proposed Development.
Awel y Môr OWF	Consented	1.10	Proposed renewable energy project, 10.50 km off the coast of North Wales, of up to 1.1 GW. Proposed for a maximum of 50 turbines, associated transmission assets, and cabling (including and interlink cable with Gwynt y Môr OWF).	2026 – 2030	2030 – 2055	This project will overlap with all three phases of the Proposed Development.
Mona OWF Suction Bucket Trails	Consented	5.60	The works proposed within this Marine Licence Application consist of trialling suction bucket foundations to assess the install viability within the Mona OWF Array Area, which is predominantly within Welsh waters.	2023 to June 2024	N/A	The suction bucket trials may overlap with early construction activities of the Proposed Development.

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
Deposits and Removal						
Burbo Bank Extension OWF Disposal Site IS153	Operational (with ongoing activities)	0.50	Deposit of substances at sea, construction works, removal of sediment, and disposal of inert material during drilling for the Burbo Bank Extension OWF.	N/a	2017–- 2042	These activities overlap with the construction and operation and maintenance phases of the Proposed Development.
Hilbre Swash	Operational (with ongoing activities)	0.00	Licence to extract up to 12 million tonnes of aggregate (mainly sand) over 15 years.	N/a	2015 – 2029	Aggregate extraction activities within this project will overlap temporally with the construction and operation and maintenance phases of the Proposed Development. This project also spatially overlaps with the Proposed Development.
Mostyn Energy Park Expansion	Submitted	2.30	Extension of the Mostyn Energy Park at the Port of Mostyn. Requires construction of a 360 m quay, reclamation of 3.5 ha area, capital dredging of new berth pockets and re-dredging of approach channel. Use of dredged material for fill material for reclamation, disposal of dredged material at Mostyn Deep. Maintenance dredging	2023 to 2025	2025 to 2030	Activities will overlap with the construction and operation and maintenance phases of the Proposed Development.

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
			of new and existing berths, approach channel and harbour area.			
Tier 2						
Offshore Renewables						
Mona OWF	Pre application	5.53	Proposed renewable energy project, 28.20 km off the coast of North Wales, of up to 350 MW.	2026–- 2028	2029–- 2089	This project will overlap with all three phases of the Proposed Development.
Cables and Pipelines						
Morgan and Morecambe OWF Transmission Assets	Pre application	3.00	The transmission assets for the Morgan and Morecambe OWF	2028–- 2029	2030–- 2065	This project will overlap with the operations and maintenance and decommissioning phases of the Proposed Development.
Tier 3						
Cables and Pipelines						
MaresConnect – Wales – Ireland Interconnector Cable	Planning application not yet submitted	30.00	A proposed 750 MW subsea and underground electricity interconnector system, linking the electricity grids in the UK and Ireland.	2025	2027–- 2037	This project will overlap with the construction and operations and maintenance phases of the Proposed Development.
Tier 4						
Offshore Renewables						

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
Removal of a meteorological mast at Gwynt y Môr OWF	Issued (variation to an existing marine licence)	0.00	A seabed survey and removal of topside lattice structures, monopiles, and scour protection.	N/a	Licence issued for 2022–- 2027	Although no information on the timeline of this project is available, the Marine License is issued for between 2022 and 2027. Therefore, this activity will overlap with the operations and maintenance phase of the Proposed Development. This project also spatially overlaps with the Proposed Development.

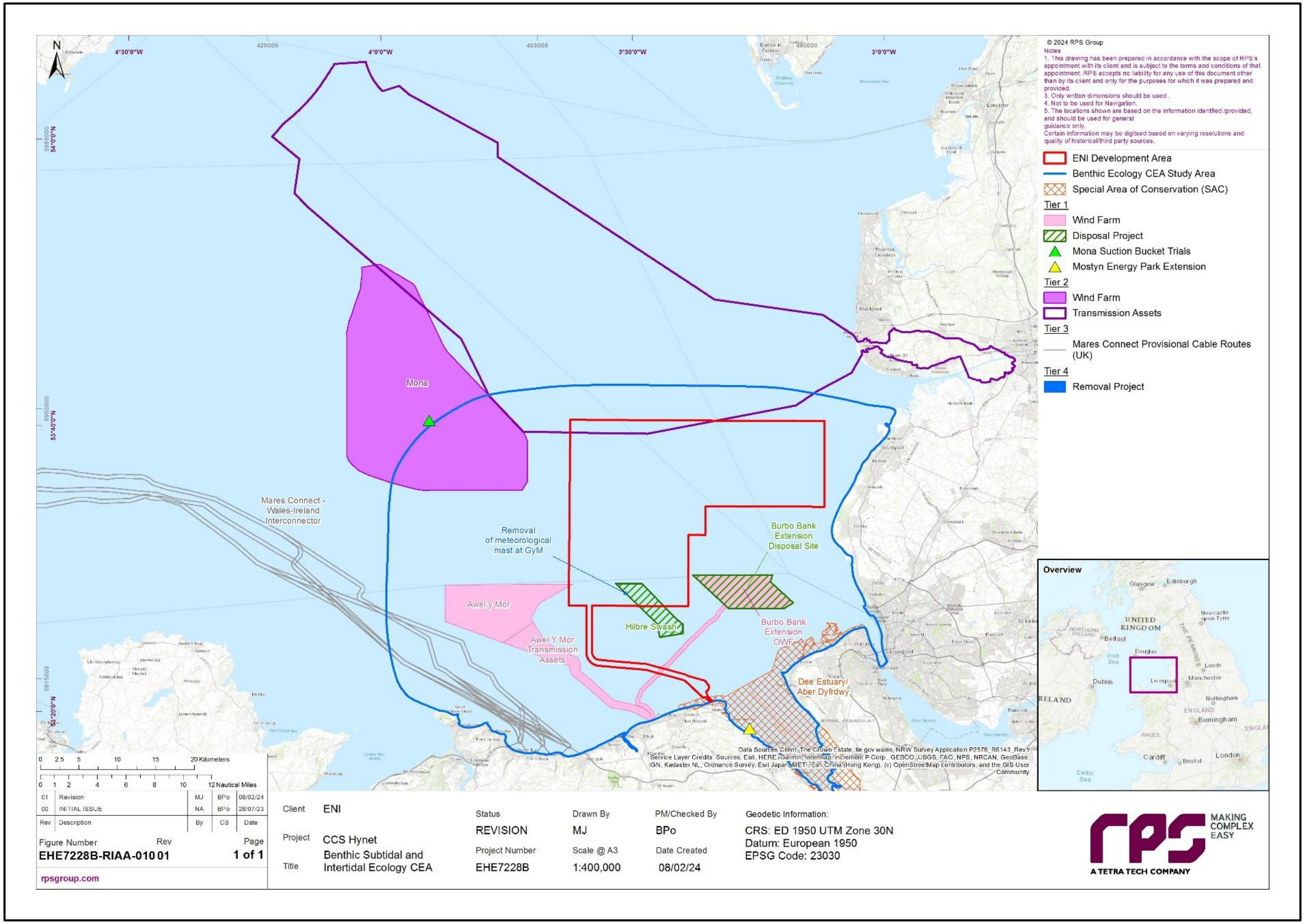

Figure 1.5: Location Of Other Projects And Plans Considered For In-Combination Effects On Sacs With Annex I Habitat Features

Table 1.7: Maximum Design Scenario Considered For The Assessment Of Impacts On Annex I Habitats In-Combination With Other Projects And Plans

Potential In-Combination Effect	Phase	MDS	Justification
Temporary subtidal habitat loss and/or disturbance (along cable connection only)	C	The MDS is as described for the Proposed Development alone (Table 1.4) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Deposits and Removal: • Mostyn Energy Park Expansion.	The projects and plans identified in the screening process (see section 1.5.5) may result in temporary subtidal habitat loss and/or disturbance within their own boundaries.
	O	There were no projects or plans identified with the potential to result in in-combination effects for temporary subtidal habitat loss and/or disturbance (along the cable connection only) during the operation and maintenance phase.	
	D	There were no projects or plans identified with the potential to result in in-combination effects for temporary subtidal habitat loss and/or disturbance (along the cable connection only) during the decommissioning phase.	
Increased SSCs and associated deposition (along cable connection only)	C	The MDS is as described for the Proposed Development alone (Table 1.4) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables: • Burbo Bank Extension OWF cable repair and remediation; • Awel y Môr OWF; and • Mona OWF Suction Bucket Trails. Deposits and Removal: • Burbo Bank Extension OWF Disposal Site IS153; • Mostyn Energy Park Expansion; and • Hilbre Swash. **Tier 2:** Offshore Renewables: • Mona OWF. **Tier 3:** Cables and Pipelines: • MaresConnect Wales – Ireland Interconnector Cable.	These projects involve activities which may impact the tidal/wave regime and sediment transport during their temporal overall with the Proposed Development.

Potential In-Combination Effect	Phase	MDS	Justification
		Tier 4: Offshore Renewables: • Removal of a meteorological mast at Gwynt y Môr OWF.	
	D	The MDS is as described for the Proposed Development alone (Table 1.4) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF. Cables and Pipelines: • Morgan and Morecambe OWF Transmission Assets.	
Increased temperature impacting benthic and marine communities (along pipeline only)	O	The MDS is as described for the Proposed Development alone (Table 1.4) and potential for in-combination effects were considered with the projects and plans outlined in Table 1.6 and Figure 1.5. There were no projects or plans identified with the potential to result in in-combination effects for increased temperature impacting benthic and marine communities (along the pipeline only).	None of the projects and plans will have pipelines or power cables within the Dee Estuary SAC (see Figure 1.5). Therefore, due to the highly localised nature of this potential impact and the static nature of Annex I habitats in the Dee Estuary SAC, no in-combination effects are anticipated for this impact.
Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)	C	The MDS is as described for the Proposed Development alone (Table 1.4) and potential for in-combination effects were considered with the projects and plans outlined in Table 1.6 and Figure 1.5. There were no projects or plans identified with the potential to result in in-combination effects for release of sediment bound contaminants (along the cable connection only).	None of the projects and plans identified in the screening process (see section 1.5.5) may result in the release of sediment bound contaminants within their own boundaries. Therefore, no in-combination effects are anticipated for this impact.
	D	As above for the construction phase.	

Temporary habitat loss/disturbance (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction, operation and maintenance, and decommissioning phases, LSE could not be ruled out for the potential impact of temporary habitat loss/disturbance along the cable connection only. The in-combination assessment for his impact relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - Mudflats and sandflats not covered by seawater at low tide;
  - *Salicornia* and other annuals colonizing mud and sand; and
  - Atlantic salt meadows.

Tier 1

In the construction phase of the Proposed Development, there was one Tier 1 project identified with a potential for in-combination effects: the Mostyn Energy Park Expansion. Given the lifetime and nature of this Tier 1 project, no in-combination effects were predicted for the operation and maintenance or decommissioning phases.

The Mostyn Energy Park Expansion is located within the Dee Estuary SAC (see Figure 1.5). Dredging activities associated with the Mostyn Energy Park Expansion have been estimated to result in temporary subtidal habitat loss of 3.16 ha (31,600 m^2), with recolonisation expected to occur over a short period of time (although any indication on this time period was not provided in the Environmental Statement for this project (ABPmer, 2022)).

Given the localised extent of this impact for the Tier 1 project, and that it doesn't overlap with the cable connection of the Proposed Development, any temporary habitat loss/disturbance is not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction phase.

Tier 2, 3, and 4

There were no Tier 2, 3 or 4 plans or projects identified with the potential to result in in-combination effects regarding temporary habitat loss/disturbance during any phases of the Proposed Development.

Increased SSCs and associated deposition (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact of increased SSCs and associated deposition along the cable connection only. The in-combination assessment for his impact relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - Mudflats and sandflats not covered by seawater at low tide;
  - *Salicornia* and other annuals colonizing mud and sand; and
  - Atlantic salt meadows.

Tier 1

In the construction phase of the Proposed Development, there were six Tier 1 projects identified with a potential for in-combination effects:

- Burbo Bank Extension OWF cable repair and remediation;
- Awel y Môr OWF;
- Mona OWF Suction Bucket Trials;

- Mostyn Energy Park Expansion;
- Hilbre Swash; and
- Burbo Bank Extension OWF Disposal Site IS153.

The potential for increased suspended sediment and associated deposition in-combination with these Tier 1 projects in the construction phase of the Proposed Development is presented in Table 1.8. All activities from the Tier 1 projects are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility.

The decommissioning phase of the Proposed Development coincides with operation and maintenance and decommissioning activities of the Awel y Môr OWF, such as cable maintenance, cable removal, and foundation removal. However, in the PEIR for Awel y Môr, this impact has been determined as localised within one tidal excursion, short term, intermittent, and reversible upon benthic receptors (RWE Renewables UK, 2021a). The Awel y Môr Offshore Wind Farm also involves the installation of an interlink cable with the Gywnt y Môr Offshore Wind Farm, with the magnitude of suspended sediments likely being of a similar magnitude to export cable installation. Thus, again it can be expected a cumulative effect that may arise would do so within the natural variability of background levels, and only occur if cable installation operations occurred simultaneously.

As part of the Mona Offshore Wind Farm application, a series of suction bucket foundation trials were consented to, to validate the suitability of foundation and optimise design. These works occur within the Mona Array Area at up to 30 locations, using a variety of parameters to best inform final design. At each location, the trial may be undertaken up to 3 times and once all activities at the site are complete the full removal of foundation would occur before moving to the next location to repeat (MarineSpace Ltd., 2023). Although the trials of foundation installation and subsequent removal may mobilise sediment within the Mona Array Area, the small scale nature associated with the installation/removal of one foundation at a time would be expected to produce a small plume with much of the sediment suspended settling in the vicinity of the structures. This, paired with the fact that the Mona Array Area is largely advected on tidal currents and situated approximately 5.60 km north-west of the Eni Development Area (at its closest point), indicate that if an overlap in SSC or deposition did occur between the projects, that it would do so at background levels. The Mona OWF suction bucket trials have only been assessed for this impact, as the WFD Compliance Assessment concluded that an assessment on ecological impacts was not required, given the low potential for impact.

The construction phase of the Proposed Development is expected to coincide with the construction and operation and maintenance phases of the Mostyn Energy Park Extension and associated maintenance dredging activities. This development, within the Dee Estuary, involves the construction of a 360 m length of new quay wall, the infilling of a 3.5 ha area behind the new quay wall (requiring 600,000 m^3 of infill material, 500,000 m^3 of which will be sourced from dredging activity arisings) (ABPmer, 2022). Alongside the new quay wall a dredged berth pocket will be required to a depth of -11 m (400,000 m^3), whilst re-dredging of the existing berth pocket along the existing quay wall to -9 m will be required (400,000 m^3) (ABPmer, 2022). The largest dredging operation will take the form of the re-dredging of the main navigation channel to a depth of -4 m (3,000,000 m^3) (ABPmer, 2022). Both seabed preparation and cable installation activities produce SSC plumes that extend into the Dee Estuary and overlap with the location of construction activities and dredging at the Port of Mostyn Energy Park Expansion, however, they do so at background levels i.e., < 3 mg/l. It can therefore be judged that although a cumulative impact may arise, the change in SSC would be of negligible significance and recoverable.

The largest overlap in SSC would occur if the disposal of dredged material within the Mostyn Deep disposal site occurred simultaneously with cable installation activities or seabed preparation across West Hoyle Bank, however even in this case, overlapping plumes in the vicinity of West Hoyle Bank and within the Dee Estuary would be of limited magnitude due to the decreases in SSC and deposition observed with distance from respective works. Noting also that sediment plumes would be traversing in parallel and not towards one another as they are advected on the same tidal current. Maximum SSC values in the area of overlap can be up to 100 mg/l for both plumes combined, however, the more representative average plumes are expected to have SSC values of negligible difference to background levels when they coincide. Likewise, sedimentation over the bank can be considered minor and the overall cumulative impact between the disposal of dredged material and the Proposed Development can be considered to be negligible, of local extent and short-term duration. The cumulative impact relating to overlap between operation and maintenance activities from the Mostyn Energy Park Extension and construction activities related to the Proposed Development are expected to be of a similar magnitude to the dredging/disposal activities described above, only of a smaller scale in line with reduced dredge volumes associated with maintenance works rather than construction works.

Given the localised extent of this impact for the Tier 1 projects, and that none overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases.

Table 1.8: Increased Suspended Sediment And Associated Deposition From Tier 1 Projects In The Construction Phase Of The Proposed Development

Project	Increased Suspended Sediment and Associated Deposition During the Construction Phase of the Proposed Development	Source
Proposed Development	The site specific modelling showed that the maximum SSC over the course of the cable trenching phase may result in the plume extending up to 15 km to the west and that the suspended sediments may reach into the Dee Estuary during cable trenching from PoA to Douglas, but generally do so at background levels (i.e. 30 mg/l).	Volume 2 chapter 7 of the Offshore ES
Burbo Bank Extension OWF cable repair and remediation	This only involves intermittent maintenance and disposal work, therefore will be of limited spatial extent, short term, intermittent, and reversible upon benthic receptors	
Burbo Bank Extension OWF Disposal Site IS153		
Hilbre Swash	Resultant plumes from the disposal of dredged material and extraction of aggregate would be advected on the tidal current running in parallel and not coincide with the Proposed Development.	
Awel y Môr OWF	In the Preliminary Environmental Information Report (PEIR) for Awel y Môr, this impact has been determined as localised within one tidal excursion, short term, intermittent, and reversible upon benthic receptors	RWE Renewables UK (2021a)
Mona Suction Bucket Trials	Although the trials of foundation installation and subsequent removal may mobilise sediment within the Mona Array Area, the small scale nature associated with the installation/removal of one foundation at a time would be expected to produce a small plume with much of the sediment suspended settling in the vicinity of the structures.	MarineSpace Ltd. (2023)
Mostyn Energy Park Expansion	Both seabed preparation and cable installation activities produce SSC plumes that extend into the Dee Estuary and overlap with the location of construction activities and dredging at the Port of Mostyn Energy Park Expansion, however, they do so at background levels i.e., < 3 mg/l. It can therefore be judged that although a cumulative impact may arise, the change in SSC would be of negligible significance and recoverable.	ABPmer (2022)

Tier 2

There is the potential for in-combination effects with one Tier 2 project in the construction phase: Mona OWF. For the Mona OWF, modelling suggested that average SSCs during the course of the construction activities was expected to be <300 mg/l with a plume envelope width of approximately 20 km, which corresponds to the local tidal excursion (Mona Offshore Wind Ltd, 2023a). Sediments deposited on slack tide in the north-east of the Mona Array Area are expected to be resuspended on subsequent tides. Typically, this plume concentration will be <10 mg/l, and this reduces as distance from the site increases due to natural sediment dispersal. Three days after installation of foundations, sediment concentrations are expected to reduce, with sedimentation and resuspension occurring dependent on the current speed and tidal cycle. Peak concentrations in a resuspension event at this point are likely to reach a maximum of <30mg/l, compared to average concentrations of a maximum of 3mg/l in the area normally (Mona Offshore Wind Ltd, 2023a). As described, the increased SSCs from construction activities at the Mona OWF would be of limited spatial extent and intermittent in frequency and unlikely to interact with sediment plumes from the Proposed Development. Given the localised extent of this impact for the Mona OWF, and that it does not overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction phase.

There is potential for in-combination impacts with two Tier 2 projects in the decommissioning phase: Mona OWF and the Morgan and Morecambe OWF Transmission Assets. The decommissioning phase of the Proposed Development will coincide with the operations and maintenance phases of these two Tier 2 projects. During their operations and maintenance phases, cable repair and reburial has the potential to result in increased SSCs. At the time of writing, there was no publicly available information to quantify this impact at the Morgan and Morecambe OWF Transmission Assets. As the Transmission Assets only involve cables, it is likely that sedimentation will be of a lower extent to that of the Mona OWF. These activities would be of limited spatial extent, intermittent in frequency, and unlikely to interact with sediment plumes from the Proposed Development.

Given the localised extent of this impact for the Tier 2 projects, and that none overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases.

Tier 3

There is the potential for in-combination effects with one Tier 3 project in the construction phase of the Proposed Development: The MaresConnect interconnector cable. There is, however, currently no information available regarding the potential impact that the MaresConnect interconnector cable will have on benthic receptors. A planning application is predicted to be submitted in 2024 which will identify and assess these impacts (Maresconnect, 2023).

The activities associated with the MaresConnect interconnector cable which are likely to result in increased SSCs and associated deposition are similar to those expected for the installation of cables for the Proposed Development. Construction is planned to occur in 2025 and the project is anticipated to become operational in 2027 (Maresconnect, 2023), although it should be noted that these timeframes are only indicative at this stage. The construction activities are likely to involve cable installation such as jet trenching, and the installation of cable protection.

Given the localised extent of this impact for the Tier 3 project, and that there is no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction phase.

There were no Tier 3 plans, projects, or activities identified with the potential to contribute to the in-combination effects as a result of increased SSCs and associated deposition during the decommissioning phase of the Proposed Development.

Tier 4

The only Tier 4 project which has been identified with the potential for in-combination effects during the construction phase of the Proposed Development was the removal of a meteorological mast at Gwynt y Môr OWF. There is, however, currently no information available on the potential impact that this project will have on benthic ecology receptors.

The activities associated with this project which are likely to result in increased SSCs and associated deposition are anchoring and the use of jack up vessels for the removal of topside lattice structures, monopiles, and scour protection. There is no timeline for these works currently publicly available, however the marine license was issued for 2022 to 2027. Therefore, while these activities may overlap with the entire construction phase of the Proposed Development, they should be completed shortly after the operation and maintenance phase of the Proposed Development begins (within 2026).

Given the localised extent of this impact for the Tier 4 project, and that there is no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction phase.

There were no Tier 4 plans, projects, or activities identified with the potential to contribute to the in-combination effects as a result of increased SSCs and associated deposition during the decommissioning phase of the Proposed Development.

Increased temperature impacting benthic and marine communities (along pipeline only)

There were no plans or projects identified with the potential to result in in-combination effects regarding increased temperature for any Tiers.

Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)

There were no plans or projects identified with the potential to result in in-combination effects regarding the release of sediment bound contaminants for any Tiers.

1.6.3 Assessment of adverse effects alone

1.6.3.1 Dee Estuary SAC

The Proposed Development overlaps with 0.21 km^2 of the Dee Estuary SAC, corresponding to 0.13% of the SAC's total area. As presented in Figure 1.4, the cable corridor and pipeline overlap only with one designated Annex I feature, mudflats and sandflats not covered by seawater at low tide. As such, the assessment of AEoI of this SAC for impacts that will result in localised effects, (e.g. temporary habitat loss/disturbance as well as increased temperature impacting benthic and marine communities will consider only this qualifying feature).

The function of the Dee Estuary SAC is to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the favourable conservation status of its qualifying features, by maintaining or restoring:

- Conservation objective 1 - The extent and distribution of qualifying natural habitats and habitats of qualifying species.
- Conservation objective 2 - The structure and function (including typical species) of qualifying natural habitats.
- Conservation objective 3 - The structure and function of the habitats of qualifying species.
- Conservation objective 4 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

Given that conservation objectives 2, 3 and 4 consider the structure, function of natural habitat and qualifying habitats as well as supporting processes on which these habitats rely, these objectives will be considered in the assessment together. Supporting habitats of qualifying species refer to natural processes as outlined in Natural England and Countryside Council for Wales (2010), for example processes that could lead to sediment accumulation and subsequently alter channel morphology.

Table 1.9 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.75.

Table 1.9: Impacts Considered For Each Conservation Objective (✓ Indicates That There Is A Potential For Impact To Affect The Conservation Objective And × Indicates That There Is No Pathway Through Which The Impact Could Undermine Conservation Objective)

Impact	Conservation Objectives	
	1	2, 3, 4
Temporary habitat loss/disturbance	✓	✓
Increased SSCs and associated deposition	✓	✓
Increased temperature impacting benthic and marine communities	✓	✓
Impacts resulting from the release of sediment bound benthic contaminants	✓	✓

Table 1.10 presents the assessment of AEoI of the Dee Estuary SAC with respect to qualifying Annex I habitats as well as natural habitats of qualifying species. The assessment was informed by detailed operations advice for the Dee Estuary SAC interest features published by Natural England and Countryside Council for Wales (Natural England and Countryside Council for Wales, 2010).

Table 1.10: Assessment Of AEOI Of The Dee Estuary SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - the extent and distribution of qualifying natural habitats and habitats of qualifying species					
Temporary habitat loss/disturbance (along cable connection only)	✓	✓	✓	As presented in section 1.6.2.1, subsea cable installation may result in up to 39,000 m^2 and 72,000 m^2 of temporary habitat loss and/or disturbance in the construction and operations and maintenance phases, respectively. The extent of temporary habitat loss and/or disturbance during decommissioning phase will be significantly lower than that of the construction phase due to the absence of seabed preparation activities. The Proposed Development overlaps only with 0.21 km^2 of the Dee Estuary SAC, corresponding to 0.13% of the SAC's total area. As such, habitats of qualifying species (e.g. habitats of prey species) within the site would be only temporarily affected over a small spatial scale. This impact is therefore highly unlikely to adversely affect natural processes within the estuarine environment. The total extent of mudflats and sandflats not covered by the seawater at low tide within the Dee Estuary SAC is 104.06 km^2, as such temporary habitat loss and disturbance could potentially impact only 0.2% of the extent of this habitat within the SAC. Natural England and Countryside Council for Wales (2010) marked intertidal mudflats and sandflats as vulnerable to physical loss (removal) and damage (abrasion). Considering the small spatial extent of cable activities, it can be anticipated that this pressure will not alter the total extent of mudflat and sandflat communities nor the abundance of typical species within the site. The temporary habitat loss/disturbance associated with offshore export cable during all phases of the Proposed Development will be temporary, of short term duration and reversible. As such, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objective 1 of the Dee Estuary SAC will not occur as a result of impacts resulting from the temporary habitat and disturbance.
Increased SSCs and associated deposition (along cable connection only)	✓	×	✓	Sand waves are to be cleared along the cable route in two locations, south of the existing Douglas platforms, and at West Hoyle Bank, however this will happen at significant distance from the Dee Estuary SAC and therefore will not affect the SAC. As mentioned in section 1.6.2.1, trenching during cable installation and decommissioning may result in the plume extending up to 15 km to the west and that the suspended sediments may reach into the estuary, but suspended sediments are expected to be within the background levels, (i.e. 30 mg/l). This impact is therefore highly unlikely to adversely affect natural processes within the estuarine environment. Natural England and Countryside Council for Wales (2010) marked intertidal mudflats and sandflats as vulnerable to siltation and changes to turbidity. However, given that the sediment plumes resulting from activities along the cable route will stay within background levels of the naturally turbid system of the Dee Estuary, it can be anticipated that this	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objective 1 of the Dee Estuary SAC will not occur as a result of impacts resulting from the temporary habitat and disturbance.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				pressure will not alter the total extent of mudflat and sandflat communities nor the abundance of typical species within the site. Salicornia and other annuals colonizing mud and sand and Atlantic salt meadows are located approximately 1.78 km and 2.21 km from the Proposed Development (Figure 1.4). These qualifying Annex I habitats are not sensitive to sediment plumes as well as associated changes in turbidity and siltation (BSH, 2012, Doody, 2008, Hough *et al.*, 1999a, Natural England and Countryside Council for Wales, 2010). As such, the extent of pioneer saltmarsh and Atlantic salt meadow vegetation communities as well as the abundance of typical and notable species of both vegetation communities within the site is unlikely to be affected. Given the sensitivity and location of Annex I features within the SAC, as well as the negligible magnitude and short term nature of any increases in SSCs, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide, Salicornia and other annuals colonizing mud and sand and Atlantic salt meadows.	
Increased temperature impacting benthic and marine communities (along pipeline only)	×	✓	×	As presented in section 1.6.2.1, although minimal increase in water temperature around the unburied pipeline is likely, natural mixing of seawater ensures that the temperature will reach equilibrium with the surrounding water within 0.5 to 1 m after crossing the pipeline (Ramboll, 2017). Further, the sand temperature study included modelling in the intertidal zone at both high and low tide (Wood, 2023). The results concluded that pipeline temperature did not significantly impact sand temperature near the surface in either high or low tide conditions, due to the low thermal capacity of sand (Wood, 2023). It is anticipated that due to the natural fluctuations in temperature throughout the year benthic receptors will be tolerant to small temperature increases associated with this impact. The temperature of the subsea pipelines will be lower than when the pipelines were used for natural gas transportation during hydrocarbon extraction as a part of the previous project which used the same pipelines. Intertidal mudflats and sandflats were not recognised as vulnerable to changes in thermal regime (Natural England and Countryside Council for Wales, 2010). This impact is highly unlikely to adversely affect natural processes within the estuarine environment. Given potential for very narrow footprint of temperature increases as a result of pipeline operation as well as natural temperature fluctuations, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objective 1 of the Dee Estuary SAC will not occur as a result of impacts resulting from the increased temperature impacting benthic and marine communities
Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)	✓	×	✓	As presented in section 1.6.2.1, the nature of the construction and decommissioning activities is not likely to result in any remobilisation of previously sediment bound contaminants due to the already turbid and dynamic nature of the intertidal zone. As such, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by seawater at low tide,	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objective 1 of the Dee Estuary SAC will not occur

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows; and estuaries.	as a result of impacts resulting from the release of sediment bound benthic contaminants
Conservation objective 2 - The structure and function (including typical species) of qualifying natural habitats **Conservation objective 3 - The structure and function of the habitats of qualifying species** **Conservation objective 4 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely**					
Temporary habitat loss/disturbance (along cable connection only)	✓	✓	✓	As presented in section 1.6.2.1, subsea cable installation may result in up to 39,000 m^2 and 72,000 m^2 of temporary habitat loss and/or disturbance in the construction and operations and maintenance phases, respectively. The extent of temporary habitat loss and/or disturbance during decommissioning phase will be significantly lower than that of the construction phase due to the absence of seabed preparation activities. The Proposed Development overlaps only with 0.21 km^2 of the Dee Estuary SAC, corresponding to 0.13% of the SAC's total area. As such, habitats of qualifying species (e.g. habitats of prey species) within the site would be only temporarily affected over a small spatial scale. This impact is therefore highly unlikely to adversely affect natural processes within the estuarine environment. The total extent of mudflats and sandflats not covered by the seawater at low tide within the Dee Estuary SAC is 104.06 km^2, as such temporary habitat loss and disturbance could potentially impact only 0.2% of the extent of this habitat within the SAC. Natural England and Countryside Council for Wales (2010) marked intertidal mudflats and sandflats as vulnerable to physical loss (removal) and damage (abrasion). The temporary habitat loss/disturbance associated with offshore export cable during all phases of the Proposed Development will be temporary, of short term duration and reversible. As such this pressure is not expected to adversely affect the structure and function of mudflats and sandflats not covered by the seawater at low tide as well as habitats of qualifying species nor impact the physical processes on which aforementioned habitats rely.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objectives 2, 3 and 4 of the Dee Estuary SAC will not occur as a result of impacts resulting from the temporary habitat and disturbance.
Increased SSCs and associated deposition (along cable connection only)	✓	×	✓	Sand waves are to be cleared along the cable route in two locations within the Proposed Development, however, this will happen at significant distance from the Dee Estuary SAC and will not affect the SAC. As mentioned in section 1.6.2.1, trenching during cable installation and decommissioning may result in the plume extending up to 15 km to the west and that the suspended sediments may reach into the estuary, but suspended sediments are expected to be within the background levels, (i.e. 30 mg/l). As such, cable trenching activities will not result in changes in sediment character that would affect physical processes acting on the structure of qualifying features and habitats of qualifying species. Natural England and Countryside Council for Wales (2010) marked intertidal mudflats and sandflats as vulnerable to siltation and changes to turbidity. However, given that the	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objectives 2, 3 and 4 of the Dee Estuary SAC will not occur as a result of impacts resulting from the increased

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				sediment plumes resulting from activities along the cable route will stay within background levels of the naturally turbid system of the Dee Estuary, this pressure is unlikely to influence the proportion of individual mudflat and sandflat communities or the topography of the intertidal flats and dynamic processes across the flats. Salicornia and other annuals colonizing mud and sand and Atlantic salt meadows are located approximately 1.78 km and 2.21 km from the Proposed Development (Figure 1.4). These qualifying Annex I habitats are not sensitive to sediment plumes as well as associated changes in turbidity and siltation (BSH, 2012, Hough *et al.*, 1999b). As such, the extent of pioneer saltmarsh and Atlantic salt meadow vegetation communities as well as the abundance of typical and notable species of both vegetation communities within the site is unlikely to be affected. Given the distance from the Proposed Development, abundance of typical species of characteristic pioneer marsh communities as well as zonation of saltmarsh and Atlantic salt meadow communities is unlikely to deviate from baseline conditions. Sediment plumes resulting from trenching activities will not result in a significant variation in water quality (e.g. turbidity, dissolved oxygen levels) that could affect habitats of qualifying species. Considering the sensitivity and location of Annex I features within the SAC, as well as the negligible magnitude and short term nature of any increases in SSCs, this pressure is not expected to adversely affect the structure and function of mudflats and sandflats not covered by the seawater at low tide, Salicornia and other annuals colonizing mud and sand and Atlantic salt meadows as well as habitats of qualifying species nor impact the physical processes on which aforementioned habitats rely.	SSCs and associated deposition.
Increased temperature impacting benthic and marine communities (along pipeline only)	×	✓	×	As presented in section 1.6.2.1, although minimal increase in water temperature around the unburied pipeline is likely, natural mixing of seawater ensures that the temperature will reach equilibrium with the surrounding water within 0.5 to 1 m after crossing the pipeline (Ramboll, 2017). Further, the sand temperature study included modelling in the intertidal zone at both high and low tide (Wood, 2023). The results concluded that pipeline temperature did not significantly impact sand temperature near the surface in either high or low tide conditions, due to the low thermal capacity of sand (Wood, 2023). It is anticipated that due to the natural fluctuations in temperature throughout the year benthic receptors will be tolerant to small temperature increases associated with this impact. The temperature of the subsea pipelines will be lower than when the pipelines were used for natural gas transportation during hydrocarbon extraction as a part of the previous project which used the same pipelines. Intertidal mudflats and sandflats were not recognised as vulnerable to changes in thermal regime (Natural England and Countryside Council for Wales, 2010). Temperature increase around the pipeline will not result in a significant variation in water quality that could affect habitats of qualifying species. This impact is highly unlikely to adversely affect natural processes within the estuarine environment.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objectives 2, 3 and 4 of the Dee Estuary SAC will not occur as a result of impacts resulting from the increased temperature impacting benthic and marine communities.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Given the potential for a very narrow footprint of temperature increases as a result of pipeline operation as well as natural temperature fluctuations, this pressure is not expected to adversely affect the structure and function of mudflats and sandflats not covered by the seawater at low tide as well as habitats of qualifying species nor impact the physical processes on which aforementioned habitats rely.	
Impacts resulting from the release of sediment bound benthic contaminants (along cable connection only)	✓	×	✓	As presented in section 1.6.2.1, the nature of the construction and decommissioning activities is not likely to result in any remobilisation of previously sediment bound contaminants due to the already turbid and dynamic nature of the intertidal zone. As such, this pressure is not expected to adversely affect the structure and functioning of mudflats and sandflats not covered by seawater at low tide, Salicornia and other annuals colonizing mud and sand, Atlantic salt meadows; and estuaries as well as habitats of qualifying species nor impact the physical processes on which aforementioned habitats rely.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine the conservation objectives 2, 3 and 4 of the Dee Estuary SAC will not occur as a result of impacts resulting from the release of sediment bound benthic contaminants

Summary

In line with findings presented in Table 1.10, adverse effects which undermine the conservation objectives set for the relevant Annex I qualifying features as well as habitats of qualifying species of the Dee Estuary SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex I qualifying features and habitats of qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the Dee Estuary SAC as a result of activities associated with the Proposed Development alone.

1.6.4 Assessment of adverse effects in-combination with other plans and projects

1.6.4.1 Dee Estuary SAC

The assessment in this section will focus on Annex I habitats that are qualifying features of the Dee Estuary SAC and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.6.3.1 for Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at Proposed Development that may affect conservation objectives of the Dee Estuary SAC, presented in Table 1.9 are also applicable to the in-combination assessment of AEoI of the Dee Estuary SAC with respect to qualifying Annex I habitats (Table 1.11).

The assessment was informed by detailed operations advice for the Dee Estuary SAC interest features published by Natural England and Countryside Council for Wales (Natural England and Countryside Council for Wales, 2010).

Table 1.11: Assessment Of AEOI Of The Dee Estuary SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - the extent and distribution of qualifying natural habitats and habitats of qualifying species **Conservation objective 2 - The structure and function (including typical species) of qualifying natural habitats** **Conservation objective 3 - The structure and function of the habitats of qualifying species** **Conservation objective 4 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely**					
Temporary habitat loss/disturbance (along cable connection only)	✓	✓	✓	Natural England and Countryside Council for Wales (2010) marked intertidal mudflats and sandflats as vulnerable to physical loss (removal) and damage (abrasion). Considering the small spatial extent of cable activities, it can be anticipated that this pressure will not alter the total extent of mudflat and sandflat communities nor the abundance of typical species within the site. As previously described for the Proposed Development alone (Table 1.10), this impact is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide, *Salicornia* and other annuals colonising mud and sand, and Atlantic salt meadows. Further, this pressure is not expected to adversely affect the structure and function of mudflats and sandflats not covered by the seawater at low tide, *Salicornia* and other annuals colonizing mud and sand and Atlantic salt meadows as well as habitats of qualifying species nor impact the physical processes on which aforementioned habitats rely. **Tier 1** As per section 1.6.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase only: the Mostyn Energy Park Expansion, which is situated within the Dee Estuary SAC. However, activities associated with the Tier 1 project are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility. Given the localised extent of this impact for the Tier 1 project, and that it doesn't overlap with the cable connection of the Proposed Development, any temporary habitat loss/disturbance is not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction phase. **Tiers 2, 3, and 4** As per section 1.6.2.2, there were no Tier 2, 3 or 4 plans or projects identified with the potential to result in in-combination effects regarding temporary habitat loss/disturbance during any phases of the Proposed Development. **Summary** Temporary habitat loss/disturbance along the cable connection is therefore not predicted to restrict conservation objectives 1 to 4 of the Dee Estuary SAC.	Adverse effects on the qualifying Annex I habitats as well as habitats of qualifying features which undermine conservation objectives 1 to 4 of the Dee Estuary SAC will not occur as a result of temporary habitat loss/disturbance in-combination with other plans and projects.
Increased SSCs and associated deposition	✓	×	✓	Salicornia and other annuals colonising mud and sand and Atlantic salt meadows are located approximately 1.78 km and 2.21 km from the Proposed Development (Figure 1.4). These qualifying Annex I habitats are not sensitive to sediment plumes or associated	Adverse effects on the qualifying Annex I habitats as well as habitats of

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
(along cable connection only)				changes in turbidity and siltation (BSH, 2012, Doody, 2008, Hough *et al.*, 1999a, Natural England and Countryside Council for Wales, 2010). As such, the extent of pioneer saltmarsh and Atlantic salt meadow vegetation communities as well as the abundance of typical and notable species of both vegetation communities within the site is unlikely to be affected. As previously described for the Proposed Development alone (Table 1.10), this impact is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide, *Salicornia* and other annuals colonising mud and sand, and Atlantic salt meadows. **Tier 1** As per section 1.6.2.2, four Tier 1 projects were identified with a potential for in-combination effects in the construction phase, and one project in the decommissioning phase. However, activities associated with these Tier 1 projects are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility. Given the localised extent of this impact for the Tier 1 projects, and that none overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases. **Tier 2** As per section 1.6.2.2, there was potential for in-combination effects with the Mona OWF in the construction phase of the Proposed Development and with Mona OWF and the Morgan and Morecambe OWF Transmission Assets in the decommissioning phase. The modelling for Mona OWF suggested that suspended sediments would be resuspended on subsequent tides and sediment plumes would reduce with distance from the site (Mona Offshore Wind Ltd, 2023a). At the time of writing, there was no publicly available information to quantify this impact at the Morgan and Morecambe OWF Transmission Assets. As the transmission assets only involve cables, it is likely that sedimentation will be of a lower extent to that of Mona OWF. These activities would be of limited spatial extent, intermittent frequency, and would be unlikely to interact with sediment plumes from the Proposed Development. As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases. **Tier 3** As per section 1.6.2.2, there was potential for in-combination effects with one Tier 3 project only in the construction phase of the Proposed Development: The Maresconnect interconnector cable. At the time of writing, there was limited information available on this project, however activities associated with increased SSCs are likely to be similar to those for the installation of cables at the Proposed Development.	qualifying features which undermine conservation objectives 1 to 4 of the Dee Estuary SAC will not occur as a result of increased SSCs and associated deposition in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases. **Tier 4** As per section 1.6.2.2, there was potential for in-combination effects with one Tier 4 project only in the construction phase of the Proposed Development: the removal of a meteorological mast at Gwynt y Môr OWF. At the time of writing, there was limited information available on this project, however activities associated with increased SSCs are likely to be lower than those for the construction of the Proposed Development. As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex I habitats of the Dee Estuary SAC during the construction or decommissioning phases. **Summary** Increased SSCs and associated deposition in-combination with other plans and projects is therefore not predicted to restrict conservation objectives 1 to 4 of the Dee Estuary SAC.	

Summary

In line with findings presented in Table 1.11, adverse effects which undermine the conservation objectives set for the relevant Annex I qualifying habitat features of the Dee Estuary SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex I qualifying habitat features, it can be concluded that there is no risk of an adverse effect on the integrity of the Dee Estuary SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7 Assessment of potential AEoI: Annex II diadromous fish

As listed in section 1.4.1.2, the HRA Stage 1 Screening Report identified the potential for LSEs on the following European sites designated for Annex II diadromous fish features and freshwater pearl mussel (Figure 1.6):

- Dee Estuary SAC;
- River Dee and Bala Lake SAC;
- Afon Gwyrfai a Llyn Cwellyn SAC;
- Afon Eden - Cors Goch Trawsfynydd SAC; and
- River Teifi SAC.
- Cardigan Bay SAC

LSEs on these European sites were identified for the following impacts:

- During construction and decommissioning phases:
  - temporary habitat loss and/or disturbance (Dee Estuary SAC and along cable connection only); and
  - increased SSC and associated deposition (Dee Estuary SAC and along cable connection only); and
  - underwater noise impacting fish receptors.
- During the operations and maintenance phase:
  - temporary habitat loss and/or disturbance (Dee Estuary SAC and along cable connection only).

Freshwater pearl mussel has been considered within this chapter (as a qualifying feature of the Afon Eden – Cors Goch Trawsfynydd SAC) because part of its life stage is reliant on salmonid species such as Atlantic salmon *Salmo salar*. The potential for adverse effects to freshwater pearl mussel, if they occur at all, would be indirect and would occur as a result of direct effects on Atlantic salmon, which is the relevant host species for freshwater pearl mussel within the SACs assessed.

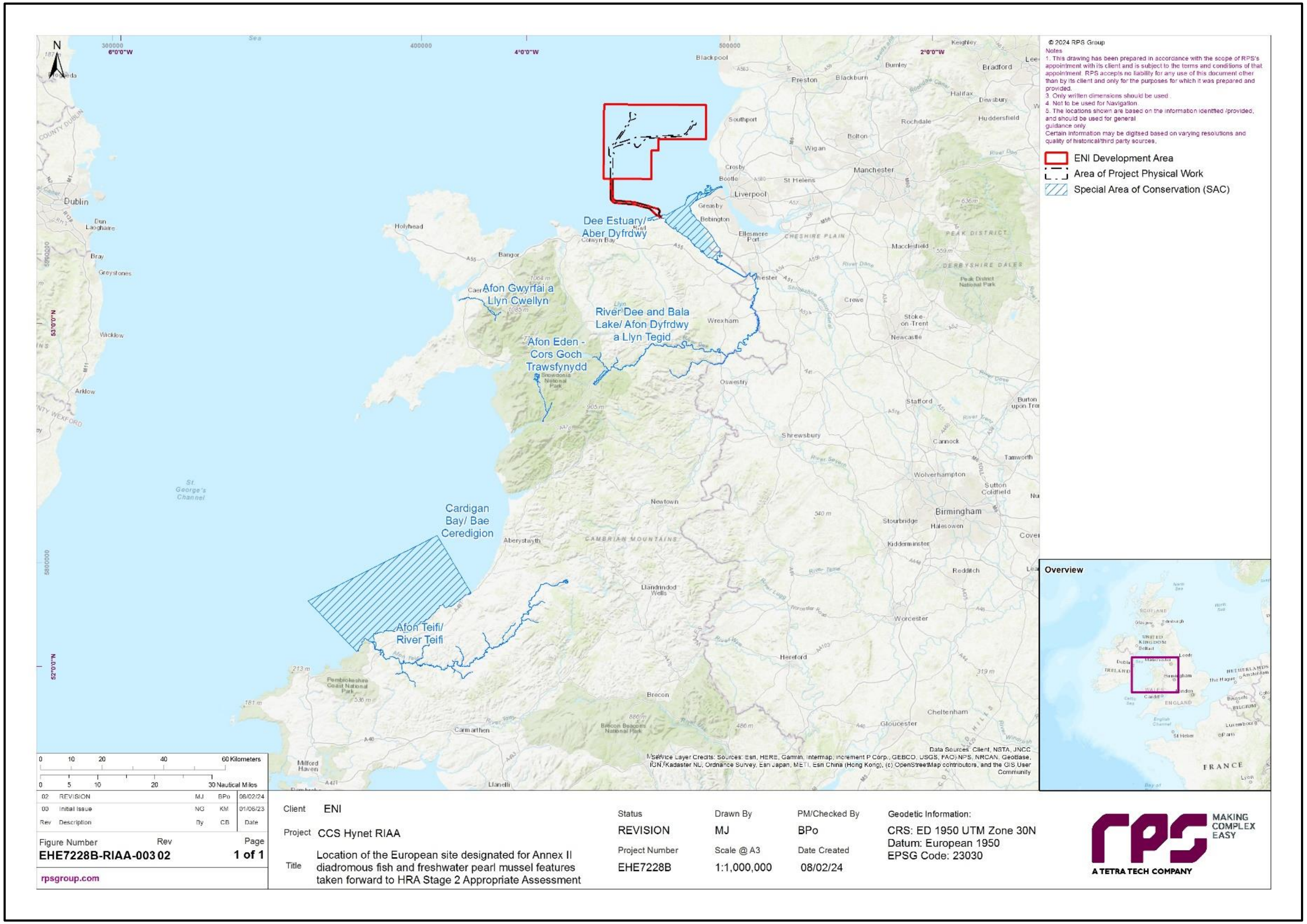

Figure 1.6: Location Of The European Site With Annex II Diadromous Fish And Freshwater Pearl Mussel For Which An Appropriate Assessment Is Required

1.7.1 Baseline information

Baseline information on the Annex II diadromous fish features of the European sites identified for further assessment within the HRA process has been gathered through a comprehensive desktop study of existing studies and datasets, using the latest available information on diadromous fish. Full details are presented within volume 2 chapter 7 of the Offshore ES.

1.7.1.1 Dee Estuary SAC

As previously mentioned in section 1.6.3.1 for Annex I habitats, the Dee Estuary SAC overlaps with the Proposed Development where the offshore cable connects to the shore. River lamprey and sea lamprey, which migrate through the SAC, are Annex II species present as qualifying features, but are not a primary reason for selection of the SAC.

Feature accounts

Sea lamprey

The sea lamprey is a primitive, jawless fish resembling an eel and is the largest of the lamprey species found in the UK. It occurs in estuaries and easily accessible rivers and is an anadromous species (i.e. spawning in freshwater but completing its life cycle in the sea) (JNCC, 2023c).

Sea lamprey are present in the River Dee which forms an essential part of their migratory route. Records of sea lamprey caught at the fish trap at Chester Weir indicate that mature adults migrate upstream almost exclusively during the months of May and June (Potter and Hatton-Ellis, 2003).

River lamprey

The river lamprey is found in coastal waters, estuaries and accessible rivers. Some populations are permanent freshwater residents; however, the species is normally anadromous (i.e. spawning in freshwater but completing part of its life cycle in the sea) (JNCC, 2023b). They live on hard bottoms or attached to larger fish such as cod *Gadus morhua* and herring *Clupea harengus* due to their parasitic feeding behaviour, with spawning taking place in pre-excavated pits in riverbeds.

River lamprey are known to congregate in large estuaries of major rivers. This species is also present in the River Dee and must therefore use the Dee Estuary as part of their migratory route. Although feeding behaviour has not yet been documented for the Dee Estuary for this species, it is known that several potential river lamprey prey species are found within the Dee Estuary including herring, sprat *Sprattus*, flounder *Platichthys flesus* and small gadoids (Henderson, 2003). Records of river lamprey caught at the fish trap at Chester weir indicate that mature adults undertake their upstream migration at two different periods of the year, either early spring (March to April) or late summer/autumn (August to November) (Natural England and Countryside Council for Wales, 2010).

Condition assessment

Table 1.12 outlines the indicative condition assessments of the relevant qualifying features of the Dee Estuary SAC, overall the condition assessment deemed that both river and sea lamprey are in unfavourable condition (NRW, 2018c). Water quality issues are likely contributing to the condition of the lamprey features at this SAC (NRW, 2018c).

Table 1.12: Feature Condition Assessment And Associated Confidence Levels For Annex II Diadromous Fish Species Within The Dee Estuary SAC

Component of habitat feature assessed	Indicative assessment of component	Level of agreement between assessors	Confidence in evidence used to make the assessment	Component confidence level
River lamprey				
Freshwater population variables	Favourable	High	Medium	Medium
Marine habitat	Unfavourable	High	High	High
Sea lamprey				
Freshwater population variables	Unfavourable	High	High	High
Marine habitat	Unfavourable	High	High	High

Conservation objectives

The conservation objectives for the Dee Estuary SAC (Natural England, 2018a) are outlined below.

Regarding the SAC and the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' as listed in Table 1.12), and subject to natural change, the following conservation objectives have been set:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of qualifying species;
- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of qualifying species;
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- the populations of qualifying species; and
- the distribution of qualifying species within the site.

Only conservation objectives relevant to the qualifying species (Annex II diadromous fish qualifying features) of the SAC will be assessed in sections 1.7.3 and 1.7.4; conservation objectives relating to the qualifying habitats of the SAC will not be considered. As such, following conservation objectives will be considered further:

- the populations of qualifying species; and
- the distribution of qualifying species within the site.

1.7.1.2 River Dee and Bala Lake SAC

The River Dee and Bala Lake SAC encompasses the Bala Lake and its banks and outfalls into the River Dee, and is located 22.5 km from the Proposed Development. The SAC extends downstream to where it joins the Dee Estuary SSSI. Several Dee tributaries are also included within the site, specifically the Ceiriog, Meloch, Tryweryn, and Mynach. Atlantic salmon is a primary reason for the selection of the River Dee and Bala Lake SAC, with the Mynach, Meloch and Ceiriog tributaries being the most prevalent salmon spawning tributaries in the Dee catchment. Other diadromous fish species include river lamprey and sea lamprey which are present as qualifying features but are not a primary reason for site selection.

Feature accounts

Atlantic salmon

No site specific information is available for this feature.

Atlantic salmon are anadromous (i.e. spawns in freshwater but completes its life cycle in the sea). They spend two to three years in freshwater, with downstream migration (to open sea) occurring between April and May. Atlantic salmon remain at sea for one to three years. Upstream migration into freshwater occurs year round, with a peak in late summer/early autumn (NRW, 2022d).

Figure 1.7 presents the likely migration routes for anadromous fish reaching UK rivers. These migration routes have been considered when assessing the potential for an adverse effect on integrity on the SACs in sections 1.7.2.1 and 1.7.2.2.

Sea lamprey

No site specific information is available for this feature. An overview of the ecology of the species is provided in section 1.7.1.

River lamprey

No site specific information is available for this feature. An overview of the ecology of the species is provided in section 1.7.1.

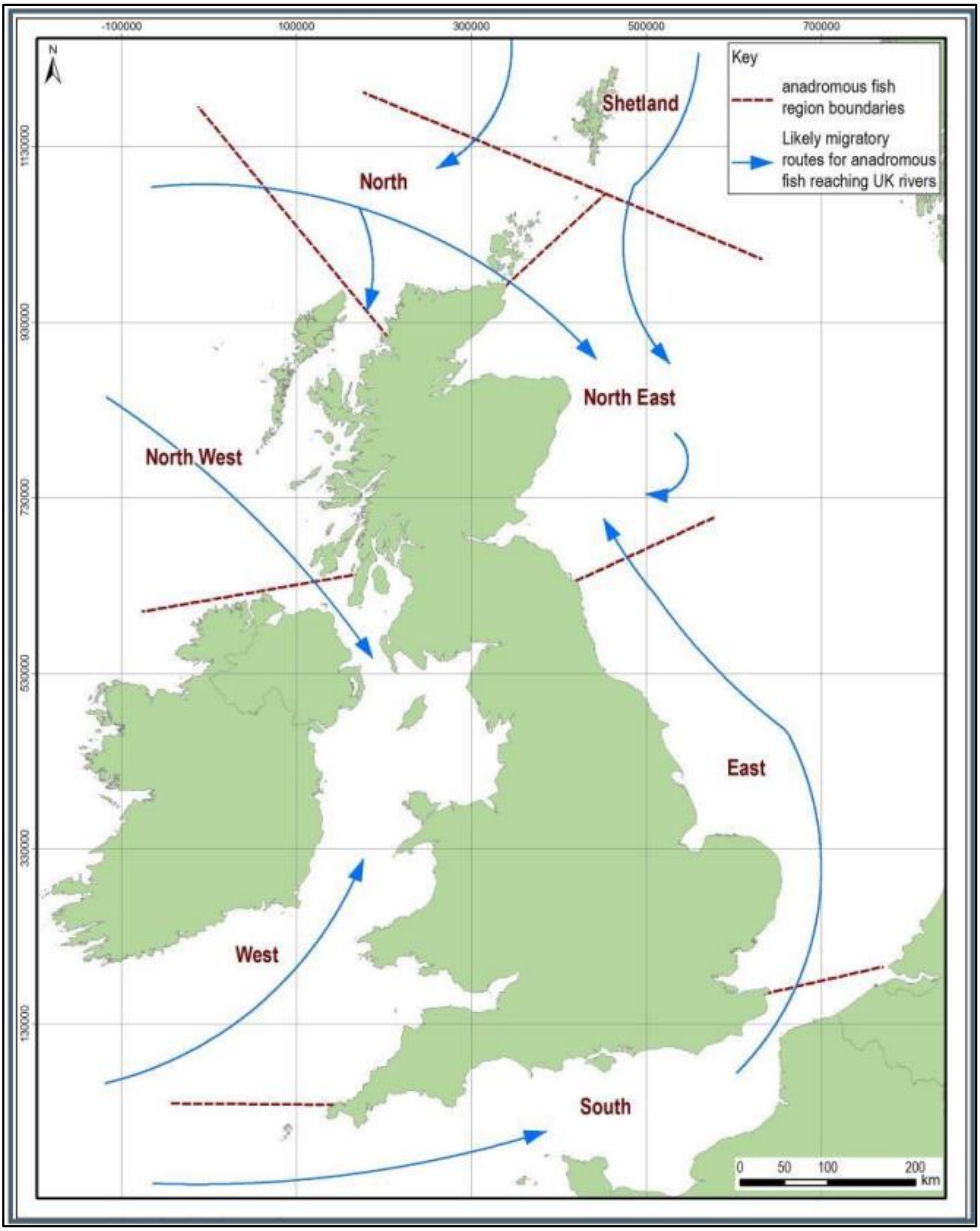

Figure 1.7: Likely Migration Routes For Anadromous Fish Reaching UK Rivers (ABPmer, 2014)

Condition assessment

Table 1.13 outlines the indicative condition assessment for the Atlantic salmon qualifying feature of the River Dee and Bala Lake SAC. Insufficient information is available to assess the population size and dynamics of the sea lamprey and river lamprey features. However overall, the condition assessment deemed that Atlantic salmon, river and sea lamprey features are all in unfavourable condition (NRW, 2022d).

Table 1.13: Condition Assessment Of Relevant Annex II Diadromous Fish Species Of The River Dee And Bala Lake SAC

Attribute	Pass	Fail
Atlantic salmon		
Juvenile population densities	✓	
Adult run		×
Overall assessment		×

Conservation objectives

The conservation objectives for the River Dee and Bala Lake SAC (NRW, 2022d) are outlined below.

Atlantic salmon

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
  - the parameters defined in the vision for the watercourse must be met;
  - the SAC feature populations will be stable or increasing over the long term;
  - the natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future;
  - there will be no reduction in the area or quality of habitat for the feature populations in the SAC on a long term basis; and
  - all known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).

Sea lamprey and river lamprey

- The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:
  - the parameters defined in the vision for the watercourse must be met;
  - the SAC feature populations will be stable or increasing over the long term;
  - the natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future;
  - there will be no reduction in the area or quality of habitat for the feature populations in the SAC on a long term basis; and
  - all factors affecting the achievement of these conditions are under control.

1.7.1.3 Afon Gwyrfai a Llyn Cwellyn SAC

The Afon Gwyrfai a Llyn Cwellyn SAC is located 113.4 km from the Proposed Development. It encompasses the Afon Gwyrfai and Llyn Cwellyn, a short river and the lake. The Gwyrfai flows out of Llyn y Gader near Rhyd Ddu and passes through Llyn Cwellyn before reaching the sea at, Caernarfon Bay. The lake Llyn Cwellyn is a deep oligotrophic lake, recognised for its conservation importance. The Gwyrfai river system is recognised for outstanding ecological and water quality and is designated for an extensive Atlantic salmon population (the primary reason for selection of the site), one of the best supporting rivers in the United Kingdom (NRW, 2022b).

Feature accounts

Atlantic salmon

The Afon Gwyrfai in north-west Wales is representative of the small montane rivers in the region and it contains a largely unexploited salmon population as per the JNCC (2023a). Electrofishing data from the Environment Agency indicates the presence of healthy juvenile populations downstream of Llyn Cwellyn within the SAC (JNCC, 2023a). An overview of the ecology of this species is provided in section 1.7.1.

Condition assessment

The condition assessment for the Atlantic salmon feature of the Afon Gwyrfai a Llyn Cwellyn SAC deemed the feature to be unfavourable: unclassified (NRW, 2022b). The current unfavourable status results from an assessment of feature distribution and abundance within the SAC, specifically salmon catch and juvenile surveys (NRW, 2022b).

Conservation objectives

The conservation objectives for the Afon Gwyrfai a Llyn Cwellyn SAC (NRW, 2022b) are outlined below.

- the conservation objective for the water course as outlined in (NRW, 2022b) must be met;
- the population of the feature in the SAC is stable or increasing over the long term;
- the natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future; and
- the Gwyrfai will continue to be a sufficiently large habitat to maintain the feature’s population in the SAC on a long term basis.

1.7.1.4 Afon Eden - Cors Goch Trawsfynydd SAC

The Afon Eden - Cors Goch Trawsfynydd SAC is located approximately 197.3 km from the Proposed Development. The Afon Eden/River Eden is a relatively unmodified river, mainly upland in character, of approximately 10km length. The Afon Eden joins with the Afon Mawddach, just above the village of Ganllwyd, but the SAC boundary continues downstream to the tidal limit of the Mawddach at Llanelltyd. The Afon Eden is fed by a number of base poor upland streams, which flow from the eastern flanks of the Rhinog mountains. The ecological structure and functions of the site are dependent on hydromorphological processes, the quality of riparian habitats and connectivity of habitats. The river contains the largest known population of freshwater pearl mussel surviving in Wales. Atlantic salmon is also an important fish species that breeds in the Mawddach catchment (NRW, 2022a).

Feature accounts

Atlantic salmon

Atlantic salmon migrate into the catchment to spawn and go through their juvenile stages. An overview of the ecology of this species is provided in section 1.7.1.

Freshwater pearl mussel

The freshwater pearl mussel population in the River Eden is almost entirely confined to one section of the river. Historically the mussels were more widespread in the catchment. The mussels rely on brown trout parr hosting, for a short period of time, the glochidial larvae of the mussels on their gills, so the success of migratory and spawning fish in the catchment is crucial to their long term survival (NRW, 2022a). Pearl mussel recruitment is also depended on salmonid populations as their hosts (JNCC, 2019c).

Condition assessment

Table 1.14 outlines the indicative condition assessment for the Atlantic salmon qualifying feature of the Afon Eden - Cors Goch Trawsfynydd SAC. Overall, the condition of Atlantic salmon was deemed as unfavourable as the attribute targets were not met for adult run size and river morphology (NRW, 2022a). The status of freshwater pearl mussel has been assessed as unfavourable declining due to declines in adult population density, an absence of evidence of further recruitment to the population and the reduced availability of suitable habitat due to levels of siltation (NRW, 2022a).

Table 1.14: Condition Assessment Of Relevant Annex II Diadromous Fish Species Of The Afon Eden - Cors Goch Trawsfynydd SAC

Population attribute	Pass	Fail
Atlantic salmon		
Population	-	-
Adult run		×
Juvenile population densities	✓	
River morphology	-	-
Artificial barriers	✓	
Maintaining characteristic physical features		×
River substrate	✓	

Conservation objectives

The generic conservation objectives for the physical habitat, water quality and population relevant to freshwater pearl mussel and Atlantic salmon were defined by and are described below.

- Physical habitat and water quality:
  - quality (including in terms of ecological structure and function) should be being maintained, or where appropriate improving; and
  - there should be sufficient habitat, of sufficient quality, to support the population in the long term.
- Population:
  - the distribution of the population should be being maintained or where appropriate increasing;
  - there should be sufficient habitat, of sufficient quality, to support the population in the long term;
  - the size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term; and
  - factors affecting the population or its habitat should be under appropriate control.

1.7.1.5 River Teifi SAC

The River Teifi SAC is located approximately 211 km from the Eni Development. The whole of the river from source to sea is included in the River Teifi SAC, as are ten tributaries: the Groes, Brefi, Dulas, Grannell, Clettwr, Cerdin, Tyweli, Ceri, Cych and Piliau. The underlying geology consists of mudstones, siltstones and sandstones, which are extensively mantled by deposits of sands and gravels, glacial lake clays, alluvium and peat. This geology produces a generally low to moderate nutrient status and a low to moderate base-flow index, making the river characteristically flashy. This means that the river is more likely subject to flooding, due to inputs from rainwater reaching the river very quickly. The ecological structure and functions of the site are dependent on hydromorphological processes, as well as the quality of riparian habitats and connectivity of habitats. Five special fish species will be present in numbers that reflect a healthy and sustainable population supported by well distributed good quality habitat. Migratory species such as the Atlantic salmon, sea and river lamprey, swim up river to spawn and go through their juvenile stages in the river (Countryside Council for Wales, 2012).

Feature accounts

Atlantic salmon

The River Teifi, at 122 km, is one of the longest rivers in Wales and one of its most productive salmon fisheries (Garrett, 2016). This is likely to reflect the high quality of the catchment, with a semi natural channel largely unaffected by poor water quality or artificial barriers to migration. However, as in many other rivers in Wales, acidification in the upper reaches is a cause for concern.

Sea lamprey

Sea lamprey is known to spawn in the lower river as far upstream as Henllan, and has been recorded at Llandysul in wet summers (Countryside Council for Wales, 2012). The natural waterfalls at Cenarth may present a partial barrier to upstream migration.

River lamprey

The River Teifi is a large catchment of high conservation value and supports a healthy population of river lamprey (Countryside Council for Wales, 2012). The semi natural channel containing a mixture of substrates and in stream features provides excellent habitat for juvenile lamprey.

Condition assessment

Table 1.14 outlines the indicative condition assessment for the sea lamprey and river lamprey qualifying features of the River Teifi SAC. Overall, condition of sea lamprey was deemed as unfavourable as monitoring undertaken in 2004 failed to find juveniles at any sites either on the main River Teifi or any of the tributaries[3] (NRW, 2022c). Similarly, the status of river lamprey and Atlantic salmon has been assessed as unfavourable (NRW, 2022c). A significant shortfall in the recorded numbers of Atlantic salmon eggs led to the Teifi being classed as “at Risk” in 2019 and is predicted to remain “at Risk” in 2024 (NRW, 2022c). The unfavourable status results from a combination of the assessment of the salmon population and the presence of a number of adverse factors, including climate change, river habitat quality, diffuse pollution and marine survival rates (NRW, 2022c).

[3] A lack of juvenile sea lamprey in surveys of this type is common to a number of rivers, despite the presence of spawning adults (NRW, 2022)

Table 1.15: Condition Assessment Of Relevant Annex II Diadromous Fish Species Of The River Teifi SAC

Target	Attribute	Condition	Level of confidence
Sea lamprey			
Population spatial extent	Should reflect distribution under near natural conditions	Pass[1]	Very low
Annual run size	Should reflect that expected under near natural conditions	Not assessed	Not applicable
River lamprey			
Population spatial extent	Should reflect distribution under near natural conditions	Pass	High
	Should be present in not less than 50% of all sampling sites surveyed with suitable habitat present within the natural range	Not assessed	Not applicable
	Where found in the past they should be present in 90% of sampling sites if suitable habitat remains	Pass	Not available
Annual run size	Should reflect that expected under near natural conditions	Not assessed	Not applicable
Larvae population structure	There should be evidence of recent recruitment in each assessment unit For individual sites where 20 – 50 larvae are caught at least two classes should be present; if >50 larvae are caught, at least three classes should be present	Pass	High
Larval density	Overall assessment unit: mean suitable habitat >5 m^2	Pass	High

[1] Given the very low quality data, expert judgement has been used to give the sea population an overall assessment of Fail.

Conservation objectives

The vision for Atlantic salmon, sea lamprey and river lamprey qualifying features of this SAC is for them to be in a favourable conservation status, where all of the following conditions are satisfied:

- The conservation objective for the watercourse as defined in NRW (2022c) must be met.
- The population of the feature in the SAC is stable or increasing over the long term.
- The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- There is, and will continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a long term basis.

1.7.1.6 Cardigan Bay SAC

The Cardigan Bay SAC is located off the north Pembrokeshire coast in the southern region of Cardigan Bay, approximately 122 km from the Proposed Development. The SAC encompasses approximately 960 km^2 and extends 12 miles offshore. The SAC has a wide range of sediment types from well sorted highly homogenous sands to well mixed muddy gravels, pebbles and cobbles. Sediments associated with coastal areas are predominantly sands with some intrusions of gravel (NRW, 2018b). The majority of the SAC is less than 30 m deep but reaches 50 m in the outer parts of the bay towards St. George's Channel. Species interactions within the SAC are complex and interrelated, with migratory species such as the sea and river lamprey using Cardigan Bay SAC as a corridor between the open sea and riverine habitats, which they use for spawning (NRW, 2018b).

Feature accounts

Sea lamprey

Adult sea lampreys are known to migrate through Cardigan Bay SAC between March and June to reach the Afon Teifi (section 1.7.4.5) and River Aeron. Populations of lampreys which migrate from the Rivers Usk, Wye and Teifi are thought to use the inshore waters of Cardigan Bay SAC, where juveniles that have moved downstream between December and June then feed before moving offshore for larger prey. It should be assumed that various stages of sea lampreys are present all year round within the Cardigan Bay SAC where they prey on a wide range of fish, shark and cetacean species (NRW, 2018b).

River lamprey

Adult river lampreys are known to migrate for spawning through Cardigan Bay SAC to reach the Afon Teifi (section 1.7.4.5) and River Aeron between October and December and juveniles returning in spring and sometimes autumn. River lampreys then use the estuarine and inshore waters to feed and grow on estuarine and coastal fish (NRW, 2018b).

Condition assessment

Table 1.16 outlines the indicative condition of the sea and river lamprey qualifying features of the Cardigan Bay SAC. The overall condition of river lamprey was assessed as favourable (NRW, 2018c). However, the overall condition of sea lamprey was found was deemed as unknown as methods used were inadequate at determining sea lamprey population size for freshwater population and there was a lack of marine population data (NRW, 2018c).

Table 1.16: Feature Condition Assessment and Associated Confidence Levels For Annex II Diadromous Fish Species Within Cardigan Bay SAC

Component of habitat feature assessed	Indicative assessment of component	Level of agreement between assessors	Confidence in evidence used to make the assessment	Component confidence level
River lamprey				
Freshwater population variables	Favourable	High	High	High
Marine habitat	Favourable	High	High	High
Sea lamprey				
Freshwater population variables	Unknown	High	Not applicable	Not applicable
Marine habitat	Favourable	High	High	High

Conservation objectives

The conservation objectives for Cardigan Bay SAC seek to maintain (or restore) the habitat and species features, as a whole, at (or to) FCS.

The vision for the Cardigan Bay SAC for sea lamprey and river lamprey qualifying features is for them to be in a condition as good as or better than when the site was selected; where human activies co-exist in harmony with them and their habitats, and where use of the marine environement is undertaken sustainably. As such, the following conditions need to be fulfilled and maintained in the long-term, or restoration measures implimented to achieve FCS:

- The population of the features in the SAC is maintaining itself and viable as part of the natural habitat on a long-term basis.
- The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- The habitats and species are in a condition that is required to support the dynamics of the features within the SAC and populations beyond the SAC is stable or increasing.

1.7.2 Information to inform the assessment

1.7.2.1 Proposed Development alone

Maximum design scenario

The design parameters identified in Table 1.17 have been selected as those having the potential to result in the greatest effect on Annex II diadromous fish and freshwater pearl mussel and therefore represent the maximum design scenario (MDS). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Description (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 1.17: Maximum Design Scenario Considered For The Assessment Of Impacts On Annex II Diadromous Fish And Freshwater Pearl Mussel

Potential impact	Phase C	O	D	Project Design Parameters	Justification
Temporary subtidal habitat loss and/or disturbance (Dee Estuary SAC and along cable connection only)	✓	✓	✓	**All Phases** The MDS for this impact is as described above for Annex I Habitats (Table 1.4).	The justification for this impact is as described above for Annex I Habitats (Table 1.4).
Increased SSCs and associated deposition (Dee Estuary SAC and along cable connection only)	✓	×	✓	**Construction and Decommissioning Phase** The MDS for this impact is as described above for Annex I Habitats (Table 1.4).	The justification for this impact is as described above for Annex I Habitats (Table 1.4).

Underwater noise impacting fish and shellfish receptors	✓	×	×	**Construction phase**
				<u>Piling during installation of the new Douglas platform foundations</u>
				• up to 4 piled jacket foundations, with one leg per foundation and up to 2 x 1.524 m diameter piles per leg (8 piles);
				• maximum hammer energy up to 3,000 kJ;
				• up to 100 minutes piling per pile; and
				• piling of up to two adjacent piles at the same platform at one time.
				<u>Clearance of UXOs within the Proposed Development</u>
				• maximum UXO size of up to 907 kg;
				• intention for low order clearance of all UXOs using low order techniques with a single donor charge of up to 80 g Net Explosive Quantity (NEQ) for each clearance event;
				• up to 500 g NEQ clearance shot for neutralisation of residual explosive material at each location;
				• risk of potential for unintended consequence of low order techniques to result in high order detonation of UXO (maximum size = 907 kg);
				• a maximum of one UXO clearance within 24 hours;
				• total duration of clearance activities up to 12 days; and
				• clearance during daylight hours only.
				<u>Geophysical and seismic site investigation surveys</u>
				• site investigation surveys will involve the use of up to 2 survey vessels (1 shallow water and 1 deep water) carrying out 2 surveys each, and take place over a period of up to 3 months.
				• Vertical Seismic Profiling (VSP):
				  - number of guns= 6;
				  - total volume= 1,200 cu in;
				  - source depth = 5 m;
					Impact piling, UXO clearance, and geophysical and seismic site investigation surveys during construction may result in in injury and/or behavioural disturbance/displacement of sensitive fish and shellfish receptors.
					The largest hammer energy could lead to the largest area of ensonification at any one time. The longest duration of piling at any location results in the greatest number of days when piling could occur. Duration of piling assumes single vessel piling at any one time.
					UXO donor charge is maximum required to initiate low order detonation. Assumption of a clearance shot of up to 500 g NEQ at all locations although noting that this may not always be required.
					Maximum range of geophysical and seismic surveys likely to be undertaken using equipment typically employed for these types of surveys will result in the greatest potential impact.

Potential impact	Phase C	Phase O	Phase D	Project Design Parameters	Justification
				- firing pressure = 2,000 psi; - SEL = 220 dB re 1 µPa2s @1m; - 0-Peak SPL = 238 dB re. 1 µPa @ 1m; - pulse interval = 20 s (during operations); and • total number of pulses per 24 h period = 4,320 (three per minute).	

Embedded mitigation measures

A number of embedded mitigation measures (primary and tertiary) have been adopted as part of Proposed Development to reduce the potential for impacts on Annex II diadromous fish and freshwater pearl mussel (Table 1.18). As there is a secured commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development. Therefore, these measures have been considered in the assessment of significance, presented in section 1.7.3 and 1.7.4. This means that the determination of AEoI assumes implementation of these measures.

Table 1.18: Embedded Mitigation Measures Adopted As A Part Of The Proposed Development Relevant To Annex II Diadromous Fish And Freshwater Pearl Mussel

Embedded Mitigation	Justification
Primary Mitigation: Measures Embedded into the Project Design	
Development of, and adherence to, a CSIP which will include cable burial where possible and cable protection, as necessary.	The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in advance of CSIP submission. The CSIP will include a detailed CBRA to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. Measures will seek to reduce the amount of EMF which benthic and fish and shellfish receptors are exposed to during the operations and maintenance phase by increasing the distance between the seabed surface and the surface of the cables.
Implementation of piling initiation, soft start, and ramp up measures within the Marine Mammal Mitigation Protocol (MMMP). An initiation stage and soft starts will be used during the installation of pin piles. This involves the implementation of an initial low hammer energy with a low number of strikes, followed by lower hammer energies at a higher strike rate at the beginning of the piling sequence before energy input is ‘ramped up’ (increased) over time to required higher levels.	This measure will minimise the risk of injury to some fish, marine mammal, and marine turtle species in the immediate vicinity of piling activities, allowing individuals to move away from the area before noise levels reach a level at which injury may occur.
Inclusion of low order techniques as a UXO clearance option noting, however, that it is not possible to fully commit to this measure at this stage. Low order techniques are not always possible and are dependent upon the individual situations surrounding each UXO. Given that high order detonation may be required, the MMMP will also include mitigation to reduce the risk of injury from UXO clearance.	Low order techniques generate less underwater noise than high order techniques and therefore present a lower risk to sound sensitive receptors such as fish, marine mammals, and marine turtles during UXO clearance.
Tertiary Mitigation: Measures Required to meet Legislative Requirements, or Adopted Standard Industry Practice	
Development of and adherence to a MMMP, based on a draft MMMP submitted alongside the ES. The MMMP will present appropriate mitigation for activities that could potentially lead to injurious effects on marine mammals including piling, UXO clearance and some types of geophysical activities. The MMMP will be developed on the basis of the most recent published statutory guidance and in consultation with key stakeholders.	**Piling:** for the purpose of developing the MMMP, a mitigation zone of 500 m will be applied, following the JNCC (2010b) guidance. The Draft MMMP will set out the measures to apply in advance of and during piling activity including the use of Marine Mammal Observers (MMObs), Passive Acoustic Monitoring (PAM), and Acoustic Deterrent Devices (ADD), thereby following the latest JNCC guidance (JNCC, 2010b). **UXO Clearance:** Measures including visual and acoustic monitoring (MMObs and PAM), the use of an ADD, and soft start charges will be applied to deter animals from the mitigation zone as defined by sound modelling for the largest possible UXO following the latest guidance (JNCC, 2010a).

Embedded Mitigation	Justification
	Geophysical and Seismic Surveys: Mitigation for injury during high resolution geophysical and seismic site investigation surveys using a sub surface sensor from a conventional vessel will involve the use of MMObs and PAM to ensure that the risk of injury over the defined mitigation zone is reduced in line with JNCC (2017b) guidance (500 m). Soft start is not possible for Sub Bottom Profiler (SBP) equipment but will be applied for other high resolution surveys where possible. It should be noted that some multi beam surveys in shallow waters (<200m) are not subject to the requirements of mitigation.
Development of, and adherence to, a CMS.	This measure will confirm the actual methodology that will be employed to construct the Proposed Development, provide details on aspects of the methodology not known at the application stage and confirm that the methodology falls within the parameters assessment in the ES.
Actions to minimise INNS, including a biosecurity plan to limit spread and introduction of INNS	These measures will aim to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable to best protect the biological integrity of the local natural environment and communities
Development of, and adherence to, a Decommissioning Plan	The aim of this plan is to adhere to the relevant UK and international legislation and guidance in place at the time, with decommissioning industry practice applied to reduce the amount of long termdisturbance to the environment so far as reasonably practicable.

Temporary habitat loss/disturbance

The assessment of LSE during the HRA screening process identified that during the construction, operations and maintenance and decommissioning phases, LSE could not be ruled out for the potential impact of temporary habitat loss and disturbance along cable connection only. This relates to the following designated site and relevant Annex II diadromous fish species:

- Dee Estuary SAC:
  - sea lamprey; and
  - river lamprey.

Temporary habitat loss and/or disturbance of intertidal habitats will occur during the construction, operations and maintenance, and decommissioning phases of the Proposed Development. Subsea cable installation will result in 1.89 km^2 of temporary habitat loss and/or disturbance due to trenching within the construction phase. This will include the installation of 126.04 km of subsea power cables with a trench width of 15 m.

Subsea power cable remedial burial may also contribute up to 37,500 m^2 of temporary habitat loss/disturbance during the 25 year operation and maintenance phase. This value accounts for up to reburial of up to 500 m of cable in one event every 5 to10 years (assuming 15 m width seabed disturbance). Only a small proportion (7,500 m^2) of the total temporary habitat loss and/or disturbance is likely to occur at any one time, with the MDS for this impact spread over the 25 year lifetime of the Proposed Development. Therefore, individual maintenance activities will be small scale and intermittent events. The MDS also includes up to 34,500 m^2 of temporary habitat loss due to the footprints of jack up vessels for maintenance activities over the 25 year lifetime. However, both values are for the entire Proposed Development, as operation and maintenance requirements within the intertidal zone along the cable connection are not available. Therefore, these values of 37,500 m^2 and 34,500 m^2 are considerable overestimations of the temporary habitat loss and/or disturbance along the cable connection.

The extent of temporary habitat loss and/or disturbance during the decommissioning phase will be significantly lower than that of the construction phase, as seabed preparation activities will not be required.

RPS (2019) reviewed the effects of cable installation on subtidal sediments and habitats, drawing on monitoring reports from over 20 UK offshore wind farms. Sandy sediments were shown to recover quickly following cable installation, with little or no evidence of disturbance in the years following cable installation. It also presented evidence that remnant cable trenches in coarse and mixed sediments were conspicuous for several years after installation. However, these shallow depressions were of limited depth (i.e. tens of centimetres) relative to the surrounding seabed, over a horizontal distance of several metres and therefore did not represent a large shift from the baseline environment (RPS, 2019). Remnant trenches (and anchor drag marks) were observed years following cable installation within areas of muddy sand sediments, although these were relatively shallow features (i.e. a few tens of centimetres).

Dredging will be undertaken at West Hoyle Bank, which is a sandbank situated off the coast of the PoA, to install subsea power cables between the new Douglas platform and the PoA terminal. This will require dredging a channel (most likely with the backhoe dredger) approximately 1,000 m in length, 21 m in width, and 7 m in depth (~3m to take bank down to LAT, then ~3m depth for cable burial). The excavated material will be side cast along the length of the trench, and then backfilled after cable installation. It would take approximately two to three weeks to excavate the trench. Even if the cable was routed further to the east of West Hoyle Bank, the water remains extremely shallow. It will, therefore, still require pre-lay dredging to allow for a self-beaching cable lay vessel to ground itself at low tide on a ‘flat’ area of sandbank. It would take approximately four to seven days to excavate the area depending on dredging technique applied. In total, dredging at West Hoyle Bank will result in 21,000 m^2 of disturbance. Physical processes modelling demonstrated that much of the material is deposited along the dredge path itself, supporting the fact the sediment will remain within the sediment cell and minimising loss to West Hoyle Bank.

Taking into account the eastward migration of the existing channel through West Hoyle Bank, it is recommended as a mitigating measure that the placement of dredged material directly to the west of seabed preparation operations would aid in the recovery of morphological features, and further encourage the feature to naturally infill. The temporary change to the morphology of West Hoyle Bank will have minimal impact on the feature's ability to act as a natural breakwater for waves propagating towards the Dee Estuary/Aber Dyfrdwy SAC. Given the location and orientation of the channel, cutting through the middle of the bank from its southern face to its northern face, there will be no change to the waves breaking on the west of the sand bank.

Increased SSCs and associated deposition

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact of increased SSCs and associated deposition along cable connection only. This relates to the following designated site and relevant Annex II diadromous fish species:

- Dee Estuary SAC:
  - sea lamprey; and
  - river lamprey.

Increased SSCs and sediment deposition from construction and decommissioning activities related to cable installation may potentially result in indirect impacts on diadromous fish species. The aspect of the construction phase which may result in the increase of SSCs is installation of up to 126.04 km of power cables between platforms and the onshore terminal PoA (this includes 1,200 m of cable within the intertidal zone). The site specific modelling showed that the maximum SSC over the course of the cable trenching phase may result in the plume extending up to 15 km to the west and that the suspended sediments may reach into the estuary during cable trenching from POA to Douglas, but generally do so at background levels of around 30 mg/l. For the PoA Terminal to Douglas cable, during peak concentrations over the course of trenching, the plume may extend up to 15 km to the west, however, it reaches background levels (<1 mg/l) at approximately 1 km from the cable trenching. Average SSC values were greatest around the cable route, particular over the shallow waters of West Hoyle Bank, where they may reach 1,000 mg/l in the shallowest water but are quickly reduced to background levels a short distance from the cable path. Average sedimentation was greatest at the location of the trenching and may be up to 160 mm in depth where the coarser material has settled within close proximity to the cable path. An analysis of sedimentation at slack water one day after the cessation of trenching, shows that some of the previously sedimented material has been re-suspended, only to settle again at slack water.

A large plume was also modelled for the trenching of the Douglas to Lennox platform cable. Average concentrations are <1,000 mg/l and are greatest in the direct vicinity of the cable path, and <10 mg/l at the extent of the Proposed Development benthic ecology study area. Average sedimentation is limited to <100 mm with peak values of 70 mm, however outside the area of project physical work, deposition is limited to negligible levels of <3 mm. Sedimentation one day after the cessation of trenching shows that fine sands and resuspended sediment settle during slack water. Overall, the largest SSC plumes are generated by cable installation activities given the magnitude of sediment disturbed and length of works. Due to the temporary nature and scale of cable laying works, combined with the cable laying works being located within a depositional area for sediment, any trenches will be quickly infilled over a short period of time. Furthermore, rapid recolonisation of disturbed sediment is expected within two years.

Underwater noise impacting fish receptors

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact of underwater noise. This relates to the following designated site and relevant Annex II diadromous fish species:

- Dee Estuary SAC:

  - sea lamprey; and
  - river lamprey.
- River Dee and Bala Lake SAC:
  - Atlantic salmon;
  - sea lamprey; and
  - river lamprey.
- Afon Gwyrfai a Llyn Cwellyn SAC:
  - Atlantic salmon.
- Afon Eden – Cors Goch Trawsfynydd SAC:
  - Atlantic salmon; and
  - Freshwater pearl mussel.
- Afon Teifi/River Teifi SAC:
  - Atlantic salmon;
  - sea lamprey; and
  - river lamprey.
- Cardigan Bay SAC:
  - sea lamprey; and
  - river lamprey.

Underwater noise can potentially have an adverse impact on fish species, such as behavioural effects, and physical injury and/or mortality. Auditory injury can occur either as a Temporary Threshold Shift (TTS) where an animal's auditory system can recover, or Permanent Threshold Shift (PTS), where there is no hearing recovery in the animal. The Popper *et al.* (2014) guidelines broadly group fish into the following categories according to the presence or absence of a swim bladder and on the potential for that swim bladder to improve the hearing sensitivity and range of hearing. Lampreys fall within Group 1, as they lack swim bladders and are only considered sensitive to particle motion, not sound pressure and show sensitivity to only a narrow band of frequencies. Salmonids are categorised under group 2, which comprises fish with a swim bladder, although it does not play a role in hearing. These species are considered more sensitive to particle motion than sound pressure and show sensitivity to only a narrow band of frequencies.

Any potential short term noise effects on fish may not necessarily translate to population scale effects, with a relatively low amount of information available about *in situ* behavioural effects. Group 1 (lampreys) and group 2 fish (salmonids) are less sensitive to sound pressure, typically detecting sound in the environment through particle motion. Lampreys are known to have relatively simple ear structures (Popper and Hoxter, 1987). They have been recorded to demonstrate very few responses to auditory stimuli overall (Popper, 2005), except a slight increase in swim speed and decrease in resting behaviour when exposed to continuous low frequency sound of 50 to 200 Hz (Mickle *et al.*, 2018). This suggests that they have a low vulnerability to underwater noise impacts overall. Physiological or behavioural responses were not observed in Atlantic salmon when subjected to noise similar to that of piling (Harding *et al.*, 2016). However, the noise levels tested were estimated at <160 dB re 1 μPa root mean square (rms), which is below the level at which injury or behavioural disturbance would be expected for this species.

Piling

The installation of the new Douglas Platform within the Proposed Development may lead to injury and/or disturbance to diadromous fish species due to underwater noise during pile driving.

During pin pile installation, salmonids and lampreys may experience mortality/recoverable injury up to 314 m and 184 m from the piling location, respectively, based on the maximum peak experience and Sound Pressure Level (SPL_{pk}) dB re 1 µPa threshold. Mortality and recoverable injury would be smaller when considering the first hammer strike, as salmonids and lampreys would be at risk of experiencing it only within 131 m and 71 m respectively. As per the MDS, there is a possibility that multiple pin piles will need to be installed in a single 24-hour period. The potential Cumulative Sound Exposure Level (SEL_{cum}) injury ranges for fish hearing groups due to impact piling of pin piles are modelled as following the same piling schedule, but with continuous installation for 24 hours, which is an overestimation, as the piling vessel will need to reposition in-between piles. It is assumed that the fish will swim away from the pile installation and not return to the area within the 24-hour period. As the piling schedule, and therefore the hammer energies, remain unchanged, the injury ranges due to the peak metric will be the same as those for the single pile case. The consecutive pin pile noise modelling based on the SEL_{cum} thresholds for fleeing fish result in no exceedance of the mortality threshold for salmonids or lampreys, based on a swim speed of 0.5 m/s. If modelled as static receptors, the SEL_{cum} mortality range was 204 m for lampreys and 625 m for salmonids. The ranges for recoverable injury and TTS were 294 m and 11,640 m for lampreys and 1,490 m and 11,640 m for salmonids. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS. Noise contours generated from the mortality, recoverable injury, and TTS ranges for static Group 1 (lampreys) and Group 2 fish (salmonids) did not overlap with the closest SACs designated for Atlantic salmon, sea lamprey and river lamprey: the Dee Estuary SAC and the River Dee and Bala Lake SAC. The largest ranges were those for TTS, which were a minimum of 15.8 km from the Dee Estuary SAC (which is the closest SAC to the Proposed Development).

The piling activities are represented by impact piling of up to 8 piles for the jacket foundation. The total duration of pin piling activity is less than 13.5 hours (based on up to 100 minutes of piling per pin pile), with total installation of less than 0.6 days. The use of soft start piling procedures (JNCC, 2010b), allowing individuals in close proximity to piling to flee the ensonified area, further reduces the likelihood of injury and mortality on diadromous species. It is acknowledged that soft start piling will likely benefit some species of fish, and not others, due to the broad nature of this group of organisms, however this measure will be implemented regardless as a measure to mitigate impacts to marine mammals, and therefore the potential benefits to some fish species cannot be discounted.

Diadromous fish species may also experience behavioural effects in response to piling noise, including startle (C-turn) responses, strong avoidance behaviour, changes in swimming or schooling behaviour, or changes of position in the water column. These would be expected to up to 33 km and therefore potential effects within coastal areas cannot be discounted (Figure 1.8). However, for group 1 and group 2 fish species this is likely to be highly precautionary as they are known to be less sensitive to underwater noise. Further, the noise contours are for the greatest hammer energy for impact piling, and in most scenarios, the maximum hammer energy will not be required, and therefore smaller contour ranges would be expected.

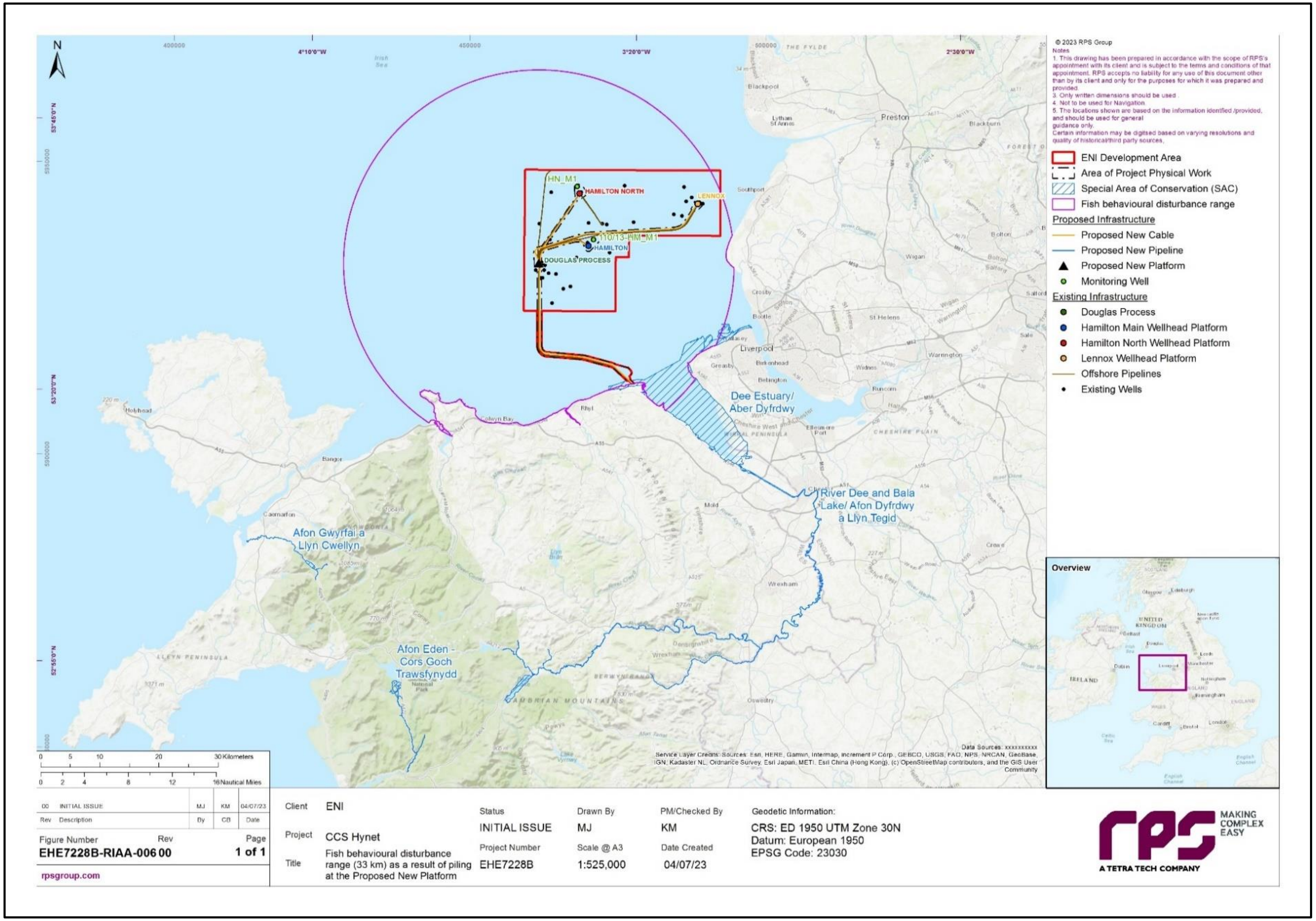

Figure 1.8: Potential Range Across Which Fish May Experience Behavioural Disturbance As A Result Of Piling, Based On Piling At The Proposed New Douglas Platform

UXO clearance

UXO clearance (including detonation) also has the capability to cause injury and/or disturbance to diadromous fish species. The precise details and locations of potential UXOs is unknown at this time. For the purposes of this assessment, it has been assumed that the MDS will be clearance of 907 kg UXO size, cleared by either low order or high order techniques. The MDS accounts for up to one UXO clearance within 24 hours, and a total duration of clearance activities of 12 days.

During the worst-case scenario of high order clearance of 907 kg UXO size, diadromous fish may experience injury up to 985 m from the source. However, given that low order detonation will be applied as preferable where possible, realistic injury ranges are expected to be much smaller and are presented in Table 1.19. Additionally, it should be noted that these ranges are highly conservative and it is unlikely that injury will occur in this range due to the implementation of soft starts as a part of embedded mitigation (JNCC, 2010a), through detonation of a series of smaller charges prior to the target UXO, which will allow fish to move away from the areas of highest noise levels, before they reach a level that would cause an injury. It is acknowledged that not all fish species may respond in this way, however it is likely that some fish will move away and therefore benefit from the implementation of a soft start.

Table 1.19: Potential Impact Ranges For Low Order And Low Yield UXO Clearance Activities

UXO Size	PTS range, SPL_{pk} (m)
0.08kg low order donor charge	
Fish (lower range*)	44
Fish (upper range*)	27
0.5kg clearing shot	
Fish (lower range)	81
Fish (upper range)	49
2 x 0.75kg low yield charge	
Fish (lower range)	117
Fish (upper range)	70
4 x 0.75kg low yield charge	
Fish (lower range)	147
Fish (upper range)	88

*The lower range and upper range refer to those provided within the Underwater Noise Technical Report (RPS Group and Seiche, 2024), based upon the Popper *et al.* (2014) guidance for explosions, where thresholds are quoted as ranges. Values presented herein reflect those associated with the extremes of the ranges presented within RPS Group and Seiche (2024).

Other noise sources

All other noise sources including cable installation and drilling are non-percussive and will result in much lower noise levels and therefore much smaller injury ranges (in most cases no injury is predicted) than those predicted for piling operations. These are not considered further here as the effect on diadromous fish receptors is considered negligible.

The geophysical surveys may be required throughout the project lifetime, however, individual survey campaigns are likely to be very short term and spatially limited at any one time, reducing the magnitude of their likely impact on diadromous fish. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m and 54 m for lampreys and salmonids, respectively. There is also a potential for TTS, within up to 2,653m for all diadromous fish species. TTS is a temporary reduction in hearing sensitivity caused by exposure to intense sound. Normal hearing ability returns following cessation of the noise causing TTS, though the recovery period is variable, during which fish may have decreased fitness due to a reduced ability to communicate, detect predators or prey, and/or assess their environment. It should be noted that these ranges highly conservative and it is unlikely that injury will occur in this range due to the implementation of soft starts as a part of embedded mitigation (JNCC, 2017b), which will allow some fish to move away from the areas of highest noise levels, before they reach a level that would cause an injury.

1.7.2.2 In-Combination with Other Plans and Projects

The other developments (projects/plans) that could result in in-combination effects associated with the Proposed Development on Annex II diadromous fish of the designated sites identified have been summarised in Table 1.21 and shown in Figure 1.9. These projects and plans were identified using the in-combination effects assessment study area (50 km buffer) and a larger study area (100 km buffer) for the effect of underwater noise only (see volume 2 chapter 7 of the Offshore ES).

As outlined in the HRA Stage 1 Screening Report, where the potential for LSE has been concluded with respect to the Proposed Development alone, the potential for LSE has also been concluded in-combination. For impacts where LSE has been ruled out with respect to the Proposed Development alone, there is either no pathway to effect, or the Proposed Development would result in only negligible or inconsequential effects that would not contribute (even collectively) or materially to in-combination effects and therefore, no additional in-combination issues are identified.

On this basis, the potential impacts identified for assessment as part of the volume 2 chapter 7 of the Offshore ES, and which have been brought forward for consideration in the in-combination assessment of the Appropriate Assessment are:

- in-combination temporary habitat loss and/or disturbance (along cable connection only);
- in-combination increased SSCs and associated deposition (along cable connection only); and
- in-combination subsea noise impacting fish receptors.

Maximum design scenario

The design parameters identified in Table 1.20 have been selected as those having the potential to result in the greatest effect on Annex I habitats as a result of impacts in-combination with other plans and projects and therefore represent the MDS.

It should be noted that the Mooir Vannin OWF is located 63 km away from the Eni Development Area, and therefore falls within the 100 km in-combination effects study area for underwater noise but out with the 50 km in-combination effects study area for all other impacts (Figure 1.9). This project would be considered under Tier 2, as it is currently in the pre-application stage. However, given that its construction phase is anticipated between 2030 – 2032, it will not overlap with that of the Proposed Development (2024 - 2026). Therefore, any impacts regarding underwater noise during the construction phase of the Mooir Vannin OWF and of the Proposed Development are not likely to occur in-combination with one another.

Table 1.20: List Of Other Projects And Plans With Potential For In-Combination Effects On Annex II Diadromous Fish

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
Tier 1						
Offshore Renewables						
Burbo Bank Extension OWF cable repair and remediation	Operational (with ongoing activities)	0.00	Export cable repair and remediation activities over the 25 year lifetime of the Burbo Bank Extension OWF.	N/a	2017–- 2042	These activities overlap spatially with the Proposed Development and temporally with the construction and operation and maintenance phases of the Proposed Development.
Awel y Môr OWF	Consented	1.10	Proposed renewable energy project, 10.50 km off the coast of North Wales, of up to 1.1 GW. Proposed for a maximum of 50 turbines, associated transmission assets, and cabling (including and interlink cable with Gwynt y Môr OWF).	2026 – 2030	2030 – 2055	This project will overlap with all three phases of the Proposed Development.
Mona OWF Suction Bucket Trials	Consented	5.60	The works proposed within this Marine Licence Application consist of trialling suction bucket foundations to assess the install viability within the Mona OWF Array Area, which is predominantly within Welsh waters.	2023 to June 2024	N/A	The suction bucket trials may overlap with early construction activities of the Proposed Development.
Deposits and Removal						
Burbo Bank Extension OWF Disposal Site IS153	Operational (with ongoing activities)	0.50	Deposit of substances at sea, construction works, removal of sediment, and disposal of inert material during drilling for the Burbo Bank Extension OWF.	N/a	2017–- 2042	These activities overlap with the construction and operation and maintenance

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
						phases of the Proposed Development.
Hilbre Swash	Operational (with ongoing activities)	0.00	Licence to extract up to 12 million tonnes of aggregate (mainly sand) over 15 years.	N/a	2015 – 2029	Aggregate extraction activities within this project will overlap temporally with the construction and operation and maintenance phases of the Proposed Development. This project also spatially overlaps with the Proposed Development.
Mostyn Energy Park Expansion	Submitted	2.30	Extension of the Mostyn Energy Park at the Port of Mostyn. Requires construction of a 360 m quay, reclamation of 3.5 ha area, capital dredging of new berth pockets and re-dredging of approach channel. Use of dredged material for fill material for reclamation, disposal of dredged material at Mostyn Deep. Maintenance dredging of new and existing berths, approach channel and harbour area.	2023 to 2025	2025 to 2030	Activities will overlap with the construction and operation and maintenance phases of the Proposed Development.
Tier 2						
Offshore Renewables						
Mona OWF	Pre application	5.53	Proposed renewable energy project, 28.20 km off the coast of North Wales, of up to 350 MW.	2026–- 2028	2029–- 2089	This project will overlap with all three phases of the Proposed Development.

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
Morgan OWF Generation Assets	Pre application	7.53	The generation assets for the Morgan OWF, which has a capacity of 1.5 GW.	2026–- 2028	2029–- 2089	Temporally, the construction, operations and maintenance, and decommissioning phases of this project will overlap with the construction and operations and maintenance phases of the Proposed Development.
Morecambe OWF Generation Assets	Pre application	30.00	The generation assets for the Morgan OWF, which has a capacity of 480 MW.	2026–- 2028	2029–- 2089	This project will overlap with all three phases of the Proposed Development.
Cables and Pipelines						
Morgan and Morecambe OWF Transmission Assets	Pre application	3.00	The transmission assets for the Morgan and Morecambe OWF	2028–- 2029	2030–- 2065	This project will overlap with the operations and maintenance and decommissioning phases of the Proposed Development.
Tier 3						
Cables and Pipelines						
MaresConnect – Wales – Ireland Interconnector Cable	Planning application not yet submitted	30.00	A proposed 750 MW subsea and underground electricity interconnector system, linking the electricity grids in the UK and Ireland.	2025	2027–- 2037	This project will overlap with the construction and operations and

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation and Maintenance Period (if applicable)	Overlap with the Proposed Development
						maintenance phases of the Proposed Development.
Tier 4						
Offshore Renewables						
Removal of a meteorological mast at Gwynt y Môr OWF	Issued (variation to an existing marine licence)	0.00	A seabed survey and removal of topside lattice structures, monopiles, and scour protection.	N/a	Licence issued for 2022–-2027	Although no information on the timeline of this project is available, the Marine License is issued for between 2022 – 2027. Therefore, this activity will overlap with the operations and maintenance phase of the Proposed Development. This project also spatially overlaps with the Proposed Development.

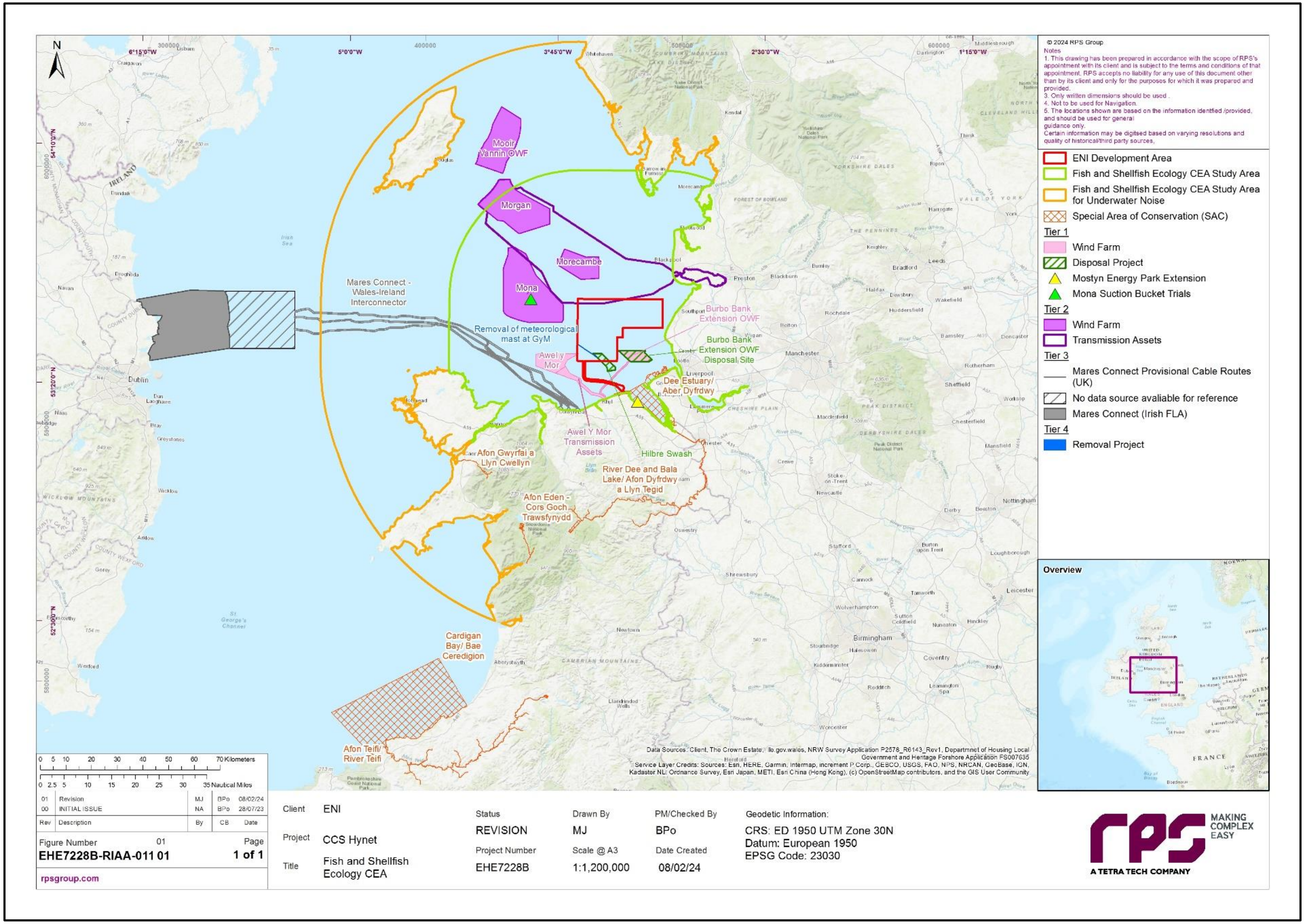

Figure 1.9: Location Of Other Projects And Plans Considered For In-Combination Effects On Sacs With Annex II Diadromous Fish

Table 1.21: Maximum Design Scenario Considered For The Assessment Of Impacts On Annex II Diadromous Fish In-Combination With Other Projects And Plans

Potential In-Combination Effect	Phase	MDS	Justification
Temporary subtidal habitat loss and/or disturbance (along cable connection only)	C	The MDS is as described for the Proposed Development alone (Table 1.17) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Deposits and Removal: Mostyn Energy Park Expansion.	The projects and plans identified in the screening process (see section 1.5.5) may result in temporary subtidal habitat loss and/or disturbance within their own boundaries. This potential impact is highly localised in nature. Therefore, no in-combination effects are anticipated for this impact from projects and plans that do not overlap or come in close proximity to any SAC within the in-combination effects assessment study area for Annex II diadromous fish (i.e. within one kilometre).
	O	There were no projects or plans identified with the potential to result in in-combination effects for temporary subtidal habitat loss and/or disturbance (along the cable connection only) during the operation and maintenance phase.	
	D	There were no projects or plans identified with the potential to result in in-combination effects for temporary subtidal habitat loss and/or disturbance (along the cable connection only) during the decommissioning phase.	
Increased SSCs and associated deposition (along cable connection only)	C	The MDS is as described for the Proposed Development alone (Table 1.17) and potential for in-combination effects were considered with the projects and plans outlined in Table 1.20 and Figure 1.9. **Tier 1:** Offshore Renewables: • Burbo Bank Extension OWF cable repair and remediation; • Awel y Môr OWF; and • Mona OWF Suction Bucket Trials. Deposits and Removal: • Burbo Bank Extension OWF Disposal Site IS153; • Hilbre Swash; and • Mostyn Energy Park Expansion. **Tier 2:** Offshore Renewables: • Mona OWF. **Tier 3:** Cables and Pipelines: • MaresConnect Wales – Ireland Interconnector Cable.	These projects involve activities which may impact the tidal/wave regime and sediment transport during their temporal overall with the Proposed Development.

Potential In-Combination Effect	Phase	MDS	Justification
		Tier 4: Offshore Renewables: • removal of a meteorological mast at Gwynt y Môr OWF.	
	D	The MDS is as described for the Proposed Development alone (Table 1.17) and potential for in-combination effects were considered with the projects and plans outlined in Table 1.20 and Figure 1.9. **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF. Cables and Pipelines: • Morgan and Morecambe OWF Transmission Assets.	
Underwater noise impacting fish and shellfish receptors	C	The MDS is as described for the Proposed Development alone (Table 1.17) and potential for in-combination effects were considered with the projects and plans outlined in Table 1.20 and Figure 1.9. **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF; • Morgan OWF Generation Assets; and • Morecambe OWF Generation Assets.	These projects all involve activities which will result in increased underwater noise which may coincide with that of construction activities for the Proposed Development. These may contribute to the impact upon fish and shellfish receptors.

Temporary habitat loss/disturbance (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction, operation and maintenance, and decommissioning phases, LSE could not be ruled out for the potential impact of temporary habitat loss/disturbance along the cable connection only. The in-combination assessment for his impact relates to the following designated site and relevant Annex I habitat features:

- Dee Estuary SAC:
  - sea lamprey; and
  - river lamprey.

The in-combination effects for the Tier 1 to 4 projects presented in Table 1.21 is as previously described for Annex I habitats (see section 1.6.4) and has not been repeated here. As outlined in Table 1.21, no other projects or plans have been identified which may result in in in-combination effects for temporary subtidal habitat loss and/or disturbance (along the cable connection only) during the operation and maintenance and decommissioning phases.

Increased SSCs and associated deposition (along cable connection only)

The assessment of LSE during the HRA screening process identified that during the construction and decommissioning phases, LSE could not be ruled out for the potential impact of increased SSCs and associated deposition along the cable connection only. The in-combination assessment for his impact relates to the following designated site and relevant Annex II diadromous fish species:

- Dee Estuary SAC:
- sea lamprey; and
- river lamprey.

The in-combination effects for the Tier 1 to 4 projects presented in Table 1.21 is as previously described for Annex I habitats (see section 1.6.4) and has not been repeated here.

Underwater noise impacting fish receptors

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact of increased underwater noise. The in-combination assessment for this impact relates to the following designated sites and relevant Annex II diadromous fish species:

- Dee Estuary SAC:
  - sea lamprey; and
  - river lamprey.
- River Dee and Bala Lake SAC:
  - Atlantic salmon;
  - sea lamprey; and
  - river lamprey.
- Afon Gwyrfai a Llyn Cwellyn SAC:
  - Atlantic salmon.
- Afon Eden – Cors Goch Trawsfynydd SAC:
  - Atlantic salmon; and
  - freshwater pearl mussel.

- Afon Teifi/River Teifi SAC:
  - Atlantic salmon;
  - sea lamprey; and
  - river lamprey.
- Cardigan Bay SAC:
  - sea lamprey; and
  - river lamprey.

Tier 1

There is the potential for in-combination impacts with one Tier 1 project in the construction phase of the Proposed Development: Awel y Môr OWF. The construction phase of the Proposed Development is between 2024 and 2026, while that of Awel y Môr OWF is currently anticipated as 2026 to 2030 (Table 1.20). Therefore, there may be some overlap between the underwater noise producing activities in the construction phases of both projects, however it should be noted that it any in-combination impacts will be of a lesser extent than if the two projects overlapped for a longer period of time (i.e. over multiple years), particularly given piling operations at the Proposed Development will take up to just 13.5 hours to complete. The MDS for Awel y Môr OWF assumes the instillation of monopiles for the foundations of 91 turbines and two platforms, with a maximum hammer energy of 5,000 kJ (RWE Renewables UK, 2021b). Furthermore, this MDS also encompasses cofferdam piling with a maximum hammer energy of 300 kJ, and clearance of up to 10 UXOs (RWE Renewables UK, 2021b).

Underwater noise modelling undertaken for the Awel y Môr OWF indicated injury and mortality to ranges of up to 1,600 m for Group 1 fish (sea and river lampreys) if modelled as static receptors (RWE Renewables UK, 2021b). Group 2 fish (Atlantic salmon) were only modelled as fleeing receptors as they were determined to be transient visitors to the Awel y Môr OWF site. Modelling of Group 1 and 2 species as fleeing receptors highly significantly reduced mortality distances, down to <100 m (RWE Renewables UK, 2021b). As with the Proposed Development, embedded mitigation, such as soft starts, will reduce the risk of injury and mortality for some fish species. With respect to behavioural effects, the Awel y Môr OWF indicated behavioural effects in the range of tens of kilometres, similar to those modelled for the Proposed Development (33 km, see section 1.7.1.1).

Overall, based on the results of the underwater noise modelling presented and the very low duration of any potential overlap in noise generating activities, there is low potential for significant in-combination impacts to Annex II diadromous fish causing injury from increased underwater noise during the construction phase for the Tier 1 project.

Tier 2

There is potential for in-combination impacts with three Tier 2 projects in the construction phase: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. The construction phase of the Proposed Development is between 2024 and 2026, while the construction phase of the three Tier 2 projects outlined above is currently anticipated as 2026 to 2028 (Table 1.20). Therefore, there may be some overlap between the construction phases of the Tier 2 projects, however it should be noted that it any in-combination impacts will be of a lesser extent than if the three projects overlapped for a longer period of time (i.e. over multiple years), particularly given that pile driving operations at the Proposed Development will be undertaken over a total of just 13.5 hours, thereby minimising the potential for any overlap in noise generation. Although the Mooir Vannin OWF is located within the 100 km screening buffer used to identify other plans and projects with potential cumulative impact with regards to underwater noise (63 km away), its construction phase is anticipated to be between 2030 – 2032. Therefore, it will not overlap with that of the Proposed Development (2024 - 2026) and is therefore not considered further in this Tier 2 assessment.

The MDS for the Mona OWF includes monopile and pin pile installation with a maximum hammer energy of 5,500 kJ and 2,800 kJ, respectively (Mona Offshore Wind Ltd, 2023e). Underwater noise modelling indicated mortality ranges of up to 420 m for Group 1 fish and 670 m for Groups 2 fish during maximum hammer energy. If modelled as static receptors, mortality ranges were modelled as 780 m for Group 1 fish and 2,090 m for Group 2 fish (Mona Offshore Wind Ltd, 2023e). If modelled as fleeing receptors, the mortality threshold was not exceeded for Groups 1 and 2 fish. As static receptors, injury ranges were calculated to reach out to 1,085 m for Group 1 and 4,440 m for Group 2. Again, these were reduced to 67 m for Group 2 when modelled as fleeing receptors, with the threshold not exceeded for Group 1 (Mona Offshore Wind Ltd, 2023e) In general, all these values exceeded those modelled for the Proposed Development (see section 1.7.2.1).

The MDS for the Morgan OWF Generation Assets includes monopile and pin pile installation with a maximum hammer energy of 5,500 kJ and 3,700 kJ, respectively, and clearance of up to 13 UXOs (Morgan Offshore Wind Ltd, 2023a). For the Morgan OWF Generation Assets, underwater noise modelling indicated mortality ranges of up to 745 m for Group 1 fish and 2,120 m for Group 2 fish, if modelled as static receptors (Morgan Offshore Wind Ltd, 2023a). In all cases, modelling the fish as fleeing receptors highly reduced mortality ranges, down to <100 m. As static receptors, injury distances were calculated to reach out to up to 4,760 m for Group 2, with this again reducing to <100 m in all cases when fish were modelled as fleeing receptors, with similar patterns for all other groups of fish (Morgan Offshore Wind Ltd, 2023a). In general, all these values exceeded those modelled for the Proposed Development (see section 1.7.2.1).

The MDS for the Morecambe OWF Generation Assets includes monopile and pin pile installation with a with a maximum hammer energy of 5,000 kJ and 2,500 kJ, respectively (Morecambe Offshore Wind Ltd, 2023b). For the Morecambe OWF Generation Assets, underwater noise modelling indicated mortality ranges of up to 1,600 m for Group 1 fish and 5,000 m for Group 2 fish, if modelled as static receptors. In all cases, modelling the fish as fleeing receptors highly reduced mortality ranges, down to100 m for Group 1 fish and to 250 m for Group 2 (Morecambe Offshore Wind Ltd, 2023b). All these values exceeded those modelled for the Proposed Development (see section 1.7.2.1).

Overall, based on the results of the underwater noise modelling presented, there is low potential for significant in-combination impacts causing injury from increased underwater noise during the construction phase for the Tier 2 projects.

Tiers 3 and 4

There were no Tier 3 or 4 plans, projects, or activities identified in the in-combination assessment with the potential to result in increased underwater noise during the construction phase of the Proposed Development.

1.7.3 Assessment of adverse effects alone

1.7.3.1 Dee Estuary SAC

With respect to Annex II diadromous fish, the function of the Dee Estuary SAC is to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the favourable conservation status of its qualifying features, by maintaining or restoring:

- Conservation objective 1 - The populations of qualifying species.
- Conservation objective 2 - The distribution of qualifying species within the site.
- Conservation objective 3 - The extent and distribution of qualifying natural habitats and habitats of qualifying species.
- Conservation objective 4 - The structure and function of the habitats of qualifying species.
- Conservation objective 5 - The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.

Please note that the assessment against conservation objectives 3, 4 and 5, referring to the extent and distribution as well as the structure and function of the habitats of qualifying species and the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely, was provided in section 1.6.3 where potential AEoI was considered with respect to natural habitats and qualifying Annex I habitats. As such, although potential impacts on habitats will be considered in the context of populations and distributions of qualifying species, the conservation objectives 3, 4 and 5 referring specifically to habitats of qualifying species will not be further considered in this section.

Table 1.22 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.23.

Table 1.22: Impacts Considered For Each Conservation Objective - Dee Estuary SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact	Conservation Objectives	
	1	2
Temporary habitat loss/disturbance	✓	✓
Increased SSCs and associated deposition	✓	✓
Underwater noise impacting fish receptors	✓	✓

Table 1.23 presents the assessment of AEoI of the Dee Estuary SAC with respect to qualifying Annex II diadromous fish. The assessment was informed by detailed operations advice for the Dee Estuary SAC interest features published by Natural England and Countryside Council for Wales (2010).

Table 1.23: Assessment Of AEoI Of The Dee Estuary SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 – the populations of qualifying species					
Temporary habitat loss/disturbance	✓	✓	✓	As presented in section 1.7.2.1, subsea cable installation may result in up to 39,000 m^2 and 72,000 m^2 of temporary habitat loss and/or disturbance in the construction and operations and maintenance phases, respectively. The extent of temporary habitat loss and/or disturbance during decommissioning phase will be significantly lower than that of the construction phase due to the absence of seabed preparation activities. The Proposed Development overlaps only with 0.21 km^2 of the Dee Estuary SAC, corresponding to 0.13% of the SAC's total area. Although relatively high levels of information are available on the biology of the river and sea lamprey in freshwater, much less is known about their habits in estuaries and the sea (Natural England and Countryside Council for Wales, 2010). Sea and river lampreys spawn and spend their juvenile phase in rivers and therefore nursery and spawning areas will not be affected by the Proposed Development. Young river lamprey are known to congregate in large numbers in the estuaries of major rivers, however the cable corridor will be installed to the west of the mouth of the River Dee and this area is not known for any particular importance to river or sea lamprey. Both species of lamprey are considered to have moderate vulnerability to physical removal but were not identified as vulnerable to selective extraction. Considering the small spatial extent and the location of cable related activities, it is unlikely that individual fish or their habitat could be lost to the extent that could impact the populations of either species. The subtidal zone of the Dee is believed to provide an important breeding, sheltering and nursery area for coastal fish species, which may be important prey for river and sea lamprey, including herring, sprat, flounder, cod and haddock *Melanogrammus aeglefinus.* However, given that this impact will be of a limited spatial extent and of high reversibility, it is not anticipated that prey resources will be significantly impacted during any of the phases of the Proposed Development. The temporary habitat loss/disturbance associated with the offshore cable during all phases of the Proposed Development will be temporary, of short term duration and reversible. As such, this pressure is not expected to adversely affect the population of river and sea lamprey.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur through impacts resulting from temporary habitat loss and/or disturbance.
Increased SSCs and associated deposition	✓	×	✓	Sand waves are to be cleared along the cable corridor in two locations, south of the existing Douglas platforms, and at West Hoyle Bank, however this will happen at a significant distance (south of the existing Douglas platforms and at West Hoyle Bank) from the nearest boundary of the Dee Estuary SAC and therefore is not considered to have potential to affect the SAC. As mentioned in section 1.7.2.1, trenching during cable installation and decommissioning may result in the plume extending up to 15 km to the west and that the suspended sediments may reach into the estuary, but suspended sediments are expected to be within the background levels (i.e. 30 mg/l). Natural England and Countryside Council for Wales (2010) identified both species of lamprey as not vulnerable to changes in turbidity or siltation due to their mobility. The subtidal zone of the Dee is	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur through impacts resulting from increased

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				believed to provide an important breeding, sheltering and nursery area for coastal fish species, which may be important prey for river and sea lamprey. However, given that the sediment plumes resulting from activities along the cable route will stay within background levels of the naturally turbid system of the Dee Estuary, it can be anticipated that this pressure will not alter the availability of prey species during any of the phases of the Proposed Development and therefore have no effect on the population of the Annex II diadromous fish. Given the low vulnerability of Annex II diadromous fish to this impact, as well as the negligible magnitude and short term nature of any increases in SSCs, this pressure is not expected to adversely affect the population of river and sea lamprey.	SSCs and associated deposition.
Underwater noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 184 m of the piling activity for sea and river lamprey. The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 204 m for lampreys. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m for lampreys (see section 1.7.2.1). The geophysical and seismic surveys may occur intermittently throughout the operation and maintenance phase. It should be noted that these ranges are the maximum ranges for the MDS (Table 1.17) and are therefore very precautionary. It is unlikely that injury will occur within these ranges due to the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. This is a highly conservative value for lampreys as they are group 1 fish species and are known to be less sensitive to underwater noise. Although the risk of barrier to migration due to behavioural responses cannot be discounted (Figure 1.8), piling will take place over a short duration (up to 13.5 hours, based upon up to 100 m minutes of piling at each of eight pin piles), intermittently and therefore unlikely to adversely affect the population of river and sea lamprey.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur through impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 2 – the distribution of qualifying species within the site					
Temporary habitat loss/disturbance	✓	✓	✓	As presented in section 1.7.2.1, subsea cable installation may result in up to 39,000 m^2 and 72,000 m^2 of temporary habitat loss and/or disturbance in the construction and operations and maintenance phases, respectively. The extent of temporary habitat loss and/or disturbance during decommissioning	Adverse effects on the qualifying Annex II diadromous fish which undermine the

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				phase will be significantly lower than that of the construction phase due to the absence of seabed preparation activities. The Proposed Development overlaps only with 0.21 km^2 of the Dee Estuary SAC, corresponding to 0.13% of the SAC's total area. Limited information is available on the biology of the river and sea lamprey habits in estuarine and marine environments, however, however both species spawn and spend their juvenile phase in rivers and therefore the distribution of both species within nursery and spawning areas will not be affected by temporary habitat loss/disturbance associated with the Proposed Development (Natural England and Countryside Council for Wales, 2010). Young river lampreys are known to congregate in large numbers in the estuaries of major rivers and given that the cable corridor will be installed to the west from the mouth of the River Dee and this area is not known as of any particular importance to river or sea lamprey. River and sea lamprey may avoid areas subject to temporary habitat loss during installation, repair or decommissioning, but these activities will be short term and both species are expected to return to the area following the cessation of activities. As such, it is unlikely that temporary habitat loss will significantly affect the distribution of species within the site. The subtidal zone of the Dee is believed to provide an important breeding, sheltering and nursery area for coastal fish species. However, given that this impact will be of a limited spatial extent and of high reversibility, it is not anticipated that prey resources will be significantly impacted during any of the phases of the Proposed Development. The temporary habitat loss/disturbance associated with offshore export cable during all phases of the Proposed Development will be temporary, of short term duration and reversible. As such, this pressure is not expected to adversely affect the distribution of river and sea lamprey.	conservation objective 2 of the Dee Estuary SAC will not occur through impacts resulting from the temporary habitat and disturbance.
Increased SSCs and associated deposition	✓	×	✓	Sand waves clearance will occur along the cable corridor in two locations, south of the existing Douglas platform, and at West Hoyle Bank. These locations are a significant distance (south of the existing Douglas platforms and at West Hoyle Bank) from the closest boundary of Dee Estuary SAC and therefore are not considered to have potential to affect the SAC. As mentioned in section 1.7.2.1, trenching during cable installation and decommissioning may result in the plume extending up to 15 km to the west of the activity with suspended sediments potentially entering the estuary. These suspended sediments are however expected to be within the background levels for the area (i.e. 30 mg/l). Natural England and Countryside Council for Wales (2010) identified both species of lamprey as not vulnerable to changes in turbidity or siltation due to their mobility. As such, this impact is unlikely to affect the distribution of species within the site. The subtidal zone of the Dee is believed to provide an important breeding, sheltering and nursery area for coastal fish species, which may be important prey for river and sea lamprey. However, given that the sediment plumes resulting from activities along the cable route will stay within background levels of the naturally turbid system of the Dee Estuary, it can be anticipated that this pressure will not alter the availability of prey species during any phase of the Proposed Development and therefore will have no effect on the distribution of Annex II diadromous fish.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Dee Estuary SAC will not occur due to impacts resulting from the increased SSCs and associated deposition.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Given the low vulnerability of Annex II diadromous fish to this impact, as well as the negligible magnitude and short term nature of any increases in SSCs, this pressure is not expected to adversely affect the distribution of river and sea lamprey.	
Underwater noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 184 m of the piling activity for sea and river lamprey (see section 1.7.2.1). The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 204 m for lampreys. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects to the diadromous fish considered may occur at a range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m for lampreys (see section 1.7.2.1). The geophysical and seismic surveys may occur intermittently throughout the operation and maintenance phase. However, the overlap of injury ranges with the boundaries of the SAC is highly unlikely and therefore the risk of affecting sea and river lamprey distribution within the site is low. In terms of behavioural disturbance due to piling, it may potentially affect diadromous fish up to 33 km from the source and there is therefore potential for an overlap between the behavioural range and the SAC boundary (Figure 1.8). However, the maximum disturbance range of 33 km is highly conservative for lampreys because these are group 1 fish species, known to be less sensitive to underwater noise. The Popper *et al.* (2014) guidelines provide qualitative behavioural criteria for fish from a range of sound sources, with the risk of behavioural effects on group 1 fish from piling operations considered to be moderate to high in the near to intermediate field (i.e. <1km from piling operations) and low in the far field (i.e. in the range of kilometres form piling operations). Although changes in the distribution of sea and river lamprey within the site due to behavioural responses cannot be discounted, impacts due to underwater noise (piling, UXO clearance, geophysical/seismic surveys) will take place over a short duration (e.g. less than 13.5 hours for piling in total), intermittently and are therefore unlikely to adversely affect their distribution outside the SAC in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Dee Estuary SAC will not occur through impacts resulting from the underwater noise impacting fish receptors.

Summary

In line with findings presented in Table 1.23, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species of the Dee Estuary SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species, it can be concluded that there is no risk of an adverse effect on the integrity of the Dee Estuary SAC as a result of activities associated with the Proposed Development alone.

1.7.3.2 River Dee and Bala Lake SAC

With respect to Annex II diadromous fish, the vision of the River Dee and Bala Lake SAC is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- Conservation objective 1 - The parameters defined in the NRW (2022d) for the watercourse must be met.
- Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term.
- Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- Conservation objective 4 - There will be no reduction in the area or quality of habitat for the feature populations in the SAC on a long termbasis.
- Conservation objective 5 - All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).

Table 1.24 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.25.

Table 1.24: Impacts Considered For Each Conservation Objective – River Dee And Bala Lake SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact		Conservation Objectives			
	1	2	3	4	5
Underwater noise impacting fish receptors	×	✓	✓	✓	✓

Please note that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022d). Table 1.25 presents the assessment of AEoI of the River Dee and Bala Lake SAC with respect to qualifying Annex II diadromous fish.

Table 1.25: Assessment Of AEoI Of The River Dee And Bala Lake SAC

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term					
Subsea noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 184 m and 314 m of the piling activity for lamprey species and Atlantic salmon, respectively (see section 1.7.2.1). The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 204 m for lampreys and 625 m for salmonids. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m and 54 for lamprey species and Atlantic salmon, respectively (see section 1.7.2.1). The geophysical and seismic surveys may occur intermittently throughout the operation and maintenance phase. It should be noted that these ranges are the maximum ranges for the MDS (Table 1.17) and are therefore very precautionary. It is unlikely that injury will occur within these ranges due to the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. This is a highly conservative value for lamprey species and Atlantic salmon as they are group 1 and 2 fish species and are known to be less sensitive to underwater noise. Although the risk of barrier to migration due to behavioural responses to underwater noise cannot be discounted (Figure 1.8), impacts such as piling, UXO clearance and geophysical/seismic surveys will take place over a short duration, intermittently and therefore unlikely to adversely affect the populations of Atlantic salmon, river and sea lamprey in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 3 – The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are highly conservative and are based upon the MDS. The implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the River Dee and Bala Lake SAC will not

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				33 km from the source. There will however be no overlap of injury and/or disturbance ranges with the boundaries of the SAC. Atlantic salmon, sea and river lamprey may potentially be temporarily deterred from the areas outside of the SAC, which may constitute their natural range, although lamprey species and Atlantic salmon are group 1 and 2 fish species and are known to be less sensitive to underwater noise. Due to the short duration and intermittent nature of piling, UXO clearance and geophysical/seismic survey activities, it is unlikely that natural range of the diadromous fish will be reduced in the long term.	occur due to impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 4 - There will be no reduction in the area or quality of habitat for the feature populations in the SAC on a long term basis					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are considered highly conservative and are based upon the MDS. The implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance due to piling, it may potentially affect diadromous fish up to 33 km from the source. There will however be no overlap of injury and/or disturbance ranges with the boundaries of the SAC, but Atlantic salmon, sea and river lamprey may be temporarily deterred from the areas outside of the SAC which may represent their habitat during certain life cycle stages. Nevertheless, lamprey species and Atlantic salmon are group 1 and 2 fish species and are known to be less sensitive to underwater noise. Due to the short duration and intermittency of piling, UXO clearance and geophysical/seismic survey activities, it is unlikely that area or quality of habitat of the diadromous fish will be reduced in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 4 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 5- All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).					
Subsea noise impacting fish receptors	✓	×	×	Given the conclusions made for the conservation objectives above, it is considered that all factors affecting the achievement of these conditions will remain under control.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 5 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Summary

In line with findings presented in Table 1.25, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species of the River Dee and Bala Lake SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species, it can be concluded that there is no risk of an adverse effect on the integrity of the River Dee and Bala Lake SAC as a result of activities associated with the Proposed Development alone.

1.7.3.3 Afon Gwyrfai a Llyn Cwellyn SAC

With respect to Annex II diadromous fish, the vision of the Afon Gwyrfai a Llyn Cwellyn SAC is for it to be of favourable conservation status, where all of the following conditions are satisfied:

- Conservation objective 1 - The conservation objective for the watercourse as outlined in (NRW, 2022b) must be met.
- Conservation objective 2 - The population of the feature in the SAC is stable or increasing over the long term.
- Conservation objective 3 - The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future. The natural range is taken to mean those reaches where predominantly suitable habitat for each life stage exists over the long term.
- Conservation objective 4 - The Gwyrfai will continue to be a sufficiently large habitat to maintain the feature's population in the SAC on a long termbasis.

Table 1.26 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.27.

Table 1.26: Impacts Considered For Each Conservation Objective - Afon Gwyrfai A Llyn Cwellyn SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact	Conservation Objectives			
	1	2	3	4
Underwater noise impacting fish receptors	×	✓	✓	×

Please note that conservation objective 1 will not be considered further as there is no pathway for underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022b). Similarly, given the distance from the Proposed Development to Afon Gwyrfai a Llyn Cwellyn SAC (113.4 km), there is no potential for the underwater noise generated by the Proposed Development to restrict the spatial extent of the suitable habitat within the river, and as such conservation objective 4 will not be considered further. Table 1.27 presents the assessment of AEoI of the Afon Gwyrfai a Llyn Cwellyn SAC with respect to qualifying Annex II diadromous fish.

Table 1.27: Assessment Of AEoI Of The Afon Gwyrfai A Llyn Cwellyn SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 - The population of the feature in the SAC is stable or increasing over the long term					
Underwater noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 314 m of the piling activity for Atlantic salmon. The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 625 m for salmonids. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at a range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 54 m for Atlantic salmon (see section 1.7.2.1). The geophysical and seismic surveys may occur intermittently throughout the operation and maintenance phase. It should be noted that these ranges are the maximum ranges for the MDS (Table 1.17) and are therefore considered very precautionary. It is unlikely that injury will occur within these ranges due to the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. Additionally, these activities will be taking place within the Proposed Development, which is located approximately 113.4 km from the Afon Gwyrfai a Llyn Cwellyn SAC. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. This is a highly conservative value for Atlantic salmon as it is group 2 fish species and is known to be less sensitive to underwater noise. Although the risk of barrier to migration due to behavioural responses cannot be discounted at a distance from the site (Figure 1.8), impacts generating underwater noise (piling, UXO clearance, geophysical/seismic surveys) will take place over a short duration and there is no potential for overlap of behavioural disturbance ranges with the SAC boundary. As such, underwater noise is unlikely to adversely affect the population of Atlantic salmon in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 3 - The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Underwater noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are considered highly conservative. The implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. There will be no overlap of injury and/or disturbance ranges with the boundaries of the SAC, however, Atlantic salmon may be temporarily deterred from	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				the areas outside of the SAC which may constitute their natural range, although Atlantic salmon is a group 2 fish species and is known to be less sensitive to underwater noise. Due to the short duration of piling, UXO clearance and geophysical/seismic survey activities, it is unlikely that natural range of the diadromous fish features will be reduced in the long term.	impacts resulting from the underwater noise impacting fish receptors.

Summary

In line with findings presented in Table 1.27, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species of the Afon Gwyrfai a Llyn Cwellyn SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species, it can be concluded that there is no risk of an adverse effect on the integrity of the Afon Gwyrfai a Llyn Cwellyn SAC as a result of activities associated with the Proposed Development alone.

1.7.3.4 Afon Eden – Cors Goch Trawsfynydd SAC

The generic conservation objectives for Atlantic salmon, an Annex II diadromous fish, and freshwater pearl mussel, two qualifying features of the Afon Eden – Cors Goch Trawsfynydd SAC, for the physical habitat, water quality and population attributes are listed below.

- Conservation objective 1 - Quality (including flow regime, water quality and physical habitat) should be being maintained, or where appropriate improving. There should be sufficient habitat, of sufficient quality, to support the population in the long term.
- Conservation objective 2 – The distribution of the population should be being maintained or where appropriate increasing.
- Conservation objective 3 –There should be sufficient habitat, of sufficient quality, to support the population in the long term.
- Conservation objective 4 - The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term.
- Conservation objective 5 - Factors affecting the population or its habitat should be under appropriate control.

Table 1.28 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.29.

Table 1.28: Impacts Considered For Each Conservation Objective - Afon Eden – Cors Goch Trawsfynydd SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact	Conservation Objectives				
	1	2	3	4	5
Underwater noise impacting fish receptors	×	✓	✓	✓	✓

Please note that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined for quality (NRW, 2022a). Table 1.29 presents the assessment of AEoI of the Afon Eden – Cors Goch Trawsfynydd SAC with respect to qualifying Annex II diadromous fish and freshwater pearl mussel.

Table 1.29: Assessment Of AEoI Of The Afon Eden – Cors Goch Trawsfynydd SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 – The distribution of the population should be being maintained or where appropriate increasing					
Subsea noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 314 m of the piling activity for Atlantic salmon. The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 625 m for salmonids. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1), with a maximum range of up to ~985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 54 m for Atlantic salmon (see section 1.7.2.1). The geophysical and seismic surveys may occur intermittently throughout the operation and maintenance phase. Given that the activities will be taking place within the Proposed Development, located approximately 197.3 km from the Afon Eden – Cors Goch Trawsfynydd SAC, the overlap of injury ranges with the boundaries of the SAC is highly unlikely and therefore the risk of affecting Atlantic salmon distribution within the site is low. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source and therefore there is potential for an overlap of behavioural range contours with the SAC boundaries (Figure 1.8). However, this maximum range of 33 km is considered highly conservative for Atlantic salmon due to the classification of this species as a group 2 fish species, known to be less sensitive to underwater noise. The Popper *et al.* (2014) guidelines provide qualitative behavioural criteria for fish from a range of sound sources, with the risk of behavioural effects on group 2 fish from piling operations considered to be moderate to high in the near to intermediate field (i.e. <1km from piling operations) and low in the far field (i.e. in the range of kilometres form piling operations). Although changes in distribution of Atlantic salmon within the site due to behavioural responses cannot be discounted, impacts through generating underwater noise (piling, UXO clearance, geophysical/seismic surveys) will take place over a short duration (e.g. piling of eight pin piles is expected to take less than 13.5 hours in total) and therefore unlikely to adversely affect their distribution outside the SAC in the long term.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 2 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Adult freshwater pearl mussel are confined to freshwater habitats therefore there is no pathway for direct effects to this species during construction of the Proposed Development as a result of underwater noise. Additionally, given that the adverse impacts on Atlantic salmon are unlikely to occur, indirect impacts on pearl mussel are not anticipated.	
Conservation objective 3 –There should be sufficient habitat, of sufficient quality, to support the population in the long term					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are highly conservative and the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. There will be no overlap of injury and/or disturbance ranges with the boundaries of the SAC, which is located approximately 197.3 km from the Proposed Development, however, Atlantic salmon may be temporarily deterred from the areas outside of the SAC which may represent their habitat during certain life cycle stages, although Atlantic salmon is a group 2 fish species that is known to be of low sensitivity to underwater noise. Due to the short duration and intermittency of piling, UXO clearance and geophysical/seismic survey activities, it is unlikely that the area or quality of habitat of the diadromous fish feature will be reduced in the long term. Adult freshwater pearl mussel are confined to freshwater habitats therefore there is no pathway for direct effects to this species during construction of the Proposed Development as a result of underwater noise. Additionally, given that the adverse impacts on Atlantic salmon are unlikely to occur, indirect impacts on pearl mussel are not anticipated.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 3 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 4 - The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are highly conservative and the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. There will be no overlap of injury and/or disturbance ranges with the boundaries of the SAC, which is located approximately 197.3 km from the Proposed Development, however, Atlantic salmon may be temporarily deterred from the areas outside of the SAC which may represent their habitat during	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 4 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				certain life cycle stages, although Atlantic salmon is a group 2 fish species that is known to be of low sensitivity to underwater noise. As such, underwater noise is unlikely to adversely affect the population of Atlantic salmon in the long term. Adult freshwater pearl mussel are confined to freshwater habitats therefore there is no pathway for direct effects to this species during construction of the Proposed Development as a result of underwater noise. Additionally, given that the adverse impacts on Atlantic salmon are unlikely to occur, indirect impacts on pearl mussel are not anticipated	
Conservation objective 5 - Factors affecting the population or its habitat should be under appropriate control					
Subsea noise impacting fish receptors	✓	×	×	Given the conclusions made for the conservation objectives above, it is considered that all factors affecting the achievement of these conditions will remain under control.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 5 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Summary

In line with findings presented in Table 1.29, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species and freshwater pearl mussel of the Afon Eden – Cors Goch Trawsfynydd SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species and freshwater pearl mussel, it can be concluded that there is no risk of an adverse effect on the integrity of the Afon Eden – Cors Goch Trawsfynydd SAC as a result of activities associated with the Proposed Development alone.

1.7.3.5 Afon Teifi/River Teifi SAC

With respect to Annex II diadromous fish, the vision of the River Teifi SAC is for it to be of favourable conservation status, where all of the following conditions are satisfied:

- Conservation objective 1 - The parameters defined in the NRW (2022c) for the watercourse must be met.
- Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term.
- Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.
- Conservation objective 4 - There is, and will continue to be, a sufficiently large habitat to maintain the feature's population in the SAC on a long termbasis.

Table 1.30 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.31.

Table 1.30: Impacts Considered For Each Conservation Objective – River Teifi SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact	Conservation Objectives			
	1	2	3	4
Underwater noise impacting fish receptors	×	✓	✓	×

Please note that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022c). Similarly, given significant distance from the Proposed Development and River Teifi SAC, there is no potential for the underwater noise to restrict spatial extent of the suitable habitat within the river and as such conservation objective 4 will not be considered further. Table 1.31 presents the assessment of AEoI of the River Teifi SAC with respect to qualifying Annex II diadromous fish.

Table 1.31: Assessment Of AEoI Of The River Teifi SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term					
Subsea noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 184 m and 314 m of the piling activity for lamprey species and Atlantic salmon, respectively. The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 204 m for lampreys and 625 m for salmonids. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m and 54 for lamprey species and Atlantic salmon, respectively (see section 1.7.2.1). It should be noted that these ranges are the maximum ranges for the MDS (Table 1.17) and therefore considered very precautionary. It is unlikely that injury will occur within these ranges due to the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. This is a highly conservative value for lamprey species and Atlantic salmon as they are group 1 and 2 fish species and are known to be less sensitive to underwater noise. Although the risk of causing a barrier to migration due to behavioural responses cannot be discounted (Figure 1.8), impacts such as piling, UXO clearance and geophysical/seismic surveys will take place at a significant distance from the SAC (approximately 211 km). Noise producing activities will be short in duration and intermittent, and therefore unlikely to adversely affect the population of Atlantic salmon, river and sea lamprey in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the River Teifi SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are considered highly conservative. The implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. There will be no overlap of injury and/or disturbance ranges with the boundaries of the SAC as the Proposed Development is located approximately 211 km away, however, Atlantic salmon, sea and river lamprey may be temporarily deterred from the areas outside of the SAC which may constitute their natural range. Lamprey and Atlantic salmon are	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the River Teifi SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				group 1 and 2 fish species and are known to be less sensitive to underwater noise. Due to the short duration and intermittency of piling, UXO clearance and geophysical/seismic survey activities, it is unlikely that natural range of the diadromous fish will be reduced in the long term.	

Summary

In line with findings presented in Table 1.31, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species of the River Teifi SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species, it can be concluded that there is no risk of an adverse effect on the integrity of the River Teifi SAC as a result of activities associated with the Proposed Development alone.

1.7.3.6 Cardigan Bay SAC

With respect to Annex II diadromous fish, the vision of the Cardigan Bay SAC is for it to be of FCS, where all of the following conditions are satisfied:

- Conservation objective 1 - The SAC feature populations is maintaining itself and viable as part of the natural habitat on a long-term basis.
- Conservation objective 2 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future.

Conservation objective 3 - The habitats and species are in a condition that is required to support the dynamics of the features within the SAC and populations beyond the SAC is stable or increasing. Table 1.32 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives and therefore will be considered further in Table 1.31.Table 1.32: Impacts Considered For Each Conservation Objective – Cardigan Bay SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine the conservation objective.

Impact	Conservation Objectives		
	1	2	3
Underwater noise impacting fish receptors	✓	✓	✓

Table 1.33 presents the assessment of AEoI of the Cardigan Bay SAC with respect to qualifying Annex II diadromous fish.

Table 1.33: Assessment of AEoI Of Cardigan Bay SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - The SAC feature populations is maintaining itself and viable as part of the natural habitat on a long-term basis					
Subsea noise impacting fish receptors	✓	×	×	Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000kJ), mortality and recoverable injury to fish may occur within a maximum of 184 m of the piling activity for lamprey species. The cumulative mortality thresholds for consecutive piling (SEL_{cum}) were not exceeded for fleeing fish, based on a swim speed of 0.5 m/s. If modelled as static receptors, the threshold for mortality was 204 m for lampreys. Although it is highly unlikely that fish will remain static in the water column, consecutive pin pile installation based on the SEL_{cum} threshold for static fish represents the worst-case scenario based on the piling parameters provided in the MDS (see section 1.7.2.1). The outputs of underwater noise modelling for UXO clearance concluded that injury effects may occur at range of tens to hundreds of metres, depending on the size of the UXO cleared and the method of detonation (see section 1.7.2.1) with a maximum range of up to approximately 985 m. VSP surveys may result in mortality/recoverable injury ranges of up to 26 m for lamprey species (see section 1.7.2.1). It should be noted that this range is the maximum range for the MDS (Table 1.17) and therefore considered very precautionary. It is unlikely that injury will occur within this range due to the implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, which will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. This is a highly conservative value for lamprey species are group 1 fish species and are known to be less sensitive to underwater noise. Although the risk of causing a barrier to migration due to behavioural responses cannot be discounted (Figure 1.8), impacts such as piling, UXO clearance and geophysical/seismic surveys will take place at a significant distance from the SAC (approximately 211 km). Noise producing activities will be short in duration and intermittent, and therefore unlikely to adversely affect the population of river and sea lamprey in the long term.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.
Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Subsea noise impacting fish receptors	✓	×	×	Potential injury ranges as a result of piling, UXO and geophysical/seismic surveys as presented in section 1.7.2.1 are considered highly conservative. The implementation of embedded mitigation measures during piling, UXO and surveys activities (Table 1.18), including soft starts, will allow some fish to move away from the areas of highest sound levels, before they reach a level that would cause an injury. In terms of behavioural disturbance as a result of piling, it may potentially affect diadromous fish up to 33 km from the source. There will be no overlap of injury and/or disturbance ranges with the boundaries of the SAC as the Proposed Development is located approximately 211 km away, however, sea and river lamprey may be temporarily deterred from the areas outside of the SAC which may constitute their natural range. Lamprey are group 1 fish species and are known to be less sensitive to underwater noise. Due to the short duration and intermittency of piling, UXO	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				clearance and geophysical/seismic survey activities, it is unlikely that natural range of the diadromous fish will be reduced in the long term.	
Conservation objective 3 - The habitats and species are in a condition that is required to support the dynamics of the features within the SAC and populations beyond the SAC is stable or increasing					
Subsea noise impacting fish receptors	✓	×	×	Given the conclusions made for the conservation objectives above, it is considered that all factors affecting the achievement of these conditions will remain under control.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of impacts resulting from the underwater noise impacting fish receptors.

Summary

In line with findings presented in Table 1.33, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying fish species of the Cardigan Bay SAC, will not occur as a result of activities associated with the Proposed Development alone.

Therefore, with respect to relevant Annex II qualifying fish species, it can be concluded that there is no risk of an adverse effect on the integrity of the Cardigan Bay SAC as a result of activities associated with the Proposed Development alone.

1.7.4 Assessment of adverse effects in-combination with other plans and projects

1.7.4.1 Dee Estuary SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the Dee Estuary SAC (sea lamprey and river lamprey) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.1 for the Proposed Development alone and will not be repeated here.

Some potential impacts resulting from the activities at Proposed Development that may affect conservation objectives of the Dee Estuary SAC, presented in Table 1.22 are also applicable to the in-combination assessment of AEoI of the Dee Estuary SAC with respect to qualifying Annex II diadromous fish species. The potential impacts applicable to the in-combination assessment are:

- temporary habitat loss/disturbance (along cable connection only);
- increased SSCs and associated deposition (along cable connection only); and
- underwater noise impacting fish receptors (Table 1.34).

The assessment was informed by detailed operations advice for the Dee Estuary SAC interest features published by Natural England and Countryside Council for Wales (Natural England and Countryside Council for Wales, 2010).

Table 1.34: Assessment Of AEoI Of The Dee Estuary SAC In-Combination With Other Plans And Projects

<table>
<tr><th rowspan="2">Impact</th><th colspan="3">Relevant project phase</th><th rowspan="2">Assessment</th><th rowspan="2">Conclusion</th></tr>
<tr><th>C</th><th>O</th><th>D</th></tr>
<tr><td colspan="6">Conservation objective 1 – the populations of qualifying species</td></tr>
<tr><td>Temporary habitat loss/disturbance (along cable connection only)</td><td>✓</td><td>✓</td><td>✓</td><td>As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the populations of qualifying species for this site (sea lamprey and river lamprey).
Tier 1
As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase only: the Mostyn Energy Park Expansion, which is situated within the Dee Estuary SAC. However, activities associated with the Tier 1 project are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility. Given the localised extent of this impact for the Tier 1 project, and that it doesn’t overlap with the cable connection of the Proposed Development, any temporary habitat loss/disturbance is not anticipated to affect the Annex II diadromous fish features of the Dee Estuary SAC during the construction phase.
Tiers 2, 3, and 4
As per section 1.6.2.2, there were no Tier 2, 3 or 4 plans or projects identified with the potential to result in in-combination effects regarding temporary habitat loss/disturbance during any phases of the Proposed Development.
Summary
Temporary habitat loss/disturbance along the cable connection is therefore not predicted to restrict conservation objective 1 of the Dee Estuary SAC.</td><td>Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur through impacts resulting from temporary habitat loss and/or disturbance in-combination with other plans and projects.</td></tr>
<tr><td>Increased SSCs and associated deposition (along cable connection only)</td><td>✓</td><td>×</td><td>✓</td><td>As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the populations of qualifying species for this site (sea lamprey and river lamprey).
Tier 1
As per section 1.7.2.2, four Tier 1 projects were identified with a potential for in-combination effects in the construction phase, and one project in the decommissioning phase. However, activities associated with these Tier 1 projects are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility. Given the localised extent of this impact for the Tier 1 projects, and that none overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction or decommissioning phases.
Tier 2
As per section 1.7.2.2, there was potential for in-combination effects with the Mona OWF in the construction phase of the Proposed Development and with Mona OWF and the Morgan</td><td>Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur as a result of impacts resulting from the increased SSCs and associated deposition in-combination with other plans and projects.</td></tr>
</table>

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				and Morecambe OWF Transmission Assets in the decommissioning phase. The modelling for Mona OWF suggested that suspended sediments would be resuspended on subsequent tides and sediment plumes would reduce with distance from the site (Mona Offshore Wind Ltd, 2023a). At the time of writing, there was no publicly available information to quantify this impact at the Morgan and Morecambe OWF Transmission Assets. As the transmission assets only involve cables, it is likely that sedimentation will be of a lower extent to that of Mona OWF. These activities would be of limited spatial extent, intermittent in frequency, and unlikely to interact with sediment plumes from the Proposed Development. As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction or decommissioning phases. **Tier 3** As per section 1.7.2.2, there was potential for in-combination effects with one Tier 3 project only in the construction phase of the Proposed Development: The Maresconnect interconnector cable. At the time of writing, there was limited information available on this project, however activities associated with increased SSCs are likely to be similar to those for the installation of cables at the Proposed Development. As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction or decommissioning phases. **Tier 4** As per section 1.7.2.2, there was potential for in-combination effects with one Tier 4 project only in the construction phase of the Proposed Development: the removal of a meteorological mast at Gwynt y Môr OWF. At the time of writing, there was limited information available on this project, however activities associated with increased SSCs are likely to be lower than those for the construction of the Proposed Development. As above for the Tier 1 projects, due to the localised extent of this impact and no overlap with the cable connection of the Proposed Development, any increased SSCs are not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction or decommissioning phases. **Summary** Increased SSCs and associated deposition in-combination with other plans and projects is therefore not predicted to restrict conservation objective 1 of Dee Estuary SAC.	

<table>
<tr><th rowspan="2">Impact</th><th colspan="3">Relevant project phase</th><th rowspan="2">Assessment</th><th rowspan="2">Conclusion</th></tr>
<tr><th>C</th><th>O</th><th>D</th></tr>
<tr><td>Underwater noise impacting fish receptors</td><td>✓</td><td>×</td><td>×</td><td>As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the populations of qualifying species for this site (sea lamprey and river lamprey).
Tier 1
As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species.
Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction phase.
Tier 2
As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for all three Tier 2 projects presented injury ranges of <100 m or with threshold not exceeded for Group 1 fish (lamprey species) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morecambe Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species.
Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Dee Estuary SAC during the construction phase.
Summary
Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 1 of Dee Estuary SAC.</td><td>Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur as a result of increased underwater noise in-combination with other plans and projects.</td></tr>
<tr><td colspan="6">Conservation objective 2 – the distribution of qualifying species within the site</td></tr>
</table>

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Temporary habitat loss/disturbance (along cable connection only)	✓	✓	✓	As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the distribution of qualifying species for this site (sea lamprey and river lamprey). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase only: the Mostyn Energy Park Expansion, which is situated within the Dee Estuary SAC. However, activities associated with the Tier 1 project are predicted to be of local spatial extent, short term in duration (for individual activities), intermittent, and of high reversibility. Given the localised extent of this impact for the Tier 1 project, and that it doesn't overlap with the cable connection of the Proposed Development, any temporary habitat loss/disturbance is not anticipated to affect the Annex II diadromous fish features of the Dee Estuary SAC during the construction phase. **Tiers 2, 3, and 4** As per section 1.6.2.2, there were no Tier 2, 3 or 4 plans or projects identified with the potential to result in in-combination effects regarding temporary habitat loss/disturbance during any phases of the Proposed Development. **Summary** Temporary habitat loss/disturbance along the cable connection is therefore not predicted to restrict conservation objective 2 of the Dee Estuary SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Dee Estuary SAC will not occur through impacts resulting from temporary habitat loss and/or disturbance in-combination with other plans and projects.
Increased SSCs and associated deposition (along cable connection only)	✓	×	✓	As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the distribution of qualifying species for this site (sea lamprey and river lamprey). Using the information presented above for conservation objective 1, increased SSCs and associated deposition in-combination with other plans and projects is not predicted to restrict conservation objective 2 of Dee Estuary SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Dee Estuary SAC will not occur as a result of impacts resulting from the increased SSCs and associated deposition in-combination with other plans and projects.
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.23), this impact is not expected to adversely affect the distribution of qualifying species for this site (sea lamprey and river lamprey).	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Dee Estuary SAC will not occur as a result of increased

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Using the information presented above for conservation objective 1, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 2 of Dee Estuary SAC.	underwater noise in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.34, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the Dee Estuary SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the Dee Estuary SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7.4.2 River Dee and Bala Lake SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the River Dee and Bala Lake SAC (Atlantic salmon, sea lamprey and river lamprey) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.2 for the Proposed Development alone and will not be repeated here.

The impact of underwater noise resulting from activities at the Proposed Development is also applicable to the in-combination assessment of AEoI with respect to the qualifying Annex II diadromous fish species and conservation objectives of the River Dee and Bala Lake SAC (Table 1.35).

It should be noted that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022d). Table 1.35 presents the in-combination assessment of AEoI of the River Dee and Bala Lake SAC with respect to qualifying Annex II diadromous fish.

Table 1.35: Assessment Of AEoI Of The River Dee And Bala Lake SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.25), this impact is not expected to adversely affect the populations of qualifying species for this site (Atlantic salmon, sea lamprey and river lamprey). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the River Dee and Bala Lake SAC during the construction phase. **Tier 2** As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for Mona OWF and Morgan OWF Generation Assets presented injury ranges of <100 m or with threshold not exceeded for Group 1 fish (lamprey species) and Group 2 fish (Atlantic salmon) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). For the Morecambe OWF Generation Assets, this range of <100 m was also modelled for Group 1 species, and 250 m was modelled for Group 2 species (Morecambe Offshore Wind Ltd, 2023b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the River Dee and Bala Lake SAC during the construction phase.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from underwater noise in-combination with other plans and projects. .

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 1 of the River Dee and Bala Lake SAC.	
Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.25), this impact is not expected to adversely affect the natural range of qualifying species for this site (Atlantic salmon, sea lamprey and river lamprey). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 3 of the River Dee and Bala Lake SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from underwater noise in-combination with other plans and projects. .
Conservation objective 4 - There will be no reduction in the area or quality of habitat for the feature populations in the SAC on a long term basis					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.25), this impact is not expected to adversely affect the area or quality of habitat of the qualifying species for this site (Atlantic salmon, sea lamprey and river lamprey). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 4 of the River Dee and Bala Lake SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 4 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from underwater noise in-combination with other plans and projects. .
Conservation objective 5- All known, controllable factors, affecting the achievement of these conditions are under control (many factors may be unknown or beyond human control).					
Underwater noise impacting fish receptors	✓	×	×	Given the conclusions made for the conservation objectives above, it is considered that all factors affecting the achievement of these conditions will remain under control.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 5 of the River Dee and Bala Lake SAC will not occur as a result of impacts resulting from underwater noise in-combination with other plans and projects. .

Summary

In line with findings presented in Table 1.35 adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the River Dee and Bala Lake SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the River Dee and Bala Lake SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7.4.3 Afon Gwyrfai a Llyn Cwellyn SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the Afon Gwyrfai a Llyn Cwellyn SAC (Atlantic salmon) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.3 for the Proposed Development alone and will not be repeated here.

The impact of underwater noise resulting from activities at the Proposed Development is also applicable to the in-combination assessment of AEoI with respect to the qualifying Annex II diadromous fish species and conservation objectives of the Afon Gwyrfai a Llyn Cwellyn SAC (Table 1.36).

It should be noted that conservation objective 1 will not be considered further as there is no pathway for underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022b). Similarly, given significant distance from the Proposed Development and Afon Gwyrfai, there is no potential for the underwater noise to restrict spatial extent of the suitable habitat within the river and as such conservation objective 4 will not be considered further. Table 1.36 presents the in-combination assessment of AEoI of the Afon Gwyrfai a Llyn Cwellyn SAC with respect to qualifying Annex II diadromous fish.

Table 1.36: Assessment Of AEoI Of The Afon Gwyrfai A Llyn Cwellyn SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Conservation objective 2 - The population of the feature in the SAC is stable or increasing over the long term					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.27) this impact is not expected to adversely affect the populations of qualifying species for this site (Atlantic salmon). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Afon Gwyrfai a Llyn Cwellyn SAC during the construction phase. **Tier 2** As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for Mona OWF and Morgan OWF Generation Assets presented injury ranges of <100 m or with threshold not exceeded for Group 2 fish (Atlantic salmon) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). For the Morecambe OWF Generation Assets, this range of up to 250 m was modelled for Group 2 species (Morecambe Offshore Wind Ltd, 2023b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Afon Gwyrfai a Llyn Cwellyn SAC during the construction phase.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Summary Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 2 of Afon Gwyrfai a Llyn Cwellyn SAC.	
Conservation objective 3 - The natural range of the feature in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.27) this impact is not expected to adversely affect the natural range of the qualifying species for this site (Atlantic salmon). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 3 of the Afon Gwyrfai a Llyn Cwellyn SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the Afon Gwyrfai a Llyn Cwellyn SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.36, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the Afon Gwyrfai a Llyn Cwellyn SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the Afon Gwyrfai a Llyn Cwellyn SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7.4.4 Afon Eden – Cors Goch Trawsfynydd SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the Afon Eden – Cors Goch Trawsfynydd SAC (Atlantic salmon and freshwater pearl mussel) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.4 for the Proposed Development alone and will not be repeated here.

The impact of underwater noise resulting from activities at the Proposed Development is also applicable to the in-combination assessment of AEoI with respect to the qualifying Annex II diadromous fish species and conservation objectives of the Afon Eden – Cors Goch Trawsfynydd SAC (Table 1.37).

It should be noted that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined for quality parameters (NRW, 2022a). Table 1.37 presents the in-combination assessment of AEoI of the Afon Eden – Cors Goch Trawsfynydd SAC with respect to qualifying Annex II diadromous fish.

Table 1.37: Assessment Of AEoI Of The Afon Eden – Cors Goch Trawsfynydd SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 – The distribution of the population should be being maintained or where appropriate increasing					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.29) this impact is not expected to adversely affect the population distribution of qualifying species for this site (Atlantic salmon and freshwater pearl mussel). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Afon Eden – Cors Goch Trawsfynydd SAC during the construction phase. **Tier 2** As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for Mona OWF and Morgan OWF Generation Assets presented injury ranges of <100 m or with thresholds not exceeded for Group 2 fish (Atlantic salmon) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). For the Morecambe OWF Generation Assets, this range of up to 250 m was modelled for Group 2 species (Morecambe Offshore Wind Ltd, 2023b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Afon Eden – Cors Goch Trawsfynydd SAC during the construction phase. **Summary**	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 2 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 2 of Afon Eden – Cors Goch Trawsfynydd SAC.	
Conservation objective 3 –There should be sufficient habitat, of sufficient quality, to support the population in the long term					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.29) this impact is not expected to adversely affect the habitat quantity and quality of the qualifying species for this site (Atlantic salmon and freshwater pearl mussel). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 3 of the Afon Eden – Cors Goch Trawsfynydd SAC.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 3 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of underwater noise in-combination with other plans and projects.
Conservation objective 4 - The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.29) this impact is not expected to adversely affect the population size of the qualifying species for this site (Atlantic salmon and freshwater pearl mussel). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 4 of the Afon Eden – Cors Goch Trawsfynydd SAC.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 4 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of underwater noise in-combination with other plans and projects.
Conservation objective 5 - Factors affecting the population or its habitat should be under appropriate control					
Underwater noise impacting fish receptors	✓	×	×	Given the conclusions made for the conservation objectives above, it is considered that all factors affecting the achievement of these conditions will remain under control.	Adverse effects on the qualifying Annex II diadromous fish and freshwater pearl mussel which undermine the conservation objective 5 of the Afon Eden – Cors Goch Trawsfynydd SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.37, adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the Afon Eden – Cors Goch Trawsfynydd SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the Afon Eden – Cors Goch Trawsfynydd SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7.4.5 River Teifi SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the River Teifi SAC (Atlantic salmon, sea lamprey, and river lamprey) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.5 for the Proposed Development alone and will not be repeated here.

The impact of underwater noise resulting from activities at the Proposed Development is also applicable to the in-combination assessment of AEoI with respect to the qualifying Annex II diadromous fish species and conservation objectives of the River Teifi SAC (Table 1.38).

It should be noted that conservation objective 1 will not be considered further as there is no pathway for the underwater noise to adversely affect the parameters defined in the vision for the watercourse (NRW, 2022c). Similarly, given significant distance from the Proposed Development and River Teifi SAC, there is no potential for the underwater noise to restrict spatial extent of the suitable habitat within the river and as such conservation objective 4 will not be considered further. Table 1.38 presents the in-combination assessment of AEoI of the River Teifi SAC with respect to qualifying Annex II diadromous fish.

Table 1.38: Assessment Of AEoI Of The River Teifi SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 - The SAC feature populations will be stable or increasing over the long term					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.31) this impact is not expected to adversely affect the populations of qualifying species for this site (Atlantic salmon, sea lamprey and river lamprey). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the River Teifi SAC during the construction phase. **Tier 2** As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for Mona OWF and Morgan OWF Generation Assets presented injury ranges of <100 m or with threshold not exceeded for Group 1 fish (lamprey species) and Group 2 fish (Atlantic salmon) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). For the Morecambe OWF Generation Assets, this range of <100 m was also modelled for Group 1 species, and 250 m was modelled for Group 2 species (Morecambe Offshore Wind Ltd, 2023b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the River Teifi SAC during the construction phase.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the River Teifi SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 2 of River Teifi SAC.	
Conservation objective 3 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.31), this impact is not expected to adversely affect the natural range of qualifying species for this site (Atlantic salmon, sea lamprey and river lamprey). Using the information presented above for conservation objective 2, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 3 of the River Teifi SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the River Teifi SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.38 adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the River Teifi SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the River Teifi SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.7.4.6 Cardigan Bay SAC

The assessment in this section will focus on Annex II diadromous fish that are qualifying features of the Cardigan Bay SAC (sea lamprey, and river lamprey) and impacts associated with Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.7.3.6 for the Proposed Development alone and will not be repeated here.

The impact of underwater noise resulting from activities at the Proposed Development is also applicable to the in-combination assessment of AEoI with respect to the qualifying Annex II diadromous fish species and conservation objectives of the Cardigan Bay SAC (Table 1.39). Table 1.39 presents the in-combination assessment of AEoI of the Cardigan Bay SAC with respect to qualifying Annex II diadromous fish.

Table 1.39: Assessment of AEoI of Cardigan Bay SAC In-Combination With Other Plans And Projects

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - The SAC feature populations is maintaining itself and viable as part of the natural habitat on a long-term basis					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.33) this impact is not expected to adversely affect the populations of qualifying species for this site (sea lamprey and river lamprey). **Tier 1** As per section 1.7.2.2, one Tier 1 project was identified with a potential for in-combination effects in the construction phase: Awel y Môr OWF. There may be some overlap between the construction phase of Awel y Môr OWF and the Proposed Development (up to a year), which suggests in-combination impacts would be lower than if they overlapped for multiple years. Furthermore, there will only be up to 13.5 hours of piling at the Proposed Development, which is low in comparison to the Tier 1 and Tier 2 projects identified. At the Awel y Môr OWF, mortality ranges were modelled for this project (<100 m for fish as fleeing receptors) and behavioural effects of underwater noise were modelled as similar to that of the Proposed Development (RWE Renewables UK, 2021b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Cardigan Bay SAC during the construction phase. **Tier 2** As per section 1.7.2.2, there was potential for in-combination effects with three Tier 2 projects in the construction phase of the Proposed Development: Mona OWF, Morgan OWF Generation Assets, and Morecambe OWF Generation Assets. As above for the Tier 1 project, there may be some overlap between the construction phases of the Tier 2 projects (up to a year), however it should be noted that it any in-combination impacts will be of a lesser extent than if the Tier 2 projects overlapped for a longer period of time (i.e. over multiple years). The underwater noise modelling for Mona OWF and Morgan OWF Generation Assets presented injury ranges of <100 m or with threshold not exceeded for Group 1 fish (lamprey species) modelled as fleeing receptors (Mona Offshore Wind Ltd, 2023b, Morgan Offshore Wind Ltd, 2023a). For the Morecambe OWF Generation Assets, this range of <100 m was also modelled for Group 1 species (Morecambe Offshore Wind Ltd, 2023b). Furthermore, embedded mitigation, such as soft starts, will potentially reduce the risk of impact to diadromous fish species. Overall, increased underwater noise is not anticipated to affect the Annex II diadromous fish of the Cardigan Bay SAC during the construction phase.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Increased underwater noise in-combination with other plans and projects is therefore not predicted to restrict conservation objective 1 of Cardigan Bay SAC.	
Conservation objective 2 - The natural range of the features in the SAC is neither being reduced nor is likely to be reduced for the foreseeable future					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.33), this impact is not expected to adversely affect the natural range of qualifying species for this site (sea lamprey and river lamprey). Using the information presented above for conservation objective 1, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 2 of the Cardigan Bay SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of underwater noise in-combination with other plans and projects.
Conservation objective 3 - The habitats and species are in a condition that is required to support the dynamics of the features within the SAC and populations beyond the SAC is stable or increasing					
Underwater noise impacting fish receptors	✓	×	×	As previously described for the Proposed Development alone (Table 1.33), this impact is not expected to adversely affect the natural range of qualifying species for this site (sea lamprey and river lamprey). Using the information presented above for conservation objective 1, underwater noise in-combination with other plans and projects is not predicted to restrict conservation objective 3 of the Cardigan Bay SAC.	Adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of underwater noise in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.39 adverse effects which undermine the conservation objectives set for the relevant Annex II qualifying species of the Cardigan Bay SAC, will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is no risk of an adverse effect on the integrity of the Cardigan Bay SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8 Assessment of potential AEoI: Annex II marine mammals

As listed in section 1.4.1.3, the HRA Stage 1 Screening Report identified the potential for LSEs on the following European sites designated for Annex II marine mammal features (Figure 1.10):

- North Anglesey Marine SAC;
- North Channel SAC;
- Lleyn Peninsula and the Sarnau SAC;
- West Wales Marine SAC;
- Strangford Lough SAC;
- Murlough SAC;
- Cardigan Bau SAC;
- The Maidens SAC;
- Pembrokeshire Marine SAC;
- Bristol Channel Approaches SAC;
- Lundy SAC;
- Rockabill to Dalkey Island SAC;
- Saltee Islands SAC; and
- Roaringwater Bay and Islands SAC.

LSEs on these European sites were identified for the following impacts:

- During the construction phase:
  - injury and disturbance from underwater noise generated from piling;
  - injury and disturbance from underwater noise generated during UXO detonation;
  - injury and disturbance from underwater noise generated during geophysical and seismic surveys;
  - injury and disturbance from vessel activity and other noise producing activities; and
  - effects on marine mammals due to changes in prey availability (North Anglesey Marine SAC only).
- During the operations and maintenance phase:
  - injury and disturbance from underwater noise generated during geophysical and seismic surveys; and
  - injury and disturbance from vessel activity and other noise producing activities; and Effects on marine mammals due to changes in prey availability (North Anglesey Marine SAC only).

- During the decommissioning phase:
  - injury and disturbance from vessel activity and other noise producing activities; and
  - effects on marine mammals due to changes in prey availability (North Anglesey Marine SAC only).

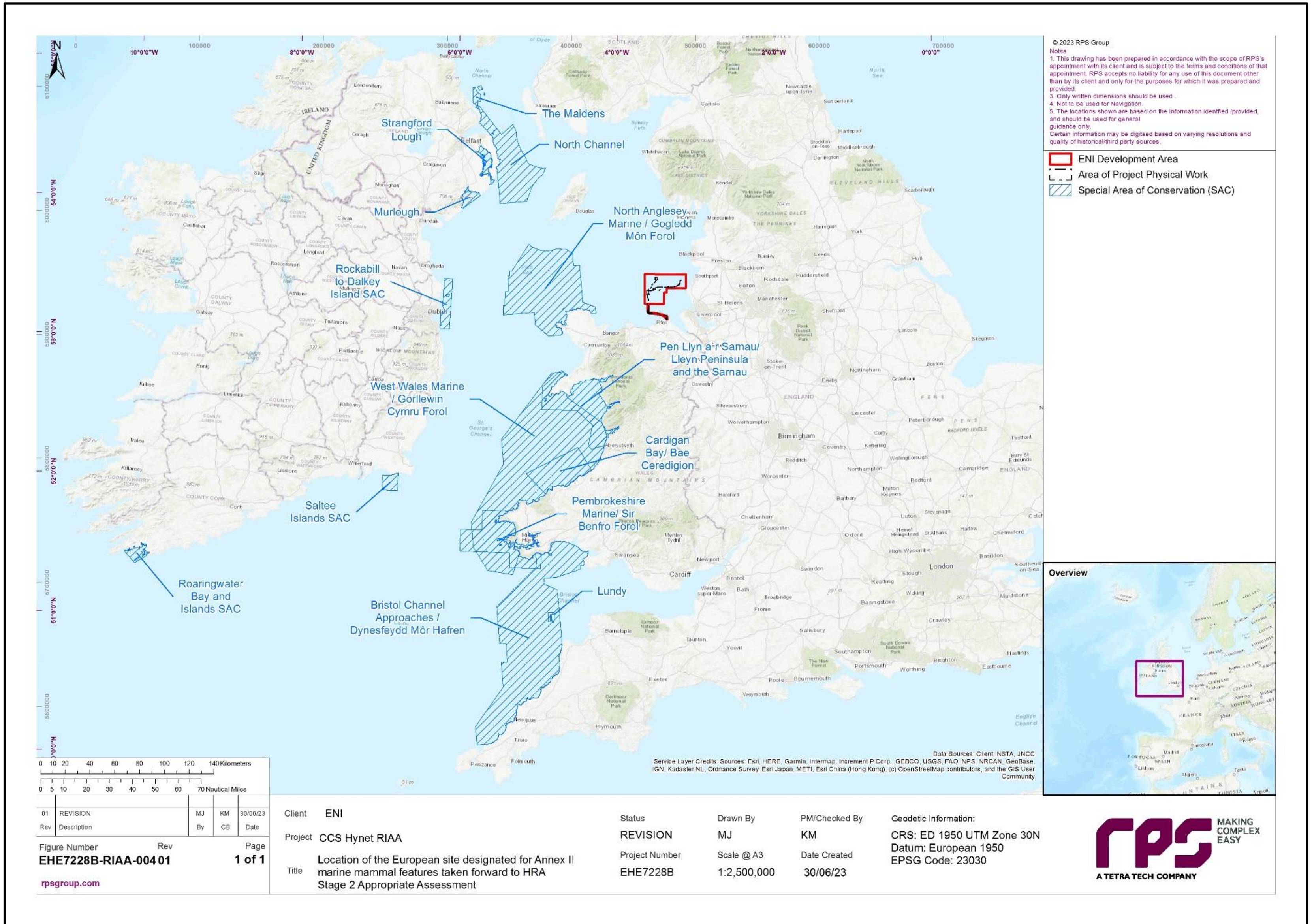

Figure 1.10: Location Of The European Site With Annex II Marine Mammals For Which An Appropriate Assessment Is Required

1.8.1 Baseline information

Baseline information on the Annex II marine mammal features of the European sites identified for further assessment within the HRA process has been gathered through a comprehensive desktop study of existing studies and datasets, using the latest available information on marine mammals. Full details are presented within volume 2, chapter 7 of the Offshore ES.

1.8.1.1 North Anglesey Marine SAC

The North Anglesey Marine SAC is located approximately 39.60 km away from the Proposed Development. The site covers an area of 3,249 km^2, extends from Anglesey in a north-west direction into the Irish Sea and is designated for harbour porpoise. Water depths within the site range from mean low water tide level to 100m with average depths of around 40 to 50 km across the site (NRW and JNCC, 2016a). Seabed substrates across the site include rock, coarse sediment, sand and muds. These physical characteristics of the site are well aligned to the environmental variables determining the probability of presence and the density of harbour porpoise and the site has been recognised as an area with predicted persistently high densities of harbour porpoise (NRW and JNCC, 2016a). The SAC provides important summer habitat for porpoises and is identified as part of the top 10% persistently high density areas for the summer season (April to September) within the UK (NRW and JNCC, 2016a).

Feature accounts

Harbour porpoise

Harbour porpoise are the most common and widespread cetacean in Welsh waters with hot spots identified off the Pembrokeshire coast, the Lleyn Peninsula (to a lesser extent), in southern Cardigan Bay and in the Bristol Channel off the south coast of Wales (around the Gower Peninsula and in Newport Bay) (Baines and Evans, 2012). The North Anglesey Marine site was identified as being within the top 10% of persistently high density areas for harbour porpoise in UK waters during the summer season (Heinänen and Skov, 2015). The Small Cetacean Abundance in the North Sea (SCANS) SCANS-II surveys in 2005 estimated that the site supports approximately 1084 individuals[4] for at least part of the year and represents approximately 4% of the population within the UK part of the Celtic and Irish Sea Management Unit (MU) (JNCC *et al.*, 2019c).

Condition assessment

The status of harbour porpoise feature of the North Anglesey Marine SAC is deemed as favourable (JNCC, 2019a).

Conservation objectives

The conservation objectives as outlined in JNCC *et al.* (2019c) and considered in the assessment which are relevant to the harbour porpoise feature are outlined below.

The integrity of the site should be maintained so that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site;
- there is no significant disturbance of the species. For example, noise disturbance within a SAC from a plan/project individually or in-combination is significant if it excludes harbour porpoises from more than:

[4] It cannot be considered as a site population estimate as this estimate is from a one-month survey in a single year (JNCC, NRW and DAERA, 2019).

  - 20% of the relevant area of the site in any given day[5]; and
  - an average of 10% of the relevant area of the site over a season[6].
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1.8.1.2 North Channel SAC

The North Channel SAC is located approximately 91.40 km from the Proposed Development. The site lies between the North Channel and the north-west Irish Sea between Northern Ireland, Scotland and the Isle of Man, covering an area of 1604 km^2. The SAC runs along the eastern coast of Northern Ireland, connects with the Maidens SAC to the north and stands in proximity to the Murlough SAC and Strangford Lough SAC to the south-west. The SAC extends from coastal to offshore waters with most of the site ranging between 10 to 40 m deep with a maximum of 150 m to the eastern boundary. Seabed substrates across the SAC consist mainly of coarse or sandy sediments, with patches of rock and mud and the site overlaps with the Pisces Reef Complex SAC.

Feature accounts

Harbour porpoise

The site provides important winter (October – March) habitat for harbour porpoise and some of the largest groups of harbour porpoise (up to 100 individuals) around Northern Ireland have been observed within the site. The SAC is estimated to support 1.2% of the UK Celtic and Irish Seas MU population and to be within the top 10% of persistently high density areas for the MU during the winter season (Heinänen and Skov, 2015). The SCANS-II surveys in 2005 estimated that the site supports approximately 537 individuals for at least part of the year (DAERA and JNCC, 2017). This however cannot be considered as a site population estimate as this estimate is derived from a one month survey in a single year (DAERA and JNCC, 2017).

Condition assessment

The status of harbour porpoise feature of the North Channel SAC is deemed as favourable (JNCC, 2019b).

Conservation objectives

The conservation objectives as outlined in (JNCC and DAERA, 2019)and considered in the assessment which are relevant to the harbour porpoise feature are outlined below.

The integrity of the site should be maintained so that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site;
- there is no significant disturbance of the species. For example, noise disturbance within an SAC from a plan/project individually or in-combination is significant if it excludes harbour porpoises from more than:
  - 20% of the relevant area of the site in any given day; and
  - an average of 10% of the relevant area of the site over a season.
- The condition of supporting habitats and processes, and the availability of prey is maintained.

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[5] The relevant area is defined as that part of the SAC that was designated on the basis of higher persistent densities for that season (summer defined as April to September inclusive, winter as October to March inclusive).

[6] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

1.8.1.3 Lleyn Peninsula and the Sarnau SAC

The Lleyn Peninsula and the Sarnau SAC is located in north-west Wales and extends from Nefyn on the north coast of Llŷn along the Meirionnydd coast to Clarach in Ceredigion south of the Dyfi estuary (NRW, 2018g), approximately 115 km from the Proposed Development. The site covers an area of about 1460.35 km^2 (Feingold and Evans, 2014).

The nature of the seabed and coast and the range of environmental conditions present vary throughout the SAC with great differences in rock and sediment type, aspect, sediment movement, exposure to tidal currents and wave action, water clarity and salinity throughout the site. This diverse environment has created a wide range of habitats and associated communities, some of which are unique to Wales (NRW, 2018g).

Feature accounts

Bottlenose dolphin and grey seal are listed as Annex II species present as a qualifying feature, but not a primary reason for site selection.

Grey seal

Grey seals range throughout the open coast areas of the site and beyond but are commonly observed within the SAC around the Llŷn, Bardsey Island and the islands along the south Llŷn coast (NRW, 2018g). Grey seals present within the SAC are thought to be a part of a wider north Wales population. The site contains several important pupping sites which are located around the north-west of the SAC including Bardsey Island, with the majority of pups born from September to October, but with some pupping activity occurring from early August to the end of November (NRW, 2018g). Haul out sites are distributed throughout the SAC and non pupping seals are present year round at these haul out sites. Haul out sites are predominantly located on intertidal rocky outcrops, rock and boulder/cobble beaches, sea caves that are tidally exposed, and occasionally sandy beaches and tidally exposed sandflats (NRW, 2018g)

Bottlenose dolphin

Bottlenose dolphins do not form a discrete site based population within the Lleyn Peninsula and the Sarnau SAC but are seen as part of a wider population that ranges across waters of south-west UK, Ireland and particularly the Cardigan Bay (NRW, 2018g). The number of individuals increases during the summer months, as does group size reaching a peak in late September and October when quite large aggregations of more than 60 individuals may be seen (NRW, 2018g). Calving has been documented within Cardigan Bay and new born and very young calves have been reported in the bay from April to September, suggesting a seasonal pattern to calving (NRW, 2018g).

Important characteristics relating to population dynamics are deemed to be common to bottlenose dolphins in both the Lleyn Peninsula and the Sarnau SAC and the Cardigan Bay SAC (see section 1.8.1.3) as both sites are located within Cardigan Bay.

Population estimates of bottlenose dolphins using Cardigan Bay derived from a robust open population model have ranged from 128 in 2005 to 232 in 2012. Although the abundance within Cardigan Bay has decreased, bottlenose dolphin sightings have been reported regularly during summer months in North Wales, particularly around the Isle of Anglesey but extending east into Liverpool Bay and north to at least the Isle of Man (Feingold and Evans, 2014).

Photo identification surveys since 2007 have revealed that nearly 40 of individuals have been identified in both Cardigan Bay and Lleyn Peninsula and the Sarnau SACs and north of the Llŷn Peninsula, around the Isle of Anglesey, Caernarfon Bay and Isle of Man (Feingold and Evans, 2014). Additionally, some individuals exhibited localised resightings, with 7% of individuals sighted only in Cardigan Bay SAC, 8% solely around the Isle of Anglesey, and 3% seen only in the Lleyn Peninsula and the Sarnau SAC (Feingold and Evans, 2014). Between 16 and 19% of the bottlenose dolphin population in Cardigan Bay can be described as transients, between 21 and 31% are considered occasional, and between 52 and 63% are considered resident inhabitants of the Bay (Feingold and Evans, 2014). The data collected within Lleyn Peninsula and the Sarnau SAC that showed 'travelling' and 'foraging/feeding' still represented the majority of the activity budget (Feingold and Evans, 2014).

Condition assessment

Table 1.40 outlines the indicative condition assessments of the relevant qualifying features of the Lleyn Peninsula and the Sarnau SAC, overall the assessment deemed that grey seal and bottlenose dolphin are in favourable condition although the condition of supporting habitats is currently unknown (NRW, 2018f). There are no activities identified as having a direct impact on the site condition (NRW, 2018f).

Table 1.40: Condition Assessment Of The Relevant Annex II Marine Mammal Features Of The Lleyn Peninsula And The Sarnau SAC

Component of species feature assessed	Indicative assessment	Key evidence type used	Level of agreement	Confidence in evidence	Component confidence level
Grey seal					
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Reports and expert judgement	Medium	Medium	Medium
Range (within site)	Favourable	Reports and expert judgement	Medium	Medium	Medium
Bottlenose dolphin					
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Monitoring data, reports	Medium	Medium	Medium
Range (within site)	Favourable	Monitoring data, reports	Medium	Medium	Medium

Conservation objectives

The conservation objectives relevant for grey seal and bottlenose dolphin features of the Lleyn Peninsula and the Sarnau SAC are outlined below (NRW, 2018g).

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

Populations

The population is maintaining itself on a long term basis as a viable component of its natural habitat. Important elements include:

- population size;
- structure, production; and
- condition of the species within the site.

As part of this objective it should be noted that for bottlenose dolphin and grey seal:

- contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression.

For grey seal populations should not be reduced as a consequence of human activity.

Range

The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

As part of this objective it should be noted that for bottlenose dolphin and grey seal:

- their range within the SAC and adjacent inter connected areas is not constrained or hindered;
- there are appropriate and sufficient food resources within the SAC and beyond; and
- the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.

Supporting habitats and species

The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include:

- distribution;
- extent;
- structure;
- function and quality of habitat; and
- prey availability and quality.

As part of this objective it should be noted that:

- the abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term;
- the management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term;
- contamination of potential prey species should be below concentrations potentially harmful to their physiological health; and
- disturbance by human activity is below levels that suppress reproductive success, physiological health or long term behaviour.

Restoration and recovery

As part of this objective, it should be noted that for the bottlenose dolphin populations should be increasing.

1.8.1.4 West Wales Marine SAC

The West Wales Marine SAC is situated between the Llŷn peninsula in the north, and the Pembrokeshire coast in the south-west and extending into Cardigan Bay. It is located approximately 82 km from the Proposed Development. Though part of this site extends offshore, much of the site lies in the inshore waters (0–12 nm) west of Wales. The SAC spans an area of 7,376 km^2 and covers a range of habitats including rock, coarse and sandy sediments, and areas of mud. The water depths within the site range between the Mean Low Water Tide (MLWT) level and 100m. Away from coastal areas, the depths largely fall within the range of 40 to 50m (NRW and JNCC, 2016b).

Feature accounts

Harbour porpoise

The SAC is designated for the protection of harbour porpoise, supporting an estimated 5.4% of the UK Celtic and Irish Seas MU population (NRW and JNCC, 2016b). The whole SAC has been identified as an important summer area for harbour porpoise, and a smaller section to the south of the site, around Cardigan Bay, has also been identified as winter habitat for this species. There is an indication that the harbour porpoises within the Celtic and Irish Seas MU have a preference for water depths shallower than 40m (NRW and JNCC, 2016b).

Condition assessment

The status of harbour porpoise feature of the West Wales Marine SAC is deemed as favourable (JNCC, 2019d).

Conservation objectives

The conservation objectives relevant for harbour porpoise features of the West Wales Marine SAC are outlined below (NRW and JNCC, 2019).

To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to maintaining FCS for the UK harbour porpoise.

In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site;
- there is no significant disturbance of the species. For example, noise disturbance within an SAC from a plan/project individually or in-combination is significant if it excludes harbour porpoises from more than:
  - 20% of the relevant area of the site in any given day[7]; and
  - an average of 10% of the relevant area of the site over a season[8].
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1.8.1.5 Strangford Lough SAC

The Strangford Lough SAC extends 15km east of Central Belfast from the north end to Downpatrick in the south-west corner. It is located approximately 142 km from the Proposed Development. The lough is a large marine inlet spanning 150 km^2 on the east coast of County Down, of which about 50 km^2 lies between high water mark mean tide and low water mark mean tide. The triangular area around the lough mouth is exposed to high wave energy and this area has rock platforms, steeply shelving rocky shores and a sandy seabed.

Feature accounts

Harbour seal

Harbour seal is a qualifying feature of the Strangford Lough SAC, however, is not a primary reason for site selection. A review conducted by Culloch *et al.* (2018) reported that in Strangford Lough, there was a 2.01% and a 1.31% annual decrease in harbour seal adults and pups, respectively (using data from 1995 to 2014,

[7] The relevant area is defined as that part of the SAC that was designated on the basis of higher persistent densities for that season (summer defined as April to September inclusive, winter as October to March inclusive).

[8] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

inclusive). Although it is highly likely that varying effort across years and areas has played an influential role in the trends identified.

Condition assessment

Overall the condition assessment 2014 to 2019 deemed that harbour seal are in unfavourable, declining condition although the condition of supporting habitats is currently unknown (Alvarez Alonso and Foster, 2019).

Conservation objectives

The conservation objectives outlined in (DAERA, 2017b) and considered in the assessment which are relevant to the harbour seal feature are outlined below.

- to maintain (or restore where appropriate) the harbour seal feature to favourable condition;
- maintain and enhance, as appropriate, the harbour seal population; and
- maintain and enhance, as appropriate, physical features used by harbour seal within the site.

1.8.1.6 Murlough SAC

The Murlough SAC is located on the south-east coast of Northern Ireland, approximately 146 km from the Proposed Development. The SAC encompasses the shallow waters of the Dundrum Bay which represents the largest area of shallow sublittoral sandbanks in Northern Ireland. The SAC spans over 119 km^2 in the north-western Irish Sea.

Feature accounts

- Harbour seal

Harbour seal is a qualifying feature of the Murlough SAC, however is not a primary reason for site selection.

The SAC is recognised as an important haul out site for harbour seal with yearly maximum counts of 141 individuals. With a 25% maximum decline from the baseline values, a target to maintain a favourable condition of 106 individuals is set (DAERA, 2018).

Condition assessment

There is no condition assessment available for the harbour seal feature of the Murlough SAC.

Conservation objectives

The conservation objectives outlined in (DAERA, 2018) and considered in the assessment which are relevant to the harbour seal feature are outlined below:

- To maintain (or restore where appropriate) the harbour seal feature to favourable condition.
- To maintain (and if feasible enhance) population numbers and distribution of harbour seal.
- To maintain and enhance, as appropriate, physical features used by harbour seals within the site.

1.8.1.7 Cardigan Bay SAC

The Cardigan Bay SAC is located off the north Pembrokeshire coast in the southern region of Cardigan Bay, approximately 122 km from the Proposed Development. The SAC encompasses approximately 960 km^2 and extends 12 miles offshore. The SAC has a wide range of sediment types from well sorted highly homogenous sands to well mixed muddy gravels, pebbles and cobbles. Sediments associated with coastal areas are predominantly sands with some intrusions of gravel (NRW, 2018b). The majority of the SAC is less than 30 m deep but reaches 50 m in the outer parts of the bay towards St. George's Channel. Species interactions within the SAC are complex and interrelated with bottlenose dolphin and grey seal being the designated features and primary top predators (NRW, 2018b).

Feature accounts

Bottlenose dolphin

Bottlenose dolphin are present all year round in the Cardigan Bay SAC, with peak numbers and group size (of more than 60 individuals) observed during September and October. Recent estimates suggest that the Cardigan Bay population is made up of around 100 to 300 individuals (NRW, 2018b). Of individuals present within the SAC, 30% have also been identified in the Pen Llyn a'r Sarnau SAC as well as to the north around the Isle of Anglesey, indicating the large home ranges of some individuals. Some individuals however show a more local residency pattern and exhibit smaller home ranges (NRW, 2018b). In coastal waters bottlenose dolphins tend to favour habitats with uneven topography and/or strong tidal currents, acoustic monitoring has also suggested the presence of reef and sandbanks for foraging. There have been high frequency of sightings along the coast from Aberaeron to Cardigan and around Fishguard which suggests these areas are of particular significance to bottlenose dolphin foraging.

Grey seal

Grey seal individuals present within the Cardigan Bay SAC do not form a discrete population, they are thought to be part of the south-west England and Wales MU. The south-west Wales population is determined from pup counts and has been estimated at around 5,000 individuals. Pup production within the Cardigan Bay SAC represents a small proportion of this (NRW, 2018b). Seals are widely distributed within the site and also travel outside of the site. Small numbers of the population also make foraging trips further offshore and into the deeper waters of the Irish Sea. Most pupping occurs towards the south-west end of the SAC but takes place throughout the site at suitable locations such as undisturbed rocky beaches, coves and caves. Moulting and resting haul out sites are also located throughout the site although seals are usually seen haling out as individuals or in small groups rather than large groups (NRW, 2018b).

Condition assessment

Table 1.41 outlines the indicative condition assessments of the relevant qualifying features of the Cardigan Bay SAC, overall the condition assessment deemed that bottlenose dolphin and grey seal are in favourable condition although the condition of supporting habitats is currently unknown (NRW, 2018a). There are no activities identified as having a direct impact on the site condition (NRW, 2018a).

Table 1.41: Condition Assessment Of The Relevant Annex II Marine Mammal Features Of The Cardigan Bay SAC

Component of species feature assessed	Indicative assessment	Key evidence type used	Level of agreement	Confidence in evidence	Component confidence level
Bottlenose Dolphin					
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Monitoring data, reports	Medium	High	Medium
Range (within site)	Favourable	Monitoring data, reports	Medium	Medium	Medium
Grey seal					

Component of species feature assessed	Indicative assessment	Key evidence type used	Level of agreement	Confidence in evidence	Component confidence level
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Expert judgement, reports	Medium	Low	Low
Range (within site)	Favourable	Expert judgement, reports	Medium	Low	Low

Conservation objectives

The conservation objectives outlined in (NRW, 2018b) and considered in the assessment which are relevant to the bottlenose dolphin and grey seal designated features are outlined below.

Populations

The population is maintaining itself on a long termbasis as a viable component of its natural habitat. Important elements include:

- population size;
- structure, production; and
- condition of the species within the site.

As part of this objective it should be noted that for bottlenose dolphin and grey seal contaminant burdens derived from human activity should be below levels that may cause physiological damage, or immune or reproductive suppression. For grey seal populations should not be reduced as a consequence of human activity.

Range

The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

As part of this objective it should be noted that for bottlenose dolphin and grey seal:

- their range within the SAC and adjacent interconnected areas is not constrained or hindered;
- there are appropriate and sufficient food resources within the SAC and beyond; and
- the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.

Supporting habitats and species

The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include:

Distribution;

- extent;
- structure;
- function and quality of habitat; and

- prey availability and quality.

As part of this objective, it should be noted that:

- the abundance of prey species subject to existing commercial fisheries needs to be equal to or greater than that required to achieve maximum sustainable yield and secure in the long term;
- the management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term;
- contamination of potential prey species should be below concentrations potentially harmful to their physiological health; and
- disturbance by human activity is below levels that suppress reproductive success, physiological health or long termbehaviour.

Restoration and recovery

As part of this objective, it should be noted that for the bottlenose dolphin populations should be increasing.

Only conservation objectives relevant to the qualifying species (Annex II marine mammal qualifying features) of the SAC will be assessed in section 1.8.3 and 1.8.4.

1.8.1.8 Maidens SAC

The Maidens SAC is located in the North Channel to the north-east coast of Northern Ireland, approximately 190 km from the Proposed Development. The SAC groups small rocky reefs either awash or just emergent detached from the coast. Two rocks within the SAC can be considered islands (i.e. West Maiden and East Maiden). There are four reef areas in addition to the reef plateau between the Maiden islands. The SAC extends over 74.6 km^2 and ranges between Mean High Water and 200 m deep and can experience currents of up to 4 knots.

Feature accounts

Grey seal

Grey seal is a qualifying feature of The Maidens SAC, however, is not a primary reason for site selection. The emergent rocks, islands and waters within the SAC is recognised as important to provide haul out site, resting sites and foraging areas for grey seal with a maximum count of 70 individuals recorded during a survey in July 2000. A target to maintain a favourable condition of 50 individuals is set (DAERA, 2017a). Surveys in 2009 observed pupping and breeding on the site. In 2002, the SAC was one of the three regions with the largest numbers of grey seal around the coast of Northern Ireland (Northern Ireland Environment Agency, 2012).

Condition assessment

There is no condition assessment available for the grey seal feature of The Maidens SAC.

Conservation objectives

The conservation objectives outlined in DAERA (2017) and considered in the assessment which are relevant to the grey seal feature are outlined below:

- to maintain (or restore where appropriate) the grey seal feature to favourable condition;
- to maintain (and if feasible enhance) population numbers and distribution of grey seal; and
- to maintain and enhance, as appropriate, physical features used by grey seal within the site.

1.8.1.9 Pembrokeshire Marine SAC

The Pembrokeshire Marine SAC extends from north of Abereiddy on the north Pembrokeshire coast to the east of Manorbier in the south and encompasses the coasts of the islands of Ramsey, Skomer, Grassholm, Skokholm, the Bishops and Clerks and The Smalls. It is located approximately 195 km from the Proposed Development. The SAC also overlaps wholly or in part with several other designated sites including the Skomer Marine Conservation Zone (MCZ) and several SPAs. Sediments across the site range from very fine, muds in sheltered area such as Milford Haven waterway, sands and gravels to pebbles and cobbles in deep subtidal areas which are subject to stronger currents (NRW, 2018e).

Feature accounts

Grey seal are present as an Annex II species that are a primary reason for selection of this site. Pembrokeshire in south-west Wales is representative of grey seal colonies in the south-west part of the breeding range in the UK. It is the largest breeding colony on the west coast, south of the Solway Firth, representing over 2% of annual UK pup production. The south-west Wales population size is also determined from pup counts and has been estimated at approximately 5,000 individuals. There was a steady increase in pup production from 2009 to 2015 with the greatest increase being at the mainland sites, although in 2014 and 2015 increases at the island sites have also been recorded (NRW, 2018d). Pup production from 2015 to 2018 has shown the highest totals ever recorded with average production for 2013 to 2015 at 357 pups (NRW, 2018d). Pupping primarily takes place in the south-west end of the SAC (NRW, 2018d).

Grey seals are highly mobile species, which can travel great distances (Carter *et al.*, 2022). Seals are widely distributed within and travel far beyond the boundary of the Pembrokeshire Marine SAC. Moulting and resting haul out sites are distributed throughout the site, with a small number of sites regularly used as haul outs by large numbers of seals. Known winter moulting haul outs and non moulting/resting haul outs are primarily located on offshore islands and remote, undisturbed and inaccessible rocky shores and beaches (NRW, 2018d).

Condition assessment

Table 1.42 outlines the indicative condition assessments of the relevant qualifying features of the Pembrokeshire Marine SAC, overall the condition assessment deemed that grey seal are in favourable condition although the condition of supporting habitats is currently unknown (NRW, 2018e). There are no activities identified as having a direct impact on the site condition (NRW, 2018e).

Table 1.42: Condition Assessment Of The Relevant Annex II Marine Mammal Features Of The Pembrokeshire Marine SAC

Component of species feature assessed	Indicative assessment	Key evidence type used	Level of agreement	Confidence in evidence	Component confidence level
Grey seal					
Population (e.g. size, structure, production, condition of species within site, contaminant burdens)	Favourable	Reports and expert judgement	High	Medium	Medium
Range (within site)	Favourable	Reports and expert judgement	Medium	Medium	Medium

Conservation objectives

The conservation objectives outlined in (NRW, 2018e) and considered in the assessment which are relevant to the grey seal feature are outlined below.

Populations

The population is maintaining itself on a long term basis as a viable component of its natural habitat. Important elements include:

- population size;
- structure, production; and
- condition of the species within the site.

As part of this objective, it should be noted that for grey seal contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression.

For grey seal, populations should not be reduced as a consequence of human activity.

Range

The species population within the site is such that the natural range of the population is not being reduced or likely to be reduced for the foreseeable future.

As part of this objective, it should be noted that for grey seal:

- The range within the SAC and adjacent interconnected areas is not constrained or hindered.
- There are appropriate and sufficient food resources within the SAC and beyond.
- The sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.

Supporting habitats and species

The presence, abundance, condition and diversity of habitats and species required to support this species is such that the distribution, abundance, and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include:

- distribution;
- extent;
- structure;
- function and quality of habitat; and
- prey availability and quality.

As part of this objective, it should be noted that:

- The management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term.
- Contamination of potential prey species should be below concentrations potentially harmful to their physiological health.
- Disturbance by human activity is below levels that suppress reproductive success, physiological health or long term behaviour.

1.8.1.10 Bristol Channel Approaches SAC

Bristol Channel Approaches SAC is located in English and Welsh waters, to the east of the Celtic Sea, approximately 194 km from the Proposed Development. The SAC extends from the north coast of Cornwall in England to Carmarthen Bay in Wales and covers an area of 5,850 km^2. The site is composed of diverse habitats comprising small areas of rocky reefs, sandbanks, sea caves, sand/mudflats and salt meadows but it is mostly characterised by sandy and coarse sediment seabed. Harbour porpoise are listed as Annex II species present as a qualifying feature as a primary reason for site selection (Natural England *et al.*, 2016).

Feature accounts

Harbour porpoise is present year round within the boundaries of the Bristol Channel Approaches SAC, however, the site provides important winter habitat for harbour porpoise with persistently higher densities throughout the site compared to other regions of the UK Celtic and Irish Seas MU (within top 10% densities of those for the MU in winter) (IAMMWG. *et al.*, 2015). The SAC is estimated to support 4.7% of the UK Celtic and Irish Seas MU population. The SCANS-II surveys in 2005 estimated that the site supports approximately 2100 individuals (95% Confidence Interval: 805 – 5,661) for at least part of the year (Natural England *et al.*, 2016). This however cannot be considered as a site population estimate as this estimate is from a one-month survey in a single year (JNCC *et al.*, 2019b) and seasonal differences are likely to occur.

Condition Assessment

There is no condition assessment available for the harbour porpoise feature of the Bristol Channel Approaches SAC. However, JNCC (2017a) JNCC *et al.* (2019b)indicates that the conservation status of the UK harbour porpoise population is currently favourable.

Conservation objectives

The conservation objectives as outlined in and considered in the assessment which are relevant to the harbour porpoise feature are outlined below.

To ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of natural change, this will be achieved by ensuring that:

- Harbour porpoise is a viable component of the site.
- There is no significant disturbance of the species. For example, noise disturbance within an SAC from a plan/project individually or in-combination is significant if it excludes harbour porpoises from more than:
  - 20% of the relevant area of the site in any given day[9]; and
  - an average of 10% of the relevant area of the site over a season[10].
- The condition of supporting habitats and processes, and the availability of prey is maintained.

1.8.1.11 Lundy SAC

The Lundy SAC is located in the outer Bristol Channel off north Devon, approximately 251 km from the Proposed Development. The Lundy SAC covers an area of 30.7 km^2 around the small rocky island of Lundy.

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[9] The relevant area is defined as that part of the SAC that was designated on the basis of higher persistent densities for that season (summer defined as April to September inclusive, winter as October to March inclusive).

[10] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) = 9.86%

The site supports important granite reefs habitats that are biologically extremely rich. This SAC sits within the Bristol Channel Approaches SAC.

Feature accounts

Grey seal is a qualifying feature of the Lundy SAC, however, is not a primary reason for site selection. The colony at Lundy, which numbers in the region of 200 to 250 individuals is important in the south-west as it is a known breeding colony (Lundy Management Forum, 2017). Individually identified seals are known to migrate between the north Cornwall coast, Lundy, the north Devon coast and south-west Wales. It is possible there is mixing with populations from as far afield as Brittany and southern Ireland too. Unusually, seal pups can be found at Lundy all year round although the main pupping season runs from August to December. Expectant mothers usually choose remote beaches on the island to give birth (Lundy Management Forum, 2017).

Condition assessment

There is no condition assessment available for the grey seal feature of the Lundy SAC.

Conservation objectives

The conservation objectives which are relevant to the grey seal feature as outlined in Natural England (2018b) and considered in the assessment are outlined below.

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the FCS of its qualifying features, by maintaining or restoring:

- the extent and distribution of qualifying natural habitats and habitats of qualifying species;
- the structure and function (including typical species) of qualifying natural habitats;
- the structure and function of the habitats of qualifying species;
- the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely;
- the populations of qualifying species; and
- the distribution of qualifying species within the site.

1.8.1.12 Rockabill to Dalkey Island SAC

The Rockabill to Dalkey Island SAC is located approximately 155 km from the Proposed Development and covers a strip approximately 7 km wide and 40 km in length and extends southwards from Rockabill, running adjacent to Howth Head, and crosses Dublin Bay to Frazer Bank in south Co. Dublin. The site encompasses Dalkey, Muglins and Rockabill islands as well as a range of dynamic inshore and coastal waters in the western Irish Sea, including sandy and muddy seabed, reefs, sandbanks and islands.

Feature accounts

The area selected for designation of the Rockabill to Dalkey Islands SAC represents a key habitat for Annex II harbour porpoise within the Irish Sea, including inshore shallow sand and mudbanks and rocky reefs scoured by strong current flow. The species occurs year round within the site and comparatively high group sizes have been recorded (NPWS, 2014b). Porpoises with young (i.e. calves) are observed within the site.

Condition assessment

There is no condition assessment available for the harbour porpoise feature of the Rockabill to Dalkey Islands SAC.

Conservation objectives

The conservation objectives which are relevant to the harbour porpoise feature as outlined in NPWS (2013a) as well as NPWS (2013b) and considered in the assessment are outlined below.

To maintain the favourable conservation condition of harbour porpoise in Rockabill to Dalkey Island SAC, which is defined by the following list of attributes and targets presented in Table 1.43.

Table 1.43: Parameters For Conservation Objectives Relevant To Harbour Porpoise In Rockabill To Dalkey Islands SAC

Attribute	Measure	Target	
Access to suitable habitat	Numbers of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	This target may be considered relevant to operations that will result in the permanent exclusion of harbour porpoise from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.
Disturbance	Level of Impact	Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Operations should not introduce manmade energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant adverse impact on individuals and/or the community of harbour porpoise within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour porpoises depend. Operations should not cause death or injury to individuals to an extent that may ultimately affect the harbour porpoise community at the site.

1.8.1.13 Saltee islands SAC

This site comprises the Saltees Islands, Great Saltee and Little Saltee, and a constellation of islets and rocks (NPWS, 2013c). The islands are situated between 4 and 5 km off the south Wexford coast, approximately 239 km from the Proposed Development. As a group, they constitute a broken reef that protrudes from a seabed of sand and shell. The reef has a north-east/south-west orientation and is typically strewn with boulders, cobbles and patches of sand and gravel.

Feature accounts

The SAC supports a breeding population of Annex II grey seal. Grey seal occupies both aquatic and terrestrial habitats within the site, including intertidal shorelines that become exposed during the tidal cycle and outlying rocky skerries when these are not inundated by wave action. It is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (approximately August to December) moulting (approximately December to April) and nonbreeding foraging and resting phases (NPWS, 2011c). The breeding population was estimated at 571 to 744 individuals in 2005. A one off moult count in 2007 gave a figure of 246 individuals (NPWS, 2013c). Ó Cadhla *et al.* (2013) reported an all age population size of 529 to 680 with a minimum pup production of 151 at Saltee Islands breeding site.

Condition assessment

There is no condition assessment available for the grey seal feature of the Saltee Islands SAC.

Conservation objectives

The conservation objectives which are relevant to the grey seal feature as outlined in NPWS (2011a) as well as NPWS (2011c) and considered in the assessment are outlined below.

To maintain the favourable conservation condition of grey seal in Saltee Islands SAC, which is defined by the following list of attributes and targets presented in Table 1.44.

Table 1.44: Parameters For Conservation Objectives Relevant To Grey Seal In Saltee Islands SAC

Attribute	Measure	Target	
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	This target may be considered relevant to operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) breeding behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual breeding season. Operations that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.
Moulting behaviour	Moult haul out sites	The moult haul-out sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) moulting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual moult. Operations that cause displacement of individuals from a moult haul out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
Resting behaviour	Resting haul out sites	The resting haul-out sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) resting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used for resting. Operations that cause displacement of individuals from a resting haul out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
Population composition	Number of cohorts	The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually.	Resting haul out sites and the composition of haul out groups may be different to those normally observed during breeding or moulting. There is some evidence of cohort linked preferential selection by grey seals of terrestrial/intertidal sites elsewhere in Ireland. Whilst information is limited in Saltee Islands SAC at this time, disturbance at a specific location may have the effect of causing cohort specific disturbance within the population. Population composition, whether in aquatic or terrestrial/intertidal habitats within the entire site or at individual locations, is likely to vary naturally within and between years. For the effective maintenance of the population, the above cohorts should be represented in the population occurring naturally within the site each year and any

Attribute	Measure	Target	
			disturbance likely to cause such a cohort specific effect should be carefully considered.
Disturbance	Level of impacts	Human activities should occur at levels that do not adversely affect the grey seal population at the site.	Operations should not introduce manmade energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant adverse impact on individuals and/or the population of grey seal within the site. This refers to both the aquatic and terrestrial/intertidal habitats used by the species in addition to important natural behaviours during the species' annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which grey seals depend.

1.8.1.14 Roaringwater Bay and Islands SAC

The Roaringwater Bay and Islands SAC includes the immediate coastline on the mainland from Long Island to Baltimore, together with the whole bay and most of the islands. It is located approximately 445 km from the Proposed Development. The bedrock in the area is composed of a series of Devonian old red sandstone reefs that run parallel to troughs of Devonian Carboniferous marine clastics in a north-east/south-west direction. These reefs emerge to form the islands on the south side of the bay and within the bay. Generally, the coast is low lying but the southern edge rises, in line with the hills behind Baltimore.

Feature accounts

The SAC provides protection for two Annex II species, harbour porpoise and grey seal.

Harbour porpoise

Harbour Porpoise in Irish waters are largely resident and observations have shown that they are regular in the waters of Roaringwater Bay (NPWS, 2014a). Most sightings occur in the autumn, when more than 100 individuals have been recorded in a day. Based on survey data, Leeney (2007) reported that although the Roaringwater Bay is a regularly used habitat for harbour porpoises throughout the year, during the months of August and September, porpoises are regularly sighted in areas of the bay as far east as Sherkin Island, west to Castle Point, and south of Cape Clear.

In 2008 the population has been estimated to be 117 to 201 individuals (NPWS, 2014a). O'Brien and Berrow (2015) reported that during visual surveys of harbour porpoise in 2015 in Roaringwater Bay and Islands SAC, the number of porpoise sightings per survey ranged from 6 to 18 and from 5 to 23 individuals with a total of 75 sightings of 141 individual porpoises overall recorded. Density estimates ranged from 0.76 porpoises per km^2 to 3.03 porpoises per km^2 and this was equated overall to 2.02 porpoises per km^2. The overall pooled density estimate from all survey days combined gave an abundance estimate of 289 ± 80 with 95% confidence intervals of 155 to 541 (O'Brien and Berrow, 2015).

The main threat to harbour porpoise is incidental capture in fishery gear, especially set gillnets but also drift nets (NPWS, 2014a).

Grey seal

Grey Seal is present at the site throughout the year during all aspects of its annual life cycle which includes breeding, moulting, nonbreeding, foraging and resting phases. It is present at the site throughout the year during all aspects of its annual life cycle which includes breeding (August to December approx.), moulting (December to April approx.) and nonbreeding foraging and resting phases (NPWS, 2013b). Current breeding sites in Roaringwater Bay and Islands SAC are Clear Island, the Calf Islands, Carthy's Islands and Castle Island (NPWS, 2013b). Known moulting locations include Calf Island West, Calf Island East, the Carthy's

Islands, Toorane Rocks, Carrigviglash and Carrigviglash Rocks, Mannin Island, Illaunrahnee and adjacent skerries (NPWS, 2013b).

A minimum population for all ages was estimated at 116 to 149 in 2005 (NPWS, 2014a). A minimum estimate of 254 grey seals was recorded at the site during the moult season in 2007 (NPWS, 2013b).

Condition assessment

There is no condition assessment available for the harbour porpoise and grey seal features of the Roaringwater Bay and Islands SAC.

Conservation objectives

The conservation objectives which are relevant to the grey seal feature as outlined in NPWS (2011a) as well as NPWS (2011c) and considered in the assessment are outlined below.

To maintain the favourable conservation condition of harbour porpoise and grey seal in Roaringwater Bay and Islands SAC, which is defined by the following list of attributes and targets presented in Table 1.45.

Table 1.45: Parameters For Conservation Objectives Relevant To Harbour Porpoise And Grey Seal In Roaringwater Bay And Islands SAC

Attribute	Measure	Target	
Harbour porpoise			
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	This target may be considered relevant to operations that will result in the permanent exclusion of harbour porpoise from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.
Disturbance	Level of impacts	Human activities should occur at levels that do not adversely affect the harbour porpoise community at the site	Operations should not introduce manmade energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant adverse impact on individuals and/or the population of harbour porpoise within the site. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour porpoises depend.
Grey seal			
Access to suitable habitat	Number of artificial barriers	Species range within the site should not be restricted by artificial barriers to site use.	This target may be considered relevant to operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.
Breeding behaviour	Breeding sites	The breeding sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) breeding behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual breeding season. Operations that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced

Attribute	Measure	Target	
			reproductive success, would be regarded as significant and should therefore be avoided.
Moulting behaviour	Moult haul out sites	The moult haul-out sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) moulting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used during the annual moult. Operations that cause displacement of individuals from a moult haul out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
Resting behaviour	Resting haul out sites	The resting haul-out sites should be maintained in a natural condition.	This target is relevant to operations that will result in significant interference with or disturbance of (a) resting behaviour by grey seal within the site and/or (b) aquatic/terrestrial/intertidal habitat used for resting. Operations that cause displacement of individuals from a resting haul out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.
Population composition	Number of cohorts	The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually.	Resting haul out sites and the composition of haul out groups may be different to those normally observed during breeding or moulting. There is some evidence of cohort linked preferential selection by grey seals of terrestrial/intertidal sites elsewhere in Ireland. Whilst information is limited in Saltee Islands SAC at this time, disturbance at a specific location may have the effect of causing cohort specific disturbance within the population. Population composition, whether in aquatic or terrestrial/intertidal habitats within the entire site or at individual locations, is likely to vary naturally within and between years. For the effective maintenance of the population, the above cohorts should be represented in the population occurring naturally within the site each year and any disturbance likely to cause such a cohort specific effect should be carefully considered.
Disturbance	Level of impacts	Human activities should occur at levels that do not adversely affect the grey seal population at the site.	Operations should not introduce manmade energy (e.g. aerial or underwater noise, light or thermal energy) at levels that could result in a significant adverse impact on individuals and/or the population of grey seal within the site. This refers to both the aquatic and terrestrial/intertidal habitats used by the species in addition to important natural behaviours during the species' annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which grey seals depend.

1.8.2 Information to inform the assessment

1.8.2.1 Proposed Development alone

Maximum design scenario

The design parameters identified in Table 1.46 have been selected as those having the potential to result in the greatest effect on Annex II marine mammals and therefore represent the MDS. Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Description (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 1.46: Maximum Design Scenario Considered For The Assessment Of Impacts On Annex II Marine Mammals

Potential impact	Phase C	Phase O	Phase D	Project design parameters	Justification
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Construction phase** New Douglas platform foundations: • up to 4 piled jacket foundations, with one leg per foundation and up to 2 x 1.524 m diameter piles per leg (8 piles); • maximum hammer energy up to 3,000 kJ; • up to 100 minutes piling per pile; and • piling of up to two adjacent piles at the same platform at one time.	Impact piling during construction may result in hearing damage/auditory injury, behavioural disturbance/displacement of marine mammals and marine turtles as well as barrier affects. The largest hammer energy could lead to the largest area of ensonification at any one time. The longest duration of piling at any location results in the greatest number of days when piling could occur.
Injury and disturbance from underwater noise generated from UXO detonation	✓	×	×	**Construction phase** Clearance of UXOs within the Proposed Development • maximum UXO size of up to 907 kg; • intention for low order clearance of all UXOs using low order techniques with a single donor charge of up to 80 g NEQ for each clearance event; • up to 500 g NEQ clearance shot for neutralisation of residual explosive material at each location; • risk of potential for unintended consequence of low order techniques to result in high order detonation of UXO (maximum size = 907 kg); • a maximum of one UXO clearance within 24 hours; • total duration of clearance activities up to 12 days; and • clearance during daylight hours only	Marine mammals and marine turtles are sensitive to increased subsea noise generated during UXO clearance, which can lead to auditory injury, behavioural disturbance as well as barrier effects. UXO Donor charge is maximum required to initiate low order detonation. Assumption of a clearance shot of up to 500 g NEQ at all locations although noting that this may not always be required.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Construction phase** Site investigation surveys will involve the use of up to 2 survey vessels (1 shallow water and 1 deep water) carrying out 2 surveys each and take place over a period of up to 3 months. • Multi Beam Echosounder (MBES) (170 to 450 kHz; 220 dB re 1 μPa (Root Mean Squared (rms); pulse rate up to 60 Hz). • SBP (85 to 115 kHz, 247 dB re 1μPa (rms), pulse rate up to 40 Hz). • VSP: - Number of guns= 6; - Total volume= 1,200 cu in; - Source depth = 5 m; - Firing pressure = 2,000 psi;	Geophysical and seismic surveys have the potential to cause direct and/or indirect effects (including injury or disturbance) on marine mammals and marine turtles as well as barrier effects. Maximum range of geophysical and seismic surveys likely to be undertaken using equipment typically employed for these types of surveys will result in the greatest potential impact.

Potential impact	Phase C	Phase O	Phase D	Project design parameters	Justification
				- SEL = 220 dB re 1 µPa2s @1m; - 0-Peak SPL = 238 dB re. 1 µPa @ 1m; - Pulse interval = 20 s (during operations); and - Total number of pulses per 24 h period = 4,320 (three per minute). **Operation and maintenance phase** Routine geophysical and seismic survey are estimated to occur annually.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Construction phase** There will be a total of 236 round trips of vessels associated with the construction phase. This includes a total of 219 round trips of vessels associated with installation of the new Douglas platform and wells (return trips are presented as total across construction period). This includes the following: • up to 2 heavy lift vessel return trips; • up to 14 tug/anchor handler return trips; • up to 12 cargo barge return trips; • up to 80 support vessel return trips; • up to 4 survey vessel return trips; • up to 4 precomm vessel return trips; • up to 1 seabed preparation vessel return trips; • up to 104 crew vessel return trips. A total of 17 round trips of vessels associated with installation of the cables (return trips are presented as total across construction period): • up to 4 cable lay and installation and support vessels making up to 4 return trips; • up to 1 jack up vessel making up to 1 return trip; • up to 2 multicat vessels making up to 2 return trips; • up to 3 working boats making up to 3 return trips; • up to 1 support vessel (for trenching) making up to 1 return trip; • up to 1 vessel for cable pull in making up to 1 return trip; • up to 1 survey vessel making up to 1 return trip; • up to 1 seabed preparation vessel making up to 1 return trip; • up to 1 crew transfer vessel making up to 4 return trips; • up to 1 cable crossing protection installation vessel making up to 1 return trip; and	Injury and disturbance of marine mammals and marine turtles may arise during the construction, operation and maintenance and decommissioning phases of the Proposed Development from vessel use and other noise producing activities (e.g. seabed preparation, drilling, and rock placement over the cable crossings). Underwater noise from vessels and other activities may also result in barrier effects. Maximum numbers of vessels on site at any one time and largest numbers of round trips during each phase of the Proposed Development and broad range of vessel types representative of vessels to be used during construction, operation and maintenance and decommissioning will result in the greatest potential impact. Range of other activities including maximum timescales (where available) during which activities are conducted.

Potential impact	Phase C	Phase O	Phase D	Project design parameters	Justification
				• up to 1 cable burial installation vessel making up to 1 return trip. Other activities: • laying of 126.04 km of the cable (including 1,200 m within the intertidal zone); • drilling of 11 wells for CO_2 injection; total duration of drilling per well is 15 days; and • use of jack up rigs **Operation and Maintenance Phase** There will be a total of 750 vessel round trips over the entire operation and maintenance phase. This encompasses vessels used during routine inspections, geophysical surveys, removal of marine growth, replacement of corrosion protection anodes, replacement of access ladders and boat landings, modification to/replacement of J tubes at platforms, topsides, interplatform cables/pipelines and PoA terminal to the new Douglas platform cables/pipelines. Maximum vessels on site at any one time: • up to 1 jack up vessel making up to 15 return trips per year; and • up to 3 multipurpose support vessels making up to 15 return trips per year. Other activities: • Potential for cable maintenance in the subtidal and intertidal zone. **Decommissioning Phase** A total of 128 round trips of vessels associated with the decommissioning phase (return trips are presented as total across construction period): • up to 4 decommissioning and support vessel making up to 7 return trips; • up to 6 tug/anchor handlers making up to 8 return trips; • up to 4 cargo barges making up to 5 return trips; • up to 1 survey vessel making up to 1 return trip; and • up to 2 crew transfer vessels making up to 108 return trips. Other activities: • Removal of infrastructure within the Proposed Development.	

Potential impact	Phase C	Phase O	Phase D	Project design parameters	Justification
Effects on marine mammals due to changes in prey availability (North Anglesey Marine SAC only)	✓	✓	✓	**Construction Phase** The MDS for impacts to prey species are presented in Table 1.17 for Annex II diadromous fish and freshwater pearl mussel. In the construction phase, these impacts are: • temporary habitat loss and/or disturbance; • underwater noise impacting fish and shellfish receptors; and • increased SSCs and associated deposition. **Operation and Maintenance Phase** The MDS for impacts to prey species are presented in Table 1.17 for Annex II diadromous fish and freshwater pearl mussel. In the operation and maintenance phase, these impacts are: • temporary habitat loss and/or disturbance. **Decommissioning Phase** The MDS for impacts to prey species are presented in Table 1.17 for Annex II diadromous fish and freshwater pearl mussel. In the decommissioning phase, these impacts are: • temporary habitat loss and/or disturbance; and • increased SSCs and associated deposition.	There is potential for changes in prey abundance resulting from activities during the construction and decommissioning phase of the Proposed Development, which could have an indirect impact on the foraging success of marine mammals and marine turtles within the Proposed Development and surrounding vicinity. Maximum design scenarios described for Annex II diadromous fish and freshwater pearl mussel (Table 1.17) will result in the greatest potential impact.

Embedded mitigation measures

A number of embedded mitigation measures (primary and tertiary) have been adopted as part of Proposed Development to reduce the potential for impacts on Annex II marine mammals (Table 1.47). As there is a secured commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development. Therefore, these measures have been considered in the assessment of significance, presented in section 1.8.3 and 1.8.4. This means that the determination of AEoI assumes implementation of these measures.

Table 1.47: Embedded Mitigation Measures Adopted As A Part Of The Proposed Development Relevant To Annex II Marine Mammals

Embedded Mitigation	Justification
Primary Mitigation: Measures Embedded into the Project Design	
Implementation of piling initiation, soft start, and ramp up measures within the MMMP. An initiation stage and soft starts will be used during the installation of pin piles. This involves the implementation of an initial low hammer energy with a low number of strikes, followed by lower hammer energies at a higher strike rate at the beginning of the piling sequence before energy input is 'ramped up' (increased) over time to required higher levels.	This measure will minimise the risk of injury to fish, marine mammal, and marine turtle species in the immediate vicinity of piling activities, allowing individuals to move away from the area before noise levels reach a level at which injury may occur.
Inclusion of low order techniques as a UXO clearance option noting, however, that it is not possible to fully commit to this measure at this stage. Low order techniques are not always possible and are dependent upon the individual situations surrounding each UXO. Given that high order detonation may be required, the MMMP will also include mitigation to reduce the risk of injury from UXO clearance.	Low order techniques generate less underwater noise than high order techniques and therefore present a lower risk to sound-sensitive receptors such as fish, marine mammals, and marine turtles during UXO clearance.
Tertiary Mitigation: Measures Required to meet Legislative Requirements, or Adopted Standard Industry Practice	
Development of and adherence to a MMMP, based on a draft MMMP submitted alongside the ES. The MMMP will present appropriate mitigation for activities that could potentially lead to disturbance or injurious effects on marine mammals including piling, UXO clearance and some types of geophysical activities. The MMMP will be developed on the basis of the most recent published statutory guidance and in consultation with key stakeholders.	**Piling:** for the purpose of developing the MMMP, a mitigation zone of 500 m will be applied, following the JNCC (2010b) guidance. The Draft MMMP will set out the measures to apply in advance of and during piling activity to reduce the risk of disturbance and injury, including the use of Marine Mammal Observers (MMObs), Passive Acoustic Monitoring (PAM), and ADD, thereby following the latest JNCC guidance (JNCC, 2010b). **UXO Clearance:** Measures to reduce the risk of disturbance and injury, including visual and acoustic monitoring (MMObs and PAM), the use of an ADD, and soft start charges will be applied to deter animals from the mitigation zone as defined by sound modelling for the largest possible UXO following the latest guidance (JNCC, 2010a). **Geophysical and Seismic Surveys:** Mitigation for injury during high resolution geophysical and seismic site investigation surveys using a subsurface sensor from a conventional vessel will involve the use of MMObs and PAM to ensure that the risk of disturbance and injury over the defined mitigation zone is reduced in line with JNCC (2017b) guidance (500 m). Soft start is not possible for SBP equipment but will be applied for other high-resolution surveys where possible. It should be noted that

Embedded Mitigation	Justification
	some multi-beam surveys in shallow waters (<200 m) are not subject to the requirements of mitigation.
Development of, and adherence to, a CMS.	This measure will confirm the actual methodology that will be employed to construct the Proposed Development, provide details on aspects of the methodology not known at the application stage and confirm that the methodology falls within the parameters assessment in the ES.
Development of, and adherence to, an EMP, which will be issued to all vessel operators, requiring them to: • not deliberately approach marine mammals, marine turtles, and basking sharks; • keep vessel speed to a minimum; and • avoid abrupt changes in course or speed should marine mammals approach the vessel to bow-ride.	To minimise the potential for collision risk, or potential injury to, marine mammals and megafauna this code of conduct outlines in the EMP will be adhered to at all times.
Development of, and adherence to, a Decommissioning Plan	The aim of this plan is to adhere to the relevant UK and international legislation and guidance in place at the time, with decommissioning industry practice applied to reduce the amount of long term disturbance to the environment so far as reasonably practicable.

Wider marine mammal populations

Where in the Appropriate Assessment it is relevant to acknowledge that the population of the SAC forms a part of the population within the wider area, reference populations (as per the volume 2, chapter 7 of the Offshore ES) are presented. Reference populations and densities for relevant Annex II species are shown in Table 1.48.

Where a range of densities has been presented, these values represent expected lower and upper estimates from published literature detailed in the footnotes of Table 1.48. Just as the lower estimates may not capture the full population size, upper estimates may not be representative of the population as a whole. For instance, the large increase in harbour porpoise density between SCANS-III (0.086 animals per km^2) and SCANS-IV (0.5153 animals per km^2) is unlikely to represent a long-term increase, given the short timeframe (six years) over which the increase has occurred. For this reason, where necessary, two density estimates have been considered as the lower and upper limits, and are reported throughout, with actual density likely sitting within this range. The number of animals affected by impacts and the corresponding proportions of relevant populations are also reported to reflect these ranges.

Table 1.48: Summary Of Marine Mammal Reference Populations And Densities

Species	Density (animals per km^2)	Management Unit (MU)[5]	Population Estimate in MU
Harbour porpoise	0.086[1] to 0.515[2]	Celtic and Irish Sea	62,517
Bottlenose dolphin	0.010[2] to 0.035[3]	Irish Sea	293
Grey seal	0.467 to 4.06[4]	Wales	3,766
		NW England	1,046
		Northern Ireland	2,113
		SW Scotland	2,163
		Isle of Man estimate	400

Species	Density (animals per km^2)	Management Unit (MU)[5]	Population Estimate in MU
		East of Ireland South-east of Ireland	1,749[6] 2,326[6]
		OSPAR Region III	60,780
Harbour seal	0.0049 to 0.593[4]	Wales	14
		NW England	7
		Northern Ireland	1,406
		Isle of Man	No estimate available

[1] SCANS-III (Hammond *et al.*, 2021) Block F

[2] SCANS-IV (Gilles *et al*., 2023) Block CS-E

[3] SCANS-III (Hammond *et al.*, 2021, Víkingsson *et al.*, 2013) for adjacent Block E, as none observed for Block F and high density coastal area density in outer Cardigan Bay from Lohrengel *et al.* (2018)

[4] Carter *et al.* (2022) – average and maximum densities calculated to per km^2 using absolute mean values for cells overlapping with the Proposed Development marine mammal study area

[5] All population estimates include the Isle of Man unless population estimate is given separately

[6] Population estimates based upon counts from Duck and Morris (2019), using scalars from Lonergan *et al.* (2013) for harbour seal and Russell *et al.* (2016) for grey seal

Injury and disturbance from underwater noise generated from piling (C)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from underwater noise generated from piling. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.
- North Channel SAC:
  - Harbour porpoise.
- Lleyn Peninsula and the Sarnau SAC:
  - Bottlenose dolphin; and
  - Grey seal.
- West Wales Marine SAC:
  - Harbour porpoise.
- Strangford Lough SAC:
  - Harbour seal.
- Murlough SAC:
  - Harbour seal.
- Cardigan Bau SAC:
  - Bottlenose dolphin.
- The Maidens SAC:
  - Grey seal.
- Pembrokeshire Marine SAC:

  - Grey seal.
- Bristol Channel Approaches SAC:
  - Harbour porpoise.
- Lundy SAC:
  - Grey seal.
- Rockabill to Dalkey Island SAC:
  - Harbour porpoise.

Pile driving during the construction phase of the Proposed Development has the potential to result in elevated levels of underwater noise that are detectable by marine mammals above background levels and could result in auditory injury and/or behavioural effects on marine mammals. The following sections explain how this potential impact on Annex II marine mammal features of the SACs outlined above have been quantified and assessed.

Injury

The maximum spatial effect was predicted for piles with a hammer energy of 3,000 kJ. The injury ranges based on the Sound Exposure Level (SEL) and SPL_{pk} metrics are presented in Table 1.49 and Table 1.50, respectively. Given that here is a possibility that multiple pin piles will need to be installed in a single 24 hour period, the SEL cumulative ranges are presented for the consecutive installation of the piles.

Table 1.49: Auditory Injury Ranges (PTS) Based On The Cumulative SEL Metric For Marine Mammals Due To Impact Driving Of Piles Consecutively With And Without The Use Of An ADD

N/E = threshold not exceeded

Hearing Group	Metric	Range (m)	
		Without ADD	With 30 mins ADD
Harbour porpoise	SEL	22	N/E
Bottlenose dolphin	SEL	N/E	N/E
Harbour, grey seal	SEL	N/E	N/E

Table 1.50: Auditory Injury Ranges (PTS) Based On The Spl_{pk} Metric For Marine Mammals Due To The Phase Of Impact Piling Resulting In The Maximum Peak Sound Pressure Level, And Due To The First Hammer Strike

N/E = threshold not exceeded

Hearing Group	Metric	Range (m)	
		First hammer strike	Maximum peak
Harbour porpoise	SEL	204	490
Bottlenose dolphin	SEL	17	41
Harbour, grey seal	SEL	49	118

Overall, based on the SEL matric, the embedded mitigation measure of ADD activation for 30 minutes resulted in no PTS injury thresholds being exceeded for marine mammals (Table 1.49). ADDs are commonly used to mitigate harm to marine mammals from offshore developments and are recommended by the JNCC (2010b) guidance for piling, particularly in periods of low visibility. There are a range of ADDs with different sound source characteristics available (McGarry *et al.*, 2022), and a suitable device will be consulted upon and decided post-submission of the ES. The selected device will be deployed from the piling vessel and activated for a determined duration to allow individuals sufficient time to flee from the source, whilst also minimising the addition sound introduced into the environment. Furthermore, the PTS injury ranges based on the SPL_{pk} thresholds are all within 500 m (Table 1.50). As per the JNCC (2010b) guidance, a standard 500 m mitigation zone monitored by MMO and PAM will be applied as part of the MMMP (Table 1.47) further reducing the risk of injury.

Disturbance

For the assessment of disturbance as a result of piling at the new Douglas platform, a dose response approach is applied. Unweighted sound exposure level single strike (SEL_{ss}) contours were plotted in 5dB isopleths in decreasing increments from 201.2 dB to 120 dB re.1µPa^{2}s using the highest modelled received sound level. Disturbance during piling was predicted to have far reaching effects across the Irish Sea (Figure 1.11). It should be noted that the extent of behavioural disturbance is likely to be an overestimate as it assumes that the sound maintains its impulsive characteristics at large distances, which is considered unlikely to be the case (there is no agreed approach to modelling the cross over point from impulsive to continuous sound and this is an ongoing active area of research).

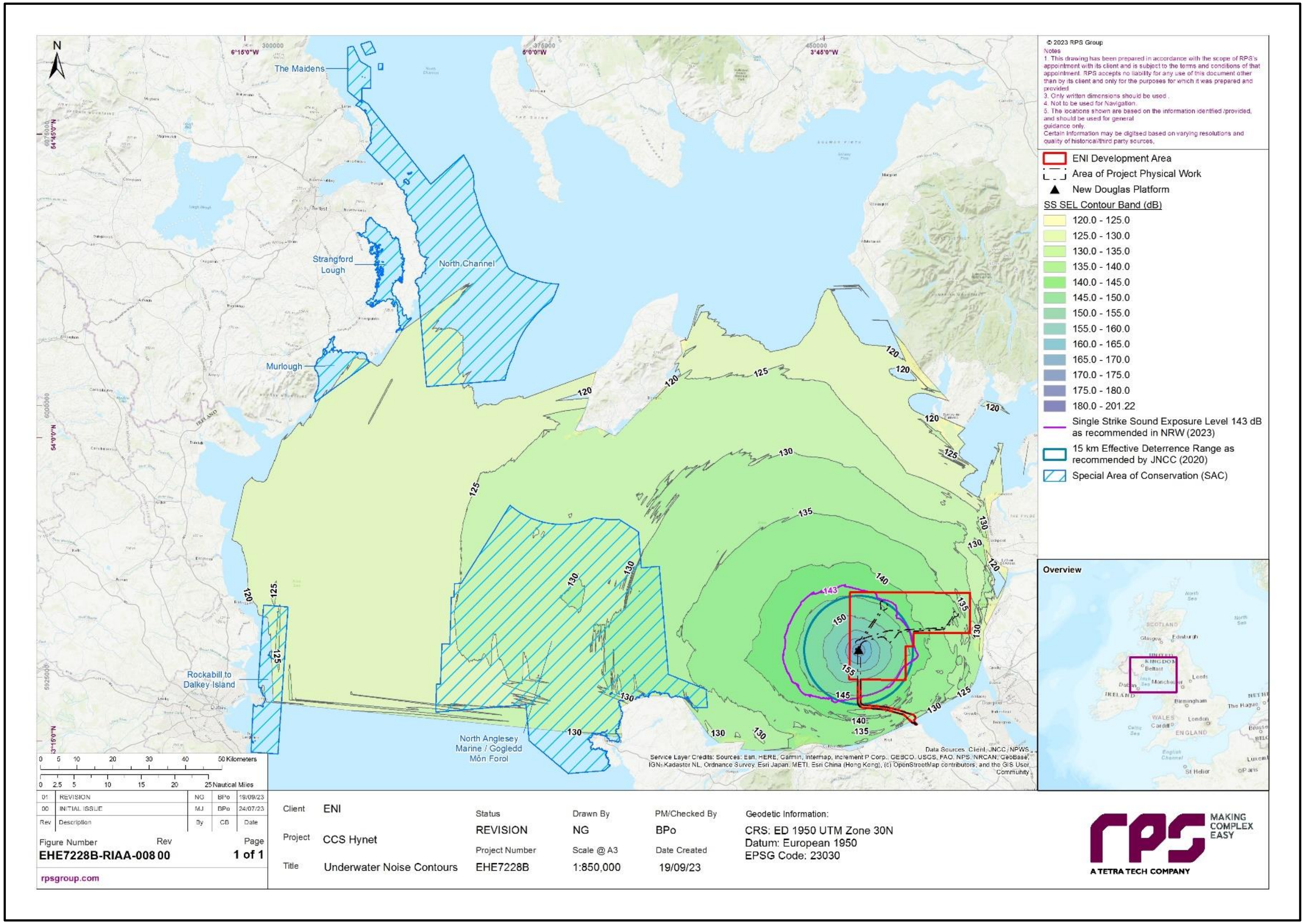

Figure 1.11: The Extent Of Behavioural Disturbance Contours Based On Different Thresholds (Weighted Sel$_{ss}$ Noise Contours Based On Southall (2021) For All Marine Mammals; For Harbour Porpoise: 143 Db Sel$_{ss}$ Contour Based On NRW (2023) And 15 Km EDR Based On JNCC (2020))

The number of animals potentially disturbed in presented in Table 1.51 along with percentages of reference populations. As highlighted in Southall (2021) there are caveats associated with simple, one size fits all, threshold approaches that could lead to errors in disturbance assessments. Recognising this inherent uncertainty in the quantification of effects, the assessment has adopted a precautionary approach at all stages of assessment including conservative assumptions in the marine mammal baseline. For example, the maximum mean density of grey seal is based on the highest value of a single 5 km x 5 km grid cell (based on Carter *et al.* (2022)) that overlaps with the Proposed Development. This high density value (4.06 animals per km^2) is extrapolated across all areas potentially affected by the underwater noise, resulting in a very precautionary number of grey seal potentially affected.

Table 1.51: Potential Number Of Animals Predicted To Be Disturbed Within Weighted SEL_{ss} Sound Contours As A Result Of Piling

Species	Density (animals per km^2)	Douglas Platform Pile Installation		
		Number of Animals	% Reference Population (MU)	% OSPAR III Region
Harbour porpoise	0.086	158	0.25	N/A
	0.515	945	1.51	N/A
Bottlenose dolphin	0.010	20	6.51	N/A
	0.035	65	21.91	N/A
Grey seal	0.467	125	0.92	0.21
	4.06	1,084	7.99	1.78
Harbour seal	0.0049	2	0.09	N/A
	0.593	159	11.1	N/A

Harbour porpoise

In addition to the results presented in section 1.8.2.1, criteria for assessing behavioural impacts on harbour porpoise published in a recent position statement from Natural Resources Wales (NRW, 2023) have been considered. The best recommended option for piling was presented as 143 dB SEL_{ss} threshold (Figure 1.11). Given that the development lies in Welsh waters, separate disturbance calculations have been undertaken based on this guidance and results are presented in Table 1.52. Please note that assumptions of dose response were not applied here, and the number of animals potentially affected across the area up to 143 dB SEL_{ss} noise contour were presented.

Table 1.52: Potential Disturbance To Harbour Porpoise Based On NRW (2023) Guidance And Numbers Of Animals Potentially Affected

Species	Density (animals per km^2)	Douglas Platform Pile Installation	
		Number of Animals	% Reference Population (MU)
Harbour porpoise	0.086	76	0.12
	0.515	451	0.72

Additionally, the Effective Deterrence Range (EDR) approach has been used for the assessment of disturbance associated with piling activities for harbour porpoise features of the designated sites (Figure 1.11), and this approach, outlined in JNCC (2020), recommends the use of a 15 km deterrence range for the installation of pinpiles.

Injury and disturbance from underwater noise generated during UXO detonation (C)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from underwater noise generated from UXO. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.
- North Channel SAC:
  - Harbour porpoise.
- Lleyn Peninsula and the Sarnau SAC:
  - Bottlenose dolphin; and
  - Grey seal.
- West Wales Marine SAC:
  - Harbour porpoise.
- Strangford Lough SAC:
  - Harbour seal.
- Murlough SAC:
  - Harbour seal.
- Cardigan Bau SAC:
  - Bottlenose dolphin.
- The Maidens SAC:
  - Grey seal.
- Pembrokeshire Marine SAC:
  - Grey seal.
- Bristol Channel Approaches SAC:
  - Harbour porpoise.
- Lundy SAC:
  - Grey seal.
- Rockabill to Dalkey Island SAC:
  - Harbour porpoise.
- Saltee Islands SAC:
  - Grey seal.
- Roaringwater Bay and Islands SAC:
  - Harbour porpoise.

UXO detonation during the construction phase may result in hearing damage/auditory injury or behavioural disturbance/displacement (including barrier effects) of marine mammals. The following sections explain how this potential impact on Annex II marine mammal features of the SACs outlined above have been quantified and assessed.

Injury

Although low order and low yield UXO clearance techniques are the preferred option, it is considered that there is a small risk that a low order clearance could result in high order detonation of UXO. Therefore, the assessment considered both high order and low order techniques.

PTS ranges for low order and low yield UXO clearance activities are presented in Table 1.53 and high order clearance of UXO is presented in Table 1.54. The number of animals predicted to experience PTS due to low order disposal is presented in Table 1.55 and high order clearance in Table 1.56.

Table 1.53: Potential PTS Ranges For Low Order And Low Yield UXO Clearance Activities

Charge Size	PTS ranges (m)			
	Threshold	Harbour Porpoise	Bottlenose Dolphin	Harbour, Grey Seal
0.08kg low order donor charge	SPL_{pk}	685	40	135
	SEL	190	2	9
0.5kg clearing shot	SPL_{pk}	1,265	73	247
	SEL	421	4	22
2 x 0.75kg low yield charge	SPL_{pk}	1,820	105	357
	SEL	650	7	38
4 x 0.75kg low yield charge	SPL_{pk}	2,290	133	449
	SEL	840	10	53

Table 1.54: Potential PTS Ranges For High Order Clearance Of UXOs

Charge Size	PTS range (m)			
	Threshold	Harbour Porpoise	Bottlenose Dolphin	Harbour, Grey Seal
1.2kg donor	SPL_{pk}	1,690	98	331
	SEL	596	6	34
3.5kg donor	SPL_{pk}	2,415	140	473
	SEL	885	10	57
25kg UXO – high order explosion	SPL_{pk}	4,645	268	910
	SEL	1,645	27	147
130kg UXO – high order explosion	SPL_{pk}	8,045	464	1,580
	SEL	2,520	61	323
907kg UXO – high order explosion	SPL_{pk}	15,370	890	3,015
	SEL	3,820	151	800

Table 1.55: Number Of Animals With The Potential To Experience PTS Due To Low Order And Low Yield UXO Clearance Activities

Threshold	Estimated Number of Animals with the Potential to be Affected			
	Harbour porpoise	Bottlenose dolphin	Grey seal	Harbour seal
0.08kg low order donor charge				
SPL_{pk}	<1	<1	<1	<1
SEL	<1	<1	<1	<1
0.5kg clearing shot				
SPL_{pk}	<1 to 3	<1	<1	<1
SEL	<1	<1	<1	<1
2 x 0.75kg low yield charge				
SPL_{pk}	<1 to 6	<1	2	<1
SEL	<1	<1	<1	<1
4 x 0.75kg low yield charge				
SPL_{pk}	2 to 9	<1	3	<1
SEL	<1 to 2	<1	<1	<1

Table 1.56: Number Of Animals With The Potential To Experience PTS Due To Donor Charges Used In High Order UXO Clearance Activities

Threshold	Estimated Number of Animals with the Potential to be Affected			
	Harbour porpoise	Bottlenose dolphin	Grey seal	Harbour seal
1.2kg donor charge				
SPL_{pk}	<1 to 5	<1	2	<1
SEL	<1	<1	<1	<1
3.5kg donor charge				
SPL_{pk}	2 to 10	<1	3	<1
SEL	<1 to 2	<1	<1	<1
25kg UXO – high order explosion				
SPL_{pk}	6 to 35	<1	<1	<1
SEL	<1 to 5	<1	<1	<1
130kg UXO – high order explosion				
SPL_{pk}	18 to 105	<1	32	<1
SEL	2 to 11	<1	2	<1
907kg UXO – high order explosion				
SPL_{pk}	64 to 383	<1	115	2
SEL	4 to 24	<1	9	<1

With regard to UXO detonation (low order techniques as well as high order events), due to a combination of physical properties of high frequency energy, the sound is unlikely to still be impulsive in character once it has propagated more than a few kilometres. The National Marine Fisheries Service (2018) guidance suggested an estimate of 3 km for transition from impulsive to continuous (although this was not subsequently presented in the later guidance, Southall *et al.* (2019)). Hastie *et al.* (2019) suggest that some measures of impulsiveness (for seismic airguns and pile driving) change markedly within approximately 10 km of the source. Therefore, caution should be used when interpreting any results with predicted injury ranges in the order of tens of kilometres as the PTS ranges are likely to be significantly lower than predicted.

For both low order and high order clearance, the injury ranges are considerably larger than the standard 1,000 m mitigation zone recommended for UXO clearance (JNCC, 2010a) and there are often difficulties in detecting marine mammals (particularly harbour porpoise) over such large ranges (McGarry *et al.*, 2017). Tertiary mitigation will therefore also include the use of ADDs and potentially scare charges to deter animals from the injury zone. In addition to the ADD, deterrence can also be achieved through the use of soft start charges, the application of which will be discussed and agreed with consultees postsubmission, once more information on the size and type of UXOs are known. Details of appropriate tertiary mitigation will be discussed and agreed with consultees postconsent when further details of the size and type of potential UXOs are understood.

Disturbance

The duration of impact (elevated sound) for each UXO detonation is very short (seconds) therefore behavioural effects are considered to be negligible in this context and as such TTS is presented as a proxy. Whilst some ecological functions would be inhibited in the short term due to TTS, these are reversible on recovery of the animal's hearing and therefore not considered likely to lead to any long term effects on the individual. The onset of TTS also corresponds to a moving away or 'fleeing response' as this is the threshold at which animals are likely to move away from the ensonified area. Thus, the onset of TTS also reflects the threshold at which behavioural displacement could occur.

TTS ranges for low order and low yield UXO clearance activities are presented in Table 1.57 and high order clearance of UXO is presented in Table 1.58. The number of animals predicted to experience TTS due to low order disposal is presented in Table 1.59 and high order clearance in Table 1.60.

Table 1.57: Potential TTS Ranges For Low Order And Low Yield UXO Clearance Activities

Charge Size	TTS ranges (m)			
	Threshold	Harbour Porpoise	Bottlenose Dolphin	Harbour, Grey Seal
0.08kg low order donor charge	SPL_{pk}	1,265	73	247
	SEL	1,500	23	124
0.5kg clearing shot	SPL_{pk}	2,325	134	455
	SEL	2,435	56	301
2 x 0.75kg low yield charge	SPL_{pk}	3,350	194	660
	SEL	3,120	95	504
4 x 0.75kg low yield charge	SPL_{pk}	4,220	244	830
	SEL	3,600	131	695

Table 1.58: Potential TTS Ranges For High Order Clearance Of UXOs

Charge Size	TTS range (m)			
	Threshold	Harbour Porpoise	Bottlenose Dolphin	Harbour, Grey Seal
1.2kg – donor change	SPL_{pk}	3,110	180	610
	SEL	2,975	85	454
3.5kg – donor charge	SPL_{pk}	4,445	257	875
	SEL	3,715	141	745

Charge Size	TTS range (m)			
	Threshold	Harbour Porpoise	Bottlenose Dolphin	Harbour, Grey Seal
25kg UXO – high order explosion	SPL_{pk}	8,555	494	1,680
	SEL	5,290	343	1,760
130kg UXO – high order explosion	SPL_{pk}	14,825	855	2,905
	SEL	6,830	680	3,360
907kg UXO – high order explosion	SPL_{pk}	28,320	1,635	5,550
	SEL	8,925	1,380	6,470

Table 1.59: Number Of Animals With The Potential To Experience TTS Due To Low Order And Low Yield UXO Clearance Activities

Threshold	Estimated Number of Animals with the Potential to be Affected			
	Harbour porpoise	Bottlenose dolphin	Grey seal	Harbour seal
0.08kg low order donor charge				
SPL_{pk}	<1 to 3	<1	<1	<1
SEL	<1 to 4	<1	<1	<1
0.5kg clearing shot				
SPL_{pk}	2 to 9	<1	3	<1
SEL	2 to 10	<1	2	<1
2 x 0.75kg low yield charge				
SPL_{pk}	4 to 19	<1	6	<1
SEL	3 to 16	<1	4	<1
4 x 0.75kg low yield charge				
SPL_{pk}	5 to 29	<1	4	<1
SEL	4 to 21	<1	7	<1

Table 1.60: Number Of Animals With The Potential To Experience TTS Due To High Order Clearance Of UXOs

Threshold	Estimated Number of Animals with the Potential to be Affected			
	Harbour porpoise	Bottlenose dolphin	Grey seal	Harbour seal
1.2kg donor charge for high order UXO disposal				
SPL_{pk}	3 to 16	<1	5	<1
SEL	3 to 15	<1	3	<1
3.5kg donor blast fragmentation charge for high order UXO disposal				
SPL_{pk}	6 to 32	<1	10	<1
SEL	4 to 23	<1	7	<1
25kg UXO – high order explosion				
SPL_{pk}	20 to 119	<1	36	<1
SEL	8 to 46	<1	40	<1
130kg UXO – high order explosion				

Threshold	Estimated Number of Animals with the Potential to be Affected			
	Harbour porpoise	Bottlenose dolphin	Grey seal	Harbour seal
SPL_{pk}	60 to 356	<1	107	2
SEL	4 to 19	<1	145	3
907kg UXO – high order explosion				
SPL_{pk}	217 to 1,299	<1	393	6
SEL	22 to 129	<1	534	8

As previously described in section 1.7.2.1, the sound is unlikely to be impulsive in character once it has propagated more than a few kilometres. It is particularly important when interpreting results for TTS with ranges of up to 28.32 km as these are likely to be significantly lower than predicted.

Harbour porpoise

Additionally, criteria for assessing behavioural impacts on harbour porpoise published in a recent position statement from Natural Resources Wales (NRW, 2023) have been considered. The best recommended option for UXO clearance was presented as 140 dB Sound Exposure Level (SEL) threshold. Given that the development lies in Welsh waters, separate disturbance calculations have been undertaken based on this guidance and results are presented in Table 1.61

Table 1.61: Potential Disturbance Ranges To Harbour Porpoise Based On NRW (2023) Guidance And Numbers Of Animals Potentially Affected

Charge Weight	Distance (m)	Number of animals
Low order and low yield donor charge configurations		
0.08kg	1,500	<1 to 4
0.5kg	2,435	2 to 10
2 x 0.75kg	3,120	3 to 16
4 x 0.75kg	3,600	4 to 21
High order donor charge options		
1.2kg	2,975	3 to 15
3.5kg	3,715	4 to 23
Potential UXOs (high order disposal)		
25kg	5,290	8 to 46
130kg	6,830	13 to 76
907kg	8,925	22 to 129

Additionally, the EDR approach has been used for the assessment of disturbance associated with UXO clearance for harbour porpoise features of the designated sites. The EDR approach, as outlined in JNCC (2020), recommends the use of 26 km deterrence range for the high order detonation of UXOs despite there being no empirical evidence of harbour porpoise avoidance and it is based on the EDR for monopiles.

Injury and disturbance from underwater noise generated during geophysical and seismic surveys (C, O&M)

The assessment of LSE during the HRA screening process identified that during the construction and operation and maintenance phases, LSE could not be ruled out for the potential impact from underwater noise generated during geophysical and seismic surveys. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.
- North Channel SAC:
  - Harbour porpoise.
- Strangford Lough SAC:
  - Harbour seal.
- Murlough SAC:
  - Harbour seal.

Site investigation surveys during the construction phase have the potential to cause injury or disturbance to marine mammals. The following sections explain how this potential impact on Annex II marine mammal features of the SACs outlined above have been quantified and assessed.

Injury

It is understood that several sonar like sources will potentially be used for the geophysical surveys, including MBES and SBP. Sonar based systems have very strong directivity which effectively means that there is only potential for injury when a marine mammal is directly underneath the sound source (or inside the swathe in the case of MBES). PTS ranges for geophysical and seismic activities are presented in Table 1.62 and Table 1.63, respectively.

The number of marine mammals potentially injured within the modelled ranges for PTS were estimated using the most up to date species specific density estimates. Due to low injury ranges, for harbour porpoise and seals, there is the potential for no more than one animal to experience PTS (and no animals where the threshold is not exceeded) as a result of geophysical and seismic site investigation surveys. The site investigation surveys are considered to be short term as they will take place over a period of several months. Mitigation for injury during geophysical and seismic surveys will involve the use of MMObs and PAM to ensure that the risk of injury over the defined mitigation zone is reduced in line with JNCC guidance (JNCC, 2017b). The largest range was predicted as 345 m for harbour porpoise during MBES activity and it is considered that standard industry measures will be effective at reducing the risk of injury over this distance. Some multibeam surveys in shallow waters (<200 m) are not subject to the requirements of mitigation (JNCC, 2017b). Requirements for mitigation will be agreed with the consultees post ES submission.

Table 1.62: PTS Ranges For Marine Mammals During Geophysical Investigation Surveys

N/E = threshold not exceeded

Activity	Range, SEL (m)	
	Harbour Porpoise	Harbour, Grey Seal
Geophysical		
MBES	345	5
SBP	335	40

Table 1.63: PTS Ranges For Marine Mammals During Seismic Site Investigation Surveys

Activity	Range, SEL (m)	
	Harbour Porpoise	Harbour, Grey Seal
Seismic - VPS		
SELcum	235	11
SPL_{pk}	124	16

Disturbance

Disturbance ranges for geophysical and seismic activities are presented in Table 1.64. The number of animals predicted to experience disturbance due to geophysical and seismic activites is presented in Table 1.65. It should be noted that there are caveats associated with simple, one size fits all, threshold approaches that could lead to errors in disturbance assessments (Southall *et al.*, 2021). Recognising this inherent uncertainty in the quantification of effects, the assessment has adopted a precautionary approach at all stages of assessment including conservative assumptions in the marine mammal baseline. For example, the maximum mean density of grey seal is based on the highest value of a single 5 km x 5 km grid cell (based on Carter *et al.* (2022)) that overlaps with the Proposed Development. This high density value (4.06 animals per km^2) is extrapolated across all areas potentially affected by the underwater noise, resulting in a very precautionary number of grey seal potentially affected.

Table 1.64: Disturbance Ranges For Marine Mammals During Geophysical And Seismic Investigation Surveys

N/E = threshold not exceeded

Activity	Range (m)
Geophysical	
MBES	1,100
SBP	1,180
Seismic	
VSP	13 km (mild)
	0.8 km (strong)

Table 1.65: Estimated Number Of Animals With The Potential To Be Disturbed From Geophysical Site Investigation Surveys (120 Db Spl_{rms}) And Seismic (Mild Disturbance - 140 Db Spl_{rms}; Strong Disturbance – 160 Db Spl_{rms})

Activity	Estimated Number of Animals with the Potential to be Disturbed		
	Harbour porpoise	Grey seal	Harbour seal
Geophysical activities			
MBES	<1 to 2	16	<1
SBP	<1 to 3	18	<1
Seismic			
VSP (mild)	46 to 274	2,155	32
VSP (strong)	<1 to 2	9	<1

Harbour porpoise

Additionally to the results presented in section 1.7.2.1, criteria for assessing behavioural impacts on harbour porpoise published in a recent position statement from Natural Resources Wales (NRW, 2023) have been considered. The best recommended option for geophysical surveys was presented as 160 dB SPL_{rms} threshold. For seismic surveys using three different thresholds has been recommended, including 140 dB, 143 dB and 145 dB SEL_{ss}, however this assessment will be based on the most recommended option of 143 dB SEl_{ss} based on Tougaard (2021). Separate disturbance calculations have been undertaken based on this guidance and the results are presented in Table 1.66.

Table 1.66: Potential Disturbance Ranges To Harbour Porpoise Based On NRW (2023) Guidance And Numbers Of Animals Potentially Affected

Activity	Range (m)	Number of animals
Geophysical		
MBES	490	<1
SBP	430	<1
Seismic		
VSP	7,500	16 to 92

Injury and disturbance from vessel activity and other noise producing activities (C, O&M, D)

The assessment of LSE during the HRA screening process identified that during the construction, operation and maintenance and decommissioning phases, LSE could not be ruled out for the potential impact from underwater noise generated from vessel activity and other noise producing activities. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.
- North Channel SAC:

- Harbour porpoise.

- Strangford Lough SAC:
  - Harbour seal.
- Murlough SAC:
  - Harbour seal.

The increased levels of vessel activity will contribute to total underwater noise levels within the Proposed Development during all phases of the Proposed Development. While the number of vessels and return trips presented in Table 1.46 will result in an increase in vessel presence, movement will be limited to within the Proposed Development and are likely to follow existing shipping routes while travelling to and from ports. Baseline levels of vessel traffic in the eastern Irish Sea are already high, largely due to ferry routes. Vessels and other noise producing activities (e.g. cable laying, trenching, and jack up rig activities) will be temporary and largely transitory, as opposed to permanent and fixed. In this respect, underwater noise due to vessel activity and other noise producing activities is unlikely to add substantially to the levels of vessel noise already in the area.

Injury

The underwater noise modelling results indicate that the threshold for PTS was not exceeded for any species for all vessels and activities. The threshold for TTS was also not exceeded for all species except harbour porpoise. The maximum range across which harbour porpoise may experience TTS is up to 6,740 m as a result of survey vessel, crew transfer vessel and support vessels.

Disturbance

Behavioural disturbance is only likely to occur if vessel sound and activities exceed the background ambient noise levels. However, vessel traffic within the Proposed Development is already relatively high, indicating high background ambient noise levels.

Disturbance ranges for vessels and other noise producing activities are presented in Table 1.67. The ranges are presented up to the 120 dB re 1 µPa (rms) threshold, (e.g. threshold which has been classed as the distance beyond which no animals would be disturbed). There is likely to be a proportional response (i.e. not all animals will be disturbed to the same extent). Individual life history and context will also influence the likelihood of an individual to exhibit an aversive response to noise. These impacts will not be continuous over the construction, operation and maintenance and decommissioning phases, instead carried out over a shorter number of days within the period. Therefore, given the limited quantitative information available, as described above, any simplified calculation would likely lead to an unrealistic overestimation of the number of animals likely to be disturbed.

Table 1.67: Disturbance Ranges For Marine Mammals From Vessel Activity And Other Noise Producing Activities

N/E = threshold not exceeded

Activity	Range (km)
Vessels	
Anchor handling vessel	6.3
Main installation vessel, construction vessel	7.5
Survey vessel, crew transfer vessels, and support vessels	20
Miscellaneous small vessel (e.g. tugs, vessels carrying ROVs, dive boats, guard vessels)	6.3

Activity	Range (km)
Activities	
Cable trenching/cutting	16
Cable laying	7.5
Jack up rig	N/E

Effects on marine mammals due to changes in prey availability (C)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from effects on marine mammals due to changes in prey availability. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.

The key prey species for marine mammals include gadoids (e.g. cod, haddock, poor cod, and whiting), forage fish (e.g. herring, sprat, sandeel, mackerel), cephalopods, and flatfish (e.g. dab, flounder, plaice, and sole). There are regional and species specific preferences which are provided in section 1.8.3, if relevant.

Main prey species were found as of varying importance in the vicinity of the Proposed Development. Consequently, potential adverse effects on fish and shellfish species may have indirect effects on marine mammals. The assessment of impacts on fish and shellfish species was provided in volume 2, chapter 7 of the Offshore ES. The impacts with a potential to adversely affect fish and shellfish species included temporary subtidal habitat loss and/or disturbance, long term subtidal habitat loss, underwater noise, as well as increased SSCs and associated deposition (see section 1.7.2.1).

The assessment presented in the volume 2, chapter 7 of the Offshore ES concluded no significant adverse effects on fish and shellfish receptors due to the activities associated with all phases of the Proposed Development.

1.8.2.2 In-combination with other plans and projects

The other developments (projects/plans) that could result in in-combination effects associated with the Proposed Development on Annex II marine mammal features of the designated sites identified have been summarised in Table 1.68 and shown in Figure 1.12.

As outlined in the HRA Stage 1 Screening Report, where the potential for LSE has been concluded with respect to the Proposed Development alone, the potential for LSE has also been concluded in-combination. For impacts where LSE has been ruled out with respect to the Proposed Development alone, there is either no pathway to effect, or the Proposed Development would result in only negligible or inconsequential effects that would not contribute (even collectively) or materially to in-combination effects and therefore, no additional in-combination issues are identified.

On this basis, the potential impacts identified for assessment as part of the volume 2, chapter 7 of the Offshore ES, and which have been brought forward for consideration in the in-combination assessment of the Appropriate Assessment are:

- injury and disturbance from underwater noisenoise generated from piling in-combination;
- injury and disturbance from underwater noisenoise generated during UXO detonation in-combination;
- injury and disturbance from underwater noisenoise generated during geophysical and seismic surveys in-combination;

- injury and disturbance underwater noise from vessel activity and and other noise producing activities in-combination; and
- effects on marine mammals due to changes in prey availability in-combination.

Table 1.68: List Of Other Projects And Plans With Potential For In-Combination Effects On Annex II Marine Mammal Features

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation Period (if applicable)	Overlap with the Proposed Development
Tier 1						
Offshore Renewables						
Awel y Môr Offshore Wind Farm (OWF)	Application submitted	1.10	Proposed renewable energy project, 10.50 km off the coast of North Wales, of up to 1.1 GW.	2026 – 2030	2030 – 2055	This project will overlap with all three phases of the Proposed Development.
Project Erebus	Application submitted	252.25	Floating energy demonstration projects.	2025	2026 - 2051	This project overlaps with the construction and operations and maintenance phases of the Proposed Development.
Construction						
Mostyn Energy Park Extension (MEPE) Project	Application submitted	4.00	Extension of quay wall at the Port of Mostyn.	Q2 2023 – Q1 2025	2025 - unknown	This project overlaps with the construction and operations and maintenance phases of the Proposed Development.
Construction and deposit						
Mona OWF Suction Bucket foundation trials	Application submitted	8.80	Trialling of suction bucket foundations to validate their viability within the Mona OWF array area.	July 2023 – July 2024	July 2023 – July 2024	This project overlaps with the construction and operations and maintenance phases of the Proposed Development.
Tier 2						
Offshore Renewables						
Mona OWF	Pre application	5.53	Proposed renewable energy project, 28.20 km off the coast of North Wales, of up to 350 MW.	2026 - 2028	2029 - 2089	This project will overlap with all three phases of the Proposed Development.
Morgan OWF Generation Assets	Pre application	7.53	The generation assets for the Morgan OWF, which has a capacity of 1.5 GW.	2026 - 2028	2029 - 2089	This project will overlap with all three phases of the Proposed Development.

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation Period (if applicable)	Overlap with the Proposed Development
Morecambe OWF Generation Assets	Pre application	30	The generation assets for the Morgan OWF, which has a capacity of 480 MW.	2026 - 2028	2029 - 2089	This project will overlap with all three phases of the Proposed Development.
Mooir Vannin OWF	Planning	63.00	OWF located approximately 11 km east of the Manx coast, with up to 100 turbines and a capacity of 80-100 MW.	2030 – 2032	2032 - 2067	This project will overlap with all three phases of the Proposed Development.
North Irish Sea Array (NISA) OWF	Pre application	143.68	OWF located approximately 12.5 km off the coast of Dublin, with between 34 and 46 turbines.	2024 – 2026	2027 - 2059	This project will overlap with all three phases of the Proposed Development.
Codling Offshore Wind Park	Pre application	145.46	OWF in the Irish Sea with a maximum capacity of 1.45 GW.	2025 – 2027	2028 - 2063	This project will overlap with all three phases of the Proposed Development.
Dublin Array OWF	Pre application	151.88	OWF located approximately 10 km off the coast of Dublin and Wicklow counties, with a maximum capacity of 900 MW.	2025 – 2026	2027 - 2062	This project will overlap with all three phases of the Proposed Development.
Oriel OWF	Pre application	161.42	OWF in the Irish Sea with a maximum capacity of 375 MW.	2025 – 2026	2026 – unknown	This project will overlap with the construction and operations and maintenance phase of the Proposed Development. It may also overlap with the decommissioning phase, but the lifespan of this project is currently not available.
Arklow Bank Wind Park Phase 2	Pre application	164.25	OWF located approximately 15 km off the coast of Arklow, with a maximum capacity of 800 MW.	Unknown	2028 – unknown	This project will overlap with the operations and maintenance phase of the Proposed Development. It may also overlap with the construction and decommissioning phases, but these dates are not currently available.

Project/Plan/Activity	Status	Distance from Proposed Development (km)	Description	Construction Period (if applicable)	Operation Period (if applicable)	Overlap with the Proposed Development
Llŷr 2 Floating OWF	Pre application	252.38	Floating offshore wind demonstration project of up to 100 MW.	2024 – 2025	2026 – 2051	This project will overlap with all three phases of the Proposed Development.
Llŷr 1 Floating OWF	Pre application	258.08	Floating offshore wind demonstration project of up to 100 MW.	2024 – 2025	2026 – 2051	This project will overlap with all three phases of the Proposed Development.
White Cross OWF	Pre application	276.39	Floating OWF with a capacity of up to 100MW	2025 – 2026	2026 – unknown	This project will overlap with the construction and operations and maintenance phase of the Proposed Development. It may also overlap with the decommissioning phase, but the lifespan of this project is currently not available.
Construction and Deposit						
Bombora WavePower mWave Pembrokeshire Project	Consented (EIA not publicly available)	218.42	Wave energy demonstration site off the coast of south Pembrokeshire with a capacity of 1.5 MW	2024 (installation)	2024-2025	This project will operate for 6-12 months, after which it will be removed from the seabed. This will overlap with the construction phase of the Proposed Development.
Cables and Pipelines						
Morgan and Morecambe OWF Transmission Assets	Pre application	3.00	The transmission assets for the Morgan and Morecambe OWF	2028 - 2029	2030 - 2065	This project will overlap with the operations and maintenance and decommissioning phases of the Proposed Development.

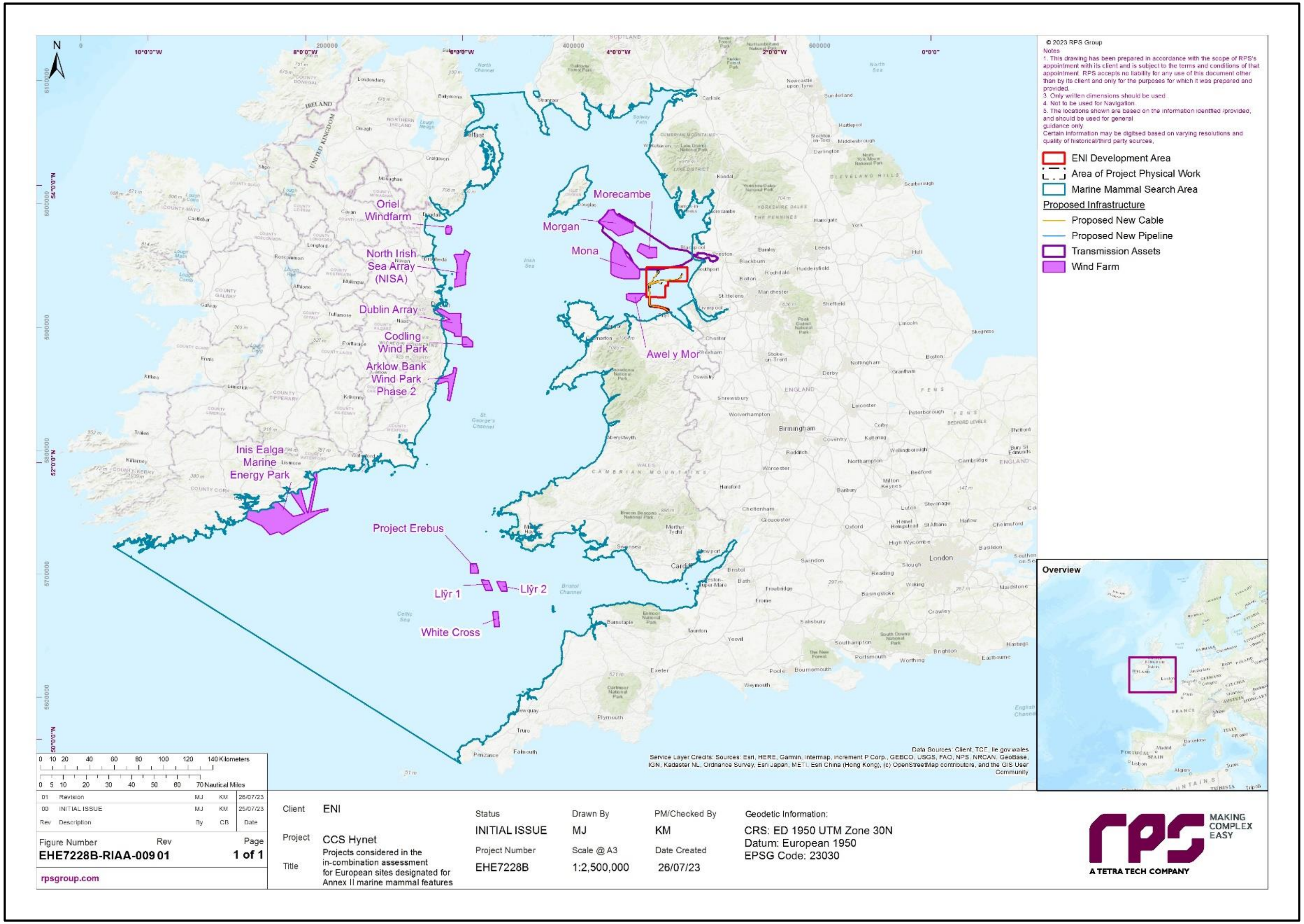

Figure 1.12: Location Of Other Projects And Plans Considered For In-Combination Effects On Sacs Designated For Annex II Marine Mammal Features

Maximum design scenario

The design parameters identified in Table 1.69 have been selected as those having the potential to result in the greatest effect on Annex II marine mammals as a result of impacts in-combination with other plans and projects and therefore represent the MDS. It should be noted that in line with the HRA Stage 1 Screening, a precautionary approach has been adopted and the search area for Annex II marine mammals and projects considered in the in-combination assessment has been extended to cover the Irish Sea, St. George’s Channel and northern part of the Celtic Sea (Figure 1.12).

Table 1.69: Maximum Design Scenario Considered For The In-Combination Assessment Of Impacts On Annex II Marine Mammals

Potential In-combination Effect	Phase			MDS	Justification
	C	O&M	D		
Injury and disturbance from underwater noise generated from piling	✓	×	×	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities: **Tier 1[11]:** Offshore Renewables: • Project Erebus. Construction Projects: • Mostyn Energy Park Extension. **Tier 2:** Offshore Renewables: • Mona OWF; • Morgan OWF Generation Assets; • Morecambe OWF Generation Assets; • Mooir Vannin OWF; • Arklow Bank Wind Park Phase 2; • Dublin Array OWF; • NISA OWF; • Oriel OWF; • Codling Offshore Wind Park; • Llŷr 1 Floating OWF; • Llŷr 2 Floating OWF; and • White Cross OWF.	The Zone of Impact (ZoI) as a result of piling can extend over kilometres. As such, the in-combination assessment will consider projects within the marine mammal search area, with construction phases that overlap temporally with the construction phase for the Proposed Development. Piling activities at the Proposed Development are anticipated to take place in April 2026. To account for sequential piling and potential residual effects, projects whose construction phase finishes in 2025 were also screened in.
Injury and disturbance from underwater noise	✓	×	×	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities:	The Zone of Impact (ZoI) as a result of UCO clearance can extend over kilometres. As such, the in-combination assessment will consider

[11] The piling phase of the Proposed Development (April/May 2026) overlaps with the construction phase of another Tier 1 project, Awel y Môr OWF. However, the MDS in the ES for Awel y Môr OWF assumes that there will be up to 201 days of piling over 12 months in 2028, within the project's four-year construction phase RWE Renewables UK. (2021c). *Volume 2, Chapter 7: Marine Mammals.* Awel y Môr Offshore Wind Farm Preliminary Environmental Information Report. Awel y Môr Offshore Wind Farm pp.185pp.Given the almost two-year gap in between piling activities at Awel y Môr OWF and the Proposed Development, the Awel y Môr OWF is not included in this Tier 1 assessment.

Potential In-combination Effect	Phase C	Phase O&M	Phase D	MDS	Justification
generated during UXO detonation				**Tier 1:** Offshore Renewables: • Awel y Môr OWF; and • Project Erebus. **Tier 2:** Offshore Renewables: • Mona OWF; • Morgan OWF Generation Assets; • Morecambe OWF Generation Assets; • Mooir Vannin OWF; • Arklow Bank Wind Park Phase 2; • Dublin Array OWF; • NISA OWF; • Oriel OWF; • Codling Offshore Wind Park; • Llŷr 1 Floating OWF; • Llŷr 2 Floating OWF; and • White Cross OWF.	projects within the marine mammal search area, with construction phases that overlap temporally with the construction phase for the Proposed Development. The construction phases of these projects would include pre-construction UXO clearance.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF; • Morgan OWF Generation Assets; and • Mooir Vannin OWF.	It is anticipated that the magnitude of the impacts will be of a similar scale to that described for the Proposed Development (maximum disturbance value of 13 km for VSP; section 1.8.2.1). Therefore, the screening exercise has screened in projects within 13 km from the Proposed Development whose construction phases (which would include pre-construction site investigation surveys) overlap temporally with the construction phase for the Proposed Development.
Injury and disturbance from vessel activity and other noise producing activities	✓	×	×	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables:	It is anticipated that the magnitude of the impacts will be of a similar scale to that described for the Proposed Development (maximum disturbance value of 20 km for

Potential In-combination Effect	Phase C	Phase O&M	Phase D	MDS	Justification
				• Awel y Môr OWF. Construction and deposit: • Mona OWF Suction Bucket Trials **Tier 2:** Offshore Renewables: • Mona OWF; and • Morgan OWF Generation Assets.	survey, crew transfer and support vessels; section 1.8.2.1). Therefore, the screening exercise has screened in projects within 20 km from the Proposed Development.
	×	✓	×	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF; and • Morgan OWF Generation Assets. Cables and Pipelines: • Morgan and Morecambe OWF Transmission Assets.	
	×	×	✓	The MDS is as described for the Proposed Development (Table 1.46) and assessed in-combination with the following plans, projects, and activities: **Tier 1:** Offshore Renewables: • Awel y Môr OWF. **Tier 2:** Offshore Renewables: • Mona OWF; and • Morgan OWF Generation Assets. Cables and Pipelines: • Morgan and Morecambe OWF Transmission Assets.	

Injury and disturbance from underwater noise generated from piling (C)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from underwater noise generated from piling. The in-combination assessment will be conducted with regard to the same designated sites and relevant Annex II marine mammals that were screened in for the assessment of impacts as a result of the Proposed Development alone, listed in section 1.8.2.1. The in-combination assessment has been provided for projects within the marine mammal search area, using the tiered approach outlined in 1.5.5.

The construction phase of the Proposed Development is anticipated to start in 2024, to enable operation to commence during 2026/2027. Piling is currently anticipated to take place over 29 days in April to May 2026, although the total piling duration, based upon 100 minutes piling for each of eight pin piles, is less than 13.5 hours in total. Therefore, as a precaution, plans, projects, and activities with a construction phase commencing in 2026 are included in the in-combination assessment for this impact, although it should be noted that in-combination effects will be of a lesser extent due to the reduced temporal overlap.

Injury

As for the assessment of the Proposed Development alone (section 1.8.3), the risk of injury in terms of PTS to marine mammals due to piling is expected to be localised within close vicinity of the respective projects. It is also anticipated that embedded mitigation and monitoring methods (which include soft starts and visual and acoustic monitoring as standard, section 1.8.2.1) will be applied during construction, thereby reducing the magnitude of impact. Therefore, there is very low potential for significant in-combination impacts for injury from increased underwater noise during pilling, and the in-combination assessment focuses on disturbance only.

Disturbance
Tier 1

There is potential for in-combination impacts with two Tier 1 projects in the construction phase: Mostyn Energy Park Extension and Project Erebus. The piling phase of the Mostyn Energy Park Extension (Q3 2023 to Q2 2024) is expected to overlap temporally with the construction phase of the Proposed Development. However, construction for Mostyn Energy Park Extension is expected to have been completed in Q1 2025, before the piling phase for the Proposed Development has commenced, and is not considered further.

Project Erebus is anticipated to be constructed in 2025 only (Table 1.68), therefore piling should not overlap with that of the Proposed Development. However, as the construction phase finishes in 2025, Project Erebus was screened into the assessment as the sequential piling of the Proposed Development in 2026 could lead to a longer duration of impact.

Numbers of animals potentially disturbed due to piling at Project Erebus and the Proposed Development are presented for each species in Table 1.70. Harbour seal was not considered in the ES for Project Erebus, and is therefore not included in Table 1.70. The duration of the piling phase at the Proposed Development will be 29 days (although within this, piling will take only approximately 13.5 hours). Piling activities at project Erebus will take 18 days over an 8 month piling phase. Given that the construction phase of Project Erebus is anticipated to be completed prior to the commencement of piling at the Proposed Development, animals are likely to recover from the disturbance between piling events and therefore the numbers of animals potentially disturbed at respective projects are not added together.

Table 1.70: Number Of Marine Mammals Predicted To Be Disturbed As A Result Of Piling For Tier 1 Projects

Project	Density (Animals per km^2)	Maximum Number of Animals Disturbed	Source
Harbour porpoise			
Proposed Development	0.086	158	Volume 2, chapter 7 of the Offshore ES
Project Erebus	0.04	1,967	Blue Gem Wind (2020)
Bottlenose Dolphin			
Proposed Development	0.0082 0.035	15 65	Volume 2, chapter 7 of the Offshore ES
Project Erebus	0.063 (array area) 0.3743 (wider area)	310	Blue Gem Wind (2020)
Grey seal			
Proposed Development	0.467 4.06	125 1,084	Volume 2, chapter 7 of the Offshore ES
Project Erebus	Not available as grid cell specific	18	Blue Gem Wind (2020)

Tier 2

There is potential for in-combination impacts with 12 Tier 2 projects in the construction phase: Mona Offshore Wind Farm (OWF), Morgan OWF Generation Assets, Morecambe OWF Generation Assets, Mooir Vannin OWF, Arklow Bank Wind Park Phase 2, Dublin Array OWF, NISA OWF, Oriel OWF, Codling Offshore Wind Park, Llŷr 1 Floating OWF, Llŷr 2 Floating OWF and White Cross OWF.

For the majority of these Tier 2 projects, only a Scoping Report is available, which does not include detailed information about behavioural disturbance due to piling. However, potential impacts of injury and disturbance due to piling were scoped in for these projects within their respective Scoping Reports (Codling Wind Park Limited, 2020, Dublin Array, 2020, Floventis Energy Ltd, 2022, North Irish Sea Array Windfarm Ltd., 2021, Oriel Windfarm Ltd, 2019, Sure Partners Limited, 2020, White Cross Offshore Wind Ltd, 2022). Preliminary Environmental Impact Assessments (PEIRs) are available for the Mona OWF, Morgan OWF Generation Assets and Morecambe OWF Generation Assets, which have been used in this assessment to provide more detailed information on this impact (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Numbers of animals potentially disturbed due to piling are provided in Table 1.71.

Temporally, the construction phases of the 12 Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68), although refined piling programmes are not currently available for any of the projects considered. The exception to this is Mooir Vannin OWF, which is anticipated to commence construction no earlier than 2030, so no temporal overlap with the Proposed Development is anticipated, This timescale constitutes a total of four years where piling activities will occur across the Irish and Celtic Seas. Piling will occur intermittently over the construction phase of respective projects. Therefore, although this will not result in a continuous risk of disturbance to marine mammals, it may affect multiple breeding seasons. In the context of these species' life cycles, the duration of the impact is classified as medium term, as the exposure to elevated sound levels could occur over a meaningful proportion of their lifespan.

Table 1.71: Number Of Marine Mammals Predicted To Be Disturbed As A Result Of Piling For Tier 2 Projects

Project	Density (Animals per km^2)	Maximum Number of Animals Disturbed	Source
Harbour porpoise			
Proposed Development	0.086 0.515	158 945	Volume 2, chapter 7 of the Offshore ES
Mona OWF	0.097	587	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	0.247	1,370	Morgan Offshore Wind Ltd (2023b)
Morecambe OWF Generation Assets	0.371	1,279	Morecambe Offshore Wind Ltd (2023a)
Bottlenose Dolphin			
Proposed Development	0.010 0.035	20 65	Volume 2, chapter 7 of the Offshore ES
Mona OWF	0.035	17	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	0.035	16	Morgan Offshore Wind Ltd (2023b)
Harbour seal			
Proposed Development	0.0049 0.593	159	Volume 2, chapter 7 of the Offshore ES
Mona OWF	Not available as grid cell specific	1	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	Not available as grid cell specific	1	Morgan Offshore Wind Ltd (2023b)
Morecambe OWF Generation Assets	Not available as grid cell specific	1	Morecambe Offshore Wind Ltd (2023a)
Grey seal			
Proposed Development	0.467 4.06	125 1,084	Volume 2, chapter 7 of the Offshore ES
Mona OWF	Not available as grid cell specific	92	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	Not available as grid cell specific	48	Morgan Offshore Wind Ltd (2023b)
Morecambe OWF Generation Assets	Not available as grid cell specific	<1	Morecambe Offshore Wind Ltd (2023a)

Tier 3/4

There were no Tier 3 or 4 plans, projects, or activities identified with the potential to result in the in-combination impacts regarding underwater noise during piling.

Injury and disturbance from underwater noise generated during UXO detonation (C)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from underwater noise generated during UXO detonation. The in-combination assessment will be conducted with regard to the same designated sites and relevant Annex II marine mammals that were screened in for the assessment of impacts as a result of the Proposed Development alone, listed in section 1.8.3. The in-combination assessment has been provided for projects within the marine mammal search area, using the tiered approach outlined in section 1.5.5.

Injury and Disturbance

As detailed above in section 0, the duration of increased underwater noise for each UXO detonation is very short (i.e. within seconds), therefore behavioural effects are considered to be negligible in this context. TTS is presented as a metric of temporary auditory injury but also represents a threshold for the onset of a displacement or moving away response in line with recommendations from Southall *et al.* (2007). Although increased underwater noise during UXO clearance has the potential to cause TTS (moving away response) in marine mammal receptors, this effect will be short term and reversible. Therefore, the potential for in-combination impact is considered to be very limited, even for multiple projects. Although some ecological functions could be temporarily inhibited due to TTS (e.g. cessation of feeding), these are reversible on recovery of the animal's hearing and therefore not considered likely to lead to any long term effects on the individual.

Tier 1

There is potential for in-combination impacts with two Tier 1 projects in the construction phase: Awel y Môr OWF and Project Erebus. The construction of Project Erebus is anticipated for 2025 only, between 2026 to 2030 for Awel y Môr OWF (Table 1.68), and between 2024 and 2026 for the Proposed Development. Therefore, it is unlikely that concurrent UXO detonations across these three projects will take place. This is because UXO clearance activities take place before other construction activities commence, at the beginning of the construction phase (i.e. 2024 for the Proposed Development, 2025 for Project Erebus and 2026 for Awel y Môr OWF). However, sequential UXO clearance at the respective projects could lead to a longer duration of impact. UXO clearance at each of these projects will occur as a discrete stage within the overall construction phase and therefore will not coincide continuously over the duration of any temporal overlap. In addition, each clearance event results in a very short duration of sound emission (within seconds) so the impact will be short in duration and therefore the temporal overlap is unlikely. The number of marine mammals potentially affected by PTS during UXO clearance at respective projects is presented in Table 1.72.

Table 1.72: Number Of Marine Mammals Predicted To Experience PTS As A Result Of UXO Clearance For Tier 1 Projects.

Project	Maximum Charge Size (kg)	Maximum PTS Range (m)	Maximum Number of Animals Potentially Affected	Source
Harbour porpoise				
Proposed Development	907	15,370	64 to 383	Volume 2, chapter 7 of the Offshore ES
Project Erebus	525	13,000	212	Blue Gem Wind (2020)
Awel y Môr OWF	164	8,600	30	Blue Gem Wind (2020), RWE Renewables UK (2021c)
Bottlenose Dolphin				
Proposed Development	907	890	<1	Volume 2, chapter 7 of the Offshore ES
Project Erebus	525	730	<1	Blue Gem Wind (2020)

Project	Maximum Charge Size (kg)	Maximum PTS Range (m)	Maximum Number of Animals Potentially Affected	Source
Awel y Môr OWF	164	500	<1	Blue Gem Wind (2020), RWE Renewables UK (2021c)
Grey seal				
Proposed Development	907	3,015	115	Volume 2, chapter 7 of the Offshore ES
Project Erebus	525	2,500	1	Blue Gem Wind (2020)
Awel y Môr OWF	164	1,600	3	Blue Gem Wind (2020), RWE Renewables UK (2021c)

Tier 2

There is potential for in-combination impacts with eleven Tier 2 projects in the construction phase: Mona Offshore Wind Farm (OWF), Morgan OWF Generation Assets, Morecambe OWF Generation Assets, Arklow Bank Wind Park Phase 2, Dublin Array OWF, NISA OWF, Oriel OWF, Codling Offshore Wind Park, Llŷr 1 Floating OWF, Llŷr 2 Floating OWF and White Cross OWF.

For the majority of these Tier 2 projects, only a Scoping Report is available, which does not include detailed information about behavioural disturbance due to piling. However, potential impacts of injury and disturbance due to piling were scoped in for these projects within their respective Scoping Reports (Codling Wind Park Limited, 2020, Dublin Array, 2020, Floventis Energy Ltd, 2022, North Irish Sea Array Windfarm Ltd., 2021, Oriel Windfarm Ltd, 2019, Sure Partners Limited, 2020, White Cross Offshore Wind Ltd, 2022). These projects are likely to have effects similar to the Proposed Development and will likely have comparable embedded mitigation measures (e.g. primary and tertiary) to mitigate the injury. However, at this state, a quantitative assessment cannot be provided for these projects.

Preliminary Environmental Impact Assessments (PEIRs) are available for the Mona OWF and Morgan OWF Generation Assets, which have been used in this assessment to provide more detailed information on this impact (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Numbers of animals potentially affected by PTS during the UXO clearance are provided in Table 1.73. For both these Tier 2 projects, the construction phases are expected to be from 2026 to 2030 (Table 1.68) and therefore may have overlap with that of the Proposed Development. Although UXO clearance activities are typically undertaken at the beginning of the construction phase (i.e. in 2024 for the Proposed Development), these timelines are only indicative at this stage and could be subject to change.

Table 1.73: Number Of Marine Mammals Predicted To Experience PTS As A Result Of UXO Clearance For Tier 2 Projects

Project	Maximum Charge Size (kg)	Maximum PTS Range (m)	Maximum Number of Animals Affected	Source
Harbour porpoise				
Proposed Development	907	15,370	64 to 383	Volume 2, chapter 7 of the Offshore ES
Mona OWF	907	15,370	72	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	907	15,370	184	Morgan Offshore Wind Ltd (2023b)

Project	Maximum Charge Size (kg)	Maximum PTS Range (m)	Maximum Number of Animals Affected	Source
Bottlenose Dolphin				
Proposed Development	907	890	<1	Volume 2, chapter 7 of the Offshore ES
Mona OWF	907	890	<1	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	907	890	<1	Morgan Offshore Wind Ltd (2023b)
Harbour seal				
Proposed Development	907	3,015	2	Volume 2, chapter 7 of the Offshore ES
Mona OWF	907	3,015	1	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	907	3,015	1	Morgan Offshore Wind Ltd (2023b)
Grey seal				
Proposed Development	907	3,015	115	Volume 2, chapter 7 of the Offshore ES
Mona OWF	907	3,015	6	Mona Offshore Wind Ltd (2023c)
Morgan OWF Generation Assets	907	3,015	2	Morgan Offshore Wind Ltd (2023b)

Tier 3/4

There were no Tier 3 or 4 plans, projects, or activities identified with the potential to result in the in-combination impacts regarding underwater noise generates during UXO clearance.

Injury and disturbance from underwater noise generated during geophysical and seismic surveys (C, O&M)

The assessment of LSE during the HRA screening process identified that during the construction phase as well as operation and maintenance phase, LSE could not be ruled out for the potential impact from underwater noise generated during geophysical and seismic surveys. The in-combination assessment will be conducted with regard to the same designated sites and relevant Annex II marine mammals that were screened in for the assessment of impacts as a result of the Proposed Development alone, listed in section 1.8.2.1. The in-combination assessment has been provided for projects within the 13 km buffer from the Proposed Development, using the tiered approach outlined in section 1.5.5.

Injury

As for the assessment of the Proposed Development alone (section 1.8.2.1), the risk of injury in terms of PTS to marine mammals from underwater noise generated during geophysical and seismic surveys is expected to be localised within close vicinity of the respective projects. It is also anticipated that embedded mitigation methods (primary and tertiary mitigation in line with JNCC (2017b)) will be applied during surveys, thereby reducing the magnitude of impact. Therefore, there is very low potential for significant in-combination impacts for injury from increased underwater noise during geophysical and seismic surveys, and the in-combination assessment focuses on disturbance only.

Disturbance

Tier 1

There is potential for in-combination impacts with one Tier 1 project in the construction and operation and maintenance phases: Awel y Môr OWF. However, this impact was not assessed in the ES for Awel y Môr OWF (RWE Renewables UK, 2021c). Given that the assessment of in-combination effects with relevant projects is focussed on information available in the public domain, only where an impact has been identified and screened in into relevant chapters, there is considered to be a potential for in-combination effects. Impacts scoped out from individual assessments of respective projects are not considered further. As such, in-combination impacts as a result of underwater noise generated during geophysical and seismic surveys will not be considered for this Tier 1 project.

Tier 2

There is potential for in-combination impacts with two Tier 2 projects in the construction phase: Mona OWF and Morgan OWF Generation Assets.

For the Mona OWF and Morgan OWF Generation Assets, the MDS includes geophysical survey techniques, such as MBES, Single Beam Echosounder (SBES), SBP, Side Scan Sonar (SSS), and Ultra High Resolution Seismic (UHRS). Both projects also assessed impacts of the geotechnical activities, such as boreholes, Cone Penetration Tests (CPT), and vibrocores (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). The underwater noise modelling for the Mona OWF predicted disturbance ranges within hundreds of metres for most activities, with the highest distances of 17.3 km and 31 km presented for SBP and vibrocores, respectively (Mona Offshore Wind Ltd, 2023c). A similar pattern was also presented by the modelling for Morgan OWF Generation Assets, and the highest behavioural disturbance ranges were 17 km and 55 km, also for SBP and vibrocores, respectively (Morgan Offshore Wind Ltd, 2023b). These values exceed those modelled for the Proposed Development, where the highest disturbance range was 13 km for mild disturbance as a result of VSP (section 1.8.2.1).

The operation and maintenance phase of the Proposed Development may interact cumulatively with that of three Tier 2 projects: the Mona OWF, Morgan OWF Generation Assets, and the Morgan and Morecambe OWF Transmission Assets.

At the time of writing, there was no publicly available information to quantify this impact at the Morgan and Morecambe OWF Transmission Assets. In addition, neither of the PEIRs for the Mona OWF and Morgan OWF Generation Assets assessed this impact in their operation and maintenance phases. Therefore, a quantitative Tier 2 assessment was not possible for the operation and maintenance phase. However, it is predicted to be of similar or lesser magnitude than provided above for the construction phase.

Tier 3/4

There were no Tier 3 or 4 plans, projects, or activities identified with the potential to result in the in-combination impacts regarding underwater noise generated during geophysical and seismic surveys.

Injury and disturbance from vessel activity and other noise producing activities (C, O&M, D)

The assessment of LSE during the HRA screening process identified that during the construction, operation and maintenance as well as decommissioning phases, LSE could not be ruled out for the potential impact from underwater noise due to vessel activity and other noise producing activities. The in-combination assessment will be conducted with regard to the same designated sites and relevant Annex II marine mammals that were screened in for the assessment of impacts as a result of the Proposed Development alone, listed in section 1.8.2.1. The in-combination assessment has been provided for projects within the 20 km buffer from the Proposed Development, using the tiered approach outlined in section 1.5.5.

Injury

As for the assessment of the Proposed Development alone (section 1.8.2.1), the risk of injury in terms of PTS to marine mammals from underwater noise generated due to vessel activity and other noise producing activities is negligible as PTS thresholds are unlikely to be exceeded. Therefore, there is very low potential for significant in-combination impacts for injury from increased und underwater noise generated due to vessel activity and other noise producing activities, and the in-combination assessment focuses on disturbance only.

Disturbance
Tier 1

There is potential for in-combination impacts with one Tier 1 project in the construction phase: Awel y Môr OWF. It should be noted that the construction phase of this project is anticipated to be between 2026 and 2030 (Table 1.69), so will only temporally overlap with that of the Proposed Development for less than a year.

The MDS for Awel y Môr OWF describes up to 101 construction vessels in total, of which 35 may be on site at one time (RWE Renewables UK, 2021c). For the Proposed Development, the MDS assumes a total of 236 vessel round trips over the two year construction phase (Table 1.46). For operation and maintenance phase, Awel y Mor assumes up to 1,232 vessel return trips annually over the 25 year operation and maintenance phase (30,800 total). In addition, the MDS for the Proposed Development assumes that there will be up to 750 and 128 vessel round trips over the operation and maintenance and decommissioning phases, respectively.

In the ES for Awel y Môr OWF, impacts associated with underwater noise due to vessel traffic and other construction activities was based on a desktop study. This study stated that using Benhemma-Le Gall *et al.* (2021), harbour porpoise and other cetaceans may be displaced up to 4 km from construction vessels. It also identified localised behavioural disturbance ranges for harbour porpoise and grey seal with avoidance reported up to 5 km from the site during dredging activities (RWE Renewables UK, 2021c).

It is a standard practice to present estimated ranges over which behavioural disturbance may occur for different vessel types in isolation. For the Proposed Development, disturbance ranges of up to 20 km were predicted for survey vessels, crew transfer vessels, and support vessels (section 1.8.2.1). It is likely that several activities could be taking place across several offshore developments, and therefore disturbance ranges may extend from several vessels/locations where the activity is carried out.

Therefore, the Proposed Development in-combination with Awel y Môr OWF, may lead to a noticeable increase in vessel activity from the baseline. Although, it should be noted that the assessments are based on the MDSs and that the number of vessels present at respective projects at any given time is likely to be lower in reality. In addition, vessel movements will be confined to their respective construction areas and will follow existing shipping routes to and from ports. Therefore, it would not be realistic to present a sum of all vessels anticipated within the Proposed Development and Awel y Môr OWF or a sum of animals potentially affected. Introduction of vessels during construction and operations and maintenance phases of the projects will not be a novel impact for marine mammals in the vicinity, and animals, therefore, are anticipated to demonstrate some degree of habituation to this impact.

Tier 2

The construction, operation and maintenance as well as decommissioning phases of the Proposed Development may interact in-combination with that of two Tier 2 projects: the Mona OWF and Morgan OWF Generation Assets.

The MDS for the Mona OWF assumes up to 80 vessels on site at any one time and up to 2,004 vessel round trips over the construction phase (Mona Offshore Wind Ltd, 2023c). The MDS for Morgan OWF Generation assets assumes up to 63 vessels on site at any one time, with 1,878 total round trips over the construction phase (Morgan Offshore Wind Ltd, 2023b). In contrast, there will be up to 236 vessel round trips in the construction phase of the Proposed Development (Table 1 23). It should be noted that the construction phases for both these Tier 2 projects are anticipated to be between 2026 and 2028, therefore will only overlap with that of the Proposed Development for <1 year (in 2026).

Both Mona OWF and Morgan OWF Generation Assets also include drilling, cable trenching and laying, and jack up rig use as other noise producing activities (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Like the assessment for the Proposed Development alone, the maximum disturbance ranges modelled for Mona OWF and Morgan OWF Generation Assets were for survey vessel movements, at 22 km and 21 km, respectively.

During operation and maintenance, both projects predict up to 21 vessels on site at any one time and up to 2,351 vessel round trips (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). For the Proposed Development, there will be up to 750 vessel round trips in the operation and maintenance phase and 128 in the decommissioning phase (Table 1.46). The three Tier 2 projects are also likely to include activities such as cable repair and reburial over their operation and maintenance phases, although values for these were not included in their PEIRs.

For the Mona OWF and Morgan OWF Generation Assets, disturbance ranges of up to 22 km and 21 km, respectively, were predicted for survey vessel, support vessels, crew transfer vessel, scour/cable protection/seabed preparation and installation vessels activities (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b).

As above for the Tier 1 assessment, there may be a noticeable increase in vessel activity from the baseline due to these projects. Although, it should be noted that the assessments are based on the MDSs and that the number of vessels present at respective projects at any given time is likely to be lower in reality. In addition, vessel movements will be confined to their respective construction areas and will follow existing shipping routes to and from ports. Introduction of vessels will not be a novel impact for marine mammals in the vicinity, and animals, therefore, are anticipated to demonstrate some degree of habituation to this impact.

Effects on marine mammals due to changes in prey availability (C, O&M, D)

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from in-combination effects on marine mammals due to changes in prey availability. This relates to the following designated site and relevant Annex II marine mammals:

- North Anglesey Marine SAC:
  - Harbour porpoise.

The key prey species for marine mammals include gadoids (e.g. cod, haddock, poor cod, and whiting), forage fish (e.g. herring, sprat, sandeel, mackerel), cephalopods, and flatfish (e.g. dab, flounder, plaice, and sole). There are regional and species specific preferences which are provided in section 1.8.3, if relevant. Effects on marine mammals due to changes in prey availability has been assessed for the Proposed Development alone and found no LSE on any of the sites (section 1.8.3).

Main prey species were found as of varying importance in the vicinity of the Proposed Development. Consequently, potential adverse effects on fish and shellfish species may have indirect effects on marine mammals. The assessment of impacts on fish and shellfish species was provided in volume 2, chapter 7 of the Offshore ES. The impacts with a potential to adversely affect fish and shellfish species included temporary subtidal habitat loss and/or disturbance, long term subtidal habitat loss, underwater noise, as well as increased SSCs and associated deposition (section 1.7.3). The assessment of cumulative impacts presented in the volume 2, chapter 7 of the Offshore ES found no significant cumulative effects on fish and shellfish receptors and therefore it can be concluded that there will be no in-combination effect on Annex II marine mammals due to changes in prey availability. As such, this impact will not be considered further.

1.8.3 Assessment of adverse effects alone

1.8.3.1 North Anglesey Marine SAC

The function of the North Anglesey Marine SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.1 are endorsed. The assessment in this section will focus on harbour porpoise, Annex II marine mammal that is a qualifying feature of the North Anglesey Marine SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – The species is a viable component of the site.

In line with the draft conservation objectives and advice on operations prepared by JNCC and DAERA (2019), harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it.

The North Anglesey Marine SAC site has been selected primarily on the basis of its long term, preferential use by harbour porpoise. The implication is that this site provides good foraging habitat and it may also be used for breeding and calving (JNCC *et al.*, 2019c). As such, the intent of this objective is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour porpoises using the site. Unacceptable levels can be defined as those having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against this objective is the MU population in which the SAC is situated (JNCC *et al.*, 2019c). The North Anglesey Marine SAC is situated in the Celtic and Irish Sea and the population of harbour porpoise in this MU is 62,517 individuals (IAMMWG, 2022).JNCC and NRW (2016), JNCC *et al.* (2019c)

- Conservation objective 2 – There is no significant disturbance of the species.

As reported by JNCC and NRW (2016), JNCC *et al.* (2019c), disturbance of harbour porpoise generally, but not exclusively, originates from activities that cause underwater noise and it may lead to harbour porpoises being displaced from the area affected.

The North Anglesey Marine SAC has been identified on the basis of having persistently higher densities of harbour porpoises (Heinänen and Skov, 2015) when compared to other areas of the UK's Irish Sea continental shelf which is linked to the habitats within the site that likely promote good feeding opportunities. Any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time (JNCC and NRW, 2016, JNCC *et al.*, 2019c), such as:

  - 20% of the relevant area of the site in any given day; and
  - an average of 10% of the relevant area of the site over a season[12].

- Conservation objective 3 – The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

As reported by JNCC and NRW (2016), JNCC *et al.* (2019c), (Lohrengel *et al.*, 2018), supporting habitats, in this context, means the characteristics of the seabed and water column. Processes encompass the movements and physical properties of the habitat. The maintenance of supporting habitats and processes contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site. The densities of porpoise using a site are likely linked to the availability (and density) of prey within the site (JNCC and NRW, 2016, JNCC *et al.*, 2019c). Although, the diet of porpoises when within the sites is not well known, it is likely comparable to that in the wider seas and therefore may include gobies, sandeel, whiting, herring and sprat.

Table 1.74 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the North Anglesey Marine SAC.

[12] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) = 9.86%

Table 1.74: Impacts Considered For Each Conservation Objective – North Anglesey Marine SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	×
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	×
Effects on marine mammals due to changes in prey availability	✓	×	✓

Please note that only one impact of effects on marine mammals due to changes in prey availability has been identified as having the potential to impact conservation objective 3 (other impacts relate to underwater noise and therefore are not applicable). Table 1.75 presents the assessment of AEoI of the North Anglesey Marine SAC with respect to qualifying Annex II marine mammals.

Table 1.75: Assessment Of AEoI Of North Anglesey Marine SAC – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for harbour porpoise (see section 1.8.2.1), as a result of piling (up to 490 m) and the distance to the SAC (39.60 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using approaches recommended to be used in the HRA, namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC. However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 130 dB and based on Graham *et al.* (2019), only approximately 10% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. Additionally, harbour porpoises outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that harbour porpoise would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise	✓	×	×	The North Anglesey Marine SAC is located approximately 39.60 km from the Proposed Development. Given that the maximum injury ranges do not overlap with the site boundary, there is no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the

Impact	Relevant project phase C	O	D	Assessment	Conclusion
generated during UXO detonation				15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on Southall *et al.* (2019) threshold, up to 217 harbour porpoises (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,299 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance as a result of high order detonation of 907 kg UXO. However, using the most recent NRW (2023) guidance, only 22 animals would experience disturbance under the same scenario. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Considering the maximum design scenario and the most precautionary threshold (Southall *et al.*, 2019), up to 0.33% (or 2.08% based on the SCANS-IV density estimate) of harbour porpoises of the Celtic and Irish Sea MU population could experience disturbance. Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site. Underwater noise associated with UXO clearance is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Considering the maximum injury ranges (see section 1.8.2.1) as a result of geophysical and seismic surveys (up to 345m) and the distance to the SAC (39.60 km), there will be no overlap with the site boundary. There is no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Given that the maximum disturbance range across all metrics presented in section 1.8.2.1 is 13 km (mild disturbance) for VSP, there will be no overlap of disturbance ranges with the boundary of the SAC. As such, the ability of harbour porpoise to access foraging/breeding/calving habitat within the site won't be affected. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 46 harbour porpoises (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 274 animals (based on SCANS-IV density estimates (see Table 1.48)) could be at risk of experiencing mild disturbance outside of the site boundary. Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of geophysical and seismic surveys (2 to 5 surveys, each up to six months in duration depending on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site. Underwater noise associated with geophysical and seismic surveys is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	There is no risk to harbour porpoise to experience injury (PTS) as a result of vessel movements and other activities (see section 1.8.2.1). Harbour porpoises may experience TTS within up to 6,740 m from the survey, crew transfer or support vessel. However, TTS is temporary and reversible, and animals are likely to respond by moving away from (fleeing) the ensonified area. There will be no overlap of TTS with the boundary of the SAC. As such, the ability of harbour porpoise to access foraging/breeding/calving habitat within the site won't be affected. Based on the most precautionary scenario, harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (see section 1.8.2.1). Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. As such, this is unlikely that this activity has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site, especially in the context of high vessel traffic in the Irish Sea. Underwater noise associated with vessels and other activities is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.
Effects on marine mammals due to changes in prey availability	✓	✓	✓	The majority of impacts on fish and shellfish associated with all phases of the Proposed Development will be highly localised and largely restricted to the boundaries of the Proposed Development. The foraging habitats within the SAC will not be affected. Outside of the SAC, only a small area will be affected when compared to available foraging habitat in the Irish Sea. Harbour porpoise feed on a variety of prey including gobies, sandeel, whiting, herring and sprat (JNCC *et al.*, 2019c). There may be an energetic cost associated with increased travelling and due to harbour porpoise high metabolic rate, this species may be particularly vulnerable to this effect. However, harbour porpoises have a widespread distribution and individuals have been documented either switching to different prey species depending on the prey availability (Santos and Pierce, 2003) or moving relatively large distances on a daily basis (Nabe-Nielsen *et al.*, 2013). Based on findings of Benhemma-Le Gall *et al.* (2021), it can be anticipated that harbour porpoise can compensate for any resulting loss in energy intake by	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from effects on marine mammals due to changes in prey availability.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				increasing foraging activities beyond the impact zone. The availability of wider suitable habitat across the Celtic and Irish Sea MU suggest that individuals may move to alternative foraging grounds without affecting animals' health. As such, effects due to changes in prey availability are not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Conservation objective 2 - There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using approaches recommended to be used in the HRA (see section 1.8.2.3.2.1), namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC. However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 130 dB and based on Graham *et al.* (2019), only approximately 10% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. Additionally, piling activities will be of short duration (up to 13.5 hours for the Proposed Development). As such, there is no potential for piling activities to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The North Anglesey Marine SAC is located approximately 39.60 km from the Proposed Development. As presented in section 1.8.2.1, considering all approaches (thresholds based on Southall *et al.* (2019), latest NRW (2023) guidance and EDR approach presented by JNCC (2020)) maximum disturbance range for harbour porpoise as a result of high order detonation of 907 kg UXO is 28,320 m. As such, there is no potential for UXO clearance activities to exclude harbour porpoise from the significant proportion of the site as there will be no overlap of disturbance ranges with the site boundaries.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	The maximum disturbance range associated with geophysical and/or seismic surveys is 13 km for VSP (see section 1.8.2.1). Given that the geophysical and seismic surveys as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of disturbance ranges with the boundaries of the SAC. As such, underwater noise from geophysical and seismic surveys will not exclude harbour porpoises from the significant proportion of the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
					will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	The maximum disturbance range associated with vessels and other activities is 20 km for survey, crew transfer or support vessels (see section 1.8.2.1). Given that the vessel and other activities as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of disturbance ranges with the boundaries of the SAC. As such, underwater noise from vessels and other activities will not exclude harbour porpoises from the significant proportion of the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.
Objective 3 - The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.					
Effects on marine mammals due to changes in prey availability	✓	✓	✓	There will be no impacts on supporting habitats and processes within the North Anglesey SAC due to lack of impact pathway (impacts that could potentially affect physical characteristic of the habitat (e.g. UXO detonation leaving a crater on the seabed) will be taking place within the Proposed Development, which is located approximately 39.60 km from the site). The impacts on physical features of the environment and subsequently on fish and shellfish, associated with all phases of the Proposed Development, will be highly localised and largely restricted to the boundaries of the Proposed Development. The foraging habitats within the SAC will not be affected. Outside of the SAC, only a small area will be affected when compared to available foraging habitat in the Irish Sea. Harbour porpoise feed on a variety of prey including gobies, sandeel, whiting, herring and sprat (JNCC *et al.*, 2019c). There may be an energetic cost associated with increased travelling and due to harbour porpoise high metabolic rate, this species may be particularly vulnerable to this effect. However, harbour porpoises have a widespread distribution and individuals have been documented either switching to different prey species depending on the prey availability (Santos and Pierce, 2003) or moving relatively large distances on a daily basis (Nabe-Nielsen *et al.*, 2013). Based on findings of Benhemma-Le Gall *et al.* (2021), it can be anticipated that harbour porpoise can compensate for any resulting loss in energy intake by increasing foraging activities beyond impact zone. The availability of wider suitable habitat across the Celtic and Irish Sea MU suggest that individuals may move to alternative foraging grounds without affecting animals' health. As such, effects due to changes in prey availability are not predicted to adversely affect the maintenance of supporting habitats and processes relevant to harbour porpoises and their prey.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 3 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from effects on marine mammals due to changes in prey availability.

Summary

In line with findings presented in Table 1.75, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the North Anglesey Marine SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the North Anglesey Marine SAC as a result of activities associated with the Proposed Development alone.

1.8.3.2 North Channel SAC

The function of the North Channel SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.2 are endorsed. The assessment in this section will focus on harbour porpoise, Annex II marine mammal that is a qualifying feature of the North Channel SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – The species is a viable component of the site.

In line with the draft conservation objectives and advice on operations prepared by JNCC and DAERA (2019), harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it.

The North Channel site has been selected primarily on the basis of its long term, preferential use by harbour porpoise. The implication is that this site provides good foraging habitat and it may also be used for breeding and calving (JNCC and NRW, 2016). As such, the intent of this objective is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour porpoises using the site. Unacceptable levels can be defined as those having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against this objective is the MU population in which the SAC is situated (IAMMWG. *et al.*, 2015, JNCC and DAERA, 2019). The North Channel SAC is situated in the Celtic and Irish Sea and the population of harbour porpoise in this MU is 62,517 individuals (IAMMWG, 2022).

- Conservation objective 2 – There is no significant disturbance of the species.

As reported by JNCC and DAERA (2019), disturbance of harbour porpoise generally, but not exclusively, originates from activities that cause underwater noise and it may lead to harbour porpoises being displaced from the area affected.

The North Channel SAC has been identified on the basis of having persistently higher densities of harbour porpoises (Heinänen and Skov, 2015) which is linked to the habitats within the site that likely promote good feeding opportunities. Any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time (JNCC and DAERA, 2019), such as:

  - 20% of the relevant area of the site in any given day; and
  - an average of 10% of the relevant area of the site over a season[13].

- Conservation objective 3 – The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

As reported by JNCC and DAERA (2019), supporting habitats, in this context, means the characteristics of the seabed and water column. Processes encompass the movements and physical properties of the habitat. The

[13] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

maintenance of supporting habitats and processes contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site. The densities of porpoise using a site are likely linked to the availability (and density) of prey within the site (JNCC and DAERA, 2019). Although, the diet of porpoises when within the sites is not well known but is likely comparable to that in the wider seas and therefore may include gobies, sandeel, whiting, herring and sprat.

Table 1.76 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the North Channel SAC.

Table 1.76: Impacts Considered For Each Conservation Objective – North Channel SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	×
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	×

Please note that impacts related to underwater noise are not considered as having the potential to impact conservation objective 3 which refer to the physical properties supporting habitats, (e.g. characteristics of the seabed and water column). As such, conservation objective 3 will not be considered further in the assessment of AEoI of the North Channel SAC as a result of impacts associated with the Proposed Development due to lack of impact pathway.

Table 1.77 presents the assessment of AEoI of the North Channel SAC with respect to qualifying Annex II marine mammals.

Table 1.77: Assessment Of AEoI Of North Channel SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for harbour porpoise (see section 1.8.2.1) as a result of piling (up to 490 m) and the distance to the SAC (91.40 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using approaches recommended to be used in the HRA (see section 1.8.2.3.2.1), namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC. However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 120 dB and based on Graham *et al.* (2019), only approximately 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. Harbour porpoises outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al.*, 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that harbour porpoise would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. As such, this impact is not anticipated to result in unacceptable levels of potential disturbance as per JNCC and DAERA (2019). Underwater noise associated with piling is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise	✓	×	×	The North Channel SAC is located approximately 91.40 km from the Proposed Development. Given that the injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is	Adverse effects on the qualifying Annex II marine

Impact	Relevant project phase C	O	D	Assessment	Conclusion
generated during UXO detonation				no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is 15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on Southall *et al.* (2019) threshold, up to 217 harbour porpoises (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,299 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance as a result of high order detonation of 907 kg UXO. However, using the most recent NRW (2023) guidance, only 22 animals would experience disturbance under the same scenario. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Considering the maximum design scenario and the most precautionary threshold (Southall *et al.*, 2019), up to 0.33% (or 2.08% based on the SCANS-IV density estimate) of harbour porpoises of the Celtic and Irish Sea MU population could experience disturbance. As such, considering the short duration of UXO detonation activities (approximately two days onsite per clearance), this impact is not anticipated to result in unacceptable levels of potential disturbance as per JNCC and Daera (2019). Although prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals, behavioural effects may take place only outside of the site boundary of the North Channel SAC. Considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, underwater noise associated with UXO clearance is not predicted to restrict the survivability and reproductive potential of harbour porpoise using the site.	mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Considering the maximum injury ranges (see section 1.8.2.1) as a result of geophysical and seismic surveys (up to 345 m) and the distance to the SAC (91.40 km), there will be no overlap with the site boundary. There is no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Given that the maximum disturbance range across all metrics presented in section 1.8.2.1 is 13 km (mild disturbance) for VSP, there will be no overlap of disturbance ranges with the boundary of the SAC. As such, the ability of harbour porpoise to access foraging/breeding/calving habitat within the site won't be affected. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 46 harbour porpoises (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 274 animals (based on SCANS-IV density estimates (see Table 1.48)) could be at risk of experiencing mild	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				disturbance outside of the site boundary. As such, up to 0.07% of harbour porpoises of the Celtic and Irish Sea MU population could experience disturbance. This is therefore unlikely to constitute unacceptable level of impacts as per JNCC and Daera (2019). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of geophysical and seismic (2 to 5 surveys, each up to six months in duration depending on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site. Underwater noise generated during geophysical and seismic surveys is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	There is no risk to harbour porpoise to experience injury (PTS) as a result of vessel movements and other activities (see section 1.8.2.1). Harbour porpoises may experience TTS within up to 6,740 m from the survey, crew transfer or support vessel. However, TTS is temporary and reversible, and animals are likely to respond by moving away from (fleeing) the ensonified area. There will be no overlap of TTS with the boundary of the SAC. As such, the ability of harbour porpoise to access foraging/breeding/calving habitat within the site won't be affected. Based on the most precautionary scenario, harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (see section 1.8.2.1). Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. As such, this is unlikely that this activity has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site, especially in the context of high vessel traffic in the Irish Sea. Underwater noise associated with vessels and other activities is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Nort Channel SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.
Objective 2 - There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using approaches recommended to be used in the HRA, namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC. However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				is 120 dB and based on Graham *et al.* (2019), only approximately 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. As such, underwater noise from pilling is not anticipated to exclude harbour porpoises from the significant proportion of the site.	injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The North Channel SAC is located approximately 91.40 km from the Proposed Development. As presented in section 1.8.2.1, considering all approaches (thresholds based on Southall *et al.* (2019), latest NRW (2023) guidance and EDR approach presented by JNCC (2020)) maximum disturbance range for harbour porpoise as a result of high order detonation of 907 kg UXO is 28,320 m. As such, there is no potential for UXO clearance activities to exclude harbour porpoise from the significant proportion of the site as there will be no overlap of disturbance ranges with the site boundaries.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	The maximum disturbance range associated with geophysical and/or seismic surveys is 13 km for VSP (see section 1.8.2.1). Given that the geophysical and seismic surveys as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of disturbance ranges with the boundaries of the SAC. As such, underwater noise from geophysical and seismic surveys will not exclude harbour porpoises from the significant proportion of the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	The maximum disturbance range associated with vessels and other activities is 20 km for survey, crew transfer or support vessels (see section 1.8.2.1). Given that the vessel and other activities as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of disturbance ranges with the boundaries of the SAC. As such, underwater noise from vessels and other activities will not exclude harbour porpoises from the significant proportion of the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.

Summary

In line with findings presented in Table 1.77, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the North Channel SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the North Channel SAC as a result of activities associated with the Proposed Development alone.

1.8.3.3 Lleyn Peninsula and the Sarnau SAC

The function of the Lleyn Peninsula and the Sarnau SAC is to achieve favourable conservation status of its qualifying features, subject to natural processes. In order for that to happen, conservation objectives need to be fulfilled and maintained in the long term. The assessment in sections 1.8.3 and 1.8.4 will focus on bottlenose dolphin and grey seal, respectively, Annex II marine mammals that are qualifying features of the Lleyn Peninsula and the Sarnau SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site.

The following conservation objectives will be considered with regard to bottlenose dolphin and grey seal qualifying features:

- Conservation objective 1 – Populations
  - As per NRW (2018g), the population should be maintaining itself on a long termbasis as a viable component of its natural habitat. Important elements include population size, structure, production and condition of the species within the site.
  - As part of this objective it should be noted that for bottlenose dolphin and grey seal contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression. For grey seal populations should not be reduced as a consequence of human activity.
- Conservation objective 2 - Range
  - As per NRW (2018g), the natural range of the population should not be reduced or likely to be reduced for the foreseeable future. As part of this objective it should be noted that for bottlenose dolphin and grey seal the range within the SAC and adjacent interconnected areas should not be constrained or hindered, there should be appropriate and sufficient food resources within the SAC and beyond and the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.
- Conservation objective 3 – Supporting habitats and species
  - As per NRW (2018g), the presence, abundance, condition and diversity of habitats and species required to support this species should be such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include distribution, extent, structure, function and quality of habitat and prey availability and quality.

As part of this objective it should be noted that:

- the management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term;
- contamination of potential prey species should be below concentrations potentially harmful to their physiological health; and
- disturbance by human activity is below levels that suppress reproductive success, physiological health or long termbehaviour.

- Conservation objective 4 – Restoration and recovery
  - As per NRW (2018g), as part of this objective, the bottlenose dolphin populations should be increasing.

Bottlenose dolphin

Table 1.78 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Lleyn Peninsula and the Sarnau SAC with respect to Annex II marine mammal, bottlenose dolphin.

Table 1.78: Impacts Considered For Each Conservation Objective - Lleyn Peninsula And The Sarnau SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4
Injury and disturbance from underwater noise generated from piling	✓	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	✓	✓

Table 1.79 presents the assessment of AEoI of the Lleyn Peninsula and the Sarnau SAC with respect to qualifying Annex II marine mammal, bottlenose dolphin.

Table 1.79: Assessment Of AEoI Of Lleyn Peninsula And The Sarnau SAC – Bottlenose Dolphin

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 - Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for bottlenose dolphin (see section 1.8.2.1) as a result of piling (up to 41 m) and the distance to the SAC (115 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to bottlenose dolphin following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 65 bottlenose dolphins could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that bottlenose dolphin would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Lleyn Peninsula and the Sarnau SAC is located approximately 115 km from the Proposed Development. The maximum injury range for bottlenose dolphin as a result of high order detonation of UXO is 890 m (see section 1.8.2.1). As such, there is no potential for overlap of injury ranges with the SAC boundary. There is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore there is no risk of adverse impact on condition of the species within the site. Nevertheless, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the precautionary densities, up to one bottlenose dolphin may experience disturbance during the UXO clearance (see section 1.8.2.1). In general, prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2 - Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges overlapping with the boundary of the SAC (Figure 1.11). However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 65 bottlenose dolphins could experience disturbance as a result of pilling (see section 1.8.2.1). As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. The Irish Sea provide an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect the bottlenose dolphin population within the SAC or beyond are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	NRW (2018g) reported that nearly 30% of individuals have been identified in both Cardigan Bay SAC and Lleyn Peninsula and the Sarnau SAC as well as north of the Llŷn Peninsula around the Isle of Anglesey, indicating large home ranges that most probably extend to the northern Irish Sea and maybe beyond. The maximum injury range for bottlenose dolphin as a result of high order detonation of UXO is 890 m (see section 1.8.2.1). As such, there is no potential for overlap of injury ranges with the SAC boundary. There is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1) for animals ranging further north from the SAC. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during the UXO clearance due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect bottlenose dolphin population within the SAC or beyond are not anticipated. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Bottlenose dolphins are generalist and opportunistic feeders eating a wide range of pelagic and benthic (demersal) fish, crustaceans and molluscs (NRW, 2018g). The distribution and movement of prey are believed to influence the distribution and movement patterns of bottlenose dolphins and feeding activities have been recorded throughout the inshore waters of the Cardigan Bay. The maximum injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to bottlenose dolphin. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on bottlenose dolphin. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to bottlenose dolphin. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats will not be altered. However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during the UXO clearance due to barrier effects. Considering the duration of the impact and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproductive success. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect bottlenose dolphin population within the SAC or beyond are not anticipated. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1) on bottlenose dolphin. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support this species.	not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Conservation objective 4 – Restoration and recovery					
Injury and disturbance from underwater noise generated from piling	✓	×	×	There will be no overlap of the maximum injury ranges as a result of piling (see section 1.8.2.1) with the boundaries of this SAC and that there is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1). As such, this impact is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish and Celtic Seas. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. There is a potential for behavioural disturbance outside of the SAC, however it is anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the restoration and recovery of bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Given that there will be no overlap of the maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) with the boundaries of this SAC and that there is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1), this impact is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish and Celtic Seas. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. There is a potential for behavioural disturbance outside of the SAC, however it is anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Lleyn Peninsula and the Sarnau SAC will

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the restoration and recovery of bottlenose dolphin population.	not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Grey seal

Table 1.80 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Lleyn Peninsula and the Sarnau SAC (see section 1.8.3.3) with respect to Annex II marine mammal, grey seal.

Table 1.80: Impacts Considered For Each Conservation Objective - Lleyn Peninsula And The Sarnau SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	✓

Table 1.81 presents the assessment of AEoI of the Lleyn Peninsula and the Sarnau SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.81: Assessment Of AEoI Of Lleyn Peninsula And The Sarnau SAC – Grey Seal

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Conservation objective 1 - Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 118 m) and the distance to the SAC (115 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to bottlenose dolphin following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that grey seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Lleyn Peninsula and the Sarnau SAC is located approximately 115 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. There is no risk of adverse impact on condition of the species within the site. Based on highly precautionary densities (the maximum mean density of grey seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to 534 grey seals may experience disturbance during the UXO clearance. In general, prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and therefore population size, structure or production. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2 - Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provide an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect grey seal population within the SAC or beyond are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Grey seals range throughout the open coast areas of the site but are more commonly observed within the SAC around the Llŷn, Bardsey Island and the islands along the south Llŷn coast (NRW, 2018g). The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during the UXO clearance due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. The assessment of fish and shellfish	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect grey seal population within the SAC or beyond are not anticipated. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Grey seals present within the Lleyn Peninsula and the Sarnau SAC at any one time do not form a discrete population, but are centred (in terms of abundance) on Cardigan Bay and are considered part of the SW England and Wales MUs (NRW, 2018g). It is acknowledged that most pupping takes place in the north-west of the SAC and around Bardsey Island in suitable habitat (i.e. physically accessible to the seals, remote and/or undisturbed rocky coast beaches, coves and caves) and that a high proportion use sea caves in the SAC for pupping. Moulting and resting haul out sites are known to be distributed throughout the SAC and nonpupping seals are present year round at these haul out sites (NRW, 2018g). The maximum injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to grey seal. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on grey seal. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats will not be altered. However, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during the UXO clearance due to barrier effects.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Considering the duration of the impact and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproductive success. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1). Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support this species.	from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.78 and Table 1.80, adverse effects which undermine the conservation objectives set for the bottlenose dolphin and grey seal qualifying features of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Lleyn Peninsula and the Sarnau SAC as a result of activities associated with the Proposed Development alone.

1.8.3.4 West Wales Marine SAC

The function of the West Wales Marine SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of the natural change, this may be achieved by ensuring that conservation objectives are endorsed. The assessment in this section will focus on harbour porpoise, Annex II marine mammal that is a qualifying feature of the West Wales SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – The species is a viable component of the site.

In line with the draft conservation objectives and advice on operations prepared by NRW and JNCC (2019), harbour porpoises are considered to be a 'viable component' of the site if they are able to survive and live successfully within it.

The West Wales SAC site has been selected primarily on the basis of its long term, preferential use by harbour porpoise. The implication is that this site provides good foraging habitat and it may also be used for breeding and calving (JNCC and NRW, 2016, NRW and JNCC, 2019). As such, the intent of this objective is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour porpoises using the site. Unacceptable levels can be defined as those having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against this objective is the MU population in which the SAC is situated (IAMMWG. *et al.*, 2015, JNCC and DAERA, 2019, NRW and JNCC, 2019). The West Wales Marine SAC is situated in the Celtic and Irish Sea and the population of harbour porpoise in this MU is 62,517 individuals (IAMMWG, 2022).

- Conservation objective 2 – There is no significant disturbance of the species.

As reported by NRW and JNCC (2019), disturbance of harbour porpoise generally, but not exclusively, originates from activities that cause underwater noise and it may lead to harbour porpoises being displaced from the area affected.

The West Wales Marine SAC has been identified on the basis of having persistently higher densities of harbour porpoises (Heinänen and Skov, 2015) which is linked to the habitats within the site that likely promote good feeding opportunities. Any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time (NRW and JNCC, 2019), such as:

  - 20% of the relevant area of the site in any given day; and
  - an average of 10% of the relevant area of the site over a season[14].

- Conservation objective 3 – The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

[14] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

As reported by NRW and JNCC (2019) supporting habitats, in this context, means the characteristics of the seabed and water column. Processes encompass the movements and physical properties of the habitat. The maintenance of supporting habitats and processes contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site. The densities of porpoise using a site are likely linked to the availability (and density) of prey within the site (NRW and JNCC, 2019). Although, the diet of porpoises when within the sites is not well known but is likely comparable to that in the wider seas and therefore may include gobies, sandeel, whiting, herring and sprat.

Table 1.82 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the West Wales Marine SAC.

Table 1.82: Impacts Considered For Each Conservation Objective – West Wales Marine SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	×

Please note that impacts related to underwater noise are not considered as having the potential to impact conservation objective 3 which refer to the physical properties of supporting habitats, (e.g. characteristics of the seabed and water column). As such, conservation objective 3 will not be considered further in the assessment of AEoI of the West Wales Marine SAC as a result of impacts associated with the Proposed Development due to lack of impact pathway.

Table 1.83 presents the assessment of AeoI of the West Wales Marine SAC with respect to qualifying Annex II marine mammals.

Table 1.83: Assessment Of Aeol Of West Wales Marine SAC – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 – The species is a viable component of the site.					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for harbour porpoise (see section 1.8.2.1) as a result of piling (up to 490 m) and the distance to the SAC (82 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using all of the following approaches: • 143 dB SEL_{ss} threshold recommended by NRW (2023), • 15 km EDR recommended by JNCC (2020), and • SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC. However, harbour porpoises outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population)) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact (up to 13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that harbour porpoise would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. As such, this impact is not anticipated to result in unacceptable levels of potential disturbance as defined by NRW and JNCC (2019). Underwater noise associated with piling is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The West Wales Marine is located approximately 82 km from the Proposed Development. Given that the injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is 15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				behavioural disturbance. Based on Southall *et al.* (2019) threshold, up to 217 harbour porpoises (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,299 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance as a result of high order detonation of 907 kg UXO. However, using the most recent NRW (2023) guidance, only 22 animals would experience disturbance under the same scenario. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Considering the maximum design scenario and the most precautionary threshold (Southall *et al*., 2019), up to 0.33% (or 2.08% based on the SCANS-IV density estimate) of harbour porpoises of the Celtic and Irish Sea MU population could experience disturbance. As such, considering the short duration of UXO detonation activities (approximately two days onsite per clearance), this impact is not anticipated to result in unacceptable levels of potential disturbance as defined by NRW and JNCC (2019). Although prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals, behavioural effects may take place only outside of the site boundary of the West Wales Marine SAC. Considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, underwater noise associated with UXO clearance is not predicted to restrict the survivability and reproductive potential of harbour porpoise using the site.	noise generated during UXO detonation.
Conservation Objective 2 – There is no significant disturbance of the species.					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using all of the following approaches: • 143 dB SEL_{ss} threshold recommended by NRW (2023), • 15 km EDR recommended by JNCC (2020), and • SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC. As such, underwater noise from pilling will not exclude harbour porpoises from the significant proportion of the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The West Wales Marine SAC is located approximately 82 km from the Proposed Development. As presented in section 1.8.2.1, considering all approaches (thresholds based on Southall *et al.* (2019), latest NRW (2023) guidance and EDR approach presented by JNCC (2020)) maximum disturbance range for harbour porpoise as a result of high order detonation of 907 kg UXO is 28,320 m. As such, there is no potential for UXO clearance activities to exclude harbour porpoise from the significant proportion of the site as there will be no overlap of disturbance ranges with the site boundaries.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the West Wales Marine SAC will not occur as a

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
					result of injury and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.83, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the West Wales Marine SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the West Wales Marine SAC as a result of activities associated with the Proposed Development alone.

1.8.3.5 Strangford Lough SAC

The function of the Strangford Lough SAC is to maintain (or restore where appropriate) the harbour seal to favourable condition, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.5 are fulfilled and maintained in the long term(DAERA, 2017b). The assessment in this section will focus on harbour seal, Annex II marine mammal that is a qualifying feature of the Strangford Lough SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – To maintain (and if feasible enhance) population numbers and distribution of harbour seal.
- Conservation objective 2 – To maintain and enhance, as appropriate, physical features used by harbour seal within the site.

Table 1.84 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Strangford Lough SAC with respect to Annex II marine mammal, harbour seal.

Table 1.84: Impacts Considered For Each Conservation Objective – Strangford Lough SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2
Injury and disturbance from underwater noise generated from piling	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	×
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	×
Injury and disturbance from vessel activity and other noise producing activities	✓	×

Given the distance between the Strangford Lough SAC and Proposed Development (142 km), there are no impacts associated with the Proposed Development that could adversely affect the physical features used by harbour seal within the site. As such, conservation objective 2 will not be considered further due to lack of impact pathway. Table 1.85 presents the assessment of AeoI of the Strangford Lough SAC with respect to qualifying Annex II marine mammal, harbour seal.

Table 1.85: Assessment Of Aeol Of Strangford Lough SAC – Harbour Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 – To maintain (and if feasible enhance) population numbers and distribution of harbour seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (115 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to harbour seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance based on 5dB SEL_{ss} noise contours, there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 120 dB and based on Graham *et al.* (2019), only approximately 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour seal from the affected area (Figure 1.11). Harbour seal outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 159 harbour seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 0.593 animals per km^2 were used for these calculations. If we assume a more realistic scenario and a density of 0.0049 animals per km^2, up to 2 harbour seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. The accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact (up to 13.5 hours) and the reversibility of the effect, it can be anticipated that harbour seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. This is also unlikely that this activity has the potential to affect the ability of harbour seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for harbour seal, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect harbour seal population within the SAC or beyond are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Strangford Lough SAC is located approximately 142 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour seal within the site to experience auditory injury. However, given that the injury range for harbour seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour seals outside the site boundary are at risk of experiencing behavioural disturbance. There is no risk of adverse impact on condition of the species within the site. Based on highly precautionary densities (the maximum mean density of harbour seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to eight harbour seals may experience disturbance during the UXO clearance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, it is unlikely that this activity has the potential to affect reproduction rates and therefore population numbers. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during the UXO clearance due to barrier effects. Harbour seals are likely to return to sites following the cessation of UXO clearance activities. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Considering the maximum injury ranges (see section 1.8.2.1) as a result of geophysical and seismic surveys (up to 40 m) and the distance to the SAC (142 km), there will be no overlap with the site boundary. There is no residual risk of injury to harbour seal following the application of embedded mitigation measures (see section 1.8.2.1). Given that the maximum disturbance range across all metrics presented in section 1.8.2.1 is 13 km (mild disturbance) for VSP, there will be no overlap of disturbance ranges with the boundary of the SAC. As such, the ability of harbour seal to access breeding/resting haul out/moulting haul out sites within the SAC won't be affected. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 32 harbour seals could be at risk of experiencing mild disturbance outside of the site boundary. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during the geophysical or	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				seismic surveys due to barrier effects. However, harbour seals are likely to return to sites following the cessation of survey activities. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of geophysical and seismic activities (2 to 5 surveys, each up to six months in duration depending on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species of the site. Underwater noise generated during geophysical and seismic surveys is therefore not predicted to restrict the objective of the population being able to maintain (and if feasible enhance) population numbers and distribution of harbour seal.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	There is no risk to harbour seal of experiencing injury as a result of vessel movements and other activities (see section 1.8.2.1). Based on the most precautionary scenario, harbour seal could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (see section 1.8.2.1). As such, there will be no overlap of disturbance ranges with the boundary of the SAC and the ability of harbour seal to access breeding/resting haul out/moulting haul out sites within the SAC won't be affected. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during vessel movements and other activities due to barrier effects. However, harbour seals are likely to return to sites following the cessation of activities. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. As such, it is unlikely that this activity has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site, especially in the context of high vessel traffic in the Irish Sea. It is therefore unlikely that the underwater noise associated with vessels and other activities has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species of the site. Underwater noise from vessel activity and other noise producing activities is therefore not predicted to restrict the objective of the population being able to maintain (and if feasible enhance) population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.

Summary

In line with findings presented in Table 1.85, adverse effects which undermine the conservation objectives set for the harbour seal qualifying feature of the Strangford Lough SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Strangford Lough SAC as a result of activities associated with the Proposed Development alone.

1.8.3.6 Murlough SAC

The function of the Murlough SAC is to maintain (or restore where appropriate) the harbour seal to favourable condition, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.6 are fulfilled and maintained in the long term(DAERA, 2018). The assessment in this section will focus on harbour seal, Annex II marine mammal that is a qualifying feature of the Murlough SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – To maintain (and if feasible enhance) population numbers and distribution of harbour seal.
- Conservation objective 2 – To maintain and enhance, as appropriate, physical features used by harbour seal within the site.

Table 1.86 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Murlough SAC with respect to Annex II marine mammal, harbour seal.

Table 1.86: Impacts Considered For Each Conservation Objective – Murlough SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2
Injury and disturbance from underwater noise generated from piling	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	×
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	×
Injury and disturbance from vessel activity and other noise producing activities	✓	×

Given the distance between the Murlough SAC and Proposed Development (146 km), there is no impacts associated with the Proposed Development that could adversely affect the physical features used by harbour seal within the site. As such, conservation objective 2 will not be considered further due to lack of impact pathway. Table 1.87 presents the assessment of AeoI of the Murlough SAC with respect to qualifying Annex II marine mammal, harbour seal.

Table 1.87: Assessment Of Aeol Of Murlough SAC – Harbour Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 – To maintain (and if feasible enhance) population numbers and distribution of harbour seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (146 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to harbour seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance based on 5dB SEL_{ss} noise contours, there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 120 dB and based on Graham *et al.* (2019), only approximately 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour seal from the affected area (Figure 1.11). Harbour seal outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 159 harbour seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 0.593 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.0049 animals per km^2, up to 2 harbour seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. The accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact (13.5 hours for the Proposed Development) and the reversibility of the effect, it can be anticipated that harbour seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. This is also unlikely that this activity has the potential to affect the ability of harbour seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for harbour seal, including cod and haddock. The assessment of fish and shellfish presented in volume 2, chapter 7 of the Offshore ES concluded no significant effects on fish and shellfish receptors. As such, consequential impacts on food resources that could affect harbour seal population within the SAC or beyond are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise	✓	×	×	The Murlough SAC is located approximately 146 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour seal within the site to experience auditory injury. However,	Adverse effects on the qualifying Annex II marine mammal species, harbour

Impact	Relevant project phase C	O	D	Assessment	Conclusion
generated during UXO detonation				given that the injury range for harbour seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour seals outside the site boundary are at risk of experiencing behavioural disturbance. There is no risk of negative impact on condition of the species within the site. Based on highly precautionary densities (the maximum mean density of harbour seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to eight harbour seals may experience disturbance during the UXO clearance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and therefore population numbers. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during the UXO clearance due to barrier effects. Harbour seals are likely to return to sites following the cessation of UXO clearance activities. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Considering the maximum injury ranges (see section 1.8.2.1) as a result of geophysical and seismic surveys (up to 40 m) and the distance to the SAC (146 km), there will be no overlap with the site boundary. There is no residual risk of injury to harbour seal following the application of embedded mitigation measures (see section 1.8.2.1). Given that the maximum disturbance range across all metrics presented in section 1.8.2.1 is 13 km (mild disturbance) for VSP, there will be no overlap of disturbance ranges with the boundary of the SAC. As such, the ability of harbour seal to access breeding/resting haul out/moulting haul out sites within the SAC won't be affected. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 32 harbour seals could be at risk of experiencing mild disturbance outside of the site boundary. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during the geophysical or seismic surveys due to barrier effects. However, harbour seals are likely to return to sites following the cessation of survey activities. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of geophysical and seismic activities (2 to 5 surveys, each up to six months in duration depending	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species of the site. Underwater noise generated during geophysical and seismic surveys is therefore not predicted to restrict the objective of the population being able to maintain (and if feasible enhance) population numbers and distribution of harbour seal.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	There is no risk to harbour seal of experiencing injury as a result of vessel movements and other activities (see section 1.8.2.1). Based on the most precautionary scenario, harbour seal could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (see section 1.8.2.1). There will be no overlap of disturbance ranges with the boundary of the SAC and therefore the ability of harbour seal to access breeding/resting haul out/moulting haul out sites within the SAC won't be affected. Although harbour seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during vessel movements and other activities due to barrier effects. However, harbour seals are likely to return to sites following the cessation of activities. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. As such, this is unlikely that this activity has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site, especially in the context of high vessel traffic in the Irish Sea. It is therefore unlikely that the underwater noise associated with vessels and other activities has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species of the site. Underwater noise from vessel activity and other noise producing activities is therefore not predicted to restrict the objective of the population being able to maintain (and if feasible enhance) population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.

Summary

In line with findings presented in Table 1.87, adverse effects which undermine the conservation objectives set for the harbour seal qualifying feature of the Murlough SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Murlough SAC as a result of activities associated with the Proposed Development alone.

1.8.3.7 Cardigan Bay SAC

The function of the Cardigan Bay SAC is to achieve favourable conservation status of its qualifying features, subject to natural processes. In order for that to happen, conservation objectives need to be fulfilled and maintained in the long term. The assessment in sections 1.8.3 and 1.8.4 will focus on bottlenose dolphin and grey seal, respectively, Annex II marine mammals that are qualifying features of the Cardigan Bay SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site.

The following conservation objectives will be considered with regard to bottlenose dolphin and grey seal qualifying features:

- Conservation objective 1 – Populations

As per NRW (2018b), the population should be maintaining itself on a long term basis as a viable component of its natural habitat. Important elements include population size, structure, production and condition of the species within the site.

As part of this objective it should be noted that for bottlenose dolphin and grey seal contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression. For grey seal populations should not be reduced as a consequence of human activity.

- Conservation objective 2 – Range

As per NRW (2018b), the natural range of the population should not be reduced or likely to be reduced for the foreseeable future. As part of this objective it should be noted that for bottlenose dolphin and grey seal the range within the SAC and adjacent interconnected areas should not be constrained or hindered, there should be appropriate and sufficient food resources within the SAC and beyond and the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.

- Conservation objective 3 – Supporting habitats and species

As per NRW (2018b), the presence, abundance, condition and diversity of habitats and species required to support this species should be such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include distribution, extent, structure, function and quality of habitat and prey availability and quality.

As part of this objective it should be noted that:

  - the management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term;
  - contamination of potential prey species should be below concentrations potentially harmful to their physiological health; and
  - disturbance by human activity is below levels that suppress reproductive success, physiological health or long termbehaviour.

- Conservation objective 4 – Restoration and recovery

As per NRW (2018b), as part of this objective, the bottlenose dolphin populations should be increasing.

Bottlenose dolphin

Table 1.88 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Cardigan Bay SAC with respect to Annex II marine mammal, bottlenose dolphin.

Table 1.88: Impacts Considered For Each Conservation Objective – Cardigan Bay SAC (Bottlenose Dolphin)

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4
Injury and disturbance from underwater noise generated from piling	✓	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	✓	✓

Table 1.89 presents the assessment of AeoI of the Cardigan Bay SAC with respect to qualifying Annex II marine mammal, bottlenose dolphin.

Table 1.89: Assessment Of Aeol Of Cardigan Bay – Bottlenose Dolphin

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1 – Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for bottlenose dolphin (see section 1.8.2.1) as a result of piling (up to 41 m) and the distance to the SAC (122 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to bottlenose dolphin following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 65 bottlenose dolphins could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (13.5 hours) and the reversibility of the effect, it can be anticipated that bottlenose dolphin would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Cardigan Bay SAC is located approximately 122 km from the Proposed Development. The maximum injury range for bottlenose dolphin as a result of high order detonation of UXO is 890 m (see section 1.8.2.1). As such, there is no potential for overlap of injury ranges with the SAC boundary. There is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore there is no risk of adverse impact on condition of the species within the site. Nevertheless, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the precautionary densities, up to one bottlenose dolphin may experience disturbance during the UXO clearance (see section 1.8.2.1). In general, prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2 – Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges overlapping with the boundary of the SAC (Figure 1.11). However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 65 bottlenose dolphins could experience disturbance as a result of pilling (see section 1.8.2.1). As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact (13.5 hours) and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. The assessment of fish and shellfish presented in volume 2 chapter 7 of the Offshore ES concluded no significant effects. As such, any impacts on food resources within the SAC or beyond are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Cardigan Bay is one of two locations within UK territorial waters hosting a semi resident group of bottlenose dolphins (NRW, 2018b). They are seen year round in Cardigan Bay but also in Welsh waters in general. NRW (2018b) reported that nearly 30% of individuals have been identified in both Cardigan Bay SAC and Lleyn Peninsula and the Sarnau SAC as well as north of the Llŷn Peninsula around the Isle of Anglesey, indicating large home ranges that most probably extend to the northern Irish Sea and maybe beyond. The maximum injury range for bottlenose dolphin as a result of high order detonation of UXO is 890 m (see section 1.8.2.1). As such, there is no potential for overlap of injury ranges with the SAC boundary. There is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1) for animals ranging further north from the SAC. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during the UXO clearance due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, it can be anticipated that bottlenose dolphins would be able to tolerate the effect	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Therefore, any impacts on food resources within the SAC or beyond are not anticipated. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Bottlenose dolphins are generalist and opportunistic feeders eating a wide range of pelagic and benthic (demersal) fish, crustaceans and molluscs (NRW, 2018g). The distribution and movement of prey are believed to influence the distribution and movement patterns of bottlenose dolphins and feeding activities have been recorded throughout the inshore waters of Cardigan Bay. The maximum Injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to bottlenose dolphin. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (13.5 hours) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on bottlenose dolphin. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to bottlenose dolphin. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats will not be altered. However, bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Cardigan Bay SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				accessibility to other areas within the Irish sea may be temporarily hindered during the UXO clearance due to barrier effects. Considering the duration of the impact and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour and use of various habitats. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproductive success. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for bottlenose dolphin, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Any impacts on food resources within the SAC or beyond are not anticipated. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1) on bottlenose dolphin. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support this species.	will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Conservation objective 4 – Restoration and recovery					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Given that there will be no overlap of the maximum injury ranges as a result of piling (see section 1.8.2.1) with the boundaries of this SAC and that there is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1), this impact is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish and Celtic Seas. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. There is a potential for behavioural disturbance outside of the SAC, however it is anticipated that bottlenose dolphins would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the restoration and recovery of bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Given that there will be no overlap of the maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) with the boundaries of this SAC and that there is no residual risk of injury following the application of embedded mitigation measures (see section 1.8.2.1), this impact is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish and Celtic Seas. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. There is a potential for behavioural disturbance outside of the SAC, however it is anticipated that bottlenose dolphins would be able to tolerate the	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Cardigan Bay SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the restoration and recovery of bottlenose dolphin population.	will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Grey seal

Table 1.90 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Cardigan Bay SAC (see section 1.8.3.3) with respect to Annex II marine mammal, grey seal.

Table 1.90: Impacts Considered For Each Conservation Objective – Cardigan Bay SAC (Grey Seal)

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	✓

Table 1.91 presents the assessment of aEoI of the Cardigan Bay SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.91: Assessment Of aEoI Of Cardigan Bay SAC – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 118 m) and the distance to the SAC (122 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SELss noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (13.5 hours) and the reversibility of the effect, it can be anticipated that grey seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Cardigan Bay SAC is located approximately 122 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. There is no risk of adverse impact on condition of the species within the site. Based on highly precautionary densities (the maximum mean density of grey seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to 534 grey seals may experience disturbance during the UXO clearance. In general, prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and therefore population size, structure or production. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using SELss noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges overlapping with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of piling will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Any impacts on food resources within the SAC are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Grey seals present within the site at any one time do not form a discrete population, but are centred (in terms of abundance) on Cardigan Bay and are considered part of the south west England and Wales mUs (NRW, 2018g). Grey seals are widely distributed within the SAC and travel beyond the SAC. The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the SAC to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during the UXO clearance due to barrier effects. However, considering the duration of the impact and the reversibility of	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Any impacts on food resources within the SAC are not anticipated. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The exact habitat requirements of grey seals are not known but must include suitable feeding, pupping, moulting and resting haul out areas. Preferred pupping habitat tend to be secluded sites, sheltered from heavy wave action, mostly towards the south-western end of the SAC. Moulting/resting haul out habitat requirements are not known precisely but suitable habitat is extensive throughout the southern part of the site and is assumed to be adequate. Grey seals are assumed to feed throughout the site and they also travel some distance from the site to forage (NRW, 2018g). The maximum injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to grey seal. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (13.5 hours) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on grey seal. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats will not be altered.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during the UXO clearance due to barrier effects. Considering the duration of the impact and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproductive success. The Irish Sea provide an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1). Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support this species.	of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.88 and Table 1.90, adverse effects which undermine the conservation objectives set for the bottlenose dolphin and grey seal qualifying features of the Cardigan Bay SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Cardigan Bay SAC as a result of activities associated with the Proposed Development alone.

1.8.3.8 The Maidens SAC

The function of the Maidens SAC is to maintain (or restore where appropriate) the grey seal to favourable condition, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.8 are fulfilled and maintained in the long term. As per DAERA (2017a), maintain implies that the feature is in favourable condition and will, subject to natural change, remain at its condition at designation. Restore implies that the feature is degraded to some degree and that activities will have to be managed to reduce or eliminate adverse impact(s). There is no condition assessment available for the grey seal feature of The Maidens SAC. The assessment in this section will focus on grey seal, Annex II marine mammal that is a qualifying feature of the Maidens SAC and impacts associated with the Proposed Development with respect to the component conservation objectives established for this site:

- Conservation objective 1–- To maintain (and if feasible enhance) population numbers and distribution of grey seal.
- Conservation objective 2 – To maintain and enhance, as appropriate, physical features used by grey seal within the site.

Table 1.92 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Maidens SAC with respect to Annex II marine mammal, grey seal.

Table 1.92: Impacts Considered For Each Conservation Objective – Maidens SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective

Impact	Conservation Objective 1	Conservation Objective 2
Injury and disturbance from underwater noise generated from piling	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	×

Given the distance between the Maidens SAC and Proposed Development (190 km), there is no impacts associated with the Proposed Development that could adversely affect the physical features used by grey seal within the site. As such, conservation objective 2 will not be considered further due to lack of impact pathway. Table 1.93 presents the assessment of aEoI of the Maidens SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.93: Assessment Of aEoI Of Maidens SAC – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- To maintain (and if feasible enhance) population numbers and distribution of grey seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (115 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SELss noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Additionally, although range of grey seal within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact (13.5 hours) and the reversibility of the effect, it can be anticipated that grey seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. This is also unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of piling will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Any impacts on food resources within the SAC are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Maidens SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. Based on highly precautionary densities (the maximum mean density of grey seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to 534 grey seals may experience disturbance during the UXO clearance. In general, behavioural disturbance as a result of underwater noise may have an effect on reproductive	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Maidens SAC will not occur as a result of injury and disturbance

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect the population numbers. Although grey seal distribution within the site will not be altered, the accessibility to other areas within the Irish sea, and subsequently its distribution within these areas, may be hindered during the UXO clearance due to barrier effects. Grey seals are likely to return to sites following the cessation of UXO clearance activities. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of grey seal.	from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.93, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Maidens SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Maidens SAC as a result of activities associated with the Proposed Development alone.

1.8.3.9 Pembrokeshire Marine SAC

The function of the Pembrokeshire Marine SAC is to achieve favourable conservation status of its qualifying features. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.9 are fulfilled and maintained in the long term. The assessment in this section will focus on grey seal, Annex II marine mammal that is a qualifying feature of the Pembrokeshire Marine SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – Populations
  - As per NRW (2018d), the population should be maintaining itself on a long term basis as a viable component of its natural habitat. Important elements include population size, structure, production and condition of the species within the site. As part of this objective it should be noted that contaminant burdens derived from human activity are below levels that may cause physiological damage, or immune or reproductive suppression. Grey seal populations should not be reduced as a consequence of human activity.
- Conservation objective 2–- Range
  - As per NRW (2018d), the natural range of the population should not be reduced or likely to be reduced for the foreseeable future. As part of this objective it should be noted that the range within the SAC and adjacent interconnected areas should not be constrained or hindered, there should be appropriate and sufficient food resources within the SAC and beyond and the sites and amount of supporting habitat used by these species are accessible and their extent and quality is stable or increasing.
- Conservation objective 3 – Supporting habitats and species

As per NRW (2018d), the presence, abundance, condition and diversity of habitats and species required to support this species should be such that the distribution, abundance and populations dynamics of the species within the site and population beyond the site is stable or increasing. Important considerations include distribution, extent, structure, function and quality of habitat and prey availability and quality.

As part of this objective it should be noted that:

- the management and control of activities or operations likely to adversely affect the species feature is appropriate for maintaining it in favourable condition and is secure in the long term;
- contamination of potential prey species should be below concentrations potentially harmful to their physiological health; and
- disturbance by human activity is below levels that suppress reproductive success, physiological health or long term behaviour.

Table 1.94 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Pembrokeshire Marine SAC with respect to Annex II marine mammal, grey seal.

Table 1.94: Impacts Considered For Each Conservation Objective – Pembrokeshire Marine SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	✓

Table 1.95 presents the assessment of aEoI of the Pembrokeshire Marine SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.95: Assessment Of aEoI Of Pembrokeshire Marine SAC – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 118 m) and the distance to the SAC (195 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SELss noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (up to 13.5 hours) and the reversibility of the effect, it can be anticipated that grey seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Pembrokeshire Marine SAC is located approximately 195 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. There is no risk of adverse impact on condition of the species within the site. Based on highly precautionary densities (the maximum mean density of grey seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to 534 grey seals may experience disturbance during the UXO clearance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				(approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and therefore population size, structure or production. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using SELss noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges overlapping with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during piling activities due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of piling will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Any impacts on food resources within the SAC are not anticipated. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be hindered during the UXO clearance due to barrier effects. However, considering the duration of the impact and the reversibility of the effect, this is unlikely that this activity has the potential to affect the ability of grey seal to access suitable habitats in the long term. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				prey resources will be significantly impacted. Any impacts on food resources within the SAC are not anticipated. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The breeding colony within Pembrokeshire Marine SAC tend to use secluded coves and caves for pupping (NRW, 2018d). Most of the important pupping beaches, caves and haul out sites occur in Pembrokeshire, however, grey seals are also known to travel widely and range throughout the Irish and Celtic seas (and beyond) and there are a significant number of pupping sites in south-western Ceredigion, Gwynedd, Anglesey as well as other counties surrounding the Irish/Celtic Seas, including Cornwall, Ireland and Isle of Man. The maximum injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to grey seal. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (up to 13.5 hours) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on grey seal. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats will not be altered. However, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during the UXO clearance due to barrier effects. Considering the duration of the impact and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproductive success. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1). Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support this species.	generated during UXO detonation.

Summary

In line with findings presented in Table 1.95, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Pembrokeshire Marine SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Pembrokeshire Marine SAC as a result of activities associated with the Proposed Development alone.

1.8.3.10 Bristol Channel Approaches SAC

The function of the Bristol Channel Approaches SAC is to ensure that the integrity of the site is maintained and that it makes the best possible contribution to maintaining FCS for harbour porpoise in UK waters. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.8.1.10 are endorsed. The assessment in this section will focus on harbour porpoise, Annex II marine mammal that is a qualifying feature of the Bristol Channel Approaches SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – The species is a viable component of the site.

The Bristol Channel Approaches SAC has been selected primarily on the basis of its long term, preferential use by harbour porpoise. The implication is that this site provides good foraging habitat and it may also be used for breeding and calving (JNCC *et al.*, 2019a). As such, the intent of this objective is to minimise the risk of injury and killing or other factors that could restrict the survivability and reproductive potential of harbour porpoise using the site. Specifically, this objective is primarily concerned with operations that would result in unacceptable levels of those impacts on harbour porpoises using the site. Unacceptable levels can be defined as those having an impact on the FCS of the populations of the species in their natural range. The reference population for assessments against this objective is the MU population in which the SAC is situated (JNCC *et al.*, 2019a). The Bristol Channel Approaches SAC is situated in the Celtic and Irish Sea and the population of harbour porpoise in this MU is 62,517 individuals (IAMMWG, 2022).

- Conservation objective 2 – There is no significant disturbance of the species.

As reported by JNCC and DAERA (2019), disturbance of harbour porpoise generally, but not exclusively, originates from activities that cause underwater noise and it may lead to harbour porpoises being displaced from the area affected.

The Bristol Channel Approaches SAC has been identified on the basis of having persistently higher densities of harbour porpoises (Heinänen and Skov, 2015) which is linked to the habitats within the site that likely promote good feeding opportunities. Any disturbance should not lead to the exclusion of harbour porpoise from a significant portion of the site for a significant period of time (JNCC *et al.*, 2019a), such as:

  - 20% of the relevant area of the site in any given day; and
  - an average of 10% of the relevant area of the site over a season[15].

- Conservation objective 3 – The supporting habitats and processes relevant to harbour porpoises and their prey are maintained.

As reported by (JNCC *et al.*, 2019a), supporting habitats, in this context, means the characteristics of the seabed and water column. Processes encompass the movements and physical properties of the habitat. The maintenance of supporting habitats and processes contributes to ensuring that prey is maintained within the site and is available to harbour porpoises using the site. The densities of porpoise using a site are likely linked to the availability (and density) of prey within the site (JNCC *et al.*, 2019a). Although, the diet of porpoises

[15] Summer defined as April to September inclusive, winter as October to March inclusive. For example, a daily footprint of 19% for 95 days would result in an average of 19x95/183 days (summer) =9.86%

when within the sites is not well known but is likely comparable to that in the wider seas and therefore may include gobies, sandeel, whiting, herring and sprat.

Table 1.96 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Bristol Channel Approaches SAC.

Table 1.96: Impacts Considered For Each Conservation Objective – Bristol Channel Approaches SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Injury and disturbance from underwater noise generated from piling	✓	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓	×

Please note that impacts related to underwater noise are not considered as having the potential to impact conservation objective 3 which refer to the physical properties supporting habitats, (e.g. characteristics of the seabed and water column). As such, conservation objective 3 will not be considered further in the assessment of aEoI of the Bristol Channel Approaches SAC as a result of impacts associated with the Proposed Development due to lack of impact pathway.

Table 1.97 presents the assessment of aEoI of the Bristol Channel Approaches SAC with respect to qualifying Annex II marine mammals.

Table 1.97: Assessment Of aEoI Of Bristol Channel Approaches SAC – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for harbour porpoise (see section 1.8.2.1) as a result of piling (up to 490 m) and the distance to the SAC (194 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using all of the following approaches, there would be no potential of behavioural disturbance ranges with the boundary of the SAC: • 143 dB SEL_{ss} threshold recommended by NRW (2023), • 15 km EDR recommended by JNCC (2020), and • SEL_{ss} noise contours presented in 5 dB increments. However, harbour porpoises outside the site boundary are also at risk of experiencing behavioural disturbance. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (see section 1.8.2.1). Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the impact (up to 13.5 hours) and the reversibility of the effect, it can be anticipated that harbour porpoise would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. As such, this impact is not anticipated to result in unacceptable levels of impacts as per JNCC *et al.* (2019a). Underwater noise associated with piling is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Bristol Channel Approaches SAC is located approximately 194 km from the Proposed Development. Given that the injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is 15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance (TTS) ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from

<table>
<tr><th rowspan="2">Impact</th><th colspan="3">Relevant project phase</th><th rowspan="2">Assessment</th><th rowspan="2">Conclusion</th></tr>
<tr><th>C</th><th>O</th><th>D</th></tr>
<tr><td></td><td></td><td></td><td></td><td>experiencing behavioural disturbance. Based on Southall et al. (2019) threshold, up to 217 harbour porpoises (based on SCANS-III density estimates (Hammond et al., 2021)), or up to 1,299 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance as a result of high order detonation of 907 kg UXO. However, using the most recent NRW (2023) guidance, only 22 animals would experience disturbance under the same scenario. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond et al., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Considering the maximum design scenario and the most precautionary threshold (Southall et al., 2019), up to 0.33% (or 2.08% based on the SCANS-IV density estimate) of harbour porpoises of the Celtic and Irish Sea MU population could experience disturbance. Given that TTS is a temporary and reversible hearing impairment, it is anticipated that any animals experiencing this shift in hearing would recover after they have moved beyond the injury zone are no longer exposed to elevated sound levels. As such, considering the short duration of UXO detonation activities (approximately two days onsite per clearance) and the reversibility of the effect (Kastelein et al., 2021, SEAMARCO, 2011), this impact is not anticipated to result in unacceptable levels of impacts as per JNCC et al. (2019a). Considering the above, underwater noise associated with UXO clearance is also not predicted to restrict the survivability and reproductive potential of harbour porpoise using the site.</td><td>underwater noise generated during UXO detonation.</td></tr>
<tr><td colspan="6">Objective 2–- There is no significant disturbance of the species</td></tr>
<tr><td>Injury and disturbance from underwater noise generated from piling</td><td>✓</td><td>×</td><td>×</td><td>Considering the behavioural disturbance using all of the following approaches:
• 143 dB SEL_{ss} threshold recommended by NRW (2023),
• 15 km EDR recommended by JNCC (2020), and
• SEL_{ss} noise contours presented in 5 dB increments,
there would be no potential of behavioural disturbance ranges with the boundary of the SAC.
As such, underwater noise from pilling will not exclude harbour porpoises from a significant proportion of the site.</td><td>Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.</td></tr>
<tr><td>Injury and disturbance from underwater noise generated during UXO detonation</td><td>✓</td><td>×</td><td>×</td><td>The Bristol Channel Approaches SAC is located approximately 194 km from the Proposed Development. As presented in section 1.8.2.1, considering all approaches (thresholds based on Southall et al. (2019), latest NRW (2023) guidance and EDR approach presented by JNCC (2020)) maximum disturbance range for harbour porpoise as a result of high order detonation of 907 kg UXO is 28,320 m. As such, there is no potential for UXO clearance activities to exclude harbour porpoise from the significant proportion of the site as there will be no overlap of disturbance ranges with the site boundaries.</td><td>Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Bristol Channel Approaches SAC will not occur as a result of injury</td></tr>
</table>

Impact	Relevant project phase C	O	D	Assessment	Conclusion
					and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.97, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the Bristol Channel Approaches SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Bristol Channel Approaches SAC as a result of activities associated with the Proposed Development alone.

1.8.3.11 Lundy SAC

The function of the Lundy SAC is to maintain (or restore where appropriate) the integrity of the site and ensure that the site contributes to achieving the FCS of its qualifying features. The assessment in this section will focus on grey seal, Annex II marine mammal that is a qualifying feature of the Lundy SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site (see section 1.8.1.11). The goal can be achieved by maintaining or restoring the following:

- Conservation objective 1 – The extent and distribution of qualifying natural habitats and habitats of qualifying species.
- Conservation objective 2–- The structure and function (including typical species) of qualifying natural habitats.
- Conservation objective 3 – The structure and function of the habitats of qualifying species.
- Conservation objective 4–- The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely.
- Conservation objective 5 – The populations of qualifying species.
- Conservation objective 6–- The distribution of qualifying species within the site.

Table 1.98 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Lundy SAC with respect to Annex II marine mammal, grey seal.

Table 1.98: Impacts Considered For Each Conservation Objective – Lundy SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation objectives					
	1	2	3	4	5	6
Injury and disturbance from underwater noise generated from piling	✓	×	×	×	✓	×
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	×	✓	×

Given the distance between the Lundy SAC and Proposed Development (251 km), there are no impacts associated with the Proposed Development that could affect the distribution of qualifying species within the site. As such, conservation objective 6 will not be considered further due to lack of impact pathway.

Conservation objective 2 refers to the qualifying natural habitats and given that the scope of this section is to assess impacts on qualifying species, this will not be taken forward to the assessment.

Additionally, because impacts associated with the Proposed Development that were taken forward to the determination at the HRA Stage 2 Appropriate Assessment are only those of noise, there will not be any physical disturbance to habitats of qualifying features from the Lundy SAC that could affect its structure and function. The same applies to potential impacts on supporting processes on which the habitats of qualifying species rely. As such, conservation objectives 3 and 4 have been screened out from further consideration based on lack of impact pathway.

Table 1.99 presents the assessment of aEoI of the Lundy SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.99: Assessment Of aEoI Of Lundy SAC – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The extent and distribution of qualifying natural habitats and habitats of qualifying species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The breeding colony at Lundy with numbers in the region of 200 to 250 individuals (with females outnumbering males) is important in the south-west (Lundy Management Forum, 2017). Individually identified seals are known to migrate between the north Cornwall coast, Lundy, the north Devon coast and south-west Wales. It is possible there is mixing with populations from as far afield as Brittany and southern Ireland (Lundy Management Forum, 2017). The Lundy SAC is located approximately 251 km from the Proposed Development. The maximum injury ranges as a result of piling (see section 1.8.2.1) do not overlap with the site boundary and there is no residual risk of injury to grey seal following the application of the embedded mitigation measures (see section 1.8.2.1). There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the presence, abundance, condition and diversity of habitats and the access to these habitats will not be altered. Nevertheless, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Although their range within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered during piling due to barrier effects. Considering the duration of the impact (up to 13.5 hours) and the reversibility of the effect, the disturbance is anticipated to be below levels that suppress long term behaviour. Appropriate embedded mitigation measures will be employed to reduce the impacts of underwater noise generated from piling (see section 1.8.2.1) on grey seal. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Lundy SAC is located approximately 251 km from the Proposed Development. The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC. As such, within the site, the extent and distribution of habitats of qualifying species will not be altered. However, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, although the availability of supporting habitats within the site will not be constrained, the accessibility to other areas within the Irish sea may be temporarily hindered	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				during the UXO clearance due to barrier effects. Grey seals are likely to return to sites following the cessation of UXO clearance activities. The Irish Sea provides an important breeding and nursery areas for fish species, which may be important prey for grey seal, including cod and haddock. However, given that behavioural disturbance as a result of UXO clearance will be of high reversibility, it is not anticipated that prey resources will be significantly impacted. Appropriate embedded mitigation measures will be employed to reduce the impacts of UXO clearance (see section 1.8.2.1). Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the extent and distribution of habitats for qualifying species.	generated during UXO detonation.
Conservation objective 5–- The populations of qualifying species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (see section 1.8.2.1) as a result of piling (up to 118 m) and the distance to the SAC (251 km), there will be no overlap of the injury ranges with the site boundary. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Based on the most precautionary approach, up to 1,084 grey seals could experience disturbance as a result of pilling (see section 1.8.2.1). It should be noted that highly conservative densities of 4.06 animals per km^2 were used for these calculations. If we assume more realistic scenario and a density of 0.467 animals per km^2, up to 125 grey seals would be at a risk of disturbance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering the duration of the piling activities (up to 13.5 hours) and the reversibility of the effect, it can be anticipated that grey seal would be able to tolerate the effect without any impact on reproduction or survival rates with ability to return to previous behavioural states or activities once the impacts had ceased. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The maximum injury ranges as a result of UXO detonation (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. There will be also no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC, however, grey seals outside the site boundary are at risk of experiencing behavioural disturbance. Based on highly precautionary densities (the maximum mean density	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				of grey seal based on one 5 km x 5 km cell that overlaps with the Proposed Development), up to 534 grey seals may experience disturbance during the UXO clearance. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect the population numbers. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect the population of grey seal.	of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.99, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Lundy SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Lundy SAC as a result of activities associated with the Proposed Development alone.

1.8.3.12 Rockabill to Dalkey Island SAC

The function of the Rockabill to Dalkey Island SAC is to maintain the favourable conservation condition of harbour porpoise in the site which is defined by the list of attributes and targes (for the purpose of this assessment these will be referred to as “conservation objectives”). The assessment in this section will focus on harbour porpoise, Annex II marine mammal that is a qualifying feature of the Rockabill to Dalkey Island SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – Species range within the site should not be restricted by artificial barriers to site use.

As per NPWS (2013b), this target may be considered relevant to operations that will result in the permanent exclusion of harbour porpoise from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.

- Conservation objective 2 – Human activities should occur at levels that do not adversely affect harbour porpoise community at the site.

As per NPWS (2013b), operations should not introduce manmade energy (e.g. underwater noise) at levels that could result in a significant adverse impact on individuals and/or the community of harbour porpoise within the site. Operations should not cause death or injury to individuals to an extent that may ultimately affect the harbour porpoise community at the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour porpoises depend.

Table 1.100 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Rockabill to Dalkey Island SAC.

Table 1.100: Impacts Considered For Each Conservation Objective – - Rockabill To Dalkey Island SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2
Injury and disturbance from underwater noise generated from piling	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	✓	✓
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓
Injury and disturbance from vessel activity and other noise producing activities	✓	✓

Table 1.101 presents the assessment of aEoI of the Rockabill to Dalkey Island SAC with respect to qualifying Annex II marine mammals.

Table 1.101: Assessment Of aEoI Of Rockabill To Dalkey Islands SAC – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Species range within the site should not be restricted by artificial barriers to site use					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using approaches recommended to be used in the HRA, namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 120 dB and based on Graham *et al.* (2019), only 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. There is a risk of experiencing strong behavioural disturbance by harbour porpoise outside of the boundaries of the SAC. However, considering short term duration of piling activities (up to 13.5 hours) associated with the Proposed Development and the reversibility of this effect, this activity will not permanently prevent access for the species to suitable habitat within or outside the boundaries of the SAC. Underwater noise associated with piling is therefore not predicted to restrict the species range within or outside of the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 155 km from the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore piling UXO activities will not result in exclusion of harbour porpoise from the SAC. There is a risk of experiencing strong behavioural disturbance by harbour porpoise outside of the boundaries of the SAC. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this activity will not permanently prevent access for the species to suitable habitat within or outside the boundaries of the SAC. Underwater noise associated with UXO clearance is therefore not predicted to restrict the species range within or outside of the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during	✓	✓	×	The maximum disturbance range for harbour porpoise associated with geophysical and/or seismic surveys is 13 km for VSP (see section 1.8.2.1). Given that the geophysical and seismic surveys as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of	Adverse effects on the qualifying Annex II marine mammal species, harbour

Impact	Relevant project phase C	O	D	Assessment	Conclusion
geophysical and seismic surveys				disturbance ranges with the boundaries of the SAC. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 46 harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary. However, considering short term duration of geophysical and seismic surveys (2 to 5 surveys, each up to six months in duration depending on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of the behavioural disturbance, underwater noise from geophysical and seismic surveys is not predicted to restrict the species range within or outside of the SAC.	porpoise, which undermine the conservation objective 1 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	The maximum disturbance range associated with vessels and other activities is 20 km for survey, crew transfer or support vessels (see section 1.8.2.1). Given that the vessel and other activities as listed in Table 1.46 will be taking place within the Proposed Development, there will be no overlap of disturbance ranges with the boundaries of the SAC. However, harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. In the context of high vessel traffic in the Irish Sea, underwater noise from vessel activity and other activities is not predicted to restrict the species range within or outside of the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.
Conservation objective 2–- Human activities should occur at levels that do not adversely affect harbour porpoise community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for harbour porpoise (see section 1.8.2.1) as a result of piling (up to 490 m) and the distance to the SAC (155 km), there will be no overlap of the injury range with the site boundary. There will be no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1). Considering the behavioural disturbance using approaches recommended to be used in the HRA (see section 1.8.2.3.2.1), namely 143 dB SEL_{ss} threshold recommended by NRW (2023) or 15 km EDR recommended by JNCC (2020), there would be no potential of behavioural disturbance ranges with the boundary of the SAC (Figure 1.11). However, when considering the most precautionary approach to behavioural disturbance based on 5dB SEL_{ss} noise contours (which so far has been only recommended for use in the ES), there is a potential for overlap of noise disturbance contours with the boundary of the SAC (Figure 1.11). The highest overlapping noise disturbance contour is 120 dB and based on Graham *et al.* (2019), only 1% animals within this noise contour may respond behaviourally to the piling noise. This level of noise constitutes mild disturbance which could lead to temporary effects such as changes in	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated from piling

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				swimming speed and direction, minor disruptions in communication, interruptions in foraging, or disruption of parental attendance/nursing behaviour (Southall *et al.*, 2021) but it is unlikely to deter harbour porpoise from the affected area. There is no risk of deterioration of key resources upon which harbour porpoise depend, such as water quality within the site, as a result of this impact. There is a risk of experiencing strong behavioural disturbance by harbour porpoise outside of the boundaries of the SAC. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of piling activities (up to 13.5 hours) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of harbour porpoise within the site. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 155 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is 15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the community of harbour porpoise within the site. Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. There is no risk of deterioration of key resources upon which harbour porpoise depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, it is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of harbour porpoise within the site. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Considering the maximum injury ranges (see section 1.8.2.1) as a result of geophysical and seismic surveys (up to 345m) and the distance to the SAC (155 km), there will be no overlap with the site boundary. There is no residual risk of injury to harbour porpoise following the application of embedded mitigation measures (see section 1.8.2.1).	

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Given that the maximum disturbance range across all metrics presented in section 1.8.2.1 is 13 km (mild disturbance) for VSP, there will be no overlap of disturbance ranges with the boundary of the SAC. As such, there is no risk of adverse impact on individuals and/or the community of harbour porpoise within the site. Based on the most precautionary threshold (140dB re 1 µPa rms), up to 46 harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary. Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of geophysical and seismic surveys (2 to 5 surveys, each up to six months in duration depending on weather downtime, during 25 year operational phase) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of the species within the site. Underwater noise associated with geophysical and seismic surveys is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	There is no risk to harbour porpoise to experience injury (PTS) as a result of vessel movements and other activities (see section 1.8.2.1). Harbour porpoises may experience TTS within up to 6,740 m from the survey, crew transfer or support vessel. However, TTS is temporary and reversible, and animals are likely to respond by moving away from (fleeing) the ensonified area. There will be no overlap of TTS with the boundary of the SAC. As such, there is no risk of adverse impact on individuals and/or the community of harbour porpoise within the site. Based on the most precautionary scenario, harbour porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (see section 1.8.2.1). Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. Vessels and other noise producing activities will be temporary and largely transitory, as opposed to permanent and fixed. As such, this is unlikely that this activity has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site, especially in the context of high vessel traffic in the Irish Sea. Underwater noise associated with vessels and other activities is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	

Summary

In line with findings presented in Table 1.101, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the Rockabill and Dalkey Island SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Rockabill and Dalkey Island SAC as a result of activities associated with the Proposed Development alone.

1.8.3.13 Saltee Islands SAC

The function of the Saltee Islands SAC is to maintain the favourable conservation condition of grey seal in the site which is defined by the list of attributes and targes (for the purpose of this assessment these will be referred to as "conservation objectives"). The assessment in this section will focus on grey seal, Annex II marine mammal that is a qualifying feature of the Saltee Islands SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Conservation objective 1 – Species range within the site should not be restricted by artificial barriers to site use.

As per NPWS (2011c), this may be considered relevant to operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.

- Conservation objective 2–- The breeding sites should be maintained in a natural condition.

As per NPWS (2011c), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of breeding behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used during the annual breeding season. Operations or activities that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.

- Conservation objective 3–- The moult haul out sites should be maintained in a natural condition.

As per NPWS (2011c), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of moulting behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used during the annual moult. Operations or activities that cause displacement of individuals from a moult haul out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

- Conservation objective 4–- The resting haul out sites should be maintained in a natural condition.

As per NPWS (2011c), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of resting behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used for resting. Operations or activities that cause displacement of individuals from a resting haul out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

- Conservation objective 5–- The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes.

As per NPWS (2011c), resting haul out sites and the composition of haul out groups may be different to those normally observed during breeding or moulting. There is some evidence of cohort linked preferential selection elsewhere in Ireland. Whilst information is limited in Saltee Islands SAC at this time, disturbance at a specific location may have the effect of causing cohort specific disturbance within the population. Population composition, whether in aquatic or terrestrial/intertidal habitats within the entire site or at individual locations, is likely to vary naturally within and between years. For the effective maintenance of the population, the above cohorts should be represented in the population occurring naturally within the site each year and any disturbance likely to cause such a cohort specific effect should be carefully considered.

- Conservation objective 6 – Human activities should occur at levels that do not adversely affect grey seal community at the site.

As per NPWS (2011c), operations should not introduce manmade energy (e.g. underwater noise) at levels that could result in a significant adverse impact on individuals and/or the community of grey seal within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which grey seal depend.

Table 1.102 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Saltee Islands SAC with respect to Annex II marine mammal, grey seal.

Table 1.102: Impacts Considered For Each Conservation Objective – Saltee Islands SAC

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objectives			
	1	2, 3, 4	5	6
Injury and disturbance from underwater noise generated from piling	×	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	×	✓	✓	✓

Given the distance between the Saltee Islands SAC and Proposed Development (239 km), there are no impacts associated with the Proposed Development that could restrict grey seal from using the full range of the Saltee Islands SAC. As such, conservation objective 1 will not be considered further due to lack of impact pathway. Conservation objectives 2 to 4 refer to moulting/breeding/resting behaviour by grey seal and the potential impacts on these will be assessed together.

Table 1.103 presents the assessment of aEoI of the Saltee Islands SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.103: Assessment Of aEoI Of Saltee Islands SAC – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 – The breeding sites should be conserved in a natural condition. **Conservation objective 3 – The moult haul out sites should be conserved in a natural condition.** **Conservation objective 4 – The resting haul out sites should be conserved in a natural condition.**					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. Also, here will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to piling. It is anticipated that piling activities taking place 239 km from the SAC boundaries will not cause displacement of individuals from a breeding site, moult and/or resting haul out site or alteration of natural moulting/breeding/resting behaviour. Behavioural effects that may take place outside of the site boundary are reversible. If animals are deterred from areas affected by underwater noise, they are likely to return to these areas following cessation of piling activities. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. Also, here will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site. It is anticipated that activities taking place 239 km from the SAC boundaries will not cause displacement of individuals from a breeding site, moult and/or resting haul out site or alteration of natural moulting/breeding/resting behaviour. Behavioural effects that may take place outside of the site boundary are reversible. If animals are deterred from areas affected by underwater noise, they are likely to return to these areas following cessation of UXO clearance activities. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 5–- The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury due to piling. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on grey seal adults, juveniles and pups within the site. Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pup cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on grey seal adults, juveniles and pups within the site. Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pups cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Conservation objective 6–- Human activities should occur at levels that do not adversely affect grey seal community at the site.					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury due to piling. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Saltee Islands SAC will not occur as a result of injury and disturbance

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				community of grey seal within the site. There is no risk of deterioration of key resources upon which grey seal depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of piling activities (up to 13.5 hours) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of grey seal within the site. Underwater noise generated from piling is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Saltee Islands SAC is located approximately 239 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the community of grey seal within the site. There is no risk of deterioration of key resources upon which grey seal depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of grey seal within the site. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.103, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Saltee Islands SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Saltee Islands SAC as a result of activities associated with the Proposed Development alone.

1.8.3.14 Roaringwater Bay and Islands SAC

The function of the Roaringwater Bay and Islands SAC is to maintain the favourable conservation condition of harbour porpoise and grey seal in the site which is defined by the list of attributes and targes (for the purpose of this assessment these will be referred to as “conservation objectives”). The assessment in sections 1.8.3 and 1.8.4will focus on harbour porpoise and grey seal, respectively, Annex II marine mammals that are qualifying features of the Roaringwater Bay and Islands SAC and impacts associated with the Proposed Development with respect to the conservation objectives established for this site.

Harbour porpoise

The following conservation objectives will be considered with regard to the harbour porpoise qualifying feature:

- Conservation objective 1 – Species range within the site should not be restricted by artificial barriers to site use.

As per NPWS (2011b), this target may be considered relevant to operations that will result in the permanent exclusion of harbour porpoise from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.

- Conservation objective 2 – Human activities should occur at levels that do not adversely affect harbour porpoise community at the site.

As per NPWS (2011b), operations should not introduce manmade energy (e.g. underwater noise) at levels that could result in a significant adverse impact on individuals and/or the community of harbour porpoise within the site. Operations should not cause death or injury to individuals to an extent that may ultimately affect the harbour porpoise community at the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which harbour porpoises depend.

Table 1.104 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Roaringwater Bay and Islands SAC with respect to Annex II marine mammal, harbour porpoise.

Table 1.104: Impacts Considered For Each Conservation Objective – Roaringwater Bay And Islands SAC (Harbour Porpoise)

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2
Injury and disturbance from underwater noise generated from piling	×	✓
Injury and disturbance from underwater noise generated during UXO detonation	×	✓

Given the distance between the Roaringwater Bay and Islands SAC and Proposed Development (445 km), there are no impacts associated with the Proposed Development that could restrict harbour porpoise from using the full range of the Roaringwater Bay and Islands SAC. As such, conservation objective 1 will not be considered further due to lack of impact pathway. Table 1.105 presents the assessment of aEoI of the Roaringwater Bay and Islands SAC with respect to qualifying Annex II marine mammal, harbour porpoise.

Table 1.105: Assessment Of aEoI Of Roaringwater Bay And Islands SAC – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2–- Human activities should occur at levels that do not adversely affect harbour porpoise community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the behavioural disturbance using all of the following approaches: • 143 dB SEL_{ss} threshold recommended by NRW (2023), • 15 km EDR recommended by JNCC (2020), and • SEL_{ss} noise contours presented in 5 dB increments, there would be no potential of behavioural disturbance ranges with the boundary of the SAC. There is a risk of experiencing strong behavioural disturbance by harbour porpoise outside of the boundaries of the SAC. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of piling activities (up to 13.5 hours) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of harbour porpoise within the site. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour porpoise within the site to experience auditory injury. However, given that the injury range for harbour porpoise as a result of high order detonation of 907 kg UXO is 15,370 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the community of harbour porpoise within the site. Although harbour porpoises need to forage frequently and are vulnerable to disturbance if their foraging is interrupted, behavioural effects may take place only outside of the site boundary and are reversible. There is no risk of deterioration of key resources upon which harbour porpoise depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of harbour porpoise within the site. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	

Grey seal

The following conservation objectives will be considered with regard to the grey seal qualifying feature:

Conservation objective 1 – Species range within the site should not be restricted by artificial barriers to site use.

As per NPWS (2011b), this may be considered relevant to operations that will result in the permanent exclusion of grey seal from part of its range within the site, or will permanently prevent access for the species to suitable habitat therein. It does not refer to short term or temporary restriction of access or range.

Conservation objective 2–- The breeding sites should be conserved in a natural condition.

As per NPWS (2011b), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of breeding behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used during the annual breeding season. Operations or activities that cause displacement of individuals from a breeding site or alteration of natural breeding behaviour, and that may result in higher mortality or reduced reproductive success, would be regarded as significant and should therefore be avoided.

Conservation objective 3–- The moult haul out sites should be conserved in a natural condition.

As per NPWS (2011b), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of moulting behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used during the annual moult. Operations or activities that cause displacement of individuals from a moult haul out site or alteration of natural moulting behaviour to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

Conservation objective 4–- The resting haul out sites should be conserved in a natural condition.

As per NPWS (2011b), this is relevant to proposed activities or operations that will result in significant interference with or disturbance of resting behaviour by grey seal within the site and/or aquatic/terrestrial/intertidal habitat used for resting. Operations or activities that cause displacement of individuals from a resting haul out site to an extent that may ultimately interfere with key ecological functions would be regarded as significant and should therefore be avoided.

Conservation objective 5–- The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes.

As per NPWS (2011b), resting haul out sites and the composition of haul out groups may be different to those normally observed during breeding or moulting. There is some evidence of cohort linked preferential selection elsewhere in Ireland. Whilst information is limited in Roaringwater Bay and Islands SAC at this time, disturbance at a specific location may have the effect of causing cohort specific disturbance within the population. Population composition, whether in aquatic or terrestrial/intertidal habitats within the entire site or at individual locations, is likely to vary naturally within and between years. For the effective maintenance of the population, the above cohorts should be represented in the population occurring naturally within the site each year and any disturbance likely to cause such a cohort specific effect should be carefully considered.

Conservation objective 6 – Human activities should occur at levels that do not adversely affect grey seal community at the site.

As per NPWS (2011b), operations should not introduce manmade energy (e.g. underwater noise) at levels that could result in a significant adverse impact on individuals and/or the community of grey seal within the site. This refers to the aquatic habitats used by the species in addition to important natural behaviours during the species annual cycle. This target also relates to operations that may result in the deterioration of key resources (e.g. water quality, feeding, etc) upon which grey seal depend.

Table 1.106 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Roaringwater Bay and Islands SAC with respect to Annex II marine mammal, grey seal.

Table 1.106: Impacts Considered For Each Conservation Objective – Roaringwater Bay And Islands SAC (Grey Seal)

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objectives			
	1	2, 3, 4	5	6
Injury and disturbance from underwater noise generated from piling	×	✓	✓	✓
Injury and disturbance from underwater noise generated during UXO detonation	×	✓	✓	✓

Given the distance between the Roaringwater Bay and Islands SAC and Proposed Development (445 km), there are no impacts associated with the Proposed Development that could restrict grey seal from using the full range of the Roaringwater Bay and Islands SAC. As such, conservation objective 1 will not be considered further due to lack of impact pathway. The conservation objectives 2 to 4 refer to moulting/breeding/resting behaviour by grey seal and the potential impacts on these will be assessed together.

Table 1.107 presents the assessment of aEoI of the Roaringwater Bay and Islands SAC with respect to qualifying Annex II marine mammal, grey seal.

Table 1.107: Assessment Of aEoI Of Roaringwater Bay And Islands SAC – Grey Seal

Impact	Relevant project phase C	 O	 D	Assessment	Conclusion
Conservation objective 2 – The breeding sites should be conserved in a natural condition **Conservation objective 3 – The moult haul out sites should be conserved in a natural condition** **Conservation objective 4 – The resting haul out sites should be conserved in a natural condition**					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. Also, there will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to piling. It is anticipated that piling activities taking place 445 km from the SAC boundaries will not cause displacement of individuals from a breeding site, moult and/or resting haul out site or alteration of natural moulting/breeding/resting behaviour. Behavioural effects that may take place outside of the site boundary are reversible. If animals are deterred from areas affected by underwater noise, they are likely to return to these areas following cessation of piling activities. Underwater noise associated with piling is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. Also, here will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site. It is anticipated that activities taking place 445 km from the SAC boundaries will not cause displacement of individuals from a breeding site, moult and/or resting haul out site or alteration of natural moulting/breeding/resting behaviour. Behavioural effects that may take place outside of the site boundary are reversible. If animals are deterred from areas affected by underwater noise, they are likely to return to these areas following cessation of UXO clearance activities. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 5–- The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury due to piling. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on grey seal adults, juveniles and pups within the site. Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pup cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on grey seal adults, juveniles and pups within the site. Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pup cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.
Conservation objective 6–- Human activities should occur at levels that do not adversely affect grey seal community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury due to piling. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures (see section 1.8.2.1). There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Roaringwater Bay and Islands SAC will not

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the community of grey seal within the site. There is no risk of deterioration of key resources upon which grey seal depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of piling activities (up to 13.5 hours) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of grey seal within the site. Underwater noise generated from piling is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	occur as a result of injury and disturbance from underwater noise generated from piling.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The Rockabill and Dalkey Island SAC is located approximately 445 km from the Proposed Development. Given that the maximum injury ranges (see section 1.8.2.1) do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. However, given that the injury range for grey seal as a result of high order detonation of 907 kg UXO is 3,015 m, tertiary mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present outside the site boundary and in the vicinity of the Proposed Development. There will be no overlap of disturbance ranges (see section 1.8.2.1) with the boundary of the SAC and therefore only grey seals outside the site boundary are at risk of experiencing behavioural disturbance. As such, there is no risk of adverse impact on individuals and/or the community of grey seal within the site. There is no risk of deterioration of key resources upon which grey seal depend, such as water quality within the site, as a result of this impact. Prolonged behavioural disturbance as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering short term duration of UXO clearance activities (approximately two days onsite per clearance) associated with the Proposed Development and the reversibility of this effect, this is unlikely that this activity has the potential to affect reproduction rates and/or probability of survival that may affect the community of grey seal within the site. Underwater noise associated with UXO clearance is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation.

Summary

In line with findings presented in Table 1.105 and Table 1.107, adverse effects which undermine the conservation objectives set for the harbour porpoise and grey seal qualifying features of the Rockabill and Dalkey Island SAC will not occur as a result of activities associated with the Proposed Development alone.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Rockabill and Dalkey Island SAC as a result of activities associated with the Proposed Development alone.

1.8.4 Assessment of adverse effects in-combination with other plans and projects

1.8.4.1 North Anglesey Marine SAC

The assessment in this section will focus on harbour porpoise, an Annex II marine mammal that is a qualifying feature of the North Anglesey Marine SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.1 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the North Anglesey Marine SAC, presented in Table 1.74 are also applicable to the in-combination assessment of aEoI of the North Anglesey Marine SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the North Anglesey Marine SAC with respect to harbour porpoise is provided in Table 1.108.

Please note that various thresholds and approaches to the assessment of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys were presented for the Proposed Development alone in Table 1.75. However, to ensure that the assessment of the conservation objective 2 ("*There is no significant disturbance of the species*") is comparable, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs.

Additionally, as presented previously in section 1.7.4, the assessment of cumulative impacts presented in the volume 2, chapter 7 of the Offshore ES found no significant cumulative effects on fish and shellfish receptors and therefore it can be concluded that there will be no in-combination effect on Annex II marine mammals due to changes in prey availability. As such, this impact will not be considered further.

Table 1.108: Assessment Of aEoI Of North Anglesey Marine SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater noise due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should also be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundary would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.1). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range with the site boundary as a result of UXO clearance at the Proposed Development. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance ranges (using TTS as a proxy; section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoise outside the site boundary are at risk of experiencing behavioural disturbance. Based on the EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 8,600 m and 13,000 m for harbour porpoise (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is a potential for small overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor (RWE Renewables UK, 2022). Due to the distance from the site, there is no potential for overlap of the EDR range at Project Erebus with the boundaries of the site. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, it is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Tier 2**	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for harbour porpoise (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Due to a large distance to other Tier 2 projects (approximately 143.6 km to the closest Tier 2 project), in-combination effects with these are unlikely. There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Morgan OWF Generation Assets. Although the overlap between the site and 26 km EDF buffer can't be discounted for Mona OWF, it is anticipated to be minimal. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater noise due to geophysical and seismic surveys is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2017b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach, harbour porpoise may experience disturbance within 13 km from the VSP survey. Up to 46 harbour porpoises (up to 0.07% of the Celtic and Irish Seas MU population) could experience mild disturbance (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 274 animals (based on SCANS-IV density estimates (see Table 1.48)) (section 1.8.2.1). **Tier 2** The largest disturbance ranges as a result of geophysical surveys presented for Mona OWF and Morgan OWFF are up to 31 km and 55 km, respectively (section 1.8.2.1). The duration of surveys with respect to harbour porpoise lifespan will be short, however, surveys are expected to occur intermittently over the construction and operation and maintenance phases of the Proposed Development. Given that the impact will be of local extent and the effects of behavioural disturbance are reversible, it is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with geophysical and seismic surveys in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Tier 1 and Tier 2** The risk of injury (PTS) and behavioural disturbance to harbour porpoise from underwater noise from vessel activity and other noise producing activities is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, it is unlikely that this activity in-combination with other plans and projects has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site and/or Celtic and Irish Sea MU, especially in the context of high vessel traffic in the Irish Sea. **Summary** Underwater noise associated with vessel activity and other noise producing activities in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities in-combination with other plans and projects.
Conservation objective 2–- There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 15 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 15 km EDR with the boundary of the SAC is highly unlikely. There will be no overlap of the 15 km EDR range as a result of piling at the Proposed Development and Morgan OWF Generation Assets (Morgan Offshore Wind Ltd, 2023b). Although the overlap of 15 km EDR as a result of piling cannot be discounted for Mona OWF, a daily footprint of 2.6% of the relevant area of the site over 74 piling days would result in an average of 1.05% of the relevant area of the SAC being affected over the season (Mona Offshore Wind Ltd, 2023c). **Summary** As such, there is no potential for piling activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 26 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development and Project Erebus. Although the overlap of 26 km EDR as a result of piling cannot be discounted for Awel y Mor, a daily footprint of 0.24% of the relevant area of the site would result in an average of 0.24% of the relevant area of the SAC being affected over the season (RWE Renewables UK, 2022). **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 26 km EDR with the boundary of the SAC is highly unlikely. There will be no overlap of the 26 km EDR range as a result of UXO clearance at the Proposed Development and Morgan OWF Generation Assets (Morgan Offshore Wind Ltd, 2023b). As per the Mona Offshore Wind Ltd (2023d), the disturbance thresholds at North Anglesey Marine SAC will also not be exceeded during UXO clearance campaign at Mona OWF. **Summary** As such, there is no potential to exclude harbour porpoise from a significant proportion of the site for a significant period of time due to UXO clearance in-combination with other plans and projects.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Tier 2** There will be no overlap of the 12 km and 5 km EDRs recommended for seismic and geophysical surveys, respectively, with the site boundary as a result of surveys taking place at the Proposed Development, Morgan OWF Generation Assets and Mona OWF (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for geophysical and seismic surveys in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and	✓	✓	✓	JNCC (2020) does not recommend any EDRs to be used for the assessment of disturbance as a result of vessel activity. During vessel and other noise producing activities at the Proposed	Adverse effects on the qualifying Annex II

Impact	Relevant project phase C	O	D	Assessment	Conclusion
other noise producing activities				Development, porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (section 1.8.2.1). **Tier 1** RWE Renewables UK (2021c) reported that harbour porpoise may experience disturbance out to 4 km from the construction vessels at Awel y Mor (section 1.8.2.1). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development and Awel y Mor with the boundaries of the SAC. **Tier 2** The largest disturbance ranges as a result of vessel activity presented for Mona OWF and Morgan OWFF are up to 22 km and 21 km, respectively (section 1.8.2.1). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development, Mona OWF and Morgan OWF Generation Assets with the boundaries of the SAC. **Summary** As such, there is no potential for vessel activity and other noise producing activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Anglesey Marine SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.

Summary

In line with findings presented in Table 1.108, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the North Anglesey Marine SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the North Anglesey Marine SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.2 North Channel SAC

The assessment in this section will focus on harbour porpoise, an Annex II marine mammal that is a qualifying feature of the North Channel SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.2 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the North Channel SAC, presented in Table 1.76 are also applicable to the in-combination assessment of aEoI of the North Channel SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the North Channel SAC with respect to harbour porpoise is provided in Table 1.109.

Please note that various thresholds and approaches to the assessment of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys were presented for the Proposed Development alone in Table 1.77. However, to ensure that the assessment of the conservation objective 2 ("*There is no significant disturbance of the species*") is comparable, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs.

Table 1.109: Assessment Of aEoI Of North Channel SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater noise due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SELss noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should be also noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.1). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of 26 km EDR range (section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 8,600 m and 13,000 m respectively for harbour porpoise (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for harbour porpoise (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Due	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				to a large distance to other Tier 2 projects (approximately 143.6 km to the closest Tier 2 project), in-combination effects with these are unlikely. There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Mona OWF and Morgan OWF Generation Assets. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour porpoise from underwater noise generated during geophysical and seismic surveys is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour porpoise from underwater noise from vessel activity and other noise producing activities is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the North Channel SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing

Impact	Relevant project phase C	O	D	Assessment	Conclusion
					activities in-combination with other plans and projects.
Conservation objective 2–- There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 15 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68,Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 15 km EDR with the boundary of the SAC is highly unlikely. There will be no overlap of the 15 km EDR range as a result of piling at the Proposed Development, Mona OWF and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for piling activities in-combination with other plans and projects to exclude harbour porpoise from a significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 26 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Awel y Mor and Project Erebus. **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 26 km EDR with the boundary of the SAC is highly unlikely. There will be no overlap of the 26 km EDR range as a result of UXO clearance at the Proposed Development, Mona OWF and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for UXO clearance in-combination with other plans and projects to exclude harbour porpoise from a significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Tier 2** There will be no overlap of the 12 km and 5 km EDRs recommended for seismic and geophysical surveys, respectively, with the site boundary as a result of surveys taking place at the Proposed Development, Morgan OWF Generation Assets and Mona OWF (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for geophysical and seismic surveys in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	JNCC (2020) does not recommend any EDRs to be used for the assessment of disturbance as a result of vessel activity. ring vessel and other noise producing activities at the Proposed Development, porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (section 1.8.2.1). **Tier 1** RWE Renewables UK (2021c) reported that harbour porpoise may experience disturbance out to 4 km from the construction vessels at Awel y Mor (section 1.8.2.1). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development and Awel y Mor with the boundaries of the SAC. **Tier 2** The largest disturbance ranges as a result of vessel activity presented for Mona OWF and Morgan OFW are up to 22 km and 21 km, respectively (section 1.8.2.1). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development, Mona OWF and Morgan OWF Generation Assets with the boundaries of the SAC. **Summary** As such, there is no potential for vessel activity and other noise producing activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the North Channel SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities.

Summary

In line with findings presented in Table 1.109, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the North Channel SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the North Channel SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.3 Lleyn Peninsula and the Sarnau SAC

The assessment in this section will focus on bottlenose dolphin and grey seal, Annex II marine mammals that are qualifying features of the Lleyn Peninsula and the Sarnau SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.3 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Lleyn Peninsula and the Sarnau SAC, for both bottlenose dolphin and grey seal (Table 1.78 and Table 1.80), are also applicable to the in-combination assessment of aEoI of the Lleyn Peninsula and the Sarnau SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the Lleyn Peninsula and the Sarnau SAC with respect to bottlenose dolphin and grey seal is provided in Table 1.110 and Table 1.111, respectively.

Table 1.110: Assessment Of aEoI Of Lleyn Peninsula And The Sarnau SAC In-Combination With Other Plans And Projects – Bottlenose Dolphin

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by bottlenose dolphin as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 65 bottlenose dolphins could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 310 bottlenose dolphins may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that bottlenose dolphin outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect bottlenose dolphin from the Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 16 and 17 bottlenose dolphins, respectively, may experience disturbance from impact piling. It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise	✓	×	×	There will be no overlap of the bottlenose dolphin injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD	Adverse effects on the qualifying Annex II marine mammal species,

Impact	Relevant project phase C	O	D	Assessment	Conclusion
generated during UXO detonation				and soft starts will be applied to reduce the risk of injury to bottlenose dolphin that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only bottlenose dolphin outside the site boundary are at risk of experiencing behavioural disturbance. Up to one bottlenose dolphin may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 500 m and 730 m respectively for bottlenose dolphin (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, it is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of bottlenose dolphin within the site or Irish Seas MU. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for bottlenose dolphin due to UXO clearance would be approximately 890 m (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, it is unlikely that	bottlenose dolphin which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of bottlenose dolphin within the site or Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although bottlenose dolphin range within the site will not be constrained, the accessibility to other areas within the Irish Sea may be hindered during piling activities due to barrier effects. Although temporal overlap between piling at respective Tier 1 and Tier 2 projects cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for bottlenose dolphin is 1,300m (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for bottlenose dolphin during UXO clearance at Awel y More has been assessed as 920 m (RWE Renewables UK, 2021c). Considering the distance to the SAC, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development (section 1.8.2.1), Project Erebus and Awel y Mor.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Tier 2 Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although bottlenose dolphin range within the site will not be constrained, the accessibility to other areas within the Irish Sea may be hindered during UXO clearance campaigns due to barrier effects. Although temporal overlap between UXO clearance at respective Tier 1 and Tier 2 projects cannot be discounted, the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and behavioural effects are reversible. It is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	from underwater noise generated during UXO detonation in-combination with other plans and projects.
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lleyn Peninsula and the Sarnau SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish Sea. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Sea MU suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint due to UXO crater) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lleyn Peninsula and the Sarnau SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish Sea. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Sea MU suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.
Conservation objective 4 – Restoration and recovery					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The potential to experience injury in terms of PTS by bottlenose dolphin as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (section 1.8.2.1). There will be also no overlap of disturbance ranges as a result of piling at the Proposed Development (section 1.8.2.1) with the boundary of the SAC. **Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary**	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				There is potential for bottlenose dolphin to experience behavioural disturbance outside of the SAC. However, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. As such, this impact in-combination with other plans and projects is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish Sea.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The risk of experiencing injury in terms of PTS by bottlenose dolphin as a result of underwater due to UXO clearance is anticipated to be mitigated by appropriate mitigation measures based on current guidance (section 1.8.2.1). There will be also no overlap of disturbance ranges as a result of UXO clearance at the Proposed Development (section 1.8.2.1) with the boundary of the SAC. **Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for bottlenose dolphin is 1,300m (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for bottlenose dolphin during UXO clearance at Awel y More has been assessed as 920 m (RWE Renewables UK, 2021c). As such, there will be no overlap of disturbance ranges during UXO clearance at Project Erebus and Awel y Mor with the boundary of the SAC. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is a potential for bottlenose dolphins to experience behavioural disturbance outside of the SAC. However, it is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. As such, this impact in-combination with other plans and projects is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish Sea.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Table 1.111: Assessment Of aEoI Of Lleyn Peninsula And The Sarnau SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish Sea over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.1). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m for grey seal (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal within relevant mUs (see Table 1.48) and/or OSPAR III region. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2 - Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during piling activities due to barrier effects. Although temporal overlap between piling at respective Tier 1 and Tier 2 projects cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for grey seal is 20 km (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for grey seal during UXO clearance at Awel y More has been assessed as 3,100 m (RWE Renewables UK, 2021c). Considering the distance to the SAC, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development (section 1.8.2.1), Project Erebus and Awel y Mor. **Tier 2**	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during UXO clearance campaigns due to barrier effects. Although temporal overlap between UXO clearance at respective Tier 1 and Tier 2 projects cannot be discounted, the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and behavioural effects are reversible. It is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on grey seal population from relevant mUs (see Table 1.48) and/or OSPAR III region. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted occur at levels that could adversely affect the natural range of the grey seal population.	with other plans and projects in-combination with other plans and projects.
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lleyn Peninsula and the Sarnau SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise	✓	×	×	**Tier 1 and Tier 2**	Adverse effects on the qualifying Annex II marine

Impact	Relevant project phase C	O	D	Assessment	Conclusion
generated during UXO detonation				As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint due to UXO crater) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lleyn Peninsula and the Sarnau SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	mammal species, grey seal, which undermine the conservation objective 3 of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.110 and Table 1.111, adverse effects which undermine the conservation objectives set for the bottlenose dolphin and grey seal qualifying features of the Lleyn Peninsula and the Sarnau SAC will not occur as a result of activities associated with the Proposed Development in combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Lleyn Peninsula and the Sarnau SAC as a result of activities associated with the Proposed Development in combination with other plans and projects.

1.8.4.4 West Wales Marine SAC

The assessment in this section will focus on harbour porpoise, an Annex II marine mammal that is a qualifying feature of the West Wales Marine SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.4 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the West Wales Marine SAC, presented in Table 1.82 are also applicable to the in-combination assessment of aEoI of the West Wales Marine SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the West Wales Marine SAC with respect to harbour porpoise is provided in Table 1.112.

Please note that various thresholds and approaches to the assessment of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys were presented for the Proposed Development alone in Table 1.83. However, to ensure that the assessment of the conservation objective 2 ("*There is no significant disturbance of the species*") is comparable, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs.

Table 1.112: Assessment Of aEoI Of West Wales Marine SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Conservation objective 1–- The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater noise due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should be also noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.1). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoise that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of 26 km EDR range (section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoise outside the site boundary are at risk of experiencing behavioural disturbance. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 8,600 m and 13,000 m for harbour porpoise (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor, however, spatial overlap due to UXO clearance at Project Erebus cannot be discounted as the project is located approximately 11.1 km from the site (Blue Gem Wind, 2021). Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Tier 2**	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for harbour porpoise (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Due to a large distance to other Tier 2 projects (approximately 143.6 km to the closest Tier 2 project), in-combination effects with these are unlikely. There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Mona OWF and Morgan OWF Generation Assets. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Conservation objective 2–- There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 15 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development. The spatial overlap due to UXO clearance at Project Erebus cannot be discounted as the project is located approximately 11.1 km from the site (Blue Gem Wind, 2021). Nevertheless, the Appropriate Assessment for Project Erebus concluded that the extent of disturbance from piling activities remains below the 10% and 20% disturbance thresholds (Blue Gem Wind, 2021). **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 15 km EDR with the boundary of the SAC is unlikely. The only exception would be Llyr projects as the site overlaps with their offshore scoping boundary (Floventis Energy Ltd, 2022). However, since the assessment for Llyr projects is not available, in-combination impact can't be assessed qualitatively. There will be no overlap of the 15 km EDR range as a result of piling at the Proposed Development, Mona OFW and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary**	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				As such, there is no potential for piling activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 26 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development and Awel y Mor. The spatial overlap due to UXO clearance at Project Erebus cannot be discounted as the project is located approximately 11.1 km from the site (Blue Gem Wind, 2021). Nevertheless, the Appropriate Assessment for Project Erebus concluded that there is no indication that the potential for auditory injury caused by UXO clearance activities would lead to a significant level of disturbance to harbour porpoise populations designated at this site (Blue Gem Wind, 2021). **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.1), the potential for overlap of 26 km EDR with the boundary of the SAC is highly unlikely. The only exception would be Llyr projects as the site overlaps with their offshore scoping boundary (Floventis Energy Ltd, 2022). However, since the assessment for Llyr projects is not available, in-combination impact can't be assessed qualitatively. There will be no overlap of the 26 km EDR range as a result of UXO clearance at the Proposed Development, Mona OFW and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for UXO clearance in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the West Wales Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.112, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the West Wales Marine SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the West Wales Marine SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.5 Strangford Lough SAC

The assessment in this section will focus on harbour seal, an Annex II marine mammal that is a qualifying feature of the Strangford Lough SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.5 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Strangford Lough SAC, presented in Table 1.84 are also applicable to the in-combination assessment of aEoI of the Strangford Lough SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Strangford Lough SAC with respect to harbour seal is provided in Table 1.113. It should be noted that Tier 1 projects included in the MDS (Table 1.69), did not assess impacts on harbour seal as a part of respective Environmental Statements (Blue Gem Wind, 2020, RWE Renewables UK, 2021c). The in-combination assessment presented in this section is provided on data available in the public domain. Given lack of data regarding impacts on harbour seal for Tier 1 projects, these projects will not be considered further.

Table 1.113: Assessment Of aEoI Of Strangford Lough SAC In-Combination With Other Plans And Projects – Harbour Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- To maintain (and if feasible enhance) population numbers and distribution of harbour seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (115 km), there will be overlap of the injury ranges with the site boundary. There will be no residual risk of injury to harbour seal following the application of embedded mitigation measures (section 1.8.2.1). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach, up to 159 harbour seals could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour seal over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 1 harbour seal (at each project) may experience disturbance from impact piling. It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during piling activities due to barrier effects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour seal population within the relevant mUs (Table 1.48). **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Given that the maximum injury ranges (section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour seal within the site to experience auditory injury. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour seals that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance ranges (section 1.8.2.1) with the boundary of the SAC. Up to eight harbour seals may experience disturbance during the UXO clearance. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for harbour seal due to UXO clearance would be approximately	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				3,015 m (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during UXO clearance activities due to barrier effects. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of harbour seal within the site. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour seal from underwater noise generated during geophysical and seismic surveys is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour seal from underwater noise from vessel activity and other noise producing activities is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Strangford Lough SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.113 adverse effects which undermine the conservation objectives set for the harbour seal qualifying feature of the Strangford Lough SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Strangford Lough SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.6 Murlough SAC

The assessment in this section will focus on harbour seal, an Annex II marine mammal that is a qualifying feature of the Murlough SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.6 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Murlough SAC, presented in Table 1.86 are also applicable to the in-combination assessment of aEoI of the Murlough SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Murlough SAC with respect to harbour seal is provided in Table 1.114Table 1.113. It should be noted that Tier 1 projects included in the MDS (Table 1.69), did not assess impacts on harbour seal as a part of respective Environmental Statements (Blue Gem Wind, 2020, RWE Renewables UK, 2021c). The in-combination assessment presented in this section is provided on data available in the public domain. Given lack of data regarding impacts on harbour seal for Tier 1 projects, these projects will not be considered further.

Table 1.114: Assessment Of aEoI Of Murlough SAC In-Combination With Other Plans And Projects – Harbour Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- To maintain (and if feasible enhance) population numbers and distribution of harbour seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (146 km), there will be overlap of the injury ranges with the site boundary. There will be no residual risk of injury to harbour seal following the application of embedded mitigation measures (section 1.8.2.1). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach, up to 159 harbour seals could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour seal over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 1 harbour seal (at each project) may experience disturbance from impact piling. It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during piling activities due to barrier effects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour seal population within the relevant mUs (Table 1.48). **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Given that the maximum injury ranges (section 1.8.2.1) do not overlap with the site boundary, there is no potential for harbour seal within the site to experience auditory injury. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour seals that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance ranges (section 1.8.2.1) with the boundary of the SAC. Up to eight harbour seals may experience disturbance during the UXO clearance. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for harbour seal due to UXO clearance would be approximately 3,015 m (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during UXO clearance activities due to barrier effects. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of harbour seal within the site. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of harbour seal.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour seal from underwater noise generated during geophysical and seismic surveys is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from underwater noise generates during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Tier 1 and Tier 2** The risk of injury (PTS) and disturbance to harbour seal from underwater noise from vessel activity and other noise producing activities is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, this impact in-combination with other plans and projects is not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long.	Adverse effects on the qualifying Annex II marine mammal species, harbour seal, which undermine the conservation objective 1 of the Murlough SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.114 adverse effects which undermine the conservation objectives set for the harbour seal qualifying feature of the Murlough SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Murlough SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.7 Cardigan Bay SAC

The assessment in this section will focus on bottlenose dolphin and grey seal, Annex II marine mammals that are qualifying features of the Cardigan Bay SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.7 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Cardigan Bay SAC, for both bottlenose dolphin and grey seal (Table 1.88 and Table 1.90), are also applicable to the in-combination assessment of aEoI of the Cardigan Bay SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the Cardigan Bay SAC with respect to bottlenose dolphin and grey seal is provided in Table 1.115 and Table 1.116, respectively.

Table 1.115: Assessment Of aEoI Of Cardigan Bay SAC In-Combination With Other Plans And Projects – Bottlenose Dolphin

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by bottlenose dolphin as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 65 bottlenose dolphins could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 310 bottlenose dolphins may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.1)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that bottlenose dolphin outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect bottlenose dolphin from the Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 16 and 17 bottlenose dolphins, respectively, may experience disturbance from impact piling. It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the bottlenose dolphin injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to bottlenose dolphin that may be present in the vicinity of the Proposed Development (section 1.8.2.1).	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin which

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only bottlenose dolphins outside the site boundary are at risk of experiencing behavioural disturbance. Up to one bottlenose dolphin may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 500 m and 730 m respectively for bottlenose dolphin (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of bottlenose dolphin within the site or Irish Seas MU. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for bottlenose dolphin due to UXO clearance would be approximately 890 m (section 1.8.2.1). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, it is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of bottlenose dolphin within the site or Irish Seas MU.	undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of bottlenose dolphin population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although bottlenose dolphin range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during piling activities due to barrier effects. Although temporal overlap between piling at respective Tier 1 and Tier 2 projects cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** There will be no overlap of disturbance ranges during UXO clearance at the Proposed Development (section 1.8.2.1) with the boundary of the SAC. The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for bottlenose dolphin is 1,300m (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for bottlenose dolphin during UXO clearance at Awel y More has been assessed as 920 m (RWE Renewables UK, 2021c). Considering the distance to the SAC, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12).	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary As such, although bottlenose dolphin range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during UXO clearance campaigns due to barrier effects. Although temporal overlap between UXO clearance at respective Tier 1 and Tier 2 projects cannot be discounted, the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and behavioural effects are reversible. It is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted occur at levels that could adversely affect the natural range of the bottlenose dolphin population.	
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Cardigan Bay SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12).	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint due to UXO crater) will be taking place within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Cardigan Bay SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish Sea. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic and Irish Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support bottlenose dolphins.	conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.
Conservation objective 4 – Restoration and recovery					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The potential to experience injury in terms of PTS by bottlenose dolphin as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (section 1.8.2.1). There will be also no overlap of disturbance ranges as a result of piling at the Proposed Development (section 1.8.2.1) with the boundary of the SAC. **Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is a potential for bottlenose dolphins to experience behavioural disturbance outside of the SAC. However, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. As such, this impact in-combination with other plans and projects is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish Sea.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	The risk of experiencing injury in terms of PTS by bottlenose dolphin as a result of underwater due to UXO clearance is anticipated to be mitigated by appropriate mitigation measures based on current guidance (section 1.8.2.1). There will be also no overlap of disturbance ranges as a result of UXO clearance at the Proposed Development (section 1.8.2.1) with the boundary of the SAC. **Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for bottlenose dolphin is 1,300m (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for bottlenose dolphin during UXO clearance at Awel y More has been assessed as 920 m (RWE Renewables UK, 2021c). As such, there will be no overlap of disturbance ranges during UXO clearance at Project Erebus and Awel y Mor with the boundary of the SAC. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is a potential for bottlenose dolphins to experience behavioural disturbance outside of the SAC. However, it is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on bottlenose dolphin population within the SAC or the Irish Sea MU. As such, this impact in-combination with other plans and projects is highly unlikely to hinder the restoration of bottlenose dolphin population either within the SAC or wider Irish Sea.	Adverse effects on the qualifying Annex II marine mammal species, bottlenose dolphin, which undermine the conservation objective 4 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Table 1.116: Assessment Of aEoI Of Cardigan Bay SAC In-Combination With Other Plans And Projects– Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish and Celtic Seas over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m respectively for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally,	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during piling activities due to barrier effects. Although temporal overlap between piling at respective Tier 1 and Tier 2 projects cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for grey seal is 20 km (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for grey seal during UXO clearance at Awel y More has been assessed as 3,100 m (RWE Renewables UK, 2021c). Considering the distance to the SAC, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Project Erebus and Awel y Mor.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Tier 2 Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during UXO clearance campaigns due to barrier effects. Although temporal overlap between UXO clearance at respective Tier 1 and Tier 2 projects cannot be discounted, the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and behavioural effects are reversible. It is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on grey seal population from relevant mUs (see Table 1.48) and/or OSPAR III region. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted occur at levels that could adversely affect the natural range of the grey seal population.	projects in-combination with other plans and projects.
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Cardigan Bay SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Irish and Celtic Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint due to UXO crater) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Cardigan Bay SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Irish and Celtic Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Cardigan Bay SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.115 and Table 1.116, adverse effects which undermine the conservation objectives set for the bottlenose dolphin and grey seal qualifying features of the Cardigan Bay SAC will not occur as a result of activities associated with the Proposed Development in combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Cardigan Bay SAC as a result of activities associated with the Proposed Development in combination with other plans and projects.

1.8.4.8 The Maidens SAC

The assessment in this section will focus on grey seal, an Annex II marine mammal that is a qualifying feature of the Maidens SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.8 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Maidens SAC, presented in Table 1.92 are also applicable to the in-combination assessment of aEoI of the Maidens SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Maidens SAC with respect to grey seal is provided in Table 1.117.

Table 1.117: Assessment Of aEoI Of Maidens SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- To maintain (and if feasible enhance) population numbers and distribution of grey seal					
Injury and disturbance from underwater noise generated from piling	✓	×	×	Considering the maximum injury ranges for seals (section 1.8.2.1) as a result of piling (up to 190 m) and the distance to the SAC (190 km), there will be overlap of the injury ranges with the site boundary. There will be no residual risk of injury to grey seal following the application of embedded mitigation measures. As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during piling activities due to barrier effects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Maidens SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects in-combination with other projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	Given that the maximum injury ranges do not overlap with the site boundary, there is no potential for grey seal within the site to experience auditory injury. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal seals that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance ranges with the boundary of the SAC. Up to 534 grey seals may experience disturbance during the UXO clearance. **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m respectively for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population numbers of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,015 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). The accessibility to the affected areas within the Irish and Celtic Seas may be temporarily hindered during UXO clearance activities due to barrier effects. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal within the site. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the population numbers and distribution of grey seal.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Maidens SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.117, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Maidens SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Maidens SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.9 Pembrokeshire Marine SAC

The assessment in this section will focus on grey seal, an Annex II marine mammal that is a qualifying feature of the Pembrokeshire Marine SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.9 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Pembrokeshire Marine SAC, presented in Table 1.94 are also applicable to the in-combination assessment of aEoI of the Pembrokeshire Marine SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Pembrokeshire Marine SAC with respect to grey seal is provided in Table 1.117.

Table 1.118: Assessment Of aEoI Of Pembrokeshire Marine SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Populations					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish and Celtic Seas over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	
Conservation objective 2–- Range					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges presented in section 1.8.2.1, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during piling activities due to barrier effects. Although temporal overlap between piling at respective Tier 1 and Tier 2 projects cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the natural range of the grey seal population.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** The potential range of behavioural disturbance as a result of UXO clearance at Project Erebus for grey seal is 20 km (Blue Gem Wind, 2020). The largest TTS onset impact range (as a proxy for behavioural disturbance) for grey seal during UXO clearance at Awel y More has been assessed as 3.1 km (RWE Renewables UK, 2021c). Considering the distance to the SAC, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development (section 1.8.2.1), Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12).	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary As such, although grey seal range within the site will not be constrained, the accessibility to other areas within the Irish and Celtic Seas may be hindered during UXO clearance campaigns due to barrier effects. Although temporal overlap between UXO clearance at respective Tier 1 and Tier 2 projects cannot be discounted, the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and behavioural effects are reversible. It is anticipated that duration of UXO clearance at the Proposed Development (approximately two days onsite per clearance) will not contribute significantly to impacts on grey seal population from relevant mUs (see Table 1.48) and/or OSPAR III region. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted occur at levels that could adversely affect the natural range of the grey seal population.	with other plans and projects.
Conservation objective 3 – Supporting habitats and species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Pembrokeshire Marine SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Irish and Celtic Seas. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Irish and Celtic Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3 of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12).	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 3

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Impacts that could potentially affect physical characteristic of the habitat (e.g. UXO detonation leaving a crater on the seabed) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Pembrokeshire Marine SAC due to lack of impact pathway. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Irish and Celtic Seas suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the presence, abundance, condition and diversity of habitats and species required to support grey seals.	of the Pembrokeshire Marine SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.117, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Pembrokeshire Marine SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Pembrokeshire Marine SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.10 Bristol Channel Approaches SAC

The assessment in this section will focus on harbour porpoise, an Annex II marine mammal that is a qualifying feature of the Bristol Channel Approaches SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.10 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Bristol Channel Approaches SAC, presented in Table 1.96, are also applicable to the in-combination assessment of aEoI of the Bristol Channel Approaches SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the Bristol Channel Approaches SAC with respect to harbour porpoise is provided in Table 1.119.

Please note that various thresholds and approaches to the assessment of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys were presented for the Proposed Development alone in Table 1.97. However, to ensure that the assessment of the conservation objective 2 ("*There is no significant disturbance of the species*") is comparable, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs.

Table 1.119: Assessment Of aEoI Of Bristol Channel Approaches SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The species is a viable component of the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater noise due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should be also noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of 26 km EDR range with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range to harbour porpoise (PTS) due to UXO clearance would be 8,600 m and 13,000 m, respectively (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor. No aEoI was determined as a result of activities at Project Erebus and therefore the Bristol Channel Approaches SAC was not considered in the Appropriate Assessment for this project (Blue Gem Wind, 2021). Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, it is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Tier 2**	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for harbour porpoise (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Due to a large distance to other Tier 2 projects (approximately 143.6 km to the closest Tier 2 project), in-combination effects with these are unlikely. There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Mona OWF and Morgan OWF Generation Assets. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat over the long term.	
Conservation objective 2–- There is no significant disturbance of the species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 15 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development. No aEoI was determined as a result of activities at Project Erebus and therefore the Bristol Channel Approaches SAC was not considered in the Appropriate Assessment for this project (Blue Gem Wind, 2021). **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.2), the potential for overlap of 15 km EDR with the boundary of the SAC is unlikely. The only exception would be Llyr projects as the site overlaps with its offshore scoping boundary (Floventis Energy Ltd, 2022) and White Cross as its offshore export cable corridor may pass through the site (White Cross Offshore Wind Ltd, 2022). However, since the assessments for Llyr projects and White Cross are not available, in-combination impact can't be assessed qualitatively. There will be no overlap of the 15 km EDR range as a result of piling at the Proposed Development, Mona OWF and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary**	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				As such, there is no potential for piling activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 26 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development and Awel y Mor. No aEoI was determined as a result of activities at Project Erebus and therefore the Bristol Channel Approaches SAC was not considered in the Appropriate Assessment for this project (Blue Gem Wind, 2021). **Tier 2** Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68, Figure 1.12) for which the assessment data is not available (section 1.8.2.2), the potential for overlap of 26 km EDR with the boundary of the SAC is highly unlikely. The only exception would be Llyr projects as the site overlaps with its offshore scoping boundary (Floventis Energy Ltd, 2022) and White Cross as its offshore export cable corridor may pass through the site (White Cross Offshore Wind Ltd, 2022). However, since the assessments for Llyr projects and White Cross are not available, in-combination impact can't be assessed qualitatively. There will be no overlap of the 26 km EDR range as a result of UXO clearance at the Proposed Development, Mona OWF and Morgan OWF Generation Assets (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for UXO clearance in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Bristol Channel Approaches SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.119, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the Bristol Channel Approaches SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Bristol Channel Approaches SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.11 Lundy SAC

The assessment in this section will focus on grey seal, an Annex II marine mammal that is a qualifying feature of the Lundy SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.4.11 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Lundy SAC, presented in Table 1.98 are also applicable to the in-combination assessment of aEoI of the Lundy SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Lundy SAC with respect to grey seal is provided in Table 1.120.

Table 1.120: Assessment Of aEoI Of Lundy SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- The extent and distribution of qualifying natural habitats and habitats of qualifying species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. seabed footprint around piling location) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lundy SAC due to lack of impact pathway. Across all phases of the Proposed Development and other plans and projects considered in the in-combination assessment, only a small area of potential foraging habitat would be affected when compared to available extent of this habitat in the Celtic Sea. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic Sea suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the extent and distribution of qualifying natural habitats and habitats of qualifying species.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1 and Tier 2** As described previously, considering the distance between the SAC and Tier 1 as well as Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). Impacts that could potentially affect physical characteristic of the habitat (e.g. UXO detonation leaving a crater on the seabed) will be taking phase within the Proposed Development or projects considered in the in-combination assessment which are located at a considerable distance from the site. As such, there will be no impacts on supporting habitats within the Lundy SAC due to lack of impact pathway. Although some fish species may temporarily avoid the area of works, the availability of wider suitable habitat within the SAC (which will not be directly affected) and across the Celtic Sea suggest that individuals may move to alternative foraging grounds without affecting animals' health. **Summary**	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect the extent and distribution of qualifying natural habitats and habitats of qualifying species.	
Conservation objective 5–- The populations of qualifying species					
Injury and disturbance from underwater noise generated from piling	✓	×	×	The potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (see section 1.8.2.1). Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish and Celtic Seas over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to maintain itself as a viable component of its natural habitat.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 1 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Lundy SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect the ability of grey seal population to maintain itself as a viable component of its natural habitat.	

Summary

In line with findings presented in Table 1.120, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Lundy SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Lundy SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.12 Rockabill to Dalkey Island SAC

The assessment in this section will focus on harbour porpoise, an Annex II marine mammal that is a qualifying feature of the Rockabill to Dalkey Island SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.10 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Rockabill to Dalkey Island SAC, presented in Table 1.100, are also applicable to the in-combination assessment of aEoI of the Rockabill to Dalkey Island SAC with respect to qualifying Annex II marine mammal. The in-combination assessment of aEoI of the Rockabill to Dalkey Island SAC with respect to harbour porpoise is provided in Table 1.121.

Please note that various thresholds and approaches to the assessment of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys were presented for the Proposed Development alone in Table 1.101. However, to ensure that the assessment is comparable, where possible, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs.

Table 1.121: Assessment Of aEoI Of Rockabill To Dalkey Island SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 1–- Species range within the site should not be restricted by artificial barriers to site use					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 15 km EDR for piling, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** There will be no overlap of the 15 km EDR range as a result of piling at the Proposed Development, Mona OFW and Morgan OWF Generation Assets with the boundary of this SAC. Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68) for which the assessment data is not available (section 1.8.2.2), the potential for overlap of 15 km EDR with the boundary of the SAC is unlikely. The only exception would be North Irish Sea Array, Dublin Array and Codling Park (Figure 1.12). North Irish Sea Array development boundary lies adjacent to the SAC, whilst the cable search areas for Dublin Array and Codling Park overlap with it. However, given the distance from this SAC to the Proposed Development (155 km), there is no potential for the piling at the Proposed Development to contribute to the restrictions on site use that may be associated with piling at the aforementioned Tier 2 projects. **Summary** As such, there is no potential for piling activities in-combination with other plans and projects to restrict the species range within the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 1 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** Considering the behavioural disturbance ranges using the approach recommended by JNCC (2020), namely the 26 km EDR for UXO clearance, there would be no potential for overlap of behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development, Project Erebus and Awel y Mor. **Tier 2** There will be no overlap of the 26 km EDR range as a result of UXO clearance at the Proposed Development, Mona OFW and Morgan OWF Generation Assets with the boundary of this SAC. Considering the distance between the SAC and majority of the Tier 2 projects (Table 1.68) for which the assessment data is not available (section 1.8.2.2), the potential for overlap of 26 km EDR with the boundary of the SAC is unlikely. The only exception would be North Irish Sea Array, Dublin Array and Codling Park (Figure 1.12). North Irish Sea Array development boundary lies adjacent to the SAC, whilst the cable search areas for Dublin Array and Codling Park overlap with it. However, given the distance from this SAC to the Proposed Development (155 km), there is no potential for the UXO clearance at the Proposed Development to	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				contribute to the restrictions on site use that may be associated with piling at the aforementioned Tier 2 projects. **Summary** As such, there is no potential for piling activities in-combination with other plans and projects to restrict the species range within the SAC.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	Based on the most precautionary approach, harbour porpoise may experience disturbance within 13 km from the VSP survey taking place within the Proposed Development. There will be no overlap of the behavioural disturbance ranges with the boundary of the SAC. **Tier 2** There will be no overlap of the 12 km and 5 km EDRs recommended for seismic and geophysical surveys, respectively, with the site boundary as a result of surveys taking place at the Proposed Development, Morgan OWF Generation Assets and Mona OWF (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). **Summary** As such, there is no potential for geophysical and seismic surveys in-combination with other plans and projects to restrict the species range within the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys in-combination with other plans and projects.
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	JNCC (2020) does not recommend any EDRs to be used for the assessment of disturbance as a result of vessel activity. During vessel and other noise producing activities at the Proposed Development, porpoises could be at risk of experiencing mild disturbance outside of the site boundary within 20 km from the source (section 1.8.2.1). **Tier 1** RWE Renewables UK (2021c) reported that harbour porpoise may experience disturbance out to 4 km from the construction vessels at Awel y Mor (section 1.8.2.2). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development and Awel y Mor with the boundaries of the SAC. **Tier 2** The largest disturbance ranges as a result of vessel activity presented for Mona OWF and Morgan OWFF are up to 22 km and 21 km, respectively (section 1.8.2.2). As such, there will be no overlap of behavioural disturbance ranges as a result of vessel activity and other noise producing activities at the Proposed Development, Mona OWF and Morgan OWF Generation Assets with the boundaries of the SAC.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Summary As such, there is no potential for vessel activity and other noise producing activities in-combination with other plans and projects to exclude harbour porpoise from the significant proportion of the site for a significant period of time.	
Conservation objective 2–- Human activities should occur at levels that do not adversely affect harbour porpoise community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of pilling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundaries would be able to tolerate the impact without adverse effects on reproduction rates and/or probability of survival that could affect the community of harbour porpoise within the site. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU. **Summary** Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of 26 km EDR range (section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 8,600 m and 13,000 m respectively for harbour porpoise (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect the community of harbour porpoise within the site. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				harbour porpoise (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Mona OWF and Morgan OWF Generation Assets. It should be noted that the overlap cannot be discounted for some projects located closer to the site boundary, such as North Irish Sea Array, Dublin Array and Codling Park. However, due to a large distance to other Tier 2 projects (approximately 143.6 km to North Irish Sea Array), in-combination effects with these are unlikely. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	
Injury and disturbance from underwater noise generated during geophysical and seismic surveys	✓	✓	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater due to geophysical and seismic surveys is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2017b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach, harbour porpoise may experience disturbance within 13 km from the VSP survey. Up to 46 harbour porpoises (up to 0.07% of the Celtic and Irish Seas MU population) could experience mild disturbance (based on SCANS-III density estimates (Hammond *et al.*, 2021)), or up to 274 animals (based on SCANS-IV density estimates (see Table 1.48)), corresponding to 0.44% of the Celtic and Irish Seas MU population (section 1.8.2.1). **Tier 2** The largest disturbance ranges as a result of geophysical surveys presented for Mona OWF and Morgan OWFF are up to 31 km and 55 km, respectively (section 1.8.2.2). The duration of surveys with respect to harbour porpoise lifespan will be short, however, surveys are expected to occur intermittently over the construction and operation and maintenance phases of the Proposed Development. Given that the impact will be of local extent and the effects of behavioural disturbance are reversible, it is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from underwater noise generated during geophysical and seismic surveys in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
				Summary Underwater noise associated with geophysical and seismic surveys in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to occur at levels that could adversely affect harbour porpoise community at the site.	
Injury and disturbance from vessel activity and other noise producing activities	✓	✓	✓	**Tier 1 and Tier 2** The risk of injury (PTS) and behavioural disturbance to harbour porpoise from underwater noise from vessel activity and other noise producing activities is expected to be localised within close vicinity of the respective projects. As such, considering the distance to the SAC, it is unlikely that this activity in-combination with other plans and projects has the potential to influence reproduction rates and/or probability of survival that may affect the population of the species within the site and/or Celtic and Irish Sea MU, especially in the context of high vessel traffic in the Irish Sea. **Summary** Underwater noise associated with vessel activity and other noise producing activities in-combination with other plans and projects is therefore not predicted to restrict the objective of the population being able to occur at levels that could adversely affect harbour porpoise community at the site.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Rockabill and Dalkey Island SAC will not occur as a result of injury and disturbance from vessel activity and other noise producing activities in-combination with other plans and projects.

Summary

In line with findings presented in Table 1.109, adverse effects which undermine the conservation objectives set for the harbour porpoise qualifying feature of the Rockabill to Dalkey Island SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Rockabill to Dalkey Island SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.13 Saltee Islands SAC

The assessment in this section will focus on grey seal, an Annex II marine mammal that is a qualifying feature of the Saltee Islands SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.3.13 for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Saltee Islands SAC, presented in Table 1.102 are also applicable to the in-combination assessment of aEoI of the Saltee Islands SAC with respect to qualifying Annex II marine mammals.

The in-combination assessment of aEoI of the Saltee Islands SAC with respect to grey seal is provided in Table 1.122.

Table 1.122: Assessment Of aEoI Of Saltee Islands SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 – The breeding sites should be conserved in a natural condition. **Conservation objective 3 – The moult haul out sites should be conserved in a natural condition.** **Conservation objective 4 – The resting haul out sites should be conserved in a natural condition.**					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to piling. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objectives 2, 3 and 4 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to UXO clearance. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objectives 2, 3 and 4 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase			Assessment	Conclusion
	C	O	D		
Conservation objective 5–- The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pups cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pups cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.
Conservation objective 6–- Human activities should occur at levels that do not adversely affect grey seal community at the site.					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Saltee Islands SAC

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2)). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish and Celtic Seas over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise generated from piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However,	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Saltee Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination

<table>
<tr><th rowspan="2">Impact</th><th colspan="3">Relevant project phase</th><th rowspan="2">Assessment</th><th rowspan="2">Conclusion</th></tr>
<tr><th>C</th><th>O</th><th>D</th></tr>
<tr><td></td><td></td><td></td><td></td><td>considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68).
Tier 1
Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m respectively for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal.
Tier 2
Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12).
It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal.
Summary
Underwater noise generated from UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.</td><td>with other plans and projects.</td></tr>
</table>

Summary

In line with findings presented in Table 1.122, adverse effects which undermine the conservation objectives set for the grey seal qualifying feature of the Saltee Islands SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Saltee Islands SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.8.4.14 Roaringwater Bay and Islands SAC

The assessment in this section will focus on harbour porpoise and grey seal, Annex II marine mammals that are qualifying features of the Roaringwater Bay and Islands SAC and impacts associated with the Proposed Development in-combination with other plans and projects, with respect to the conservation objectives established for this site. The assessment of adverse effects in-combination will be provided with respect to the same conservation objectives that were presented in section 1.8.1.14 for harbour porpoise and grey seal for the Proposed Development alone and will not be repeated here.

Potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Roaringwater Bay and Islands SAC, for both harbour porpoise and grey seal (Table 1.104 and Table 1.106), are also applicable to the in-combination assessment of aEoI of the Roaringwater Bay and Islands SAC with respect to qualifying Annex II marine mammals. The in-combination assessment of aEoI of the Roaringwater Bay and Islands SAC with respect to harbour porpoise and grey seal is provided in Table 1.123 and Table 1.124, respectively.

Please note that various thresholds and approaches to the assessment of impacts of underwater noise as a result of piling, UXO clearance and seismic/geophysical surveys on harbour porpoise were presented for the Proposed Development alone in Table 1.105. However, to ensure that the assessment is comparable, where possible, the in-combination assessment will focus only on the approach recommended by JNCC (2020) guidance and will use impact specific EDRs. Table 1.123 presents the assessment of aEoI of the Roaringwater Bay and Islands SAC in-combination with other plans and projects and with respect to qualifying Annex II marine mammal, harbour porpoise.

Subsequently, Table 1.124 presents the assessment of aEoI of the Roaringwater Bay and Islands SAC in-combination with other plans and projects and with respect to qualifying Annex II marine mammal, grey seal.

Table 1.123: Assessment Of aEoI Of Roaringwater Bay And Islands SAC In-Combination With Other Plans And Projects – Harbour Porpoise

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2–- Human activities should occur at levels that do not adversely affect harbour porpoise community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by harbour porpoise as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). As such, the in-combination assessment is focused on disturbance only. Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours, up to 158 harbour porpoises (up to 0.25% of the Celtic and Irish Seas MU population) based on SCANS-III density estimates (Hammond *et al*., 2021), or up to 945 animals (up to 1.51% of the Celtic and Irish Seas MU) based on SCANS-IV density estimates (see Table 1.48) could experience disturbance as a result of piling (section 1.8.2.1). **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 1,967 harbour porpoise may experience disturbance from impact piling (up to 3.15% of the Celtic and Irish Sea MU population). It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that harbour porpoise outside of the SAC boundaries would be able to tolerate the impact without adverse effects on reproduction rates and/or probability of survival that could affect the community of harbour porpoise within the site. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect harbour porpoise within the Celtic and Irish Sea MU population over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, 587 (up to 0.94% of the Celtic and Irish Sea MU population) and 1,370 harbour porpoises (up to 2.19% of the Celtic and Irish Sea MU population), respectively, may experience disturbance from impact piling. Also, up to 1,279 harbour porpoises may experience disturbance during piling at Morecambe OWF (up to 2.05% of the Celtic and Irish Sea MU population; section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects (Mona Offshore Wind Ltd, 2023c, Morecambe Offshore Wind Ltd, 2023a, Morgan Offshore Wind Ltd, 2023b). Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on harbour porpoise population within the SAC or the Celtic and Irish Sea MU.	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				Summary Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the injury range as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to harbour porpoises that may be present outside the site boundary and in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of 26 km EDR range (section 1.8.2.1) with the boundary of the SAC and therefore only harbour porpoises outside the site boundary are at risk of experiencing behavioural disturbance. Based on EDR approach, up to 183 individuals (based on SCANS-III density estimates (Hammond *et al*., 2021)), or up to 1,094 animals (based on SCANS-IV density estimates (see Table 1.48)) could experience disturbance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However, considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 8,600 m and 13,000 m respectively for harbour porpoise (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the 26 km EDR range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect the community of harbour porpoise within the site. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) due to UXO clearance would be approximately 15,370 m for harbour porpoise (section 1.8.2.2)). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd,	Adverse effects on the qualifying Annex II marine mammal species, harbour porpoise, which undermine the conservation objective 2 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				2023b). There will be no overlap with the SAC with the 26 km EDR range as the result of UXO clearance at Mona OWF and Morgan OWF Generation Assets. It should be noted that the overlap cannot be discounted for some projects located closer to the site boundary, such as North Irish Sea Array, Dublin Array and Codling Park. However, due to a large distance to other Tier 2 projects (approximately 143.6 km to North Irish Sea Array), in-combination effects with these are unlikely. It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of the species within the site or Celtic and Irish Seas MU. **Summary** Underwater noise associated with UXO clearance in-combination with other projects and plans is therefore not predicted to occur at levels that could adversely affect harbour porpoise community at the site.	

Table 1.124: Assessment Of aEoI Of Roaringwater Bay And Islands SAC In-Combination With Other Plans And Projects – Grey Seal

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 2 – The breeding sites should be conserved in a natural condition **Conservation objective 3 – The moult haul out sites should be conserved in a natural condition** **Conservation objective 4 – The resting haul out sites should be conserved in a natural condition**					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to piling. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** There is no risk of significant interference with or disturbance of moulting/breeding/resting behaviour by grey seal within the site as a result of underwater noise due to UXO clearance. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect breeding, moult or resting haul out sites.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 2, 3 and 4 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.

Impact	Relevant project phase C	O	D	Assessment	Conclusion
Conservation objective 5 - The grey seal population occurring within this site should contain adult, juvenile and pup cohorts annually, subject to annual processes					
Injury and disturbance from underwater noise generated from piling	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of piling at the Proposed Development and Project Erebus. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of piling at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pup cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	**Tier 1** As presented in section 1.8.2.2, there would be no potential for overlap of injury or behavioural disturbance ranges with the boundary of the SAC as a result of UXO clearance at the Proposed Development, Project Erebus and Awel y Mor. **Tier 2** Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of injury and behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). **Summary** Behavioural effects that may take place outside of the site boundary are reversible and therefore are not anticipated to adversely affect the site population. Underwater noise associated with UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal adult, juvenile and pup cohorts at the site.	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 5 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination with other plans and projects.
Conservation objective 6 - Human activities should occur at levels that do not adversely affect grey seal community at the site					
Injury and disturbance from underwater noise generated from piling	✓	×	×	As previously described in section 1.8.2.1, the potential to experience injury in terms of PTS by grey seal as a result of underwater due to piling is anticipated to be localised and mitigated by appropriate mitigation measures based on current guidance (JNCC, 2010b). Based on the most precautionary approach using the extent of 5 dB SEL_{ss} noise contours and highly precautionary densities (4.06 animals per km^2), up to 1,084 grey seals could experience disturbance as a result of pilling at the Proposed Development (section 1.8.2.1). Using more	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Roaringwater Bay

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				realistic densities of 0.467 animals per km^2, up to 125 grey seals would be at risk of experiencing behavioural disturbance. **Tier 1** The ES for Project Erebus predicted that, in the worst case scenario, 18 grey seals may experience disturbance from impact piling. It should be noted that the duration of piling activity at both projects is relatively short, (e.g. 13.5 hours at the Proposed Development and 18 days at Project Erebus (section 1.8.2.2). Given the distance from Project Erebus and the Proposed Development and small temporal overlap of construction phases (one year; Table 1.68), it can be anticipated that grey seal outside of the SAC boundaries would be able to tolerate the effect without any impact on reproduction or survival rates. **Tier 2** Temporally, the construction phases of the eleven Tier 2 projects are anticipated to occur between 2024 and 2028 (Table 1.68). Although piling will not result in continuous risk of disturbance, it may affect grey seal within the Irish and Celtic Seas over a meaningful proportion of their lifespan. The PEIR for Mona OWF and Morgan OWF predicted that, in the worst case scenario, up to 92 and 48 grey seals, respectively, may experience disturbance from impact piling. Also, up to 1 grey seal may experience disturbance during piling at Morecambe OWF (section 1.8.2.2). It should be highlighted that duration of piling at the Proposed Development will be very short in comparison to Tier 2 projects. Although temporal overlap cannot be discounted, it is anticipated that duration of piling at the Proposed Development (13.5 hours) will not contribute significantly to impacts on grey seal population. **Summary** Underwater noise generated from piling in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated from piling in-combination with other plans and projects.
Injury and disturbance from underwater noise generated during UXO detonation	✓	×	×	There will be no overlap of the grey seal injury ranges as a result of UXO clearance at the Proposed Development with the site boundary. The embedded mitigation including ADD and soft starts will be applied to reduce the risk of injury to grey seal that may be present in the vicinity of the Proposed Development (section 1.8.2.1). There will be no overlap of disturbance range (section 1.8.2.1) as a result of UXO clearance with the boundary of the SAC and therefore only grey seal outside the site boundary are at risk of experiencing behavioural disturbance. Up to 534 grey seals may experience disturbance during the UXO clearance. Temporally, the construction phases of Tier 1 and Tier 2 projects are anticipated to occur between 2023 and 2030 (Table 1.68). UXO clearance activities are typically undertaken at the beginning of the construction phase and therefore it is challenging to estimate whether there will a temporal overlap in UXO clearance activities between any of the projects. However,	Adverse effects on the qualifying Annex II marine mammal species, grey seal, which undermine the conservation objective 6 of the Roaringwater Bay and Islands SAC will not occur as a result of injury and disturbance from underwater noise generated during UXO detonation in-combination

Impact	Relevant project phase C	O	D	Assessment	Conclusion
				considering that the construction phase of the Proposed Development is planned to start in 2024, it is likely that more than a year may pass until the UXO clearance begins at other projects (Table 1.68). **Tier 1** Underwater noise modelling results presented for Awel y Mor and Project Erebus indicated that the largest injury range (PTS) due to UXO clearance would be 1,600 and 2,500 m respectively for grey seal (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS to negligible levels (Blue Gem Wind, 2021, RWE Renewables UK, 2022). There is no potential of overlap of the behavioural disturbance range with the site boundary as a result of UXO clearance at Awel y Mor and Project Erebus. Prolonged behavioural disturbance outside the SAC as a result of underwater noise may have an effect on reproductive success of some individuals. However, considering that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and effects of behavioural disturbance are reversible, this is unlikely that this activity in-combination with Tier 1 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Tier 2** Underwater noise modelling results presented for Mona OWF and Morgan OWF indicated that the largest injury range (PTS) for grey seal due to UXO clearance would be approximately 3,215 m (section 1.8.2.2). Both projects will also be adhering to UXO mitigation which will further reduce the risk of PTS (Mona Offshore Wind Ltd, 2023c, Morgan Offshore Wind Ltd, 2023b). Considering the distance between the SAC and Tier 2 projects (Table 1.68) the potential for overlap of behavioural disturbance ranges as a result of UXO clearance at respective projects with the boundary of the SAC is highly unlikely (Figure 1.12). It should be noted that the duration of impact (elevated sound) for each UXO detonation is very short (seconds) and that the activity may take place intermittently over the years. Additionally, the effects of behavioural disturbance are reversible. Considering the above, this is unlikely that this activity in-combination with Tier 2 projects has the potential to affect reproduction rates and/or probability of survival that may affect the population of grey seal. **Summary** Underwater noise generated from UXO clearance in-combination with other plans and projects is therefore not predicted to occur at levels that could adversely affect grey seal community at the site.	with other plans and projects.

Summary

In line with findings presented in Table 1.123 and Table 1.124, adverse effects which undermine the conservation objectives set for the harbour porpoise and grey seal qualifying features of the Roaringwater Bay and Islands SAC will not occur as a result of activities associated with the Proposed Development in-combination with other plans and projects.

Therefore, it can be concluded that there is no risk of an adverse effect on the integrity of the Roaringwater Bay and Islands SAC as a result of activities associated with the Proposed Development in-combination with other plans and projects.

1.9 Assessment of potential aEoI: Offshore and intertidal ornithological features

The HRA Stage 1 Screening Report identified the potential for LSEs on the following European sites and features designated for offshore and intertidal ornithological features (Table 1.125).

Table 1.125: European Sites Designated For Offshore And Intertidal Ornithological Features With Potential For LSE's

SPA	Marine ornithological features
Liverpool Bay/Bae Lerpwl SPA	Red-throated diver *Gavia stellata* – non breeding Little gull *Hydrocoloeus minutus* – non breeding Common scoter *Melanitta nigra* – non breeding Little tern *Sternula albifrons* – breeding Common tern *Sterna hirundo* – breeding Waterbird assemblage – non breeding
Dee Estuary SPA	Sandwich tern *Sterna sandvicensis* – passage Common tern – breeding Little tern – breeding Pintail *Anas acuta* – wintering Teal *Anas crecca* – wintering Dunlin *Calidris alpina* – wintering Knot *Calidris canutus* – wintering Oystercatcher *Haematopus ostralegus* – wintering Bar-tailed godwit *Limosa lapponica* – wintering Black-tailed godwit *Limosa islandica* – wintering Curlew *Numenius arquata* – wintering Grey plover *Pluvialis squatarola* – wintering Shelduck *Tadorna tadorna* – wintering Redshank *Tringa totanus* – wintering and passage Waterbird assemblage – non breeding
Ribble and Alt Estuaries SPA	Lesser black-backed gull *Lasus fuscus* – breeding Common tern – breeding
Anglesey Terns/Morwenoliaid Ynys Môn SPA	Sandwich tern – breeding
Morecambe Bay and Duddon Estuary SPA	Lesser black-backed gull – breeding
Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys EnlliSPA	Manx shearwater *Puffinus puffinus* – breeding
Ailsa Craig SPA	Northern gannet *Morus bassanus* – breeding
Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA	European storm petrel *Hydrobates pelagicus* – breeding Manx shearwater – breeding
Grassholm SPA	Northern gannet – breeding
Saltee Islands SPA	Northern gannet – breeding Northern fulmar *Fulmarus glacialis* – breeding

LSEs on these European sites were identified for the following potential impacts:

During the construction and decommissioning phases:

- temporary habitat displacement and disturbance;
- disturbance and displacement from airborne sound, and presence of vessels and infrastructure,

- changes in prey availability; and
- accidental pollution in the surrounding area.

During the operation and maintenance phases:

- changes in prey availability;
- accidental pollution in the surrounding area;
- creation of roosting and nesting habitats among project infrastructure;
- disturbance and displacement from airborne sound, and presence of vessels and infrastructure; and
- collision with offshore infrastructure.

1.9.1 Baseline information

Baseline information related to the offshore ornithological features of the European sites has been gathered through a comprehensive desktop study of existing studies and datasets. The baseline information related to intertidal features was established from a combination of desktop study and site specific surveys. For intertidal features, RPS survey results were analysed in conjunction with the most recent Wetland Bird Survey (WeBS) sector counts to derive the baseline. This document contains only information pertaining to those identified features identified for further assessment in Table 1.125, full details are presented within the Ornithology Baseline Technical Report (RPS group, 2024a); the Offshore Ornithology Displacement Technical Report (RPS group, 2024b); the Intertidal Ornithology Technical Report (RPS group, 2023); and the Little Tern Foraging Distribution Technical Report (RPS group, 2024c);.

1.9.1.1 Liverpool Bay SPA

1.9.1.1.1 Site Description

The Proposed Development lies within the Liverpool Bay SPA. The SPA covers an area of 2,528 km^2 and extends out from Morecambe Bay beyond 12 nautical miles at the north-west point and offshore of the mouth of the Dee Estuary. The western boundary extends into Welsh seas to Point Lynas on Anglesey. The landward boundary follows the mean low water mark or the boundary of existing SPAs.

1.9.1.1.2 Feature accounts

The qualifying ornithological features of Liverpool Bay SPA are listed below with details of listed counts from the SPA classification citation document (Natural England, 2017).

- Red-throated diver – 1,171 non breeding individuals. The highest recorded densities of red-throated diver occur off the Ribble Estuary, North Wales and the North Wirral Foreshore (Webb et al., 2006).
- Little gull – 319 non breeding individuals.
- Common scoter – 56,679 non breeding individuals.
- Little tern – 260 breeding individuals.
- Common tern – 360 breeding individuals.
- Waterbirds assemblages – minimum 69,687 individuals during the non breeding season.

1.9.1.1.3 Condition assessment

The condition of each qualifying feature is taken from the Liverpool Bay SPA Departmental Brief (Natural England, 2010).

- Red-throated diver – The conservation status is currently considered to be in an unfavourable and depleted but stable condition.
- Little gull – The conservation status is currently considered to be in a favourable condition.
- Common scoter – The conservation status is currently considered to be in a favourable condition.
- Little tern – The conservation status is currently considered to be in a favourable condition.
- Common tern – The conservation status is currently considered to be in a favourable condition.
- Waterbird assemblage – The conservation status is currently considered to be in a favourable condition.

1.9.1.1.4 Conservation objectives

The overarching conservation objectives for the Liverpool Bay SPA are to:

Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the population of each of the qualifying features; and
- the distribution of the qualifying features within the site.

Conservation attributes and targets for each qualifying species of the Liverpool Bay SPA have been produced to meet the overarching objectives, these are outlined in Table 1.126 (Natural England, NRW and JNCC, 2022).

Table 1.126: Conservation Attributes And Targets For The Qualifying Features Of Liverpool Bay SPA

Feature	Attribute	Target
Red-throated diver	Non-breeding population: abundance	Maintain the size of the non breeding population at a level which is at or above 1800 individuals (mean peak, 2015, 2018, 2019 and 2020).
	Non-breeding population: distribution	Restore the distribution of the feature; preventing further deterioration, and where possible, reduce any existing anthropogenic influences impacting feature distribution.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: food availability and quality of prey	Maintain the distribution, abundance and availability of key food and prey items (e.g. fish) to maintain the population.
	Supporting habitat: extent, distribution, and quality of supporting habitat for the non breeding season	Restore the extent, distribution and availability of suitable habitat which supports the feature; preventing further deterioration, and where possible, reduce any existing anthropogenic influences impacting the extent and quality (including water quality).
Common scoter	Non-breeding population: abundance	Maintain the size of the non breeding population at a level which is at or above 141,801 individuals (mean peak 2015, 2018, 2019 and 2020).
	Non-breeding population: distribution	Maintain the distribution of the feature; the extent should not be reduced by anthropogenic factors.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: food availability	Maintain the distribution, abundance and availability of key food and prey items (e.g. molluscs and bivalves) to maintain the population.
	Supporting habitat: extent, distribution, and quality of supporting habitat for the non breeding season	Maintain the extent, distribution and availability of suitable habitat which supports the feature; the quality and extent should not deteriorate by anthropogenic factors (including water quality).
Little gull	Non-breeding population abundance:	Maintain the size of the non breeding population at a level which is at or above 319 individuals (mean peak 2004/5 to 2010/11).
	Non-breeding population: distribution	Maintain the distribution of the feature; the extent should not be reduced by anthropogenic factors.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: food availability	Maintain the distribution, abundance and availability of key food and prey items (e.g. fish) to maintain the population.
	Connectivity with supporting habitats	Maintain safe passage of birds moving between roosting and feeding areas.
	Supporting habitat: extent, distribution and quality of supporting habitat for the non breeding season	Maintain the extent, distribution and availability of suitable habitat which supports the feature; the quality and extent should not deteriorate by anthropogenic factors (including water quality).

Feature	Attribute	Target
Common tern	Breeding population: abundance	Maintain the size of the breeding population at a level which is at or above 180 pairs (2011 – 2015).
	Breeding population: distribution	Maintain the distribution of the feature; the extent should not be reduced by anthropogenic factors.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: food availability	Maintain the distribution, abundance and availability of key food and prey items (e.g. fish) to maintain the population.
	Connectivity with supporting habitats	Maintain safe passage of birds moving between nesting and feeding areas.
	Supporting habitat: extent, distribution, and quality of supporting habitat for the breeding season	Maintain the extent, distribution and availability of suitable habitat which supports the feature; the quality and extent should not deteriorate by anthropogenic factors (including water quality).
Little tern	Breeding population: abundance	Maintain the size of the breeding population, at a level which is at or above 69 pairs (1995-1999).
	Breeding population: distribution	Maintain the distribution of the feature; the extent should not be reduced by anthropogenic factors.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: food availability	Maintain the distribution, abundance and availability of key food and prey items (e.g. fish) to maintain the population.
	Connectivity with supporting habitats	Maintain safe passage of birds moving between nesting and feeding areas.
	Supporting habitat: extent, distribution, and quality of supporting habitat for the breeding season	Maintain the extent, distribution and availability of suitable habitat which supports the feature; the quality and extent should not deteriorate by anthropogenic factors (including water quality).
Waterbird assemblage	Assemblage of species: abundance	Maintain the size of the non breeding population of component species at a level which is at or above 157,952 individuals (mean peak 2015, 2018, 2019 and 2020).
	Assemblage of species: diversity	Maintain the species diversity of the bird assemblage which should include common scoter, red-throated diver, little gull, red-breasted merganser, and great cormorant.
	Assemblage of species: distribution	Maintain the distribution of the feature; the extent should not be reduced by anthropogenic factors.
	Disturbance caused by human activity	Minimise the frequency, duration and/or intensity of disturbance affecting the feature so that the population, its distribution within the site, or its use of the habitat is not significantly affected.
	Supporting habitat: extent, distribution, and quality of supporting habitat for the non breeding season	Maintain the extent, distribution and availability of suitable habitat which supports the feature; the quality and extent should not deteriorate by anthropogenic factors (including water quality).

1.9.1.2 Dee Estuary SPA

Site Description

The Proposed Development Area lies within the Dee Estuary SPA, specifically where the cable route makes landfall at Point of Ayr. The Dee Estuary is located on the border between England and Wales. It is a large, funnel-shaped, sheltered estuary, which supports extensive areas of intertidal sand and mudflats and saltmarsh. It covers an area of approximately 142.9 km^2. The SPA is of major importance for waterbirds.

Feature accounts

The qualifying ornithological features of Dee Estuary SPA are listed below with details of listed counts (5-year mean 1994/95-1998/99) from the SPA classification citation document (Natural England and NRW 2010).

- Sandwich tern – 957 individuals (autumn passage)
- Common tern – 392 breeding pairs
- Little tern – 69 breeding pairs
- Pintail – 5,407 non breeding individuals
- Teal – 5,521 non breeding individuals
- Dunlin – 27,769 non breeding individuals
- Knot – 12,394 non breeding individuals
- Oystercatcher – 22,677 non breeding individuals
- Bar-tailed godwit – 1,150 non breeding individuals
- Black-tailed godwit – 1,747 non breeding individuals
- Curlew – 3,899 non breeding individuals
- Grey plover – 1,643 non breeding individuals
- Shelduck – 7,725 non breeding individuals
- Redshank – 8,795 passage individuals/5,293 wintering individuals
- Waterbird assemblage – regularly used by over 20,000 individual waterbirds in any season and supports 120,726 individuals in the non breeding season (including nationally important bird populations (e.g. great crested grebe *Podiceps cristatus* – 195 individuals, cormorant *Phalacrocorax carbo* – 393 individuals, wigeon *Anas penelope* – 4,526 individuals, sanderling *Calidris alba* – 526 individuals).

Condition assessment

The condition assessment for the Dee Estuary SPA features, as taken from the Dee Estuary Conservation Package (NE, 2012):

- Sandwich tern - The conservation status is currently considered to be in a favourable condition.
- Common tern - The conservation status is currently considered to be in a favourable condition.
- Little tern - The conservation status is currently considered to be in a favourable condition.
- Pintail - The conservation status is currently considered to be in a favourable condition.
- Teal - The conservation status is currently considered to be in a favourable condition.
- Dunlin - The conservation status is currently considered to be in a favourable condition.
- Knot - The conservation status is currently considered to be in a favourable condition.

- Oystercatcher - The conservation status is currently considered to be in a favourable condition.
- Bar-tailed godwit - The conservation status is currently considered to be in a favourable condition.
- Black-tailed godwit - The conservation status is currently considered to be in a favourable condition.
- Curlew - The conservation status is currently considered to be in a favourable condition.
- Grey plover - The conservation status is currently considered to be in a favourable condition.
- Shelduck - The conservation status is currently considered to be in a favourable condition.
- Redshank - The conservation status is currently considered to be in a favourable condition.
- Waterbird assemblage – The conservation status is currently considered to be in a favourable condition.

Conservation objectives

The overarching conservation objectives for the Dee Estuary SPA are to:

"*Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;*

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the population of each of the qualifying features; and,
- the distribution of the qualifying features within the site."

The attributes and targets of the Dee Estuary SPA for each qualifying species are described in Table 1.127 (Natural England and NRW 2010).

Table 1.127: Conservation Attributes And Targets For The Qualifying Features Of Dee Estuary SPA

Feature	Attribute	Target
Sandwich tern	Population size	The 5-year mean peak population size for the autumn passage sandwich tern population is no less than 957 individuals (i.e. the 5-year mean peak between 1995-1999).
	Disturbance in feeding, and roosting areas	Aggregations of sandwich tern roosting on the upper shore over high tide are not subject to significant disturbance.
Common tern	Population size	Maintain the size of the breeding population at a level which is no less than 392 individuals (i.e. 5-year mean between 1995-1999).
	Productivity of breeding colonies	The year mean productivity of the breeding population is no less than 1.34 chicks fledging per breeding pair per year (i.e. 5-year mean between 1995-1999).
	Disturbance in feeding, and roosting areas	Aggregations of common tern roosting on the upper shore over high tide are not subject to significant disturbance.
	Food availability/prey abundance and dispersion	Maintain the distribution, abundance and availability of key food and prey items (e.g. sand eel and sprat) to maintain the population.
	Unimpeded access for common tern between feeding/roosting and breeding sites	Common tern are able to pass freely between Dee Estuary and their breeding site at Shotton Lagoons and Reedbeds without obstruction.
Little tern	Population size	The 5-year mean population size for the breeding little tern population is no less than 69 breeding pairs (i.e. the 5-year mean between 1995-1999).
	Productivity of breeding colonies	The 5-year mean productivity of the breeding little tern population is no less than 0.80 chicks fledging per breeding pair per year (i.e. the 5-year mean between 1995-1999).
	Extent of shingle banks with less than 10% vegetation cover and avoid regular inundation	The extent of shingle habitat at Gronant, which is suitable for nesting little tern is maintained.
	Disturbance at little tern breeding colony and feeding/roosting areas	The breeding site is not subject to significant disturbance; and aggregations of little tern roosting on the beach at Gronant or Point of Ayr over high tide are not subject to significant disturbance.
Pintail	Population size	The 5-year peak mean population size for the wintering pintail population is no less than 5,407 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; and the extent of saltmarsh and the spatial distribution of its constituent vegetation community types is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of pintail prey species (e.g. mudsnails Hydrobia spp.) is maintained at levels required to support the current population size in 5,407 individuals. Greater than 25% cover of soft leaved herbs and grasses (e.g. common saltmarsh grass Puccinellia maritima and glasswort Salicornia spp., Kirby *et al.*, 2000) is maintained during winter across the saltmarsh.

Feature	Attribute	Target
	Disturbance to feeding, roosting and loafing areas	Aggregations of loafing or feeding pintail are not subject to significant disturbance.
	Unimpeded sightlines at feeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around loafing areas and feeding areas.
Teal	Population size	The 5-year peak mean population size for the wintering teal population is no less than 5,251 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained.
	Extent of standing water pools or “flashes”	The extent of standing water pools or “flashes” in the saltmarsh is maintained.
	Food availability/prey abundance and dispersion	The extent of saltmarsh and the spatial distribution of its constituent vegetation community types is maintained; and greater than 25% cover of seed-bearing plants (e.g. glasswort, and oraches Atriplex spp. which teal feed on, Kirby *et al.*, 2000) is maintained during winter across the saltmarsh.
	Disturbance to feeding, roosting and loafing areas	Aggregations of loafing or feeding teal are not subject to significant disturbance.
	Unimpeded sightlines at feeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Dunlin	Population size	The 5-year peak mean population size for the wintering dunlin population is no less than 27,769 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of dunlin prey species (e.g. ragworms *Hediste diversicolor*, Baltic tellin *Macoma balthica*, mud snails, brown shrimp *Crangon crangon*, and small shore crabs Carcinus maenas, Kirby *et al.*, 2000) are maintained at levels sufficient to support the current population size of 27,769 individuals.
	Disturbance to feeding, roosting and loafing areas	Aggregations of roosting or feeding dunlin are not subject to significant disturbance.
	Unimpeded sightlines at feeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Knot	Population size	The 5-year peak mean population size for the wintering knot population is no less than 12,394 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of knot prey species (e.g. small molluscs, Baltic tellin, mussel spat *Mytilus edulis* and cockle spat *Cerastoderma edule*, and mud snails., Kirby *et al.*, 2000) are maintained at levels sufficient to support the current population size of 12,394 individuals.
	Disturbance in feeding, and roosting areas	Aggregations of roosting or feeding knot are not subject to significant disturbance.

Feature	Attribute	Target
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Oystercatcher	Population size	The 5-year peak mean population size for the wintering oystercatcher population is no less than 22,677 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Habitat extent/height	The extent of rocky shore at Hilbre Island, Middle Eye, Little Eye and Tanskey Rocks is maintained; extent and height of the shingle spit at Point of Ayr is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of oystercatcher prey species are maintained at levels sufficient to support the current population size of 22,677 individuals.
	Disturbance in feeding, and roosting areas	Aggregations of roosting or feeding oystercatcher are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Bar-tailed godwit	Population size	Maintain the size of the non breeding population at a level which is no less than 1,150 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent, spatial distribution of roosting habitat and distribution of constituent communities	Maintain the extent of the intertidal flats and the spatial distribution of their constituent sediment community types; and maintain the extent and spatial distribution of vegetation less than 10cm in height across the saltmarsh.
	Disturbance in feeding, and roosting areas	Aggregations of birds roosting and feeding or on the intertidal flats or saltmarsh are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Maintain existing unrestricted bird sightlines of at least 200m in every direction around roosting sites and feeding areas.
Black-tailed godwit	Population size	The 5-year peak mean population size for the wintering black-tailed godwit population is no less than 1,747 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent, spatial distribution of roosting habitat and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of black-tailed godwit prey species (e.g. Baltic tellins, cockles Cerastoderma edule and polychaete worms including ragworms *Hediste diversicolor*, Kirby *et al.*, 2000) are maintained at levels sufficient to support the current population size of 1,747 individuals.
	Disturbance in feeding, and roosting areas	Aggregations of roosting and feeding black-tailed godwit are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Curlew	Population size	The 5-year peak mean population size for the wintering curlew population is no less than 3,899 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).

Feature	Attribute	Target
	Habitat extent, spatial distribution of roosting habitat and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of curlew prey species (e.g. shore crab *Carcinus maenas* and polychaete worms including ragworms, Kirby *et al.*, 2000) are maintained at levels sufficient to support the current population size of 3,899 individuals.
	Disturbance in feeding, and roosting areas	Aggregations of roosting or feeding curlew are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Grey plover	Population size	The 5-year peak mean population size for the wintering grey plover population is no less than 1,643 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent, spatial distribution of roosting habitat and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10 cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of grey plover prey species (e.g. polychaete worms, small molluscs and crustaceans, Kirby *et al.*, 2000) are maintained at levels sufficient to support the current population size of 1,643.
	Disturbance in feeding, and roosting areas	Aggregations of roosting or feeding grey plover are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Shelduck	Population size	The 5-year peak mean population size for the wintering shelduck population is no less than 7,725 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Habitat extent and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of shelduck prey species are maintained at levels sufficient to support the current population size of 7,725 individuals.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
	Disturbance in feeding, and roosting areas	Aggregations of loafing or feeding shelduck are not subject to significant disturbance.
Redshank	Population size	The 5-year peak mean population size for the passage redshank population is no less than 8,795 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Population size	The 5-year peak mean population size for the wintering redshank population is no less than 5,293 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).

Feature	Attribute	Target
	Habitat extent, spatial distribution of roosting habitat and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10cm in height is maintained.
	Food availability/prey abundance and dispersion	The abundance and dispersion of redshank prey species (e.g. amphipod crustaceans *Corophium* spp, mud snails, tellins. and ragworms, Kirby *et al.*, 2000) are maintained at levels sufficient to support the passage population size of 8,795 individuals and wintering population of 5,293.
	Disturbance in feeding, and roosting areas	Aggregations of roosting or feeding redshank are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around both roosting sites and feeding areas.
Waterbird assemblage	Population size	The 5-year peak mean population size for the wintering waterbird assemblage is no less than 120,726 individuals (i.e. the 5-year mean peak between 1994/95-1998/99).
	Proportion of biogeographic population	The relative proportions of waders and wildfowl comprising the wintering waterbird assemblage is maintained.
	Habitat extent and height, spatial distribution of roosting habitat and distribution of constituent communities	The extent of intertidal flats and the spatial distribution of their constituent sediment community types is maintained; the extent of saltmarsh and the spatial distribution of its constituent vegetation community types is maintained; the extent and spatial distribution of saltmarsh vegetation less than 10 cm in height is maintained; the extent of rocky shore at Hilbre Island, Middle Eye, Little Eye and Tanskey Rocks is maintained; and the extent and height of the shingle spit at Point of Ayr is maintained.
	Food availability/prey abundance and dispersion	The abundance of waterbird prey species is maintained at levels sufficient to support the population size of 120,726 individuals; and greater than 25% cover of both seed-bearing plants and soft leaved herbs and grasses is maintained during winter across the saltmarsh.
	Disturbance in feeding, and roosting areas	Aggregations of roosting, loafing or feeding waterbirds are not subject to significant disturbance.
	Unimpeded sightlines at feeding, breeding and roosting sites	Existing unrestricted bird sightlines of at least 200m are maintained in every direction around roosting sites, loafing and feeding areas.

1.9.1.3 Ribble and Alt Estuaries SPA

Site Description

The Ribble and Alt Estuaries SPA is situated in north-west England, approximately 1 km from the Proposed Development. The SPA comprises two estuaries and covers the extensive areas of sand and mudflats, large areas of saltmarsh and coastal grazing marsh. There is considerable interchange in the movements of birds between this site and Morecambe Bay, Mersey Estuary, Dee Estuary and Martin Mere. The site supports internationally important populations of waterbirds in winter, including swans, geese, ducks, and waders. It is also of major importance during migration periods, especially for wader populations moving along the west coast of Britain. The larger expanses of saltmarsh and areas of coastal grazing marsh support breeding birds, including large concentrations of gulls and terns.

Feature accounts

The qualifying ornithological features of Ribble and Alt Estuaries SPA are listed below with details of listed counts from the SPA classification citation document (Natural England 2002).

- Lesser black-backed gull– 1,800 breeding pairs (count as at 1993)
- Common tern - 182 breeding pairs (count as at 1996)

Condition assessment

The condition of the qualifying features, lesser-black backed gull and common tern are yet to be assessed.

Conservation objectives

The overarching conservation objectives for the Ribble and Alt Estuaries SPA are:

"*Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:*

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the population of each of the qualifying features; and
- the distribution of the qualifying features within the site."

No specific conservation objectives have been set for lesser black-backed gull or common tern within the Ribble and Alt Estuaries SPA, however there are objectives stated in the Sefton Ribble Site Improvement Plan (Natural England 2014) which aim to enhance population data and protect these features from disturbance, as shown in Table 1.128

Table 1.128: Conservation Issues And Targets For The Qualifying Features Of Ribble And Alt Estuaries SPA As Stated In The Sefton Ribble Site Improvement Plan (Natural England 2014)

Feature	Issue	Target
Lesser black-backed gull	Feature location/extent/pressure condition unknown	Improve population data and monitor impact of activities on local populations
	Threat from public access/disturbance	Raise public awareness via Landscape Partnership Scheme and the new Sefton Coastal Strategy
	Pressure from shooting/scaring and culling of gulls	Continue to support collection of data on gull numbers and on-going monitoring of the population of gulls in the colony (every 5 years)

Feature	Issue	Target
Common tern	Feature location/extent/pressure condition unknown	Improve population data and monitor impact of activities on local populations
	Threat from public access/disturbance	Raise public awareness via Landscape Partnership Scheme and the new Sefton Coastal Strategy
	Pressure/threat from invasive species	Use current and future research to investigate current population trends and determine whether action is needed, identify areas at risk, and implement best practice biosecurity and biosecurity planning.

1.9.1.4 Anglesey Terns SPA

Site description

The Anglesey Terns/Morwenoliaid Ynys Môn SPA extends around most of the east, north and west coasts of Anglesey, from the mean high-water mark out to between 10 and 20 km from the shore. It is a marine extension to the existing coastal SPA designated in 1992 to protect the breeding tern colonies at Ynys Feurig, Cemlyn Bay and the Skerries, to include the marine area used by the foraging terns during the breeding season. The SPA is located approximately 30 km from the Proposed Development.

Feature accounts

The qualifying ornithological features of Anglesey Terns SPA are listed below with details of listed counts from the SPA classification citation document (NRW 2015).

- Sandwich tern– 460 breeding pairs (3.3% of GB population)

Condition assessment

- Sandwich tern – The conservation status is currently considered to be in a favourable condition (Countryside Council for Wales 2008).

Conservation objectives

The conservation objectives of sandwich tern within the SPA are taken from the Anglesey Terns/Morwenoliaid Ynys Môn possible Special Protection Area: Draft conservation objectives (NRW 2015) are shown below.

- The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term.
- The distribution of the population should be being maintained, or where appropriate increasing.
- There should be sufficient habitat, of sufficient quality, to support the population in the long term.
- Factors affecting the population, or its habitat should be under appropriate control.

Table 1.129: Conservation Objectives For Sandwich Tern In Anglesey Terns SPA (NRW 2015)

Attribute	Target
Population	The breeding population of sandwich tern should be stable or increasing. The site was designated for 460 pairs across the SPA.
Distribution	The range and distribution of terns within the SPA and beyond is not constrained or hindered.
Habitat extent and quality	The extent of supporting habitats used by terns is stable or increasing. Supporting habitats are of sufficient quality to support the requirements of terns. There are appropriate and sufficient food sources for terns within access of the SPA.

Attribute	Target
Factors affecting the population, or its habitat	The number of chicks successfully fledged in the SPA and beyond is sufficient to help sustain the population. Actions or events likely to impinge on the sustainability of the population are under control. There should be no mammalian land predators present in the SPA, and control measures should be in place to ensure that accidental introduction does not take place.

1.9.1.5 Morecambe Bay and Duddon Estuary SPA

Site description

The SPA extends between Rossall Point in Lancashire and Drigg Dunes in Cumbria and is located approximately 22 km from the Proposed Development. The Morecambe Bay is the second largest embayment in Britain, extending over 310 km^2. It contains the largest continuous area of intertidal mudflats and sandflats, large areas of saltmarsh and transitional habitats, as well as sand dune systems and coastal lagoons. The Duddon and Ravenglass Estuaries support saltmarsh, intertidal mud and sand communities and sand dune systems with small areas of stony reef. The intermediate coast comprises extensive shingle and sand beaches. The SPA is used regularly by over 20,000 seabirds in any season.

Feature accounts

The qualifying ornithological features of Morecambe Bay and Duddon Estuary SPA are listed below with details of listed counts from the SPA classification citation document (Natural England, 2017).

- Lesser black-backed gull–
  - 9,450 non breeding individuals (2009/10-2013/14) (WeBS data)
  - 9,720 breeding individuals (2011-2015) (Seabird Monitoring Programme database, RSPB and Cumbria Wildlife Trust)

Condition assessment

The condition of the qualifying feature, lesser black-backed gull, within Morecambe Bay and Duddon Estuaries SPA has not been formally assessed.

Conservation objectives

The overarching conservation objectives for Morecambe Bay and Duddon Estuaries SPA are:

"*Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:*

- the extent and distribution of the habitats of the qualifying features;
- the structure and function of the habitats of the qualifying features;
- the supporting processes on which the habitats of the qualifying features rely;
- the population of each of the qualifying features; and
- the distribution of the qualifying features within the site."

The targets for conserving the ornithological features within the Morecambe Bay and Duddon Estuaries SPA shown in Table 1.130 are taken from the Morecambe Bay European Marine Site Conservation Advice Package (English Nature, 2000).

Table 1.130: Conservation Attributes And Targets For Waterfowl And Seabirds In Morecambe Bay And Duddon Estuaries SPA (English Nature, 2000)

Interest Feature	Attribute	Target
Internationally important assemblage of waterfowl and seabirds including internationally important populations of regularly occurring migratory species	Habitat extent	Subject to natural change, to maintain in favourable condition the habitats of the internationally important assemblage of waterfowl and seabirds and the internationally important populations of regularly occurring migratory species, in particular: • Intertidal mudflat and sandflat communities • Intertidal and subtidal boulder and cobble skear communities • Saltmarsh communities • Coastal lagoon communities (i.e. no decrease in extent of habitat from an established baseline (aerial photographs 1997), subject to natural change).
	Presence and abundance of prey species	Presence and abundance of prey species should not deviate from an established baseline, subject to natural change.
	Disturbance in feeding and roosting areas	No significant reduction in numbers of or displacement of birds from an established baseline, subject to natural change.

1.9.1.6 Aberdaron Coast and Bardsey Island SPA

Site description

The Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA is approximately 98 km from the Proposed Development, located in north-west Wales and consists of Ynys Enlli/Bardsey Island and a length of adjacent coastline together with two small islands and an area of sea extending approximately 9 km out from Bardsey. The coastline is rocky, with many crags and low cliffs in a distinctive landscape of small fields and stone-faced banks. Bardsey Island holds a large breeding colony of Manx shearwaters which forage widely across the ocean and loaf on adjacent areas of the sea for a number of essential activities, such as preening, bathing and displaying, before attempting their hazardous approach to the nest site after nightfall.

Feature accounts

The qualifying ornithological features of Aberdaron Coast and Bardsey Island SPA are listed below with details of listed counts.

Manx shearwater– 6,930 breeding pairs (count as of 1996, Stroud *et al.*, 2001)

Condition assessment

- Manx shearwater - The conservation status is currently considered to be in a favourable, maintained condition (Countryside Council for Wales 2008).

Conservation objectives

The Core Management Plan for Aberdaron Coast and Bardsey Island SPA (Countryside Council for Wales 2008) states:

The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:

- breeding population of Manx shearwater (confined to Ynys Enlli) is stable or increasing;
- reproductive rates remain stable;
- deaths from the lighthouse attractions, fencing and other infrastructure are minimal;

- no ground predators are introduced;
- nesting birds are not disturbed by restoration works on boundary walls or recreational activities; and
- all factors affecting the achievement of these conditions are under control.

To maintain favourable conservation status of Manx shearwater, several conservation objectives and targets have been set, as shown in Table 1.131.

Table 1.131: Conservation Attributes And Targets For Manx Shearwater Within Aberdaron Coast And Bardsey Island SPA (Countryside Council For Wales 2008)

Attribute	Target
Breeding population size	Breeding population of Manx shearwater (confined to Ynys Enlli) is stable or increasing, (i.e. lower limit of 10,000 pairs or 1% of the UK population).
Productivity /breeding success	Reproductive rates remain stable, (i.e. 5-year mean of 0.6 per pair (lowest tolerable limit of >0.5 for 3 consecutive years)).
Deaths from lighthouse attraction	Upper limit: 30 fatalities per year or <0.3% of the Enlli population. Lower limit: Gantry lights and light exclusion zone in place annually.
Deaths from barbed wire/other fencing and similar materials	Upper limit: 5 fatalities per year or <0.05% of the Enlli population. No unnecessary barbed wire erected. Lower limit: All unnecessary barbed wire removed.
Ground-based predators	Upper limit: No domestic or wild predators introduced to the island. Lower limit: None set.
Avian predators	Upper limit: None set. Lower limit: All corvids seen predating in burrows should be controlled to prevent spread of learned behaviour.
Boundary wall maintenance practice	Upper limit: None set. Lower limit: All boundary restoration work must take account of the potential effects on Manx shearwaters and must only be carried out to the strict guidelines set out in the Ynys Enlli Management Plan. All staff, contractors or volunteers working on field boundaries must be made aware of the guidelines. All field boundaries have been surveyed and the number of Manx shearwater burrows in each recorded. Boundaries have thus been categorised as to whether they are of importance to Manx shearwaters. Significant boundaries are those with 5 or more burrows per 100m.
Marine pollution incidents	Upper limit: No incidences of island generated pollution. No major pollution incidents within 30 miles of Ynys Enlli. Lower limit: None set.
Human disturbance/trampling	Upper limit: 2 burrows accidentally damaged per year. Lower limit: All promoted paths should avoid Manx shearwater burrows. All visitors to be advised of sensitive areas.

1.9.1.7 Ailsa Craig SPA

Site description

Ailsa Craig SPA is approximately 196 km from the Proposed Development, located in the outer part of the Firth of Clyde, on the west coast of Scotland. It consists of cliffs up to 100 m which encircle the island and provide nesting sites for a variety of seabirds, notably one of the largest Northern gannet colonies in the world. The boundary of Ailsa Craig SPA is coincident with Ailsa Craig SSSI. The seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface.

Feature accounts

The qualifying ornithological features of Ailsa Craig SPA are listed below with details of listed counts.

- Northern gannet– 23,000 breeding pairs (8.7% of world biogeographic population) (Nature Scot 2009)

Condition assessment

- Northern gannet - The conservation status is currently considered to be in favourable maintained condition (Nature Scot 2021)

Conservation objectives

Although conservation objectives targeted specifically to gannets have not been set, the overarching conservation objectives for the Ailsa Craig SPA (Nature Scot 2009) are:

"*To avoid deterioration of the habitats of the qualifying species (listed below) or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and*

To ensure for the qualifying species that the following are maintained in the long term:

- population of the species as a viable component of the site;
- distribution of the species within site;
- distribution and extent of habitats supporting the species;
- structure, function and supporting processes of habitats supporting the species; and
- no significant disturbance of the species."

1.9.1.8 Skomer, Skokholm and the Seas off Pembrokeshire SPA

Site description

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA is located approximately 213 km from the Proposed Development, in south-west Wales and extends beyond the 12 nautical mile boundary, lying in Welsh territorial waters and in UK offshore waters. The islands of Skomer and Skokholm support the largest concentration of breeding seabirds in England and Wales. They hold the largest breeding colony of Manx shearwater in the world, one of the largest colonies of lesser black-backed gull in Britain as well as being important Welsh breeding sites for other seabird populations, such as razorbill *Alca torda*, black-legged kittiwake *Rissa tridactyla*, Atlantic puffin *Fratercula arctica* and common guillemot *Uria aalge*.

Feature accounts

The qualifying ornithological features of Skomer, Skokholm and the Seas of Pembrokeshire SPA are listed below with details of listed counts.

- Storm petrel– 3,500 pairs (13% of the GB population) (Stroud *et al.*, 2001)
- Manx shearwater– 150,968 breeding pairs (68.6% of the GB population and up to 57% of the global population) (Stroud *et al.*, 2001)

Condition assessment

The condition assessments for each qualifying feature of Skomer, Skokholm and the Seas off Pembrokeshire SPA (Countryside Council for Wales 2008) are listed below:

- Storm petrel – The conservation status is currently considered to be unfavourable unclassified.
  - "*The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:*

 - *The population of storm petrel will be at least 3500 pairs within the SPA.*
 - *Sufficient suitable nesting sites will be present to support at least the current populations.*
 - *The factors affecting the feature are under control*."
- Manx shearwater – The conservation status is currently considered to be favourable maintained.

Conservation objectives

The conservation objectives for storm petrel and Manx shearwater within Skomer, Skokholm and the Seas off Pembrokeshire SPA are shown in Table 1.132.

- Breeding population size.
- Human disturbance affecting distribution.
- Availability and quality of habitat.
- Disturbance affecting breeding success.

Table 1.132: Conservation Attributes And Targets For Storm Petrel And Manx Shearwater Within Skomer, Skokholm And The Seas Off Pembrokeshire SPA (NRW 2015).

Feature	Attribute	Target
Storm petrel	Breeding population size	The breeding population of storm petrel should be stable or increasing. The aim, across the 2 islands is for at least 3,500 pairs, with this number to be stable or increasing.
	Human disturbance affecting distribution	The distribution of this species within the site should not be constrained by anthropogenic factors, including disturbance by the public and activities leading to possible loss of suitable nesting sites.
	Availability and quality of habitat	The foraging habitat of this species should be stable or increasing in terms of its area, and its quality should remain unaffected by anthropogenic factors. There should be no contraction of the distribution of nesting sites as a result of anthropogenic factors.
	Disturbance affecting breeding success	Breeding success of this species should remain unaffected by negative human influence. Factors affecting the species within the site should be under control.
Manx shearwater	Breeding population size	The breeding population of Manx shearwater should be stable or increasing with no measured decrease in numbers (based on a population count of 150,968), based on annual study plots. Breeding success will be at least 0.5 chicks per egg laid.
	Human disturbance affecting distribution	The distribution of this species within the site should not be constrained by anthropogenic factors, including disturbance of nesting sites by the public and activities leading to possible loss of suitable nesting sites.
	Availability and quality of habitat	The breeding and foraging habitat of this species should be stable or increasing in terms of its area, and its quality should remain unaffected by anthropogenic factors.
	Human disturbance	Rafting birds should remain unaffected by boat use and other anthropogenic factors; appropriate codes of conduct must be followed by all visitors and craft surrounding the islands. Factors affecting the species within the site should be under control.

1.9.1.9 Grassholm SPA

Site description

Grassholm SPA is a 10-ha island located approximately 10 miles off the Pembrokeshire coast. It supports a gannet colony of international importance, and small colonies of lesser, herring and great black-backed gulls which nest in the turf and rocks of the eastern side of the island. The western rock ledges support small numbers of guillemot, razorbill and kittiwake. Small numbers of storm petrels are also thought to breed among the rock boulders. The Grassholm SPA is approximately 224 km from the Proposed Development.

Feature accounts

The qualifying ornithological features of Grassholm Island SPA are listed below with details of listed counts.

- Northern gannet– 33,000 pairs (representing at least 12.5% of the breeding North Atlantic population) (NRW 2013)

Condition assessment

- Northern gannet - The conservation status is currently considered to be in favourable, maintained condition (Countryside Council for Wales 2008)

Conservation objectives

The Core Management Plan for Grassholm Island SPA (Countryside Council for Wales 2013) states:

"*The vision for this feature is for it to be in a favourable conservation status, where all of the following conditions are satisfied:*

- the population will not fall below 30,000 pairs in three consecutive years;
- it will not drop by more than 25% of the previous year's figures in any one year; and
- there will be no decline in this population significantly greater than any decline in the North Atlantic population as a whole."

To achieve this vision, performance indicators for the feature have been set. These are shown in Table 1.133.

Table 1.133: Conservation Attributes And Targets For Northern Gannet On Grassholm Island SPA (Countryside Council For Wales 2008)

Attribute	Target
Number of pairs	Upper limit: Not set Lower limit: 30,000 (based on population extent as in 2008)
Measurable change in number of pairs	Upper limit: Not required Lower limit: decline of 25% on previous year
Pollution	Upper limit: none set Lower limit: none set
Litter	Upper limit: none set Lower limit: none set
Human disturbance	Upper limit: none set Lower limit: none set
Fisheries management	Upper limit: none set Lower limit: none set

1.9.1.10 Saltee Islands SPA

Site description

The Saltee Islands SPA covers an area of approximately 8.7 km^2 and is situated some 4-5 km off the coast of south Co. Wexford. It comprises the two islands, Great Saltee and Little Saltee, and the surrounding seas both between them and to a distance of 500 m from them. Both islands have exposed rocky cliffs on their south and east rising up to 30 m. The northern and western sides of both islands are fringed with shingle and boulder shores, backed by boulder clay cliffs, as well as small areas of intertidal sandflats. Sea caves occur at the base of the cliffs on Great Saltee. The site is of special conservation interest for holding an assemblage of over 20,000 breeding seabirds. The Saltee Islands SPA is approximately 246 km from the Proposed Development.

Feature accounts

The qualifying ornithological features of Saltee Islands SPA are listed below with details of listed counts (Saltee Islands SPA Site Synopsis 2012).

- Northern fulmar– 520 breeding pairs (estimates from 1998-2000 breeding seasons)
- Northern gannet– 2,446 breeding pairs (2004)

Condition assessment

The condition of each qualifying feature is taken from the Saltee Islands SPA Conservation Objectives Series (NPWS 2011).

- Northern fulmar– The conservation status is currently considered to be in favourable condition.
- Northern gannet – The conservation status is currently considered to be in favourable condition.

Conservation objectives

The Saltee Islands SPA Conservation Objectives Series (NPWS 2011) state:

The favourable conservation status of a species is achieved when:

- Population dynamics data on the species concerned indicate that it is maintaining itself on a long- term basis as a viable component of its natural habitats;
- The natural range of the species is neither being reduced nor is likely to be reduced for the foreseeable future; and
- There is, and will probably continue to be, a sufficiently large habitat to maintain its populations on a long-term basis.

The conservation objectives for the qualifying ornithological features within Saltee Islands SPA are shown in Table 1.134.

Table 1.134: Conservation Attributes And Targets For Fulmar And Northern Gannet Within Saltee Islands SPA

Feature	Attribute	Target
Northern fulmar	Breeding population abundance: apparently occupied sites (AOSs)	No significant decline
	Productivity rate	No significant decline
	Distribution: breeding colonies	No significant decline
	Prey biomass available	No significant decline
	Barriers to connectivity	No significant increase

Feature	Attribute	Target
	Disturbance at the breeding site	No significant increase
	Disturbance at marine areas immediately adjacent to the colony	No significant increase
Northern gannet	Breeding population abundance: apparently occupied sites (AOSs)	No significant decline
	Productivity rate	No significant decline
	Distribution: breeding colonies	No significant decline
	Prey biomass available	No significant decline
	Barriers to connectivity	No significant increase
	Disturbance at the breeding site	No significant increase
	Disturbance at marine areas immediately adjacent to the colony	No significant increase

1.9.2 Information to inform the alone assessment

1.9.2.1 Proposed Development alone

1.9.2.1.1 Maximum design scenario

The design parameters identified in Table 1.135 have been selected as those having the potential to result in the greatest effect on offshore and intertidal ornithological features, and therefore represent the maximum design scenario (MDS). Effects of greater adverse significance are not predicted to arise should any other development scenario, based on details within the Project Description (e.g. different infrastructure layout), to that assessed here be taken forward in the final design scheme.

Table 1.135: Maximum Design Scenario Considered For The Assessment Of Impacts On Offshore And Intertidal Ornithological Features

[a] C=construction phase, O=operation and maintenance phase, D=decommissioning phase

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	**Construction Phase** **Offshore Inter-platform Cables** Number of cables: 3 Zone of disturbance: 15 m width per trench Maximum burial depth: 3 m Maximum width of trench: 1.5 m Cable length: 12 km (Douglas to Hamilton), 15 km (Douglas to Hamilton North), 35 km (Douglas to Lennox) **Point of Ayr Terminal-Douglas Cable** Number of cables: 2 Distance between cables: 30 m minimum Zone of disturbance: 15 m width per trench Maximum width of trench: 1.5 m Total length: 34 km per cable **Injection Wells – Hamilton** Number of wells: 4 Days to completion: 35 per well Distance to coastline: 23 km **Injection Wells – Hamilton North** Number of wells: 2 Days to completion: 35 per well Distance to coastline: 26 km **Injection Wells – Lennox** Number of wells: 2 targets Days to completion: 45 per well Distance to coastline: 11 km	**Construction Phase** The MDS includes the maximum construction corridor width, within which the cables will be located – this represents the largest physical impact and greatest area of habitat loss. Open cut trenching generally represents the worst case in relation to habitat loss, compared to HDD beneath a feature. The MDS includes the maximum number of wells to be drilled or altered. The works associated with this represent largest physical and disturbance impact. **Decommissioning Phase** Decommissioning is likely to operate within the parameters identified for construction.

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
				Monitoring Wells – Hamilton Main Number of wells: 1 Days to completion: 55 Distance to coastline: 23 km **Monitoring Wells – Hamilton North** Number of wells: 1 Days to completion: 55 Distance to coastline: 26 km **Monitoring Wells – Lennox** Number of wells: 1 Days to completion: 45 Distance to coastline: 26 km **Sentinel Wells – Hamilton North** Number of wells: 1 Days to completion: 20 Distance to coastline: 26 km **Sentinel Wells – Lennox** Number of wells: 1 Days to completion: 20 Distance to coastline: 11 km **Decommissioning Phase** Decommissioning activities are anticipated to occur within the areas affected by the construction phase. Temporary habitat loss will be limited to temporary works areas no greater in size than the construction works areas	

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	**Construction Phase** **OP and Wells** Maximum number of installation and support vessels: 3 Maximum number of tugs/anchor handlers: 7 Maximum number of cargo barges: 5 Maximum number of support vessels: 2 Maximum number of survey vessels: 2 Maximum number of seabed preparation vessels: 2 Maximum number of crew transfer vessels: 2 **Cables and Pipeline** Preferred burial technique: plough Maximum number of cable lay installation and support vessels: 4 Maximum number of jack up vessels: 2 Maximum number of multicat vessels: 2 Maximum number of working boats: 3 Maximum number of support vessels for trenching: 1 Maximum number of DSV/LCV for cable pull in: 1 Maximum number of survey vessels: 1 Maximum number of seabed preparation vessels: 1 Maximum number of crew transfer vessels: 1 Maximum number of cable protection installation vessels: 1 Maximum number of cable burial installation vessels: 1 **UXO** Possibility of finding UXO **Operation and Maintenance Phase** Maximum number of jack up vessels: 1 Maximum number of other vessels: 3 Maximum number of helicopters: 1 **Decommissioning Phase**	**Construction Phase** The MDS includes the maximum number of vessels to be present on site in relation to topside installation at any given time and the extent of impact is based on this. These vessels will be present across the whole site, including each platform and well location. The preferred method for laying cables using a plough will contribute to sound levels. Magnetometer surveys have not indicated a high potential for UXO to be found however if located may be detonated in situ. **Operation and Maintenance Phase** The MDS includes the maximum number of vessels to be present on site in relation to the operation and maintenance of the project. These vessels will be present across the whole site, including each platform and well location. **Decommissioning Phase** The MDS includes the maximum number of vessels to be present on site in relation to the decommissioning of the project. These vessels will be present across the whole site, including each platform and well location.

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
				Maximum number of main decommissioning and support vessels: 2 Maximum number of tug/anchor handlers: 6 Maximum number of number of barges: 4 Maximum number of cable decommissioning and support vessels: 2 Maximum number of survey vessels: 1 Maximum number of crew transfe2 vessels: 2	
Collision with static offshore infrastructure	✗	✓	✗	**Operation and Maintenance Phase** Number of platforms: 4 Heights below taken at lowest astronomical tide (LAT). **Douglas OP** Height of main structure: 38.5 m Height of helideck: 46.5 m Height of crane: 62.7 m Length: 76.7 m Width: 45.6 m **Hamilton Main OP** Height: 33.5 m Length: 27.8 m Width: 23.9 m **Hamilton North OP** Height: 33.5 m Length: 27.8 m Width: 23.9 m **Lennox OP** Height: 35.7 m Length: 33.9 m Width: 29.6 m	**Operation and Maintenance Phase** The MDS includes the maximum heights of the operating platforms in relation to the operation and maintenance of the project. These structures present the greatest risk of collision across the site. A reduced number of vessels operating in the area compared to during the construction and decommissioning phases may reduce disturbance levels and increase the number of birds in the area.

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
Indirect impacts to birds from changes in prey availability	✓	✓	✓	**Construction Phase** Disturbance to fish and shellfish from underwater sound and sedimentation leading to possible displacement of prey. Underwater noise caused by cable laying activities may impact prey up to 68 m from activities. Piling activities associated with platform construction have the potential to displace prey. The dredging of West Hoyle Bank to install a cable route will involve dredging a trench 1 km long, 60 m wide and 7 m deep and the Suspended Sediment Concentration (SSC) may lead to possible displacement of prey. The cable laying plough and associated SSCs may lead to possible displacement of prey. **Operation and Maintenance Phase** Disturbance to fish and shellfish from underwater sound and sedimentation leading to possible displacement of prey. **Decommissioning Phase** Disturbance to fish and shellfish from underwater sound and sedimentation leading to possible displacement of prey.	**Construction Phase** The preferred method of laying cables is via plough, likely to generate high vibration levels. The presence of surface vessels and below water construction activity will impact the distribution of prey in the area. **Operation and Maintenance Phase** Routine maintenance and operation will impact prey distribution and many present an injury risk to fish/shellfish through the presence of vessels. Activities such as the removal of marine growth from subsea structures will likely give rise to vibration levels, sediment disturbance and noise resulting in an impact on prey distribution. **Decommissioning Phase** Subsea installations on the seabed that are exposed or at a depth of up to 0.6 m will be removed, this will generate vibration and noise disturbance.
Accidental pollution in the surrounding area	✓	✓	✓	**Construction Phase** Drilling of wells (creation of new and re-directing existing). Cutting of trenches for cable laying. Detonation of UXO along cable route. Presence of vessels involved in construction processes. **Operation and Maintenance Phase** Presence of vessels involved in routine operation and maintenance. **Decommissioning Phase** Presence of vessels involved in decommissioning processes.	**Construction Phase** Vessels associated with the construction process present a risk of fuel run-off. **Operation and Maintenance Phase** Vessels associated with the routine operation and maintenance processes present a risk of fuel run-off. **Decommissioning Phase** Vessels associated with the decommissioning process present a risk of fuel run-off.

Potential Impact	Phase[a] C	O	D	Maximum Design Scenario	Justification
					The cleaning of pipelines during decommissioning present a risk of contamination should leakage occur into the sea.
Creation of roosting and nesting habitats among project infrastructure	✗	✓	✗	**Operation and Maintenance Phase** Number of platforms: 4 Heights below taken at lowest astronomical tide (LAT). **Douglas OP** Height of main structure: 38.5 m Height of helideck: 46.5 m Height of crane: 62.7 m Length: 76.7 m Width: 45.6 m **Hamilton Main OP** Height: 33.5 m Length: 27.8 m Width: 23.9 m **Hamilton North OP** Height: 33.5 m Length: 27.8 m Width: 23.9 m **Lennox OP** Height: 35.7 m Length: 33.9 m Width: 29.6 m	**Operation and Maintenance Phase** The MDS includes the maximum heights of the operating platforms in relation to the operation and maintenance of the project. These structures provide the only potential for offshore roosting and nesting habitat within the project area.

1.9.2.2 Impacts

Temporary habitat loss leading to displacement/disturbance of birds

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from temporary habitat loss leading to displacement/disturbance of birds. This relates to the following designated site and relevant features;

Liverpool Bay SPA;

- All features – see Table 1.125.

Dee Estuary SPA;

- All features – see Table 1.125.

The impact of the construction and decommissioning is likely to result in the temporary removal of habitat that supports water birds. The potential impact on receptors is predicted to vary both spatially and temporally across habitats and seasons in which receptors are present in throughout the offshore and intertidal ornithology study area and through which elements of the Proposed Development. The new cable corridor and the associated vessels used during construction are likely to affect receptors utilising the intertidal area for foraging, loafing and roosting. Offshore species may be disturbed and displaced from their foraging grounds due to construction works and the associated vessel traffic. In addition, breeding species may be impacted by the loss of foraging habitat.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from disturbance and displacement from airborne sound and presence of vessels and infrastructure. This relates to the following designated site and relevant features;

Liverpool Bay SPA;

- All features – see Table 1.125.

Dee Estuary SPA;

- All features – see Table 1.125.

Ribble and Alt Estuaries SPA;

- Common tern.

Anglesey Terns/Morwenoliaid Ynys Môn SPA;

- All features – see Table 1.125.

Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA;

- All features – see Table 1.125.

Alisa Craig SPA;

- All features – see Table 1.125.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA;

- All features – see Table 1.125.

Grassholm SPA;

- All features – see Table 1.125.

Saltee Islands SPA;

- All features – see Table 1.125.

All phases of the Project involve airborne noise due to the presence of vessels and infrastructure within the site boundary. The potential impact on receptors is predicted to vary both spatially and temporally across habitats and seasons in which receptors are present throughout the offshore and intertidal ornithology study area. The construction of a cable corridor and the associated vessels used during all phases are likely to affect receptors utilising the intertidal area for foraging, loafing and roosting. Offshore species may be disturbed and displaced from their foraging grounds due to noise from works and the presence of associated vessel across all phases.

Collision with static offshore infrastructure

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from collision with static offshore infrastructure. This relates to the following designated site and relevant features;

Ribble and Alt Estuaries SPA;

- Lesser black-backed gull.

Morecambe Bay and Duddon Estuary SPA

- Lesser black-backed gull.

Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA

- Manx shearwater

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

- All features – see Table 1.125.

Collisions of seabirds and/or migratory waterbirds with static offshore structures may result in the death or injury of individuals. Therefore, seabird species which forage within, or commute through, the Proposed Development may be vulnerable to such effects, as is also the case for migratory waterbirds which transit this area on migration. Risk of collision of seabirds to offshore stationary structures is likely to be restricted to species attracted to lights (such as storm-petrels and shearwaters; Ronconi *et al.*, 2015 and Deakin *et al.*, 2022) that may become disoriented under specific circumstances. In addition, species which are attracted to the platform due to potential roosting and nesting opportunities (e.g gull species; Ronconi *et al.*, 2015).

Given the offshore location of the Proposed Development, it is extremely unlikely that any of the migratory waterbird species associated with European sites would make more frequent movements across the Proposed Development (e.g. when commuting between foraging and roosting sites), and it is considered that collision risk for these species is limited to their migratory movements.

Indirect impacts from changes in prey availability

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from indirect impacts from changes in prey availability. This relates to the following designated site and relevant features;

Liverpool Bay SPA;

- All features – see Table 1.125.

Dee Estuary SPA;

- All features – see Table 1.125.

Ribble and Alt Estuaries SPA;

- Common tern.

Anglesey Terns/Morwenoliaid Ynys Môn SPA;

- All features – see Table 1.125.

Morecambe Bay and Duddon Estuary SPA

- All features – see Table 1.125.

Alisa Craig SPA;

- All features – see Table 1.125.

Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA;

- Storm petrel

Grassholm SPA;

- All features – see Table 1.125.

Saltee Islands SPA;

- Gannet

There is the potential for changes in bird prey (e.g. fish species or intertidal invertebrates) abundance and distribution to arise as a result of construction, operation and maintenance as well as decommissioning activities. Reduction or disruption to prey availability to birds may cause displacement from foraging grounds in the area, or result in reduced energy intake, affecting survival rates or productivity in the population. Changes in prey distribution, availability or abundance in the marine environment due to the presence of offshore infrastructure, and as a result of operation and maintenance activities that disturb the seabed (and cause increased SSCs) or increase subsea noise levels. The exception in this regard is fulmar and Manx shearwater, for which this effect pathway is unlikely to be important because of the particularly large foraging range of the species.

During operation indirect impacts of prey availability affecting birds will be significantly lower in the operation and maintenance phase, therefore, the potential for adverse effects on prey species as a result is greatly reduced. Similarly, seabed disturbance and associated increased SSCs will also be substantially lower in the operation and maintenance phase, namely occurring during cable or foundation maintenance activities. There is also potential that once *in situ* the offshore structures increase the presence and abundance of prey and could lead to a beneficial impact on bird species.

Migratory waterbird species would not be significantly affected when passing through (or over) the site on migration (as they are not expected to forage or rest in the marine environment around the Proposed Development). However, as the offshore cable corridor passes through the Liverpool Bay and Dee Estuary SPAs there is the potential for LSE in relation to these sites.

Accidental pollution in the surrounding area

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from accidental pollution in the surrounding area. This relates to the following designated site and relevant features;

Liverpool Bay SPA;

- All features – see Table 1.125.

Dee Estuary SPA;

- All features – see Table 1.125.

Although there is a risk of pollution being accidentally released during the construction, operation and maintenance as well as decommissioning phases of the Proposed Development from sources including vessels/vehicles and equipment/machinery, the likelihood of an accidental release of pollutants is extremely low, but should an event occur, effects would be limited in spatial extent. In addition, it is anticipated that the risk of such events occurring will be managed by the implementation of measures set out in standard industry guidance documents such as ERP, OPEPs and SOPEPs.

Creation of roosting and nesting habitats among project infrastructure

The assessment of LSE during the HRA screening process identified that during the construction phase, LSE could not be ruled out for the potential impact from creation of roosting and nesting habitats among project infrastructure. This relates to the following designated site and relevant features;

Ribble and Alt Estuaries SPA;

- Lesser black-backed gull.

Morecambe Bay and Duddon Estaury SPA

- All features – see Table 1.125.

The introduction of newly refurbished infrastructure and additional components of the Proposed Development has the potential to create new roosting and nesting habitats, which may attract some species of seabirds. The main infrastructure that could potentially serve as roosting and/or nesting habitat within the Proposed Development would include the reconfigured platforms. Three already existing offshore platforms will be reconfigured with new modules and structures and one new platform will be built.

Only certain species of seabird have been proven to roost on offshore structures habitually (Dierschke *et al.*, 2016) namely cormorants and gulls (Burke *et al.*, 2012, Hope Jones, 1980, Tasker *et al.*, 1986) therefore it is considered that there is the potential for a positive LSE on offshore ornithological qualifying features of Ribble and Alt Estuaries SPA and Morecambe Bay and Duddon Estuary SPA.

1.9.3 Assessment of adverse effects alone

1.9.3.1 Liverpool Bay SPA

The objective of the Liverpool Bay SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.1 and impacts associated with the Proposed Development with respect to the overarching conservation objectives established for this site (Natural England, 2019):

Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.

Conservation objective 2 – The structure and function of the habitats of the qualifying features.

Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.

Conservation objective 4 – The population of each of the qualifying features.

Conservation objective 5 – The distribution of the qualifying features within the site.

Not all conservation objectives are relative to each impact, therefore Table 1.136 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Liverpool Bay SPA.

Table 1.136: Impacts Considered For Each Conservation Objective – Liverpool Bay Spa

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Temporary habitat loss leading to displacement/disturbance of birds	✓	✓	✓	✓	✓
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Accidental pollution in the surrounding area	×	×	×	✓	✓

Temporary habitat loss leading to displacement/disturbance of birds

A total of 37.02 km^2 of the physical works area sits within the Liverpool Bay SPA which itself is 2521.77 km^2 in extent. Assuming that all of the SPA represents foraging for its various features, this equates to 1.47% of the Liverpool Bay SPA that will be temporarily affected by proposed works. It can be presumed that the area of the phyical works would be lost to all qualifying species. However, once construction has finalised the habitat will be returned to it's previous state.

For little tern that only use a very limited area within the Liverpool Bay, the areas of loss within their respective foraging range has been calculated. This equates to 0.167% of the little tern foraging range.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Displacement modelling has been undertaken for all species where data was available (see Offshore Ornithology Displacent Technical Report (RPS group, 2024b) utilising a mixture of the HiDef Aerial Surveying Limited (2023); Waggit, *et. al*. (2020) and Bradbury, *et. al*. (2016) data, the results of this are summarised in Table 1.137. The number presented within the table represent a 100% displacement around the 12 construction vessels and a 1% mortality rate. This is deemed the worst case scenario.

Density data was not available for little tern within Liverpool Bay SPA so instead the amount of available foraging habitat that will be subject to disturbance from visual and audial sources at any one time has been calculated. A precautionary disturbance distance of 50 m is used for little tern, see Offshore Ornithology Baseline Technical Report (RPS group, 2024a) for further information.

Table 1.137: Showing The Maximum Excess Mortality Caused Through Displacement As Calculated For The Liverpool Bay Features

Feature	Season	Excess mortality caused by displacement (%)	Amount of foraging habitat subject to disturbance (%)
Red-throated diver	Non-breeding	0.89	N/A
Little gull	Non-breeding	0.040	N/A

Common scoter	Non-breeding	0.98	N/A
Little tern	Breeding	0.04	0.8

Displacement will be highest during the construction phase but this can be considered a temporary impact, and as all excess mortality is below 1% displacement does not significantly impact the long term viability of the populations. As the increase in excess mortality (or reduction in available habitat) is short term and reversible and is not sufficient to significantly impact population viability there would be no adverse effects to the integrity of the Liverpool Bay SPA.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are predicted to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases.

For mobile species during the non-breeding season, the assessment of fish within volume 2, chapter 7: marine biodiversity, and the diadromous fish section of this RIAA concluded that there would be no significant impact on fish. Therefore, the fish are likely to move away from construction and operational areas in a similar manner as the birds and therefore the impacts from changes in prey availability will be of the same, if not of less significance that the temporary habitat loss.

For breeding species that are concentrated within a small foraging range such as little tern. Displacement of prey due to underwater noise created by cable laying activities has been quantified as affecting between 2.4% and 2.9% of the little tern foraging range (Little Tern Foraging Distribution Technical Report). Common tern have a larger foraging range (18 km from Woodward et al., 2014) and the area affected will be approx. 0.01% which is negligible.

Displacement caused by sedimentation is harder to quantify due a lack of numerical data in the literature, however dredging works for the West Hoyle Bank will be approx. 1 km across, 60 m in width and 7 m in depth, these will take approx. two to three weeks to complete and may result in average Suspended Sediment Concentration (SSC) values of over 3000 mg/l in shallower waters. In addition, the cable plough itself may result in SSCs of over 1000 g/l in the shallower nearshore waters where the little tern forage Physical Processes Technical Report (RPS, 2024d). This is over the 1 g/l that may be harmful to adult fish (Engell-Sørensen and Skyt, 2001), and it would be reasonable to assume that some displacement of fish may occur, although it is not possible to quantify this. Additionally, fish eggs may be smothered and killed which will further reduce the amount of small prey items available for the little tern.

Assuming works were to take place during the breeding season (which for little tern is between April and July), then although the impacts caused by construction may be high in any one year, the impacts will be reversible causing no long-term effects to the biogeographic populations of little tern and common tern. Taking that into consideration the magnitude of impact during construction is taken as a precautionary ‘low’.

Although work is still needed to define the sensitive egg laying and chick rearing period for the Gronant Dunes colony, measures to limit works during the sensitive egg laying and chick rearing period (Volume 2, Chapter 8: Offshore Ornithology) when little tern are concentrated within a small foraging range are to be discussed further with NRW. Works carried out after chick fledging when the little tern are not confined to a small foraging range would have a negligible impact. Therefore, for these receptors the magnitude of impact for construction is presented for both work during the breeding period and for works outside of the breeding period.

Accidental pollution in the surrounding area

There is a risk of pollution being accidentally released during the construction, operation and maintenance as well as decommissioning phases from sources including vessels/vehicles and equipment/machinery. The likelihood of an accidental release of pollutants is extremely low. However, should an event occur, effects would be limited in spatial extent. In addition, it is anticipated that the risk of such events occurring will be managed by the implementation of measures set out in standard industry guidance documents such as ERP, OPEPs and SOPEPs. Birds that spend a lot of time in the water such as common scoter and red-throated diver would be more susceptible to any risks, however as the risks of spillage are low, any spills will be limited in extent, and any effects will be reversible, so there would be no adverse effects to the integrity of the Liverpool Bay SPA in any phase caused by the risk of accidental pollution in the surrounding area.

Summary

Table 1.138 below contains the summary assessment of each conservation objective (section 1.9.1.1.4) for each feature of the Liverpool Bay SPA against each impact pathway. Only impact pathways which have potential to affect the conservation objects are presented, see Table 1.74 for breakdown.

For little tern, assuming that works are carried out during the core egg laying and chick rearing period, for the construction and decommissioning phases there will be a **negligible adverse effect upon the integrity of the Liverpool Bay SPA for conservation objectives 1, 2 and 3** and a **moderate adverse effect upon the integrity of the Liverpool Bay SPA for conservation objectives 4 and 5.**

For little tern, assuming that works are carried out outside of the core egg laying and chick rearing period, for the construction and decommissioning phases there will be a **negligible adverse effect upon the integrity of the Liverpool Bay SPA for all conservation objectives.**

For all other features during all phases and for all impacts of temporary habitat loss due to disturbance/displacement, indirect impacts upon prey availability, and accidental pollution in the surrounding area there will be a **negligible adverse effect upon the integrity of the Liverpool Bay SPA.**

Table 1.138: A Summary Of The Liverpool Bay Spa Assessment

Impact relative to the conservation objective	Relevant project phase			Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	C	O	D					
Objective 1: To maintain or restore the extent and distribution of the habitats of the qualifying feature								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	37.02 km^2 of the proposed works sits within the Liverpool Bay SPA, this equates to 1.47% of available habitats that will be temporarily unavailable. However, this is short term and reversible and works will not be taking place within the entire 1.47% of affected habitats at any one time.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little gull				
	✓	×	✓	Common scoter				
	✓	×	✓	Common tern				
	✓	×	✓	Waterbird assemblage				
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the extent and distribution of habitats.			
Objective 2 – To maintain and restore the structure and function of the habitats of the qualifying features								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	37.02 km^2 of the proposed works sits within the Liverpool Bay SPA, this equates to 1.47% of available habitats that will be temporarily unavailable. However, this is short term and reversible and works will not be taking place within the entire 1.47% of affected habitats at any one time.	Negligible adverse effects upon the structure and function of the habitats and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little gull				
	✓	×	✓	Common scoter				
	✓	×	✓	Common tern				
	✓	×	✓	Waterbird assemblage				

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the structure and function of habitats.			
Objective 3 – To maintain or restore the supporting processes on which the habitats of the qualifying features rely								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	37.02 km^2 of the proposed works sits within the Liverpool Bay SPA, this equates to 1.47% of available habitats that will be temporarily unavailable. However, this is short term and reversible and works will not be taking place within the entire 1.47% of affected habitats at any one time.	Negligible adverse effects upon the supporting processes of habitats and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little gull				
	✓	×	✓	Common scoter				
	✓	×	✓	Common tern				
	✓	×	✓	Waterbird assemblage				
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the supporting processes.			
Objective 4 – To maintain or restore the population of each of the qualifying feature								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	37.02 km^2 of the proposed works sits within the Liverpool Bay SPA, this equates to 1.47% of available habitats that will be temporarily unavailable. However, this is short term and reversible and works will not be taking place within the entire 1.47% of affected habitats at any one time. This temporary loss is not expected to impact the population with features able to relocate to non-impacted areas.	No adverse effects on the population and therefore no adverse effect on. site integrity	N/A	N/A
	✓	×	✓	Little gull				
	✓	×	✓	Common scoter				
	✓	×	✓	Common tern				

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	×	✓	Waterbird assemblage				
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the supporting processes.	Negligible effects and therefore no adverse effects on site integrity.		
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	Red-throated diver	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.89%.	No adverse effects on the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little gull	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.040%.			
	✓	×	✓	Common scoter	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.98%.			
	✓	×	✓	Common tern	Disturbance will be mostly temporary and excess mortality was calculated at 0.006%			
	✓	×	✓	Little tern	Disturbance will be mostly temporary and reversible, and excess mortality was calculated at 0.06%.			
	✓	×	✓	Waterbird assemblage	The small scale of displacement around the vessels is not likely to impact any of the assemblage features to a greater extent than the highly sensitive common scoter and red-throated diver and therefore the conclusion for these features is relevant to the assemblage also.			
Indirect impacts from changes in prey availability	✓	✓	✓	Red-throated diver	Impacts to prey populations will be localised and temporary in nature and are therefore unlikely to impact mobile non-breeding features or features	No adverse effects on the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little gull				

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	✓	✓	Common scoter	with a large enough foraging range to alter their foraging strategy.			
	✓	✓	✓	Common tern				
	✓	✓	✓	Waterbird assemblage				
	✓	✓	✓	Little tern with construction during the breeding period and with dredging of the West Hoyle Bank	Up to 2.4% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, the dredging activities may result in SSCs of over 3,000 mg/l. Therefore, a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	✓	✓	✓	Little tern with construction during the breeding period without dredging of the West Hoyle Bank	Up to 2.9% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, cable laying activities may result in SSCs of over 1,000 mg/l. Therefore, a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
Accidental pollution in the surrounding area	✓	✓	✓	Red-throated diver	Any effects would be limited both temporally and spatially with necessary action plans already in place. Therefore, for all receptors, any effects to population would be negligible	No adverse effects on the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little gull				
	✓	✓	✓	Common scoter				
	✓	✓	✓	Common tern				
	✓	✓	✓	Little tern				
	✓	✓	✓	Waterbird assemblage				
Objective 5: To maintain or restore the distribution of the qualifying features within the site								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	37.02 km^2 of the proposed works sits within the Liverpool Bay SPA, this equates to 1.47% of available habitats that will be temporarily unavailable. However, this is short term and reversible and works will not be taking place within the entire 1.47% of affected habitats at any one time. This temporary loss is expected to impact the distribution with features able to relocate to non-impacted areas.	Negligible adverse effects on the distribution and therefore no adverse effect on. site integrity.	N/A	N/A
	✓	×	✓	Little gull				
	✓	×	✓	Common scoter				
	✓	×	✓	Waterbird assemblage				
	✓	×	✓	Common tern				
	✓	×	✓	Little tern	Habitat loss will be up to 0.167%			
Disturbance and displacement from airborne sound and	✓	×	✓	Red-throated diver	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.89%.	Negligible adverse effects on the distribution and	N/A	N/A

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
presence of vessels and infrastructure	✓	×	✓	Little gull	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.040%.	therefore no adverse effect on. site integrity. Negligible adverse effects on the distribution and therefore no adverse effect on site integrity.		
	✓	×	✓	Common scoter	Disturbance will be mostly temporary and reversible and excess mortality caused by disturbance was calculated at 0.98%.			
	✓	×	✓	Common tern	Disturbance will be mostly temporary and excess mortality was calculated at 0.006%			
	✓	×	✓	Little tern	Disturbance will be mostly temporary and reversible, and excess mortality was calculated at 0.06%.			
	✓	×	✓	Waterbird assemblage	The small scale of displacement around the vessels is not likely to impact any of the assemblage features to a greater extent than the highly sensitive common scoter and red-throated diver and therefore the conclusion for these features is relevant to the assemblage also.			
Indirect impacts from changes in prey availability	✓	✓	✓	Red-throated diver	Impacts to prey populations will be localised and temporary in nature and are therefore unlikely to impact mobile non-breeding features or features with a large enough foraging range to alter their foraging strategy.	Negligible adverse effects on the distribution and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little gull				
	✓	✓	✓	Common scoter				
	✓	✓	✓	Common tern				
	✓	✓	✓	Waterbird assemblage				

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	✓	✓	Little tern with construction during the breeding period and with dredging of the West Hoyle Bank	Up to 2.4% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, the dredging activities may result in SSCs of over 3,000 mg/l. Therefore, a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	✓	✓	✓	Little tern with construction during the breeding period without dredging of the West Hoyle Bank	Up to 2.9% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, cable laying activities may result in SSCs of over 1,000 mg/l. Therefore, a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
Accidental pollution in the surrounding area	✓	✓	✓	Red-throated diver	Any effects would be limited both temporally and spatially with necessary action plans already in place. If an event were to occur, the distributional impacts would be short term and reversible.	Negligible adverse effects on the distribution and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little gull				
	✓	✓	✓	Common scoter				
	✓	✓	✓	Common tern				
	✓	✓	✓	Little tern				

Impact relative to the conservation objective	Relevant project phase			Feature	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	C	O	D					
	✓	✓	✓	Waterbird assemblage				

1.9.3.2 Dee Estuary SPA

The objective of the Dee Estuary SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.1 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site (Natural England, 2019):

- Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.
- Conservation objective 2 – The structure and function of the habitats of the qualifying features.
- Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.
- Conservation objective 4 – The population of each of the qualifying features.
- Conservation objective 5 – The distribution of the qualifying features within the site.

Not all conservation objectives are relative to each impact, therefore Table 1.139 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Dee Estuary SPA.

Table 1.139: Impacts Considered For Each Conservation Objective – Dee Estuary Spa

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Temporary habitat loss leading to displacement/disturbance of birds	✓	✓	✓	✓	✓
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Accidental pollution in the surrounding area	×	×	×	✓	✓

To understand the risk to each individual feature within the area of the proposed works, the number of birds present was reviewed. The peak count from the site-specific surveys (as reported in the Intertidal Ornithology Technical Report (RPS group, 2023)) can then be compared with Dee Estuary populations at citation and the most recent estimate, this is shown in Table 1.140. As surveys were conducted outside of the breeding season those totals for breeding little tern and common tern have been omitted although, due to the proximity of the little tern colony (at Point of Ayr and Gronant Dunes), it is likely that a high percentage of birds will be present.

Species which represent more than 1% of the current population have been included for assessment within Table 1.141 are shown in bold within Table 1.140. Species which were present within 500 m of the proposed works below 1% of the current Dee Estuary population were considered to have no potential to be adversely impacted by the proposed works and have not been included within Table 1.141.

Table 1.140: The Citation Counts And Current Population Estimates In Relation To The Site Specific Survey Results

Feature	Citation count	Current WeBS count	Site specific survey count (area of proposed works plus 500 m)	% of current SPA population present within the 500 m disturbance buffer
Sandwich tern	957	1,402	1,043	74.39
Common tern	784	533	N/A	N/A
Little tern	138	357	N/A	N/A
Pintail	5,407	5,442	2	0.04
Teal	5,251	6,053	29	0.48
Dunlin	27,394	16,864	1,357	8.05
Knot	12,394	25,459	2	0.01
Oystercatcher	22,677	28,033	89	0.32
Bar-tailed godwit	1,150	475	0	0.00
Black-tailed godwit	1,747	6,929	32	0.46
Curlew	3,899	3,439	60	1.74
Grey plover	1,643	1,014	52	5.13
Shelduck	7,725	9,854	77	0.78
Redshank	8,795	10,724	48	0.45
Waterbird assemblage	120,726	183,228	8,479	4.63

Temporary habitat loss leading to displacement/disturbance of birds

Approximately 0.209 km^2 of the proposed works area is situated within the Dee Estuary SPA which is exclusively composed of intertidal habitats. During construction, it is considered that the entirety of this area will be unavailable for all features.

Although sandwich tern were present in large numbers during April (spring passage), this feature is on passage and is not restricted to a foraging range as during the breeding season. The Dee Estuary SPA is 143.03 km^2 in extent and almost all of this area is available for roosting or foraging sandwich tern. The amount of habitat that will be temporarily lost for this feature is 0.209 km^2. Therefore, the proportion of habitat that will be temporarily lost to this species is 0.146%.

For the remaining intertidal species (dunlin, curlew, grey plover, and the waterbird assemblage) 0.209 km^2 of intertidal mud and sandflats will be temporarily lost during construction. There are 98.69 km^2 of intertidal mud and sandflat habitat available within the Dee Estuary SPA. Therefore, the proportion of habitat that will be temporarily lost to this species is 0.212%.

In addition, a detailed Method Statement will be produced to outline how impacts on birds will be avoided during the works. The Method Statements will be developed in collaboration with NRW, and shared with NRW-MLT for approval at least three months prior to works commencing.

The nearest Dee Estuary SPA common tern colony is situated at Shotton, approximately 23 km away from the Proposed Development and outside of the 18 km foraging range for common tern. Therefore, no impacts upon the integrity of the Dee Estuary caused by displacement and/or temporary habitat loss for common tern within the Dee Estuary SPA are anticipated. Therefore, common tern is not presented within Table 1.141.

For little tern that only use a very limited area, the areas of loss within their respective foraging range has been calculated. This equates to 0.167% of the little tern foraging range.

The habitat lost would consist of both habitat within and outside the Dee Estuary SPA.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure.

Displacement modelled was not undertaken for intertidal species; however, a precautionary 500 m disturbance zone was applied around the area of proposed works for data analysis, based upon typical disturbance distances for waders and wildfowl (Cutts, *et. al*., 2013, Goodship and Furness, 2022), and it has been assumed that all birds within this zone will be subject to disturbance/displacement. The disturbance zone, in addition to the area of proposed works is approximately 0.983 km^2, which represents 0.996% of the entire intertidal extent of the Dee Estuary SPA.

Displacement modelling was undertaken (see the Offshore Ornithology Displacement Technical Report (RPS group, 2024b)) for sandwich tern with the increase in baseline mortality during passage estimated at 0.279%. Non-modelled estimates of the potential disturbance within the intertidal area where the species was reported loafing/roosting indicate a displacement over 0.687% of the Dee Estuary SPA.

Increases in little tern mortality are expected to be 0.06%.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are predicted to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases.

For mobile species during the non-breeding season, the assessment of fish within Chapter 7: Marine Biodiversity, and the diadromous fish section of this RIAA concluded that there would be no significant impact on fish. Therefore, the fish are likely to move away from construction and operational areas in a similar manner as the birds and therefore the impacts from changes in prey availability will be of the same, if not of less significance that the temporary habitat loss.

For breeding species that are concentrated within a small foraging range such as little tern. Displacement of prey due to underwater noise created by cable laying activities has been quantified as affecting between 2.4% and 2.9% of the little tern foraging range (Little Tern Foraging Distribution Technical Report). Common tern have a larger foraging range (18 km from Woodward et al., 2014) and the area affected will be approx. 0.01% which is negligible.

Displacement caused by sedimentation is harder to quantify due a lack of numerical data in the literature, however dredging works for the West Hoyle Bank will be approx. 1 km across, 60 m in width and 7 m in depth, these will take approx. two to three weeks to complete and may result in average Suspended Sediment Concentration (SSC) values of over 3000 mg/l in shallower waters. In addition, the cable plough itself may result in SSCs of over 1000 g/l in the shallower nearshore waters where the little tern forage Physical Processes Technical Report (RPS, 2024d). This is over the 1 g/l that may be harmful to adult fish (Engell-Sørensen and Skyt, 2001), and it would be reasonable to assume that some displacement of fish may occur, although it is not possible to quantify this. Additionally, fish eggs may be smothered and killed which will further reduce the amount of small prey items available for the little tern.

Assuming works were to take place during the breeding season (which for little tern is between April and July), then although the impacts caused by construction may be high in any one year, the impacts will be reversible causing no long-term effects to the biogeographic populations of little tern and common tern. Taking that into consideration the magnitude of impact during construction is taken as a precautionary 'low'.

Although work is still needed to define the sensitive egg laying and chick rearing period for the Gronant Dunes colony, measures to limit works during the sensitive egg laying and chick rearing period (Volume 2, Chapter 8: Offshore Ornithology) when little tern are concentrated within a small foraging range are to be discussed further with NRW. Works carried out after chick fledging when the little tern are not confined to a small foraging range would have a negligible impact. Therefore, for these receptors the magnitude of impact for construction is presented for both work during the breeding period and for works outside of the breeding period.

Accidental pollution in the surrounding area

There is a risk of pollution being accidentally released during the construction, operation and maintenance as well as decommissioning phases from sources including vessels/vehicles and equipment/machinery, the likelihood of an accidental release of pollutants is extremely low. However, should an event occur, effects would be limited in spatial extent. In addition, it is anticipated that the risk of such events occurring will be managed by the implementation of measures set out in standard industry guidance documents such as ERP, OPEPs and SOPEPs. As the risks of spillage are low, any spills will be limited in extent, and any effects will be reversible, reversible there would be no adverse effects to the integrity of the Dee Estuary SPA in any phase caused by the risk of accidental pollution in the surrounding area.

Summary

Table 1.141 below contains the summary assessment of each conservation objective (section 1.9.1) for each feature of the Dee Estuary SPA against each impact pathway. Only impact pathways which have potential to affect the conservation objects are presented, see Table 1.139 for breakdown.

For little tern, assuming that works are carried out during the core egg laying and chick rearing period, for the construction and decommissioning phases there will be a **negligible adverse effect upon the integrity of the Liverpool Bay SPA for conservation objectives 1, 2 and 3** and a **moderate adverse effect upon the integrity of the Liverpool Bay SPA for conservation objectives 4 and 5.**

For little tern, assuming that works are carried out outside of the core egg laying and chick rearing period, for the construction and decommissioning phases there will be a **negligible adverse effect upon the integrity of the Liverpool Bay SPA for all conservation objectives.**

For all other features during all phases and for all impacts there will be **no adverse effects upon the integrity of the Dee Estuary SPA.**

Table 1.141: A Summary Of The Dee Estuary SPA And Ramsar Assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
Objective 1: To maintain or restore the extent and distribution of the habitats of the qualifying feature								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Sandwich tern	The proportion of habitat that will be temporarily lost to sandwich tern is 0.146%. For this passage species, there is a vast range of other habitats available and this temporary loss of less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.212%. As this is also a temporary effect, this will have a no effect upon the extent and distribution of habitats. All habitat temporarily lost will be restored and no overall next loss will occur.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Curlew				
	✓	×	✓	Grey plover				
	✓	×	✓	Waterbird assemblage				
Objective 2 – To maintain and restore the structure and function of the habitats of the qualifying features								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Sandwich tern	The proportion of habitat that will be temporarily lost to sandwich tern is 0.146%. For this passage species, there is a vast range of other habitats available and this temporary loss of less than 1%, will not	Negligible adverse effects upon the structure and function of habitats and therefore no adverse effect on site integrity.	N/A	N/A

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
					impact the over extent of distribution.			
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.212%. As this is also a temporary effect, this will have a no effect upon the structure and function of habitats. All habitats temporarily lost will be restored and no overall next loss will occur.	Negligible adverse effects upon the structure and function of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Curlew				
	✓	×	✓	Grey plover				
	✓	×	✓	Waterbird assemblage				
Objective 3 – To maintain or restore the supporting processes on which the habitats of the qualifying features rely.								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Sandwich tern	The proportion of habitat that will be temporarily lost to sandwich tern is 0.146%. For this passage species, there is a vast range of other habitats available and this temporary loss of less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the supporting processes of habitats and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Dunlin				

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	×	✓	Curlew	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.212%. As this is also a temporary effect, this will have a no effect upon the structure and function of habitats. All habitats temporarily lost will be restored and no overall next loss will occur.	Negligible adverse effects upon the supporting processes of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Grey plover				
	✓	×	✓	Waterbird assemblage				
Objective 4 – To maintain or restore the population of each of the qualifying feature								
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Sandwich tern	The proportion of habitat that will be temporarily lost to sandwich tern is 0.146%. For this passage species, there is a vast range of other habitats available and this temporary loss of less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.212%. As this is also a temporary effect, this will have a no effect upon the structure and function of habitats. Similarly, only a small proportion of the population of each species uses the area. All habitats temporarily lost will be	Negligible adverse effects upon the population and therefore no adverse effect on site integrity.		
	✓	×	✓	Curlew				
	✓	×	✓	Grey plover				
	✓	×	✓	Waterbird assemblage				

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
					restored and no overall next loss will occur.			
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Sandwich tern	Sandwich tern excess mortality caused by displacement is expected to be 0.279% well below the 1% threshold.	Negligible adverse effects upon the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little tern	Little tern excess mortality caused by displacement is expected to be 0.06% well below the 1% threshold.	Negligible adverse effects upon the population and therefore no adverse effect on site integrity.		
	✓	✓	×	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.996%. As this is also a temporary effect, this will have a no effect upon the overall population of the features. Similarly, only a small proportion of the population of each species uses the area.	Negligible adverse effects upon the population and therefore no adverse effect on site integrity.		
	✓	✓	×	Curlew				
	✓	✓	×	Grey plover				
	✓	✓	×	Waterbird assemblage				
Indirect impacts from changes in prey availability	✓	✓	✓	Sandwich tern	Impacts to prey populations will be localised and temporary in nature and are therefore unlikely to impact mobile non-breeding features or features with a large enough foraging range to alter their foraging strategy.	No adverse effects on the population and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Dunlin				
	✓	✓	✓	Curlew				
	✓	✓	✓	Grey plover				
	✓	✓	✓	Waterbird assemblage				
	✓	✓	✓	Little tern with construction during the breeding period and with	Up to 2.4% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, the dredging activities may result in SSCs	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
				dredging of the West Hoyle Bank	of over 3,000 mg/l. Therefore a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.			
	✓	✓	✓	Little tern with construction during the breeding period without dredging of the West Hoyle Bank	Up to 2.9% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, cable laying activities may result in SSCs of over 1,000 mg/l. Therefore a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
Accidental pollution in the surrounding area	✓	✓	✓	Sandwich tern	Any effects would be limited both temporally and spatially, affecting an area of less than 1% of available intertidal habitats at most, with necessary action plans already in place. Therefore, there would be no adverse effects to the population	No adverse effects upon site integrity	N/A	N/A
	✓	✓	✓	Little tern				
	✓	✓	✓	Dunlin				
	✓	✓	✓	Curlew				
	✓	✓	✓	Grey plover				
	✓	✓	✓	Waterbird assemblage				
Objective 5: To maintain or restore the distribution of the qualifying features within the site								
Temporary habitat loss leading to	✓	×	✓	Sandwich tern	The proportion of habitat that will be temporarily lost to sandwich tern is 0.146%. For this passage species, there is	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.	N/A	N/A

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
displacement/disturbance of birds					a vast range of other habitats available and this temporary loss of less than 1%, will not impact the over extent of distribution.			
	✓	×	✓	Little tern	The proportion of habitat that will be temporarily lost to little tern is 0.167%. As this temporary loss is less than 1%, will not impact the over extent of distribution.	Negligible adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity.		
	✓	×	✓	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.212%. As this is also a temporary effect, this will have a no effect upon the structure and function of habitats. Similarly, only a small proportion of the population of each species uses the area. All habitats temporarily lost will be restored and no overall next loss will occur.	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.		
	✓	×	✓	Curlew				
	✓	×	✓	Grey plover				
	✓	×	✓	Waterbird assemblage				
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Sandwich tern	Sandwich tern excess mortality caused by displacement is expected to be 0.279% well below the 1% threshold.	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Little tern	Little tern excess mortality caused by displacement is expected to be 0.06% well below the 1% threshold.	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.		
	✓	✓	×	Dunlin	The proportion of intertidal habitat that will be temporarily lost to this feature is 0.996%. As this is also a temporary	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.		
	✓	✓	×	Curlew				
	✓	✓	×	Grey plover				

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
	✓	✓	×	Waterbird assemblage	effect, this will have a no effect upon the overall population of the features. Similarly, only a small proportion of the population of each species uses the area.			
Indirect impacts from changes in prey availability	✓	✓	✓	Sandwich tern	Impacts to prey populations will be localised and temporary in nature and are therefore unlikely to impact mobile non-breeding features or features with a large enough foraging range to alter their foraging strategy.	Negligible adverse effects upon the distribution and therefore no adverse effect on site integrity.	N/A	N/A
	✓	✓	✓	Dunlin				
	✓	✓	✓	Curlew				
	✓	✓	✓	Grey plover				
	✓	✓	✓	Waterbird assemblage				
	✓	✓	✓	Little tern with construction during the breeding period and with dredging of the West Hoyle Bank	Up to 2.4% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, the dredging activities may result in SSCs of over 3,000 mg/l. Therefore a moderate adverse effect is predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	✓	✓	✓	Little tern with construction during the breeding period without dredging of	Up to 2.9% of little tern's foraging range may be affected by temporary changes in prey availability caused by underwater noise. In addition, cable laying activities may result in SSCs of over 1,000 mg/l. Therefore a moderate adverse effect is	Moderate adverse effects upon the extent and distribution of habitats and therefore moderate adverse effects on site integrity.	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion	Proposed mitigation	Residual effects after mitigation
				the West Hoyle Bank	predicated upon this feature for temporary habitat loss. During operation and maintenance there will be no impact.			
Accidental pollution in the surrounding area	✓	✓	✓	Sandwich tern	Any effects would be limited both temporally and spatially, affecting an area of less than 1% of available intertidal habitats at most, with necessary action plans already in place. Therefore, there would be no adverse effects to the population	No adverse effects upon site integrity	N/A	N/A
	✓	✓	✓	Little tern				
	✓	✓	✓	Dunlin				
	✓	✓	✓	Curlew				
	✓	✓	✓	Grey plover				
	✓	✓	✓	Waterbird assemblage				

1.9.3.3 Ribble and Alt Estuaries SPA

The objective of the Ribble and Alt Estuaries SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.1 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site (Natural England, 2019):

- Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.
- Conservation objective 2 – The structure and function of the habitats of the qualifying features.
- Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.
- Conservation objective 4 – The population of each of the qualifying features.
- Conservation objective 5 – The distribution of the qualifying features within the site.

Not all conservation objectives are relative to each impact, therefore Table 1.142 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Ribble and Alt Estuaries SPA. Conservation Objective 1, 2 and 3 will not be impacted by the proposed works as there is no change in the habitat extent, distribution or structure of the site due to no direct overlap.

Table 1.142: Impacts Considered For Each Conservation Objective – Ribble And Alt Estuaries Spa

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	×	×	×	✓	✓
Collision with static offshore infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Creation of roosting and nesting habitats among project infrastructure	×	×	×	✓	✓

The Ribble and Alt SPA and Ramsar is situated approximately 1 km from the boundary of the Proposed Development. The saltmarsh habitats fringing the estuary hold breeding colonies of lesser black-backed gull and common tern, these are the features that have been screened in for LSEs.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Whilst there were no available data to calculate excess mortality caused by displacement for common tern. Assuming a foraging range of 18 km (Woodward, et. al., 2014), and by applying a 100 m disturbance (Goodship and Furness 2022) buffer around working vessels it was calculated that the area of proposed works does not overlap with the Ribble and Alt SPA common tern colonies foraging range. Therefore, there will be no disturbance/displacement caused by the Proposed Development upon the Ribble and Alt SPA population of common tern during any phase. As there is no potential for impact to occur to common tern from Ribble and Alt Estuaries SPA it is not presented within Table 1.143.

Lesser black-backed gull was screened out of this impact pathway during Stage 1.

Collision with static offshore infrastructure

Risk of collision of seabirds to offshore stationary structures is likely to be restricted to species attracted to the platform due to potential roosting and nesting opportunities (e.g gull species; Ronconi *et al.*, 2015). However, there is no quantification of the risk and therefore an assessment must be made at a high level. As only one new platform is to be built and there is already a considerable amount of static infrastructure within the lesser black-backed gull foraging range, the additional risk is assumed to be negligible and any effects may be mitigated by the usefulness of such structures as roosting refuges in bad weather. Therefore there will be no adverse effects to the Ribble and Alt Estauries SPA during the operation and maintenance phase.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are thought to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases. As has already been discussed the area of proposed works is outside of the common tern foraging range, therefore there will be no impacts upon prey availability for the Ribble and Alt SPA common tern population during any phase.

Lesser black-backed gull foraging range is 127 km (mean max from Woodward, *et. al*., 2014), this includes terrestrial, freshwater, and marine habitats and equates to 50,671 km^2. The area of proposed works which could overlap with the foraging range of the lesser black-backed gull from colonies within the Ribble and Alt Estuaries SPA is 65.45 km^2. Therefore, the overlap equates to 0.13% of the total available foraging range. Therefore, there will be no impacts upon prey availability for the Ribble and Alt SPA population during any phase.

Creation of roosting and nesting habitats among project infrastructure

Lesser black-backed gull are likely to roost on the offshore structures. The extent on which the species may utilise this new roosting habitat and the potential beneficial impact this might have on the species have not been quantified.

Summary

For both species screened in and for all phases and impacts there will be **no adverse effects upon the site integrity of the Ribble and Alt Estuaries SPA.**

Table 1.143: A Summary Of The Ribble And Alt Estuaries And SPA Assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion
Objective 4 – To maintain or restore the population of each of the qualifying feature						
Collision with static offshore infrastructure	×	✓	×	Lesser black-backed gull	Any effects are unquantifiable and will be counteracted by the benefits provided for this species. Therefore, overall there will be no adverse effects upon the population	No adverse effects on the population and therefore no adverse effect on site integrity.
Indirect impacts from changes in prey availability	✓	✓	✓	Lesser black-backed gull	The overlap between lesser black-backed gull foraging range and the proposed works is approximate 0.13%. Fish species have a negligible adverse impact during works and therefore the prey might be impacted, leading to the lesser black-backed gull also impacted. However, the area of impact is *de minimis*.	
Creation of roosting and nesting habitats among project infrastructure	×	✓	×	Lesser black-backed gull	As this is a beneficial impact that may benefit this/these species there will be no adverse effects upon the population	
Objective 5: To maintain or restore the distribution of the qualifying features within the site						
Collision with static offshore infrastructure	×	✓	×	Lesser black-backed gull	Any effects are unquantifiable and will be counteracted by the benefits provided for this species. Therefore, overall there will be no adverse effects upon the population	No adverse effects on the distribution and therefore no adverse effect on site integrity.
Indirect impacts from changes in prey availability	✓	✓	✓	Lesser black-backed gull	The overlap between lesser black-backed gull foraging range and the proposed works is approximate 0.13%. Fish species have a negligible adverse impact during works and therefore the prey might be impacted, leading to the lesser black-backed gull also impacted. However, the area of impact is *de minimis*.	
Creation of roosting and nesting habitats among project infrastructure	×	✓	×	Lesser black-backed gull	As this is a beneficial impact that may benefit this/these species there will be no adverse effects upon the population	

1.9.3.4 Anglesey Terns SPA

The objective of the Anglesey Terns SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.4 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1: The size of the population should be stable or increasing, allowing for natural variability, and sustainable in the long term.
- Objective 2 – The distribution of the population should be being maintained, or where appropriate increasing.
- Objective 3 – There should be sufficient habitat, of sufficient quality, to support the population in the long term.
- Objective 4 – Factors affecting the population, or its habitat should be under appropriate control.

The Anglesey Terns SPA is designated for four species of breeding terns of these, sandwich tern have the largest foraging range of 34.3 km (Woodward, *et. al*., 2014). Sandwich tern colonies within the SPA are mostly situated on the northern and western coasts of Anglesey with Cemlyn Bay being the colony situated closet to the Proposed Development (JNCC - Seabird Monitoring Programme).

Using the mean foraging range of 34.3 km and using the Cemlyn Bay sandwich tern colony as the nearest Anglesey Terns SPA sandwich tern colony, the area of proposed works is over 60 km away from the nearest sandwich tern colony. **Therefore, there is no connectivity with the Proposed Development for the Anglesey Terns SPA breeding sandwich tern colony. Thus, there will be no adverse effect or impact to the Anglesey Terns SPA sandwich tern population during any phase.**

Summary

For breeding sandwich tern during all phases and impacts there will be **no adverse effects upon the integrity of the Anglesey Terns SPA.**

1.9.3.5 Morecambe Bay and Duddon Estuary SPA and Ramsar

The objective of the Morecambe Bay and Duddon Estuary SPA and Ramsar is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that the conservation objectives as set out in section 1.9.1.5 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.5 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site (Natural England, 2019):

- Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.
- Conservation objective 2 – The structure and function of the habitats of the qualifying features.
- Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.
- Conservation objective 4 – The population of each of the qualifying features.
- Conservation objective 5 – The distribution of the qualifying features within the site.

Not all conservation objectives are relative to each impact, therefore Table 1.144 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Morecambe Bay and Duddon Estuary SPA. Conservation Objective 1, 2 and 3 will not be impacted by the proposed works as there is no change in the habitat extent, distribution or structure of the site due to no direct overlap.

Table 1.144: Impacts Considered For Each Conservation Objective – Morecambe Bay And Duddon Estuary SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Collision with static offshore infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Creation of roosting and nesting structures among project infrastructure	×	×	×	✓	✓

Morecambe Bay and Duddon Estuary SPA is situated to the north of the Proposed Development and contains internationally important breeding lesser black-backed gull, this is the feature that has been screened in for LSEs. The largest (and closest to the Proposed Development) colony is situated at South Walney.

Collision with static offshore infrastructure

Risk of collision of seabirds to offshore stationary structures is likely to be restricted to species attracted to the platform due to potential roosting and nesting opportunities (e.g gull species; Ronconi *et al.*, 2015). However, there is no quantification of the risk and therefore an assessment must be made at a high level. As only one new platform is to be built and there is already a considerable amount of static infrastructure within the lesser black-backed gull foraging range, the additional risk is assumed to be negligible and any effects may be mitigated by the usefulness of such structures as roosting refuges in bad weather. Therefore there will be no adverse effects to the Morecambe Bay and Duddon Estuary SPA during the operation and maintenance phase.

Indirect impacts from changes in prey availability

Lesser black-backed gull foraging range is 127 km (mean max; Woodward, *et. al.*, 2014), this includes terrestrial, freshwater, and marine habitats and equates to 50,671 km^2. The area of proposed works which could overlap with the foraging range of the lesser black-backed gull from the South Walney colony as the closest colony within the Morecambe Bay and Duddon Estuary SPA is 65.45 km^2. Therefore, the overlap equates to 0.13% of the total available foraging range. Therefore, there will be no impacts upon prey availability for the Morecambe Bay and Duddon Estuary SPA population during any phase.

Creation of roosting and nesting habitats among project infrastructure

Lesser black-backed gull are likely to roost on the offshore structures. The extent on which the species may utilise this new roosting habitat and the potential beneficial impact this might have on the species have not been quantified.

Summary

For lesser black-backed gull impacts there will be **no adverse effects upon the site integrity of the Morecambe Bay and Duddon Estuary SPA (**Table 1.145**).**

Table 1.145: A Summary Of The Morecambe Bay And Duddon Estuary SPA And Ramsar Assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion
Objective 4 – To maintain or restore the population of each of the qualifying feature						
Collision with static offshore infrastructure	×	✓	×	Lesser black-backed gull	Any effects are unquantifiable and will be counteracted by the benefits provided for this species. Therefore, overall there will be no adverse effects upon the population	
Indirect impacts from changes in prey availability	✓	✓	✓	Lesser black-backed gull	The overlap between lesser black-backed gull foraging range and the proposed works is approximate 0.13%. Fish species have a negligible adverse impact during works and therefore the prey might be impacted, leading to the lesser black-backed gull also impacted. However, the area of impact is *de minimis*.	
Creation of roosting and nesting habitats among project infrastructure	×	✓	×	Lesser black-backed gull	As this is a beneficial impact that may benefit this/these species there will be no adverse effects upon the population	
Objective 5: To maintain or restore the distribution of the qualifying features within the site						
Collision with static offshore infrastructure	×	✓	×	Lesser black-backed gull	Any effects are unquantifiable and will be counteracted by the benefits provided for this species. Therefore, overall there will be no adverse effects upon the population	No adverse effects upon site integrity
Indirect impacts from changes in prey availability	✓	✓	✓	Lesser black-backed gull	The overlap between lesser black-backed gull foraging range and the proposed works is approximate 0.13%. Fish species have a negligible adverse impact during works and therefore the prey might be impacted, leading to the lesser black-backed gull also impacted. However, the area of impact is *de minimis*.	No adverse effects upon site integrity
Creation of roosting and nesting habitats among project infrastructure	×	✓	×	Lesser black-backed gull	As this is a beneficial impact that may benefit this/these species there will be no adverse effects upon the population	N/A

1.9.3.6 Aberdaron Coast and Bardsey Island SPA

The objective of the Aberdaron Coast and Bardsey Island SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.6 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.6 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1 – To ensure that the breeding population of Manx shearwater is stable or increasing.
- Objective 2 – To ensure that reproductive rates remain stable.
- Objective 3 – To ensure that deaths from lighthouse attractions, fencing and other infrastructure are minimal.
- Objective 4 – To ensure that no ground predators are introduced.
- Objective 5 – To ensure that birds are not disturbed by restoration works or recreational activities.
- Objective 6 – To ensure that all factors affecting the achievement of these conditions are under control.

Not all conservation objectives are relative to each impact, therefore Table 1.146 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Ribble and Alt Estuaries SPA. Conservation objectives 2, 3,4 and 6 are not impacted by the proposed works and not included within this assessment nor Table 1.147.

Table 1.146: Impacts Considered For Each Conservation Objective – Ribble And Alt Estuaries SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5	Conservation Objective 6
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	×	×	✓	×
Collision with static offshore infrastructure	✓	×	×	×	✓	×

The Aberdaron Coast and Bardsey Island SPA is situated at the on the Llyn peninsula to the south of Anglesey in North Wales. The island of Bardsey holds an internationally important Manx shearwater colony, this is the feature that has been screened in.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Using the Waggit, *et. al*. (2020) density data it was found that during the breeding season zero birds were predicted to die, but to disturbance or displacment. This was mainly due to the very low adundance across the

Proposed Development (see Offshore Ornithology Displacement Technical Report (RPS group, 2024b). Therefore, and assuming that all of the Liverpool Bay Manx shearwater originated from the Bardsey Island colony, there would be no adverse effects to the integrity of the Aberdaron coast and Bardsey Island SPA Manx shearwater population in any phase caused by the impacts of disturbance and displacement from the presence of vessels and infrastructure.

Collision with static offshore infrastructure

Risk of collision of seabirds to offshore stationary structures is likely to be restricted to species attracted to lights (such as storm-petrels and shearwaters; Ronconi *et al.*, 2015 and Deakin *et al.*, 2022) that may become disoriented under specific circumstances. However, there are is no quantification of the risk and therefore an assessment must be made at a high level. As only one new platform is to be built and the Manx shearwater foraging range is vast, the additional impacts created by the addition of one platform are considered negligible. Therefore there will be no adverse effects to the integrity of the Aberdaron coast and Bardsey Island SPA Manx shearwater population during the operation and maintenance phase caused by the impacts of collision with static offshore infrastructure.

Summary

For breeding Manx shearwater during all phases and impacts there will be **no adverse effects upon the integrity of the Aberdaron Coast and Bardsey Island SPA.**

Table 1.147: A Summary Of The Aberdaron Coast And Bardsey Island SPA Assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion
Objective 1: To ensure that the breeding population of Manx shearwater is stable or increasing						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Manx shearwater	Mortality caused by displacement is calculated at zero birds. Therefore, there will be no impact upon the breeding population.	No adverse effects on the population therefore no adverse effect on site integrity
Collision with static offshore infrastructure	×	✓	×	Manx shearwater	Any effects are unquantifiable and will be minimised by the size of the Manx shearwater foraging range. Therefore, there will be no adverse effects upon the breeding population	
Objective 5 – To ensure that birds are not disturbed by restoration works or recreational activities						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Manx shearwater	The Proposed Development is approx. 215 km from site within an area of very low Manx shearwater abundance. Therefore, there will be no additional disturbance within the SPA	Negligible potential for birds to be disturbed due to the number present within the area. No adverse effects on site integrity
Collision with static offshore infrastructure	×	✓	×	Manx shearwater	The Proposed Development is approximately. 215 km from site. Therefore, there will be no additional disturbance to the feature of the SPA	

1.9.3.7 Ailsa Craig SPA

The objective of the Ailsa Crag SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.7 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.7 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1: To maintain or restore the population of the species as a viable component of the site.
- Objective 2 – To maintain or restore the distribution of the species within site.
- Objective 3 – To maintain or restore the distribution and extent of habitats supporting the species.
- Objective 4 – To maintain or restore the structure, function and supporting processes of habitats supporting the species.
- Objective 5 – Ensure that there is no significant disturbance of the species.

Not all conservation objectives are relative to each impact, therefore Table 1.148 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Alisa Craig SPA. Conservation objective 2 and 4 are not impacted by the proposed works and not included within this assessment nor Table 1.149.

Table 1.148: Impacts Considered For Each Conservation Objective – Alisa Craig SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	×	✓
Indirect impacts from changes in prey availability	✓	×	×	×	×

Ailsa Crag SPA is situated in the Firth of Clyde off the northern Galloway coastline. It contains an internationally important breeding colony of northern gannet; this is the feature that has been screened in for LSEs. Impacts that have been screened in for this site are disturbance and displacement from airborne sound and presence of vessels and infrastructure, and indirect impacts from changes in prey availability.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Using the Waggit, *et. al*. (2020) density data it was found that during the breeding season zero birds were predicted to die, but to disturbance or displacment. This was mainly due to the low adundance across the Proposed Development (see Offshore Ornithology Displacement Technical Report (RPS group, 2024b)). Therefore, and assuming that all of the Liverpool Bay northern gannet originated from the Ailsa Crag SPA colony, there would be no adverse effects to the integrity of the Ailsa Crag SPA in any phase from the impacts of disturbance and displacement from the presence of vessels and infrastructure.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are thought to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases. The northern gannet foraging range is 315 km (mean max; Woodward, *et. al*., 2014), this includes only marine habitats and equates to 116,758.8 km^2. The area of proposed works is 65.45 km^2. The area which the Ailsa Crag SPA northern gannet population overlaps the area of proposed works by equates to 0.06% of the total available foraging range. Therefore, there will be no adverse effects upon the Ailsa Crag SPA northern gannet population during any phase.

Summary

For breeding northern gannet during all phases and impacts there will be **no adverse effects upon the integrity of Ailsa Crag SPA.**

Table 1.149: A summary of the Ailsa Crag SPA assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion
Objective 1: To maintain or restore the population of the species as a viable component of the site						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	Mortality caused by displacement is calculated as zero birds. Therefore, there will be no impact upon the breeding population.	Negligible adverse effects on the population and therefore no adverse impact on site integrity
Indirect impacts from changes in prey availability	✓	✓	✓	Northern gannet	As the affected area equates to 0.06% of the available foraging range there will be no adverse effects upon the population	
Objective 3 – To maintain or restore the distribution and extent of habitats supporting the species						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	As the affected area equates to 0.06% of the available foraging range there will be no adverse effects upon the distribution and extent of habitats supporting the species	Negligible adverse effects on the supporting habitat and therefore no adverse impact on site integrity
Objective 5 – Ensure that there is no significant disturbance of the species						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	As the affected area equates to 0.06% of the available foraging range there will be no significant disturbance of foraging birds due to the vast amount of alternative habitat in which the species can forage	Negligible adverse effects on the supporting habitat and therefore no adverse impact on site integrity.

1.9.3.8 Skomer, Skokholm and the Seas off Pembrokeshire SPA

The objective of the Skomer, Skokholm and the Seas off Pembrokeshire SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.8 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.8 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1 – To ensure that the breeding population is stable or increasing.
- Objective 2 – To ensure that human disturbance does not affect distribution within the site.
- Objective 3 – To ensure that the availability and quality of breeding and foraging habitats are maintained.
- Objective 4 – To ensure that human disturbance does not affect breeding success.

Not all conservation objectives are relative to each impact, therefore Table 1.150 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Skomer, Skokholm and the Seas off Pembrokeshire SPA. Conservation objective 2 and 4 are not impacted by the proposed works and not included within this assessment nor Table 1.151.

Table 1.150: Impacts Considered For Each Conservation Objective – Skomer, Skokholm And The Seas Off Pembrokeshire SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	×
Collision with static offshore infrastructure	✓	×	×	×
Indirect impacts from changes in prey availability	✓	×	×	×

Skomer, Skokholm and the Seas off Pembrokeshire SPA is situated off the south coast of Wales approximately 213 km from the Proposed Development. The two features screened in for LSEs are breeding Manx shearwater and European storm petrel.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Using the Waggit, *et. al*. (2020) density data it was found that during the breeding season zero birds were predicted to die due to disturbance or displacment for either Manx shearwater or European storm petrel (see Offshore Ornithology Displacement Technical Report (RPS group, 2024b)). Therefore, and assuming that all of the Liverpool Bay Manx shearwater and European storm petrel originated from the Skomer, Skokholm and the Seas off Pembrokeshire SPA colonies, there would be no adverse effects to the integrity of the Skomer, Skokholm and the Seas off Pembrokeshire SPA in any phase from the impacts of disturbance and displacement from the presence of vessels and infrastructure.

Collision with static offshore infrastructure

Risk of collision of seabirds to offshore stationary structures is likely to be restricted to species attracted to lights (such as storm-petrels and shearwaters; Ronconi *et al.*, 2015 and Deakin *et al.*, 2022) that may become disoriented under specific circumstances. However, there are no hard data quantifying the risk and therefore an assessment must be made at a high level. As only one new platform is to be built and the Manx shearwater foraging range is vast, and European storm petrel densities are low within the Proposed Development, the additional impacts created by the addition of one platform are considered negligible. Therefore there will be no adverse effects to the Skomer, Skokholm and the Seas off Pembrokeshire SPA during the operation and maintenance phase caused by the impact of collision with static offshore infrastructure.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are thought to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases.

The Manx shearwater foraging range is 1,346.8 km (mean max; Woodward, *et. al*., 2014), this includes only marine habitats and equates to 3,618,200 km^2. The area of proposed works is 65.45 km^2. The area which the Skomer, Skokholm and the Seas off Pembrokeshire SPA Manx shearwater population overlaps the area of proposed works by equates to 0.002% of the total available foraging range. Therefore, there will be no adverse effects to the Skomer, Skokholm and the Seas off Pembrokeshire SPA caused by the impact upon prey availability for European storm petrel population during any phase.

The European storm petrel foraging range is 336 km (mean max; Woodward, *et. al*., 2014), this includes only marine habitats and equates to 194,133.4 km^2. The area of proposed works is 65.45 km^2. The area which the Skomer, Skokholm and the Seas off Pembrokeshire SPA European storm petrel populations foraging range overlaps the area of proposed works by equates to 0.034% of the total available foraging range. Therefore, there will be no adverse effects to the Skomer, Skokholm and the Seas off Pembrokeshire SPA caused by the impact upon prey availability for European storm petrel population during any phase.

Summary

For breeding Manx shearwater and European storm petrel during all phases and impacts there will be **no adverse effects upon the integrity of Skomer, Skokholm and the Seas off Pembrokeshire SPA.**

Table 1.151: A summary of the Skomer, Skokholm and the Seas off Pembrokeshire SPA assessment

Impact	Relevant project phase C	O	D	Species	Assessment	Conclusion
Objective 1: To ensure that the breeding population is stable or increasing						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Manx shearwater	Mortality caused by displacement is calculated at zero birds. Therefore, there will be no impact upon the breeding population.	No adverse effects on the population and therefore no adverse effect on site integrity
	✓	✓	✓	European storm petrel		
Collision with static offshore infrastructure	×	✓	×	Manx shearwater	Any effects are unquantifiable and will be minimised by the size of the Manx shearwater foraging range. Therefore, there will be no adverse effects upon the breeding population	No adverse effects on the population and therefore no adverse effect on site integrity
	×	✓	×	European storm petrel		
Indirect impacts from changes in prey availability	✓	✓	✓	Manx shearwater	As the affected area equates to 0.002% of the available foraging range there will be no significant change to the population	Negligible adverse effects on the population and therefore no adverse effect on site integrity
	✓	✓	✓	European storm petrel	As the affected area equates to 0.034% of the available foraging range there will be no significant change to the population	
Objective 3 – To ensure that the availability and quality of breeding and foraging habitats are maintained						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Manx shearwater	As the affected area equates to 0.002% of the available foraging range there will be no significant change to the availability and quality of the foraging habitats	Negligible adverse effects on the availability and quality of the habitats and therefore no adverse effect on site integrity
	✓	✓	✓	European storm petrel	As the affected area equates to 0.034% of the available foraging range there will be no significant change to the availability and quality of the foraging habitats	

1.9.3.9 Grassholm SPA

The objective of the Grassholm SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.9 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.9 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1: The population will not fall below 30,000 pairs in three consecutive years.
- Objective 2 – The population will not drop by more than 25% of the previous years figures in any one year.
- Objective 3 – There will be no decline in this population significantly greater than any decline in the North Atlantic population as a whole.

Not all conservation objectives are relative to each impact, therefore Table 1.152 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Grassholm SPA.

Table 1.152: Impacts Considered for Each Conservation Objective – Grassholm SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓
Indirect impacts from changes in prey availability	✓	✓	✓

Grassholm SPA is situated off the Pembroke coast approximately 220 km from the Proposed Development. It contains an internationally important population of breeding northern gannet; this is the feature that has been screened in for LSEs.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Using the Waggit, *et. al*. (2020) density data it was found that during the breeding season zero birds were predicted to die, but to disturbance or displacment. This was mainly due to the low adundance across the Proposed Development (see Offshore Ornithology Displacement Technical Report (RPS group, 2024b)). Therefore, and assuming that all of the Liverpool Bay northern gannet originated from the Grassholm SPA colony, there would be no adverse effects to the integrity of the Grassholm SPA in any phase from the impacts of disturbance and displacement from the presence of vessels and infrastructure.

Therefore, there will be no adverse effects upon the Ailsa Crag SPA northern gannet population during any phase.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are thought to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases. The northern gannet foraging range is 315 km (Woodward, *et. al*., 2014), this includes only marine habitats and equates to 173,263.7 km^2. The area of proposed works is 65.45 km^2. The area which the Grassholm SPA northern gannet population overlaps the area of proposed works by equates to 0.04% of the total available foraging range. Therefore, there would be no adverse effects to the integrity of the Grassholm SPA northern gannet population in any phase from the impacts upon prey availability.

Summary

For breeding northern gannet during all phases and impacts there will be **no adverse effects upon the integrity of Grassholm SPA.**

Table 1.153: A summary of the Grassholm SPA assessment

Impact	Relevant project phase			Species	Assessment	Conclusion
	C	O	D			
Objective 1: The population will not fall below 30,000 pairs in three consecutive years						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	Mortality caused by displacement is calculated as zero birds. Therefore, there will be no impact upon the breeding population.	No increased in mortality due to the project and therefore on adverse effects on site integrity.
Indirect impacts from changes in prey availability	✓	✓	✓	Northern gannet	As the affected area equates to 0.04% of the available foraging range there will be no adverse effects upon the population	No impact on foraging resource availability and therefore on the population. No adverse effects on site integrity
Objective 2 – The population will not drop by more than 25% of the previous years figures in any one year						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	Mortality caused by displacement is calculated as zero birds. Therefore, there will be no impact upon the breeding population.	No increased in mortality due to the project and therefore on adverse effects on site integrity.
Indirect impacts from changes in prey availability	✓	✓	✓	Northern gannet	As the affected area equates to 0.04% of the available foraging range there will be no adverse effects upon the population	No impact on foraging resource availability and therefore on the population. No adverse effects on site integrity
Objective 3 – There will be no decline in this population significantly greater than any decline in the North Atlantic population as a whole						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern gannet	Mortality caused by displacement is calculated as zero birds. Therefore, there will be no impact upon the breeding population.	No increased in mortality due to the project and therefore on adverse effects on site integrity.
Indirect impacts from changes in prey availability	✓	✓	✓	Northern gannet	As the affected area equates to 0.04% of the available foraging range there will be no adverse effects upon the population	No impact on foraging resource availability and therefore on the population. No adverse effects on site integrity

1.9.3.10 Saltee Islands SPA

The objective of the Saltee Islands SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.10 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.10 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site:

- Objective 1: To ensure that there is no significant decline in breeding population abundance.
- Objective 2 – To ensure that there is no significant decline in productivity rate.
- Objective 3 – To ensure that there is no significant decline in the distribution of breeding colony.
- Objective 4 – To ensure that there is no significant decline in available prey biomass.
- Objective 5 – To ensure that there is no significant increase in barriers to connectivity.
- Objective 6 – To ensure that there is no significant increase in disturbance at the breeding site.
- Objective 7 – To ensure that there is no significant increase in disturbance at marine areas immediately adjacent to the colony.

Not all conservation objectives are relative to each impact, therefore Table 1.154 presents potential impacts resulting from the activities at the Proposed Development that may affect conservation objectives of the Saltee Islands SPA. Conservation Objective 2, 3, 4, 5, 6 and 7 have no ability to be undermined by the proposed works and are not included within the assessment (Table 1.155).

Table 1.154: Impacts Considered For Each Conservation Objective – Saltee Islands Spa

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5	Conservation Objective 6	Conservation Objective 7
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	×	×	×	×	×
Collision with static offshore infrastructure	✓	×	×	×	×	×	×
Indirect impacts from changes in prey availability	✓	×	×	×	×	×	×

The Saltee Islands SPA are located approximately 246 km from the Proposed Development off the south-eastern coast of Ireland. Features that have been screened in for LSEs are breeding northern gannet and northern fulmar.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Using the Waggit, *et. al*. (2020) density data it was found that during the breeding season zero birds were predicted to die, but to disturbance or displacment for both northern gannet and northern fulmar. This was mainly due to the low adundance across the Proposed Development (see Offshore Ornithology Displacement Technical Report (RPS group, 2024b)). Therefore, and assuming that all of the Liverpool Bay northern gannet and northern fulmar originated from the Saltee Islands SPA colonies, there would be no adverse effects to the integrity of the Saltee Islands SPA in any phase from the impacts of disturbance and displacement from the presence of vessels and infrastructure.

Collision with static offshore infrastructure

Risk of collision of seabirds with offshore stationary structures is likely to be restricted to species attracted to lights (such as storm-petrels and shearwaters; Ronconi *et al.*, 2015 and Deakin *et al.*, 2022) that may become disoriented under specific circumstances. However, there is no quantification of the risk and therefore an assessment must be made at a high level. As only one new platform is to be built and the northern fulmar foraging range is vast with low densities recorded within the Proposed Development area (see Offshore Ornithology Baseline Technical Report (RPS group, 2024a)), the additional impacts created by the addition of one platform are considered negligible. Therefore there will be no adverse effects to the integrity of the Saltee Islands SPA during the operation and maintenance phase caused by the impacts of collision with static offshore infrastructure.

Northern gannet is not considered senstiivet to collision with static offfshore infrastructure and was screened out at Stage 1.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are thought to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases. Northern gannet's foraging range is 315 km (mean max; Woodward, *et. al*., 2014), this includes only marine habitats and equates to 176,261 km^2. The area of proposed works is 65.45 km^2. Therefore, the area with which the Saltee Islands SPA northern gannet population overlaps the area of proposed works by equates to 0.037% of the total available foraging range. Therefore, there will be no adverse effects upon the Saltee Islands SPA northern gannet population during any phase caused by impacts from changes in prey availability.

Northern fulmar is not considered senstive to changes in prey availbilty and was screened out at Stage 1.

Summary

For breeding northern gannet and northern fulmar during all phases and impacts there will be **no adverse effects upon the integrity of the Saltee Islands SPA.**

Table 1.155: A Summary Of The Saltee Islands SPA Assessment

Impact	Relevant project phase			Species	Assessment	Conclusion
	C	O	D			
Objective 1: To ensure that there is no significant decline in breeding population abundance						
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Northern fulmar	Mortality caused by displacement is calculated at zero birds. Therefore, there will be no impact upon the breeding population.	No adverse effects on the population and therefore no adverse effect on site integrity
	✓	✓	✓	Northern gannet		
Collision with static offshore infrastructure	×	✓	×	Northern fulmar	Any effects are unquantifiable and will be minimised by the size of the northern fulmar foraging range. Therefore, there will be no adverse effects upon the population	
Indirect impacts from changes in prey availability	✓	✓	✓	Northern gannet	As the affected area equates to 0.037% of the available foraging range there will be no adverse effects upon the population	

1.9.3.11 Conclusion of assessment of adverse effects alone

Many of the sites are suitably far away and the impacts small and temporary, for there to be no adverse effect on site integrity. Therefore, adverse effects are only predicted for the Liverpool Bay SPA and the Dee Estuary SPA. A summary of effects upon the screened in sites is provided below Table 1.156.

Table 1.156: A Summary Of The Effects Upon Screened In Sites, Impacts With A Predicted Effect Are Highlighted In Yellow

Site	Feature	Impact	Conservation Objective	Effect on site integrity	Proposed mitigation	Residual effects after mitigation
Liverpool Bay SPA	Little tern	• Indirect impacts from changes in prey availability	Objectives 4 and 5	Moderate adverse effect	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	Little tern	• Temporary habitat loss leading to displacement/disturbance of birds • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Accidental pollution in the surrounding area	Objectives 1, 2 and 3	No adverse effects	N/A	N/A
	Red-throated diver Little gull Common scoter Waterbird assemblage	• Temporary habitat loss leading to displacement/disturbance of birds • Indirect impacts from changes in prey availability • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Accidental pollution in the surrounding area	All objectives	No adverse effects		
Dee Estuary SPA	Little tern	• Indirect impacts from changes in prey availability	Objectives 4 and 5	Moderate adverse effect	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	Little tern	• Temporary habitat loss leading to displacement/disturbance of birds • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Accidental pollution in the surrounding area	Objectives 1, 2 and 3	No adverse effects	N/A	N/A

Site	Feature	Impact	Conservation Objective	Effect on site integrity	Proposed mitigation	Residual effects after mitigation
	Dunlin Curlew Grey plover Waterbird assemblage	• Temporary habitat loss leading to displacement/disturbance of birds • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Indirect impacts from changes in prey availability • Accidental pollution in the surrounding area	All objectives	No adverse effects		
Ribble and Alt SPA and Ramsar	Lesser black-backed gull Common tern	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Collision with static offshore infrastructure • Indirect impacts from changes in prey availability	All objectives	No adverse effects	N/A	N/A
Anglesey Terns SPA	Sandwich tern	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Indirect impacts from changes in prey availability • Creation of roosting and nesting habitats among project infrastructure	All objectives	No adverse effects	N/A	N/A
Morecambe Bay and Duddon Estuary SPA and Ramsar	Lesser black-backed gull	• Collision with static offshore infrastructure • Indirect impacts from changes in prey availability	All objectives	No adverse effects	N/A	N/A
Aberdaron Coast and Bardsey Island SPA	Manx shearwater	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure. • Collision with static offshore infrastructure	All objectives	No adverse effects	N/A	N/A
Ailsa Crag SPA	Northern gannet	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure	All objectives	No adverse effects	N/A	N/A

Site	Feature	Impact	Conservation Objective	Effect on site integrity	Proposed mitigation	Residual effects after mitigation
		• Indirect impacts from changes in prey availability				
Skomer, Skokholm and the Seas off Pembrokeshire SPA	Manx shearwater European storm petrel	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Collision with static offshore infrastructure • Indirect impacts from changes in prey availability	All objectives	No adverse effects	N/A	N/A
Grassholm SPA	Northern gannet	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Indirect impacts from changes in prey availability	All objectives	No adverse effects	N/A	N/A
Saltee Islands SPA	Northern fulmar Northern gannet	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Collision with static offshore infrastructure • Indirect impacts from changes in prey availability	All objectives	No adverse effects	N/A	N/A

1.9.4 Assessment of adverse effects in-combination with other plans and projects

All designated sites and the associated features screened in for Stage 2 assessment were fully assessed during the project alone assessment. However, in order to bring designated sites and associated features forward for assessment of adverse effects in-combination with other plans and projects a screening process has been used.

If the predicted magnitude for the project alone assessment was less than 1% of the baseline mortality of the reference population for a qualifying feature or affects less than 1% of the qualifying feature and/or supporting habitats, then a conclusion of no AEoI has been made (Table 1.156). In these cases, it will be concluded that the predicted magnitude will not undermine the conservation objectives for the SPA and as a result will not have an adverse effect on the integrity of the SPA.

If the predicted magnitude is greater than 1% of the baseline mortality of the reference population for a qualifying feature or affects more than 1% of the qualifying feature and/or supporting habitats then further consideration is given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination.

This approach broadly follows the same approach as that followed for other DCO applications (e.g. Hornsea Four).

Therefore, the sites and features that have been taken forward for an in-combination assessment are:

- Liverpool Bay SPA – All features with the exception of common tern
- Dee Estuary SPA– Little tern, dunlin, curlew, grey plover, waterbird assemblage

The adverse effects upon site integrity for the sites and features listed above were considered negligible or greater (Table 1.156).

1.9.5 Information to inform the in-combination assessment

As the impacts of the project are only expected to affect the Liverpool Bay SPA and the Dee Estuary SPA, the Zone of Influence (ZoI) has been reduced to reflect the features that these sites are designated for. Wader winter foraging ranges are poorly represented in the literature, although they are regarded as being site faithful with restricted foraging ranges, and the Liverpool Bay SPA was enlarged to include all areas that were regularly used by the qualifying features (Lawson, *et. al*., 2016).

Therefore, 20 km was used as the ZoI to search for other projects and plans that have the potential to cause cumulative adverse effects upon these sites' integrity as this is the largest core foraging range (for pink footed goose) as reported in the NatureScot 2016 note; '*Assessing Connectivity with Special Protection Areas*', this encompasses connectivity for all of the features concerned.

In addition, as the impacts screened in are all of considerably greater magnitude during the construction and maintenance phase, and no AEoI were predicted for the operation and maintenance phase within the alone assessment, impacts during the operation and maintenance phase have been screened out of the in-combination assessment.

Table 1.157: List Of Other Projects And Plans Considered Within The CEA

Project/Plan	Status	Distance from the Project (km)	Description of project/plan	Start date of license	Expiration date of license	Overlap with the Project
Tier 1						
Awel y Môr	Submitted	1.1	Offshore wind farm to generate in excess of 500 MW.	01/01/2023	01/01/2055	Spatial and temporal overlap (construction and operation and maintenance phase)
Tier 2						
Morgan and Morecambe offshore wind farms transmission assets	Pre application	3	The offshore and onshore assets that will be used to transport electricity from the Morgan and Morecambe Offshore Wind Farms to the National Grid substation at Penwortham	No data	No data	Temporal overlap (construction and operation and maintenance phase)
Mostyn Energy Park extension	Pre application	4	An extension to Mostyn docks to enable future wind farm support.	No data	No data	Temporal overlap (construction and operation and maintenance phase)
Morgan offshore wind farm generation assets	Pre application	7.53	Offshore wind farm with up to 107 turbines with a maximum height of 324 m and maximum rotor diameter of 280 m.	No data	No data	Temporal overlap (construction and operation and maintenance phase)
Morecambe offshore wind farm generation assets	Pre application	30	Offshore wind farm with a nominal capacity of 480 MW and between 20 and 40 fixed bottom turbines.	01/01/2026	No data	Temporal overlap (construction and operation and maintenance phase)
Mona offshore wind farm	Pre application	No data	Offshore wind farm with up to 107 turbines with a maximum height of 324 m and maximum rotor diameter of 280 m, and a total capacity of approximately 1.5 GW.	01/01/2028	31/12/2065	Spatial and temporal overlap (construction and operation and maintenance phase)

1.9.5.1 Maximum Design Scenario

Table 1.158: The Maximum Design Scenario For The In-Combination Assessment

Potential cumulative effect	Phase[a] C	O	D	Maximum Design Scenario	Justification
Temporary habitat loss leading to disturbance and displacement of birds	✓	×	✓	MDS as described for the Project assessed cumulatively with the following wind farms: **Construction** **Tier 1** • Awel y Môr **Tier 2** • Morgan offshore wind farm generation assets • Mostyn Energy Park extension • Morecambe offshore wind farm generation assets • Mona offshore wind farm **Decommissioning** • Expected end of lifetime 2050.	There is a possibility that construction could overlap spatially, and temporally with all Tier 1 and Tier 2 projects listed within the MDS column.
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	MDS as described for the Project assessed cumulatively with the following wind farms: **Construction** **Tier 1** • Awel y Môr **Tier 2** • Morgan offshore wind farm generation assets • Mostyn Energy Park extension • Morecambe offshore wind farm generation assets • Mona offshore wind farm **Decommissioning** • Expected end of lifetime 2050.	There is a possibility that construction could overlap spatially, and temporally with all Tier 1 and Tier 2 projects listed within the MDS column.
Indirect impacts to birds from changes to prey availability	✓	×	✓	MDS as described for the Project assessed cumulatively with the following wind farms: **Construction**	There is a possibility that construction could overlap spatially, and temporally with all Tier 1 and Tier 2 projects listed within the MDS column.

Potential cumulative effect	Phase[a] C	O	D	Maximum Design Scenario	Justification
				Tier 1 • Awel y Môr **Tier 2** • Morgan and Morecambe offshore windfarm transmission assets • Mostyn Energy Park extension • Morgan offshore wind farm generation assets • Morecambe offshore wind farm generation assets • Mona offshore wind farm **Decommissioning** • Expected end of lifetime 2050.	
Accidental pollution in the surrounding area	✓	✗	✓	MDS as described for the Project assessed cumulatively with the following wind farms: **Construction** **Tier 1** • Awel y Môr **Tier 2** • Morgan and Morecambe offshore windfarm transmission assets • Mostyn Energy Park extension • Morgan offshore wind farm generation assets • Morecambe offshore wind farm generation assets • Mona offshore wind farm **Decommissioning** Expected end of lifetime 2050.	There is a possibility that construction could overlap spatially, and temporally with all Tier 1 and Tier 2 projects listed within the MDS column.

1.9.6 In-combination assessment

1.9.6.1 Liverpool Bay SPA

1.9.6.1.1 Screening

The objective of the Liverpool Bay SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.1 and impacts associated with the Proposed Development with respect to the overarching conservation objectives established for this site (Natural England, 2019):

- Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.
- Conservation objective 2 – The structure and function of the habitats of the qualifying features.
- Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.
- Conservation objective 4 – The population of each of the qualifying features.
- Conservation objective 5 – The distribution of the qualifying features within the site.

Table 1.159 highlights which impacts are considered against each conservation objective after taking into consideration the results of the project alone assessment.

Table 1.159: Impacts Considered For Each Conservation Objective – Liverpool Bay SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4	Conservation Objective 5
Temporary habitat loss leading to displacement/disturbance of birds	✓	✓	✓	✓	✓
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Accidental pollution in the surrounding area	×	×	✓	×	✓

Connectivity amongst the Liverpool Bay SPA features more or less directly correlates with the SPAs' boundary (Lawson, 2016). For additional impacts caused by in-combination effects, projects that were screened in are: the transmission aspects of the Mona Offshore Wind Farm, Awel Y Mor offshore wind farm, and Morgan and Morecambe offshore wind farms. Impacts that are screened in for LSEs are temporary habitat loss leading to displacement/disturbance of birds, indirect impacts from changes in prey availability, and accidental pollution in the surrounding area.

Temporary habitat loss leading to displacement/disturbance of birds

Spatial data was not available for Morgan and Morecambe Offshore Wind Farms, however as works are expected to be broadly similar to Mona and Awel Y Mor (i.e. and export cable route) the mean of those two schemes was taken. The area of proposed works for Mona is expected to cover 28.53 km^2, and for Awel Y Mor 41.11 km^2. Therefore Morgan/Morecambe was estimated at 34.82 km^2. This combines to 104.46 km^2 and the Liverpool Bay SPA is 2,521 km^2.

Assuming that all works were to take place at once, this would equate to an additional temporary loss of habitats of 4.14% of the Liverpool Bay SPA that will be affected by proposed works. As works may take up to 3.5 years to complete, these effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the integrity of the Liverpool Bay SPA caused by temporary habitat loss leading to displacement/disturbance of birds for all features except for little tern.

As none of the other projects are within connectivity of the breeding little tern there will be no additional effects upon them.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

Displacement for the transmission aspects of the other projects is summarised in Table 1.160. With the exception of Awel Y Mor, there was little quantified information available. Therefore, the qualitative assessment made by Mona offshore wind farm has been taken into account. There is currently no data publicly available for the Morgan/Morecambe transmission aspect. Although there is no data, the temporal and spatial habitat loss of Mona and Morgan/Morecambe transmissions are expected to roughly mirror that of Awel Y Mor, as the length and width of the cable corridors are presumed to be similar.

Table 1.160: Summary Of The Displacement Results From Other Projects Within The Liverpool Bay Spa

Project	Feature	Increase in Baseline Mortality (%)
Proposed Development	Red-throated diver	Up to 0.89
	Little gull	Up to 0.040
	Common scoter	Up to 0.98
	Little tern	0.04
	Waterbird assemblage	No data available
Mona offshore wind farm transmission	All features	The transmission aspect of the Mona offshore wind farm was not assessed quantitively. The qualitative assessment was of no significant adverse effects to the Liverpool Bay SPA
Awel Y Mor offshore wind farm transmission	Red-throated diver	Up to 0.582
	Little gull	No data available
	Common scoter	Up to 0.007
	Little tern	Beyond 5km foraging range
	Waterbird assemblage	No data available
Morecambe	Red-throated diver	0.01
	Little gull	No data available

Project	Feature	Increase in Baseline Mortality (%)
	Common scoter	No data available
	Little tern	Beyond 5km foraging range
	Waterbird assemblage	No data available
Morgan/Morecambe offshore wind farms shared transmission	Red-throated diver	Up to 0.35
	Little gull	No data available
	Common scoter	Up to 0.98
	Little tern	Beyond 5km foraging range
	Waterbird assemblage	No data available
Minimum total in-combination excess mortality*	Red-throated diver	1.932*
	Little gull	0.040*
	Common scoter	1.967*
	Little tern	0.04
	Waterbird assemblage	No data available

* For projects with quantitative data only

The additional projects' increases in baseline mortality are below zero for little tern and little gull (these species are not expected to be significantly impacted by the Proposed Development alone either). For common scoter and red-throated diver the increase in baseline mortality is expected to be above 1%. The increases to above 1% and will be a temporary effect if/when construction overlaps temporally.

Although no data was available for little gull, as the project alone increases in mortality are so low it is not expected that these projects would push excess mortality above 1%.

With a definite in-combination increase in excess mortality of over 1%, it is predicted that there will be minor additional adverse effects upon common scoter and red-throated diver due to the combined impact of disturbance and displacement from airborne sound and presence of vessels and infrastructure.

The effects on the waterbird assemblage are not quantified, however as most birds within the Liverpool Bay SPA are common scoter (Lawson, *et. al.*, 2016) the effects upon the assemblage will most closely mirror those of the scoter and are therefore predicted to be minor.

As none of the other projects are within connectivity of the breeding little tern there will be no additional effects upon them.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are predicted to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases.

For mobile species during the non-breeding season, the assessment of fish within Chapter 7: Marine Biodiversity, and the diadromous fish section of this RIAA concluded that there would be no significant impact on fish. Therefore, the fish are likely to move away from construction and operational areas in a similar manner as the birds and therefore the impacts from changes in prey availability will be of the same, if not of less significance that the temporary habitat loss.

None of the other projects are within the foraging range of little tern. Therefore, there will be no additional additional adverse effects to the integrity of the Liverpool Bay SPA for this feature.

Accidental pollution in the surrounding area

These impacts were scoped out of the assessment by both Mona Offshore Wind Farm and Awel Y Mor Offshore Wind Farm. Therefore, there are predicted to be no additional adverse effects upon the Liverpool Bay SPA caused by accidental pollution in the surrounding area.

Table 1.161: A Summary Of The Liverpool Bay SPA In-Combination Assessment

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion
Objective 1: To maintain or restore the extent and distribution of the habitats of the qualifying feature						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	4.14% of the Liverpool Bay SPA will be affected by the additional works. These effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the distribution and extent of habitats	Minor additional adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Little tern	As the in-combination projects are beyond connectivity with the little tern foraging range and therefore will be no additional adverse effects upon the extent and distribution of habitats.	No additional adverse effects upon the extent and distribution of habitats and therefore this remains at a negligible adverse effect on site integrity in-combination.
Objective 2 – To maintain and restore the structure and function of the habitats of the qualifying features						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	4.14% of the Liverpool Bay SPA will be affected by the additional works. These effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the distribution and extent of habitats	Minor additional adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon the structure and function of habitats	No additional adverse effects upon the structure and function of habitats and therefore this remains a negligible adverse effect on site integrity in-combination.
Objective 3 – To maintain or restore the supporting processes on which the habitats of the qualifying features rely						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	4.14% of the Liverpool Bay SPA will be affected by the additional works. These effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the distribution and extent of habitats	Minor additional adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon the supporting processes of habitats	No additional adverse effects upon the supporting processes of habitats and therefore this remains a negligible adverse effect on site integrity in-combination.
Objective 4 – To maintain or restore the population of each of the qualifying feature						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	4.14% of the Liverpool Bay SPA will be affected by the additional works. These effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the distribution and extent of habitats	Minor additional adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon the population	No additional adverse effects upon the population and therefore this remains at a neglible adverse effect on site integrity in-combination.
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon the population	No additional adverse effects upon the population and therefore this remains at no adverse effect on site integrity in-combination.
Indirect impacts from changes in prey availability	✓	×	✓	Red-throated diver	Impacts to prey populations will be localised and temporary in nature and are therefore unlikely to impact mobile non-breeding features or features with a large enough foraging range to alter their foraging strategy.	Minor additional adverse effects upon distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon distribution	No additional adverse effects upon distribution and therefore this remains at a moderate adverse effect on site integrity without mitigation and a negligible adverse effect on site integrity with seasonal limitations to works.
Objective 5: To maintain or restore the distribution of the qualifying features within the site						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Red-throated diver	4.14% of the Liverpool Bay SPA will be affected by the additional works. These effects would be medium-term and reversible. However, as wintering birds have a high level of movement and are not tied to a colony, there would be minor additional adverse effects to the distribution and extent of habitats	Minor additional adverse effects upon the extent and distribution of habitats and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon distribution	No additional adverse effects upon distribution and therefore this remains at a moderate adverse effect on site integrity in-combination.
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	Red-throated diver	In-combination the increase of baseline morality is above 1% red-throated diver.	Minor additional adverse effects upon distribution and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Little gull	In-combination the increase of baseline morality is below 1% for little gull.	Negligible additional adverse effects upon distribution and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Common scoter	In-combination the increase of baseline mortality is above 1% for common scoter (and by proxy the assemblage).	Minor additional adverse effects upon distribution and therefore no adverse effect on site integrity in-combination.
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon distribution	No additional adverse effects upon distribution and therefore no additional adverse effects on site integrity in-combination.
Indirect impacts from changes in prey availability	✓	×	✓	Red-throated diver	The impacts are expected to be the same as those from temporary habitat loss leading to displacement/disturbance of birds. Therefore, it is predicted that there will be minor additional adverse effects upon distribution.	Minor additional adverse effects upon distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Little tern	As the other projects are beyond connectivity with the little tern foraging range there will be no additional adverse effects upon distribution	No additional adverse effects upon distribution and therefore this remains at a moderate adverse effect on site integrity without mitigation and a negligible adverse effect on site integrity with seasonal limitations to works.

Impact relative to the conservation objective	Relevant project phase C	O	D	Feature	Assessment	Conclusion
Accidental pollution in the surrounding area Impact relative to the conservation objective	✓	×	✓	Red-throated diver	As this impact was scoped out from assessment in the other projects there is predicted to be no additional adverse effects upon distribution	No additional adverse effects on distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Little gull		
	✓	×	✓	Common scoter		
	✓	✓	✓	Little tern		
	✓	✓	✓	Waterbird assemblage		

1.9.6.2 Dee Estuary SPA and Ramsar

Screening

The objective of the Dee Estuary SPA is to ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive subject to natural change. In the context of the natural change, this may be achieved by ensuring that conservation objectives as set out in section 1.9.1.1.4 are endorsed.

The assessment in this section will focus on each of the designated ornithological features of the SPA, as stated in section 1.9.1.1 and impacts associated with the Proposed Development with respect to the conservation objectives established for this site (Natural England, 2019):

- Conservation objective 1 – The extent and distribution of the habitats of the qualifying features.
- Conservation objective 2 – The structure and function of the habitats of the qualifying features.
- Conservation objective 3 – The supporting processes on which the habitats of the qualifying features rely.
- Conservation objective 4 – The population of each of the qualifying features.
- Conservation objective 5 – The distribution of the qualifying features within the site.

Table 1.162 highlights which impacts are considered against each conservation objective after taking into consideration the results of the project alone assessment.

Table 1.162: Impacts Considered for Each Conservation Objective – Dee Estuary SPA

The ✓ indicates that there is a potential for impact to affect the conservation objective and × indicates that there is no pathway through which the impact could undermine conservation objective.

Impact	Conservation Objective 1	Conservation Objective 2	Conservation Objective 3	Conservation Objective 4*	Conservation Objective 5
Temporary habitat loss leading to displacement/disturbance of birds	✓	✓	✓	✓	✓
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	×	×	×	✓	✓
Indirect impacts from changes in prey availability	×	×	×	✓	✓
Accidental pollution in the surrounding area	×	×	×	×	✓

* Assessment for little tern only.

Foraging ranges for waders and wildfowl are generally lower than those of seabirds and it is widely accepted that many wader species are site faithful to their wintering grounds (Van de Kam *et al.*, 2004) and roost close to their foraging grounds (Burton and Armitage, 2005; Rehfisch *et al.*, 1996). Therefore, connectivity for the Dee Estuary's intertidal wildfowl and wader features has been screened using the 20 km core foraging range for pink footed goose as recommended by the NatureScot 2016 note: *Assessing Connectivity with Special Protection Areas*. There are two cable landfalls that fall within 20 km of the Dee Estuary SPA and will affect intertidal habitats, they are both cable corridor landfalls – Mona Offshore Wind Farm and Awel Y Mor Offshore Wind Farm**.** Both projects reported **'No significant effects'** upon wintering and migratory intertidal birds.

Temporary habitat loss leading to displacement/disturbance of birds

For little tern with their limited foraging range there is no connectivity with any other plans or projects. Therefore, no other projects will lead to temporary habitat loss leading to displacement/disturbance of birds for this feature.

Table 1.163 shows the peak count of each feature of the in-combination assessment of the Dee Estuary SPA, recorded at the landfall location of each project where data is available. Awel Y Mor landfall is approx. 3.5 km from the Dee Estuary SPA and Mona landfall is approx. 13.2 km from the Dee Estuary SPA, and therefore both could be discounted as having an additive effect on the Dee Estuary due to them being outwith potential connectivity.

Table 1.163: The Peak Numbers Of SPA Features Recorded At Project Landfall Locations

Species	Awel Y Mor	Mona Offshore Wind Farm	Mostyn Energy Park extension	Proposed Development	In-combination Total	In-combination total as a % of the current Dee Estuary SPA population
Dunlin	4	0	442	1,357	1,803	10.69
Curlew	1	71	45	60	177	5.15
Grey plover	0	0	2	52	54	5.33
Waterbird assemblage	836	*2,759	N/A	8,479	12,074	6.96

* Minus common scoter which are not a feature of the Dee Estuary SPA waterbird assemblage.

As no grey plover and very few dunlin were found at the other sites it can be assumed that the habitats available at these projects are unfavourable for these species. Recent tracking studies on the Humber have shown that curlew are site faithful and occupy small winter home ranges, utilising intertidal and coastal grazing plain habitats within 5.5 km^2 (Mander, *et. al*., 2022). This would make it unlikely that any of the curlew found at the Mona landfall were Dee Estuary birds. The waterbird assemblage reported at both the Mona Offshore Wind Farm and Awel Y Mor landfalls was made up by a large proportion of gulls which are highly mobile and tolerant of disturbance.

Assuming that all of the birds found at Mona, Awel Y Mor and Mostyn are Dee Estuary birds, this increases the additional adverse effects. However, as Mostyn Energy Park extension have committed to soft starts, cold weather construction restriction, screening and a noise suppression system and the applicant has committed to tidal restrictions where possible during the winter period when extra energy expenditure can increase mortality, this will reduce disturbance and displacement effects.

Disturbance and displacement from airborne sound and presence of vessels and infrastructure

As Mostyn Energy Park extension have committed to soft starts, cold weather construction restriction, screening and noise suppression system, there will only be limited additional effects.

Indirect impacts from changes in prey availability

Indirect effects to prey availability are predicted to be short term and reversible (Chapter 7: Marine Biodiversity) lasting only for the duration of construction. Any impacts can therefore be assumed to apply only to the construction and decommissioning phases.

For mobile species during the non-breeding season any temporary and localised changes in prey availability are likely to have a negligible impact as mobile bird species will be able to move to other foraging areas temporarily whilst works take place.

For little tern with their limited foraging range there is no connectivity with any other plans or projects. Therefore, no other projects will lead to indirect impacts from changes in prey availability for this feature.

Table 1.164: A Summary Of The Dee Estuary SPA And Ramsar In-Combination Assessment

Impact	Relevant project phase C	O	D	Feature	Assessment	Conclusion
Objective 1: To maintain or restore the extent and distribution of the habitats of the qualifying feature						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional effects upon the extent and distribution of habitats of the feature	No additional adverse effects on the extent and distribution of habitats and therefore the impact remains as a negligible adverse effect on site integrity.
Objective 2 – To maintain and restore the structure and function of the habitats of the qualifying features						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional effects upon the structure and function of habitats of the feature	No additional adverse effects on the structure and function of habitats and therefore the impact remains as a negligible adverse effect on site integrity.
Objective 3 – To maintain or restore the supporting processes on which the habitats of the qualifying features rely.						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon the supporting processes of the habitats of the feature	No additional adverse effects on the supporting processes of the habitats and therefore the impact remains as a negligible adverse effect on site integrity.
Objective 4 – To maintain or restore the population of each of the qualifying feature						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon the population	No additional adverse effects on population and therefore the impact remains as a negligible adverse effect on site integrity.
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	✓	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon the population	No additional adverse effects on population and therefore the impact remains as a negligible adverse effect on site integrity.
Indirect impacts from changes in prey availability	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon the population	No additional adverse effects upon distribution and therefore this remains at a moderate adverse effect on site integrity without mitigation and a negligible adverse effect on site integrity with seasonal limitations to works.

Impact	Relevant project phase C	O	D	Feature	Assessment	Conclusion
Objective 5: To maintain or restore the distribution of the qualifying features within the site						
Temporary habitat loss leading to displacement/disturbance of birds	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon distribution	No additional adverse effects upon distribution and therefore the impact remains as a negligible adverse effect on site integrity.
	✓	×	✓	Curlew	The number of additional SPA features potentially affected increases. These effects are mitigated for with measures from Mostyn Energy Park. Therefore, there will be negligible additional effects to distribution	Negligible additional adverse effects upon distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Waterbird assemblage		
	✓	×	✓	Dunlin	The number of additional SPA features potentially affected increases. These effects are mitigated for with measures from Mostyn Energy Park. Therefore, there will be negligible additional effects to distribution	Negligible additional adverse effects on distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Grey plover		
Disturbance and displacement from airborne sound and presence of vessels and infrastructure	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon the population	No additional adverse effects on distribution and therefore the impact remains as a negligible adverse effect on site integrity.
	✓	×	✓	All other features	The number of additional SPA features potentially affected increases. These effects are mitigated for with measures from Mostyn Energy Park. Therefore, there will be negligible additional effects to distribution	Negligible additional adverse effects on distribution and therefore no adverse effect on site integrity.
Indirect impacts from changes in prey availability	✓	×	✓	Little tern	None of the other projects are within the foraging range of little tern. Therefore, there will be no additional adverse effect upon distribution	No additional adverse effects upon distribution and therefore this remains at a moderate adverse effect on site integrity without mitigation and a negligible adverse effect on site integrity with seasonal limitations to works.
	✓	×	✓	Dunlin	The number of additional SPA features potentially affected increases. These effects are mitigated for with measures from Mostyn Energy Park. Therefore, there will be negligible additional effects to distribution	Negligible additional adverse effects upon distribution of habitats and therefore no adverse effect on site integrity.
	✓	×	✓	Curlew		
	✓	×	✓	Grey plover	The number of additional SPA features potentially affected increases. These effects are mitigated for with measures from Mostyn Energy Park. Therefore, there will be negligible additional effects to distribution	Negligible additional adverse effects on distribution and therefore no adverse effect on site integrity.
	✓	×	✓	Waterbird assemblage		

1.9.7 Conclusion

For the Liverpool Bay SPA there were no additional effects in-combination with other plans and projects for little tern. This was due to no other projects impacting upon the little tern foraging range. For all other features there were minor additional impacts for all conservation objectives. For common scoter, red-throated diver and little gull there were negligible additional impacts for all conservation objectives. The combined effect, after the additional impacts are taken into account, remains as moderate for little tern for conservation objectives 4 and 5 and therefore there will be a moderate adverse effect upon site integrity for this feature if works were to take place during the sensitive egg laying and chick rearing period. If mitigation was put in place to limit works during this period, then there will no adverse effect upon site integrity. For all other features the effects were minor or lower and therefore there will be no adverse effects upon site integrity.

For the Dee Estuary there were no additional effects caused by other plans or projects for any of the conservation objectives due to measures committed to by Mostyn Energy Park extension. The combined effect, after the additional impacts are taken into account, remains as moderate for little tern for conservation objectives 4 and 5 and therefore there will be a moderate adverse effect upon site integrity for this feature if works were to take place during the sensitive egg laying and chick rearing period. If mitigation was put in place to limit works during this period, then there will no adverse effect upon site integrity. For all other features the effects were minor or lower and therefore there will be no adverse effects upon site integrity.

A summary of the additional and combined effects is shown in Table 1.165 below.

Table 1.165: A Summary Of The In-Combination Effects Upon Screened In Sites, Impacts With A Predicted Adverse Effect Are Highlighted In Yellow

Site	Feature	Impact	Conservation Objective	Additional effect from other projects	Combined effect	Proposed mitigation	Residual effect after mitigation
Liverpool Bay SPA	Little tern	• Indirect impacts from changes in prey availability	4 and 5	No additional adverse effect	Moderate adverse effects upon site integrity	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	Little tern	• Temporary habitat loss leading to displacement /disturbance of birds • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Accidental pollution in the surrounding area	1, 2 and 3	No additional adverse effect	No adverse effects upon site integrity	N/A	N/A

Site	Feature	Impact	Conservation Objective	Additional effect from other projects	Combined effect	Proposed mitigation	Residual effect after mitigation
	Red-throated diver Little gull Common scoter Waterbird assemblage	• Temporary habitat loss leading to displacement /disturbance of birds • Indirect impacts from changes in prey availability	All objectives	Minor additional adverse effect	No adverse effects upon site integrity		
	Common scoter Red-throated diver Waterbird assemblage	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure	Objective 5	Minor additional adverse effect	No adverse effects upon site integrity		
	Little gull	• Disturbance and displacement from airborne sound and presence of vessels and infrastructure	Objective 5	No additional adverse effect	No adverse effects upon site integrity		
	Red-throated diver Little gull Common scoter Waterbird assemblage	• Accidental pollution in the surrounding area	All objectives	No additional adverse effect	No adverse effects upon site integrity		
Dee Estuary SPA	Little tern	• Indirect impacts from changes in prey availability	4 and 5	No additional adverse effect	Moderate adverse effects upon site integrity	Construction activities are timed to avoid the egg laying and chick rearing period.	Negligible effects and therefore no adverse effects on site integrity.
	Little tern	• Temporary habitat loss leading to displacement /disturbance of birds • Disturbance and displacement from airborne	1, 2 and 3	No additional adverse effect	No adverse effects upon site integrity	N/A	N/A

Site	Feature	Impact	Conservation Objective	Additional effect from other projects	Combined effect	Proposed mitigation	Residual effect after mitigation
		sound and presence of vessels and infrastructure • Accidental pollution in the surrounding area					
	Dunlin Curlew Grey plover Waterbird assemblage	• Temporary habitat loss leading to displacement /disturbance of birds • Disturbance and displacement from airborne sound and presence of vessels and infrastructure • Indirect impacts from changes in prey availability • Accidental pollution in the surrounding area	All objectives	Negligible additional adverse effect	No adverse effects upon site integrity		

1.10 Summary

A summary of the assessments presented in this RIAA, considering the relevant designated sites is provided in the following sections.

1.10.1 Annex I habitats

1.10.1.1 Dee Estuary SAC

Based on the evidence presented in sections 1.6.2, 1.6.3, and 1.6.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex I qualifying habitats, it can be concluded that there is **no risk of an adverse effect on the integrity of the Dee Estuary SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.2 Annex II diadromous fish

1.10.2.1 Dee Estuary SAC

Based on the evidence presented in sections 1.7.2, 1.7.3, and 1.7.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Dee Estuary SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.2.2 River Dee and Bala Lake SAC

Based on the evidence presented in sections 1.7.2, 1.7.3, and 1.7.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the River Dee and Bala Lake SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.2.3 Afon Gwyrfai a Llyn Cwellyn SAC

Based on the evidence presented in sections 1.7.2, 1.7.3, and 1.7.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Afon Gwyrfai a Llyn Cwellyn SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.2.4 Afon Eden - Cors Goch Trawsfynydd SAC

Based on the evidence presented in sections 1.7.2, 1.7.3, and 1.7.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Afon Eden - Cors Goch Trawsfynydd SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.2.5 River Teifi SAC

Based on the evidence presented in sections 1.7.2, 1.7.3, and 1.7.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the River Teifi SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3 Annex II marine mammals

1.10.3.1 North Anglesey Marine SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the North Anglesey Marine SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.2 North Channel SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the North Channel SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.3 Lleyn Peninsula and the Sarnau SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Lleyn Peninsula and the Sarnau SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.4 West Wales Marine SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the West Wales Marine SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.5 Strangford Lough SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Strangford Lough SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.6 Murlough SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Murlough SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.7 Cardigan Bay SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Cardigan Bay SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.8 The Maidens SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of The Maidens SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.9 Pembrokeshire Marine SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Pembrokeshire Marine SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.10 Bristol Channel Approaches SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Bristol Channel Approaches SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.11 Lundy SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Lundy SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.12 Rockabill to Dalkey Island SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Rockabill to Dalkey Island SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.13 Saltee Islands SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Saltee Islands SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.3.14 Roaringwater Bay and Islands SAC

Based on the evidence presented in sections **Error! Reference source not found.**, 1.8.3, and 1.8.4, the assessment concluded that the conservation objectives for the site would not be undermined. Therefore, with respect to relevant Annex II qualifying species, it can be concluded that there is **no risk of an adverse effect on the integrity of the Roaringwater Bay and Islands SAC** as a result of activities associated with the Proposed Development alone and in-combination with other plans and projects.

1.10.4 Offshore and intertidal ornithological features

1.10.4.1 Liverpool Bay/Bae Lerpwl SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives of this site could be undermined for little tern as a result of indirect impacts upon prey availability (Table 1.138). These impacts were concluded to result in a **moderate adverse effect upon the integrity of the Liverpool Bay/Bae Lerpwl SPA** for little tern conservation objective 4 and 5 as a result of activities associated with the Proposed Development alone. The assessment concluded that the conservation objectives of this site could not be undermined for little tern as a result of the other impacts (disturbance and displacement from airborne sound and presence of vessels and infrastructure and accidental pollution in the surrounding area). The addition of mitigation limiting construction activities during the sensitive egg laying and chick rearing period would reduce these adverse effets to **negligible and therefore no adverse effect upon the integrity of the Liverpool Bay/Bae Lerpwl SPA.**

For all other features, the assessment concluded that the conservation objectives of this site would not be undermined as a result of any impacts. Therefore, it can be concluded that there is **no risk of an adverse effect on the integrity of the Liverpool Bay/Bae Lerpwl SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was predicted for the little tern feature of the Liverpool Bay SPA, an in-combination assessment was conducted.

As presented in section 1.9.6, the in-combination assessment concluded there were no additional effects in-combination with other plans and projects for little tern. For all other features there were minor additional impacts for all conservation objectives. For red-throated diver and little gull there were negligible additional impacts for all conservation objectives. The combined effect, after the additional impacts are taken into account, remains as moderate for little tern conservation objectives 4 and 5 and therefore there will be a **moderate adverse effect upon site integrity** for this feature (see Table 1.165). The addition of mitigation limiting construction activities during the sensitive egg laying and chick rearing period would reduce these adverse effects to **negligible and therefore no adverse effect upon the integrity of the Liverpool Bay/Bae Lerpwl SPA.**

For all other features the effects were minor or lower and therefore there will be **no adverse effects upon site integrity** (see Table 1.165).

1.10.4.2 Dee Estuary SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives of this site could be undermined for little tern as a result of the following impacts:

- indirect impacts upon prey availability (Table 1.141).

These impacts were concluded to result in a **moderate adverse effect upon the integrity of the Dee Estuary SPA** for little tern conservation objectives 4 and 5 as a result of activities associated with the Proposed Development alone. The addition of mitigation limiting construction activities during the sensitive egg laying and chick rearing period would reduce these adverse effets to **negligible and therefore no adverse effect upon the integrity of the Liverpool Bay/Bae Lerpwl SPA.**

For all other features, the assessment concluded that the conservation objectives of this site would not be undermined as a result of any impacts. Therefore, it can be concluded that there is **no risk of an adverse effect on the integrity of the Dee Estuary SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was predicted for the little tern feature of the Dee Estuary SPA, an in-combination assessment was conducted.

As presented in section 1.9.6, the in-combination assessment concluded there were no additional effects in-combination with other plans and projects for little tern. For all other features there were negligible additional impacts for all conservation objectives. The combined effect, after the additional impacts are taken into account, remains as moderate for little tern conservation objectives 4 and 5 and therefore there will be a **moderate adverse effect upon site integrity** for this feature (see Table 1.165). The addition of mitigation limiting construction activities during the sensitive egg laying and chick rearing period would reduce these adverse effets to **negligible and therefore no adverse effect upon the integrity of the Liverpool Bay/Bae Lerpwl SPA.**

For all other features the effects were minor or lower and therefore there will be **no adverse effects upon site integrity** (see Table 1.165)

1.10.4.3 Ribble and Alt Estuaries SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Ribble and Alt Estuaries SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Ribble and Alt Estuaries SPA, no in-combination assessment was conducted.

1.10.4.4 Anglesey Terns/Morwenoliaid Ynys Môn SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Anglesey Terns/Morwenoliaid Ynys Môn SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Anglesey Terns/Morwenoliaid Ynys Môn SPA, no in-combination assessment was conducted.

1.10.4.5 Morecambe Bay and Duddon Estuary SPA and Ramsar

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Morecambe Bay and Duddon Estuary SPA and Ramsar** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Morecambe Bay and Duddon Estuary SPA and Ramsar, no in-combination assessment was conducted.

1.10.4.6 Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Aberdaron Coast and Bardsey Island/Glannau Aberdaron ac Ynys Enlli SPA, no in-combination assessment was conducted.

1.10.4.7 Ailsa Craig SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Ailsa Craig SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Aisla Craig SPA, no in-combination assessment was conducted.

1.10.4.8 Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Skomer, Skokholm and the Seas off Pembrokeshire/Sgomer, Sgogwm a Moroedd Penfro SPA, no in-combination assessment was conducted.

1.10.4.9 Grassholm SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Grassholm SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Grassholm SPA, no in-combination assessment was conducted.

1.10.4.10 Saltee Islands SPA

Based on the evidence presented in sections 1.9.2 and 1.9.3, the assessment concluded that the conservation objectives for this site would not be undermined. Therefore, with respect to relevant ornithological features, it can be concluded that there is **no risk of an adverse effect on the integrity of the Saltee Islands SPA** as a result of activities associated with the Proposed Development alone.

As per section 1.9.4, if the predicted magnitude was greater than 1% of the baseline mortality of the reference population for a qualifying feature or affected more than 1% of the qualifying feature and/or supporting habitats then further consideration was given to the magnitude of the likely effect, including the contribution of impacts from other plans and projects, in-combination. As this >1% threshold was not predicted for **any feature** of the Saltee Islands SPA, no in-combination assessment was conducted.

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MAKING COMPLEX EASY

A TETRA TECH COMPANY

Liverpool Bay CCS Ltd
HYNET CARBON DIOXIDE TRANSPORTATION AND STORAGE PROJECT - OFFSHORE

Environmental Statement
Volume 3: WFD Assessment

EHE7228B
Liverpool Bay CCS Limited
Version Final
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Offshore ES
WFD Assessment

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Liverpool Bay CCS Limited

Glossary

Term	Meaning
The Applicant	This is Liverpool Bay CCS Ltd, the entity making the application and the entity that ultimately develops/operates the HyNet Carbon Dioxide Transportation and Storage System.
Bathing Waters	Originally designated under the EU Bathing Waters Directive (2006/7/EC), this indicates sites at which there is no permanent advice against bathing, based on water quality indicators.
Cefas Action Level 1	Measure of concentrations of metallic and organic contaminants within the marine environment, with concentrations above these levels requiring mitigation actions in some capacity.
Environmental Impact Assessment	A statutory process by which certain planned projects must be assessed before a formal decision to proceed can be made. It involves the collection and consideration of environmental information, which fulfils the assessment requirements of the EIA Directive and EIA Regulations, including the publication of an Environmental Statement (ES).
Hydromorphology	The physical characteristics of the waterbody including the size, shape, structure and the 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	Areas protected based on the presence of nationally important, rare, or threatened species or habitats.
Marine Pollution Contingency Plan	Plan required in licenced marine activities detailing specific best practice responses to any potential identified chemical or physical pollution event.
Maximum design scenario	The scenario within the project 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.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact
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.
Non-statutory stakeholder	Organisations with whom the regulatory authorities may choose to engage who are not designated in law but are likely to have an interest in a proposed development.
Project Design Envelope	Also known as the Rochdale Envelope, the PDE concept is routinely utilised in both onshore and offshore planning applications to allow for some flexibility in design options, particularly offshore, and more particularly for foundations and turbine type, where the full details of the project are not known at application submission but where sufficient detail is available to enable all environmental impacts to be appropriately considered during the EIA.
Surface Water Body	Any body of water above ground, including streams, rivers, lakes, wetlands, reservoirs, and creeks.
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 and Initialisations

Acronym and Initialisations	Description
AEoI	Adverse Effect on Integrity
BP	Biosecurity Plan
CBRA	Cable Burial Risk Assessment

Acronym and Initialisations	Description
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CMS	Construction Method Statement
CSIP	Cable Specification and Installation Plan
DO	Dissolved Oxygen
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
EQSD	Environmental Quality Standards Directive
EU	European Union
FLCP	Fisheries Liaison and Coexistence Plan
FLO	Fisheries Liaison Officer
FO	Fibre optic
HDD	Horizontal Directional Drilling
INNS	Invasive Non-Native Species
LSE	Likely Significant Effect
MARPOL	International Convention for the Prevention of Pollution from Ships
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
MMMP	Marine Mammal Mitigation Protocol
MPCP	Marine Pollution Contingency Plan
NRW	Natural Resources Wales
NVZ	Nitrate Vulnerable Zone
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
PDE	Project Design Envelope
PLONOR	Poses Little or No Risk
RBMP	River Basin Management Plan
SAC	Special Area of Conservation
SPA	Special Protection Area
SSC	Suspended Sediment Concentration
UXO	Unexploded Ordnance
WFD	Water Framework Directive
ZOI	Zone of Influence

Units

Unit	Description
km	Kilometre
km^2	Square kilometre
m	Metre
m^2	Square metre
nm	Nautical Mile
%	Percent

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1 WFD ASSESSMENT TECHNICAL REPORT

1.1 Introduction

This Water Framework Directive (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) (WFD) coastal and transitional waters assessment Technical Report (hereafter 'WFD assessment') provides a WFD screening, scoping and assessment of effects for the HyNet Carbon Dioxide Transportation and Storage Project – Offshore (hereafter referred to as 'the Proposed Development) against the objectives for the WFD water bodies relevant to the Proposed Development. It has described the current baseline conditions and quantified the potential changes due to the installation and presence of the Proposed Development, which is illustrated in Figure 1.1 and described in detail in section 1.4.

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 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.

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. The aim of the WFD was for all water bodies to achieve 'good' status by 2015. This aim was not achieved and therefore the Environment Agency subsequently aimed to achieve 'good' status in at least 60% of waters by 2021[1] and in as many waters as possible by 2027. Under all conditions, it requires that there should be no deterioration in status.

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 (Environment Agency, 2017). Therefore, this WFD assessment has been undertaken to assess the potential impact of the Proposed Development on WFD transitional and coastal receptors out to 1 nm, as advised in '*Clearing the Waters for All*'.

This WFD assessment has considered the different activities associated with the Proposed Development in the context of the environmental objectives of any affected WFD coastal or transitional water body out to 1nm. WFD compliance of onshore infrastructure has been assessed and presented as part of the HyNet Project Onshore application WFD assessment (See T4 Volume III Appendix 18.3 available at: Citizen Portal Planning (agileapplications.co.uk)). The compliance assessment has also provided the opportunity to inform the detailed design of the Proposed Development 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] By the 2021 update, 36% of surface water bodies in the UK were assessed as being of 'good' or 'high' status (JNCC, 2022).

The ‘*Clearing the Waters for All*’ guidance, the Planning Inspectorate ‘Advice Note 18: Water Framework Directive’ (Planning Inspectorate, 2017) and the relevant chapters of the Offshore ES for the Proposed Development, have been used to inform the screening, scoping and assessment of the potential for the Proposed Development to have a significant non temporary effect on WFD parameters at water body level. This has been undertaken on the basis of the Proposed Development information detailed within the Offshore ES at volume 1, chapter 3. Temporary effects of the Proposed Development 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).

This WFD assessment should be read alongside the following chapters of the Offshore ES for the Proposed Development:

- volume 2, chapter 6;
- volume 2, chapter 7;
- volume 3, Physical Processes Technical Report (RPS Group, 2024a); and
- volume 3, Marine Biodiversity Technical (RPS Group 2024b).

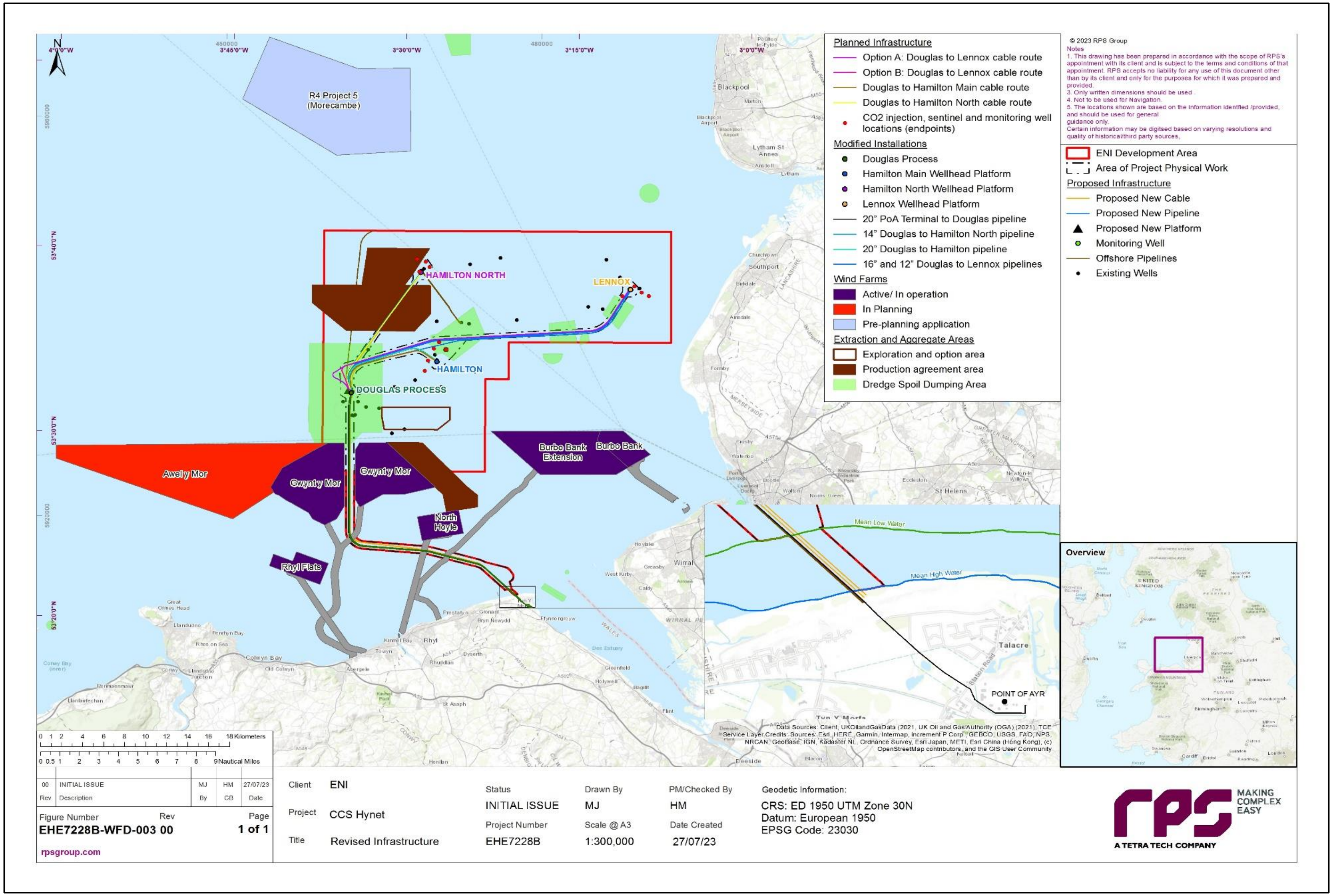

Figure 1.1: Overview of Location and Infrastructure Associated with the Proposed Development and Relationship to Third Party Infrastructure

1.2 Consultation

A summary of the key issues raised during consultation activities undertaken to date relevant to the WFD Assessment is presented in Table 1.1 below.

Table 1.1: Summary of Key Consultation Issues Raised During Consultation Activities Undertaken for the Proposed Development Relevant to WFD Assessment

Date	Consultee and type of response	Issues raised	How comments have been addressed
27 January 2023	Offshore Petroleum Regulator for Environment and Decommissioning (OPRED) – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*Increases in suspended sediment concentrations (SSC) during construction and operation of the Project (e.g. future dredging work) have the potential to smother sensitive habitats. It is therefore advised that the ES includes information on the sediment quality and the potential for any effects on water quality through suspension of contaminated sediments. The ES should also consider whether increased SSC have the potential to impact upon interest features and supporting habitats of any designated sites*."	The potential for increased SSC to affect sensitive habitats is considered in the 'water quality' scoping sections for the relevant water bodies (Table 1.14 and Table 1.23) and is assessed in section 1.8.1.
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*The following potential impact pathways for marine water and sediment quality which are not currently scoped in but which will require further consideration have been identified: bacterial release from sediments due to the proximity of designated bathing and shellfish waters; pipeline contents temperature effects; and impacts to Dissolved Oxygen and Phytoplankton as a result of elevated suspended sediment concentrations*."	Potential effects to bathing waters and shellfish water are considered in the 'protected areas' sections for each water body (Table 1.18 and Table 1.26) and is assessed in section 1.8.2. The potential for increased SSC to affect dissolved oxygen and phytoplankton s is considered in the 'water quality' scoping sections for the relevant water bodies (Table 1.15 and Table 1.23) and is assessed in section 1.8.1
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*Should trenching take place in the intertidal area, it is advised that bacterial release from sediments is assessed due to the potential proximity to designated bathing and shellfish waters.*"	Potential effects to bathing waters and shellfish water from potential bacterial release are considered in the 'protected areas' sections for each water body (Table 1.18 and Table 1.26) and is assessed in section 1.8.2.
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*Potential increased temperature effects from the pipeline contents should be considered as part of the marine water and sediment quality assessment.*"	The potential effects of temperature change due to pipeline contents s is considered in the 'water quality' scoping sections for the relevant water bodies (Table 1.15 and Table 1.23) and is assessed in section 1.8.1

Date	Consultee and type of response	Issues raised	How comments have been addressed
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*As a result of elevated suspended sediment concentration as a result of the activities it is advised that impacts to dissolved oxygen (DO) and phytoplankton are assessed.*"	The potential for increased SSC to affect dissolved oxygen and phytoplankton s is considered in the 'water quality' scoping sections for the relevant water bodies (Table 1.15 and Table 1.23) and is assessed in section 1.8.1
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*Whilst water quality is incorporated into the physical processes heading, the mitigation measures associated with water quality have not been clearly outlined. It is recommended that mitigation measures such as the Code of Construction Practice, Environmental Management Plan and Marine Pollution Contingency Plan are included, although it is noted that two of these are included elsewhere in Section 5.3.3.2: Mitigation Measures - Tertiary Inexorable Mitigation.*"	Measures proposed to be adopted as part of the Proposed Development are presented in section 1.4.5.
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*It is advised that contaminated sediment concentrations are compared to the Centre for the Environment, Fisheries and Aquaculture Science (CEFAS) action levels, and that further sampling may be required at the landfall location to assess the potential of bacterial release from the sediment*."	Potential for sediment contamination is considered in the 'water quality' sections for the relevant water bodies, and WFD requirements state that these should not exceed Cefas Action Level 1 concentrations. Details are presented in Table 1.16 and Table 1.24.
27 January 2023	OPRED – Scoping Opinion. Annex 1, Section 3, Subsection: Marine Water and Sediment Quality and WFD.	"*Since the UK has left the European Union, Section 2.5.2: The Water Framework Directive (WFD) Regulations, should make reference to the Water Environment Regulations. It is recommended that the Environment Agency's "Clearing the Waters for All" WFD guidance is consulted as it forms a useful basis for performing a WFD assessment.*"	This WFD compliance assessment has followed the approach and structure outlined in the '*Clearing the Waters for All*' guidance (Environment Agency, 2017), with scoping following the template referenced therein (Environment Agency, 2016a). The Water Environment Regulations are discussed in section 1.1.
13 December 2023	Natural Resources Wales	"*The impacts of the proposal to the whole Waterbody should be considered, not only to the 1 nm limit. The WFD compliance assessment should be undertaken to 1 nm for ecological status and to the limit of territorial waters (12 nm) for chemical status.*"	Assessment of chemical status considers the results of sediment sampling out to 12 nm, and the potential effects to the whole North Wales water body. Additional consideration to disturbance of contaminated sediment from historical industry and oil and gas extraction has been given in sections 1.5, 1.6.2, 1.7.3.4, 1.7.4.4 and 1.8.1. Consideration of sensitive habitats throughout the relevant waterbodies is presented in Table 1.12, Table 1.13 and Table 1.21

1.3 Data sources

Information to inform the WFD coastal waters and transitional waters assessment within the WFD coastal waters assessment Study Area was collected through a detailed desktop review of existing studies and datasets. These are summarised in Table 1.2 below.

Table 1.2: Summary of Key Desktop Reports

Title	Source	Year	Author
RBMP Measures and Objectives data July 2022	https://cyfoethnaturiolcymru.sharefile.eu/share/view/sc0c2a20ae9c2429394326eb75e0eda5d	2023	NRW
2023 Bathing Water Profile for Prestatyn	https://environment.data.gov.uk/wales/bathing-waters/profiles/profile.html?site=ukl1302-40700	2023	NRW
Offshore Chemical Notification Scheme (OCNS) Definitive ranked list of registered products	https://www.cefas.co.uk/data-and-publications/ocns/	2022	Cefas
JNCC MPA Mapper	https://jncc.gov.uk/mpa-mapper/	2022	JNCC
Water Watch Wales: Cycle 3 (2021) Web Mapping Application	https://waterwatchwales.naturalresourceswales.gov.uk/en/	2022	NRW
Dee River Basin Management Plan 2021 – 2027 Summary	https://cdn.cyfoethnaturiol.cymru/media/695219/dee-rbmp-2021_2027-summary.pdf	2022	NRW
Western Wales River Basin Management Plan 2021-2027 Summary	https://cdn.cyfoethnaturiol.cymru/media/695227/western-wales-rbmp-2021_2027-summary.pdf	2022	NRW
Heavily Modified Uses and Mitigation Measures July 2022	https://cyfoethnaturiolcymru.sharefile.eu/share/view/sdde43d782ae54702ad52b189cadcd827	2022	NRW
Reason for not achieving good Cycle 3 October 2022	https://cyfoethnaturiolcymru.sharefile.eu/share/view/s11466c27806c4fccb29ba4c6900cc3a1	2022	NRW
River basin planning: progress report	https://www.gov.uk/government/publications/river-basin-planning-progress-report/river-basin-planning-progress-report	2021	Environment Agency
2021 Cycle 3 Classification Data	https://cyfoethnaturiolcymru.sharefile.eu/d-sc8f1ea840a594d32a5ac24f3aa3c2350	2021	NRW
List of Substances Used and Discharged Offshore which Are Considered to Pose Little or No Risk to the Environment	https://www.ospar.org/documents?d=32939	2021	OSPAR
Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019	https://www.legislation.gov.uk/uksi/2019/579/contents/made	2019	UK Government
‘Clearing the Waters for All’ Guidance. Water Framework assessment: estuarine and coastal waters	https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters	2017	Environment Agency
Advice note eighteen: The Water Framework Directive	https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-18/	2017	Planning Inspectorate
Water Environment Water Framework Directive) (England and Wales) Regulations 2017	https://www.legislation.gov.uk/uksi/2017/407/contents/made	2017	UK Government

Title	Source	Year	Author
Water Framework Directive assessment: scoping template for activities in estuarine and coastal waters	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/577892/wfd_scoping_template.odt	2016a	Environment Agency
Environmental Quality Standards Directive (EQSD) list for WFD assessments	https://www.gov.uk/government/publications/list-of-chemicals-for-water-framework-directive-assessments/environmental-quality-standards-directive-eqsd-list-for-wfd-assessments	2016	Environment Agency
The Bathing Water Regulations 2013	https://www.legislation.gov.uk/uksi/2013/1675/made	2013	UK Government
Council Directive 2000/60/EC establishing a framework for community action in the field of water policy	https://eur-lex.europa.eu/legal-content/EN/TXT/PDF/?uri=OJ:L:2000:327:FULL	2000	European Parliament and the Council of the European Union
The Urban Waste Water Treatment (England and Wales) Regulations 1994	https://www.legislation.gov.uk/uksi/1994/2841/made	1994	UK Government
Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat	https://ramsar.org/sites/default/files/documents/library/current_convention_text_e.pdf	1971 (UK ratified 1976)	Ramsar Convention

1.4 Proposed Development description

1.4.1 Overview

Liverpool Bay CCS Ltd (hereafter referred to as ‘the Applicant’) is proposing the development of the HyNet Carbon Dioxide Transportation and Storage Project – Offshore (‘the Proposed Development”). The Proposed Development is a Carbon Capture and Storage project within Liverpool Bay in the east Irish Sea. It is located within the CS004 Carbon Dioxide (CO_2) Appraisal and Storage Licence area, approximately 12 km to the north of the Welsh coastline and 2 km west of the English coastline (Figure 1.1).

The Applicant intends to repurpose existing oil and gas (O&G) infrastructure to transport and store CO_2 offshore at the depleted Hamilton, Hamilton North and Lennox hydrocarbon reservoirs. This will include the installation of new planned infrastructure, and modifications to existing installations. The offshore elements of the are hereafter referred to as “the Proposed Development”, located in the “Eni Development Area”, and are described in full in the Offshore ES at volume 1, chapter 3. These include:

- Offshore Platforms (OPs), including installation of the new Douglas CCS OP;
- Offshore CO_2 injection wells and CO_2 monitoring and sentinel wells;
- Offshore pipelines connecting the Point of Ayr (PoA) Terminal to Douglas OP;
- Offshore integrated power and Fibre Optic (FO) cables connecting the PoA Terminal to Douglas OP; and
- Offshore interplatform pipelines and integrated power and FO cables.

Most of the infrastructure associated with the Proposed Development is located seaward of 1 nm. Elements of the Proposed Development that are within 1 nm of the coastline and therefore relevant to this WFD assessment are:

- Repurposing of offshore pipelines connecting the PoA Terminal to Douglas OP; and

- New offshore integrated power and FO cables connecting the PoA Terminal to Douglas OP (seawards of MHWS).

1.4.1.1 Offshore pipelines

The existing pipeline from the PoA Terminal to the Douglas OP and a selection of the existing pipelines connecting Douglas OP to Hamilton North, Hamilton Main and Lennox OPs will be repurposed to transport CO_2. There are no additional modifications needed for the purpose of transporting CO_2 other than rerouting the short pipeline sections from the existing Douglas OP to tie in to the new Douglas CCS platform, located approximately 26 km from the PoA landfall site. Therefore, no physical changes to the current pipelines are expected within the Zone of Influence of the Proposed Development (as defined in section 1.5).

1.4.1.2 Offshore power and fibre optic cables

Douglas OP currently generates 13.8 kV, 60 Hz power with the existing gas fuelled turbine installed on the platform, and supplies Hamilton Main and Hamilton North OPs via a subsea cable, while Lennox OP is provided with power from Hamilton Main OP.

The existing inter platform subsea power cables are not suitable for re use for CO_2 service, consequently new inter platform power cables would be installed as part of the Proposed Development. In addition, the existing gas fuelled turbine on Douglas OP will be decommissioned at the end of its current use, and electrification of Douglas OP will be required from the Onshore PoA Terminal.

It is expected that the main power to Douglas OP would be supplied from the Onshore PoA Terminal by two new 33 kV, 50 Hz parallel subsea cables integrated with FO connection, each 35 km in length.

The Project Design Envelope (PDE) approach (also known as the Rochdale Envelope approach) has been adopted for the assessment of the Proposed Development, in accordance with current good practice (National Infrastructure Planning, 2018) and the ’Rochdale Envelope Principle’. The PDE concept allows for some flexibility in project design options, particularly cable installation and protection, where the full details of the Proposed Development are not known at application submission but will be confirmed in detail once the installation contractor is appointed. This approach has enabled a maximum design scenario (MDS) to be developed for the offshore power cables, fibre optic cables, and associated activities, which is presented in Table 1.3.

Table 1.3: Maximum Design Scenario for Installation of Offshore Power and FO Cables out to 1 Nm from MHWS, and out to the boundary of the North Wales water body

Parameter	Maximum Design Scenario
Maximum number of offshore power and FO cables	2
Offshore power and FO cable length, per cable (m) out to 1nm	1,852 (≈1 nm)
Maximum total offshore export cable length (m) out to 1nm	3,704
Maximum external cable diameter (mm)	152.40
Cable installation methodologies – seaward of MLWS (subtidal)	Plough, trenching, jetting. Preferred method is via plough.
Cable installation methodologies – landward of MLWS (intertidal)	Plough, trenching, jetting. Preferred method is via plough.
Maximum distance of trenchless (e.g. Horizontal Directional Drilling (HDD)) exit punch out from MHWS (m)	There will be no trenchless installation below MHWS
Maximum distance of trenching in intertidal	1,200 m
Target Minimum cable burial dept	2 m

Parameter	Maximum Design Scenario
Maximum cable burial depth	3 m
Maximum width of top of cable trench (per circuit) – intertidal	15 m
Maximum width of bottom of cable trench (per circuit) – intertidal	15 m
Maximum width of seabed disturbed by cable installation (per cable)	15 m
Maximum width of cable protection	7 m. Included within 15 m disturbance width from cable installation
Impacts up to WFD assessment 1 nm boundary	
Maximum area of seabed disturbed by cable installation via trenching (intertidal and subtidal)	2 x 1,852 m x 15 m = 55,560 m^2
Maximum area of seabed disturbance (intertidal) (see volume 2, chapter 7: Marine Biodiversity)	**18,000 m^2**
Maximum area of seabed disturbance due to dredging at West Hoyle Bank (see volume 2, chapter 6: Physical Processes)	1,000 m length x 21 m width = 21,000 m^2
Dredge footprint (guidance stipulates 1.5x the actual footprint)	21,000 m^2 x 1.5 = **31,500 m^2**
Maximum area of seabed disturbed by cable installation via trenching (excluding 1,000 m dredged length)	55,560 m^2 – (1,000 m x 15 m) = 55,560 m2 – 15,000 m2 = **40,560 m^2**
Maximum area of seabed disturbance out to 1 nm (intertidal and subtidal)	31,500 m + 40,560 m = **72,060 m^2** (0.072 km^2)
Impacts up to boundary of North Wales water body	
Straight line distance from boundary of water body to MHWS	6,400 m
Length of cable route out to water body boundary	7,300 m
Maximum area of seabed disturbed by cable installation via trenching (intertidal and subtidal)	2 x 7,300 m x 15 m = 219,000 m^2
Maximum area of seabed disturbance (intertidal)	18,000 m^2
Maximum area of seabed disturbance due to dredging at West Hoyle Bank	1,000 m length x 21 m width = **21,000 m^2**
Dredge footprint (guidance stipulates 1.5x the actual footprint)	21,000 m^2 x 1.5 = **31,500 m^2**
Maximum area of seabed disturbed by cable installation via trenching (excluding 1,000 m dredged length)	219,000 m^2 – (1,000 m x 15 m) = 219,000 m^2 – 15,000 m^2 = **204,500 m^2**
Maximum area of seabed disturbance out to water body boundary (intertidal and subtidal)	204,500m2 + 31,500 m^2 = 236,000 m^2 (0.236 km^2)

1.4.2 Construction

The area of disturbance for cable installation is expected to be approximately 15 m width for each trench. The two cables from PoA Terminal to Douglas OP are expected to be laid at a minimum separation distance of 30 m, within two separate trenches. The minimum cable burial depth (i.e. the distance from the seabed to the top of the cable) is expected to be between 2 to 3 m. The use of external cable protection, consisting of freshly quarried rock, sand filled geotextile bags, and concrete mattresses, is only planned where our cables cross other cables, and pipelines. The exact crossing arrangements will be confirmed following agreements with the relevant cable owners, but indicative arrangements would be for each crossing to be approximately 200 m in length, 7 m in width, and with ah profiled cross section of <1 m in height. The linear coverage at these crossing locations translates into approximately 10% of each length of cable.

1.4.2.1 Offshore cable installation

The cable route from PoA Terminal to Douglas OP crosses the Talacre dune system, which extends to the Mean Low Water Springs (MLWS) point. To cross the dunes, two parallel conduits would be installed using a Horizontal Directional Drilling (HDD) trenchless method. The exit pits of the HDD works would likely consist of temporary prefabricated steel containment sumps to capture any drilling fluid emitted from the drilling process. These would be located just above MHWS mark at approximately 2 m to 3 m below beach level, and due to this depth, following reburial would not require any external protection.

Following completion of HDD works it is expected that cables would be delivered via a marine vessel and then pulled ashore through the conduits using a winch.

Seawards of MLWS, at the shore approach, the proposed route for the cable corridor takes account of possible alternative options currently under assessment, accounting for the presence of the West Hoyle Spit and other constraints. Seawards of the shore approach, the cable routes would broadly follow the alignment of the existing pipelines connecting PoA Terminal to Douglas OP. Casing is not considered necessary for the offshore cables and as such the armoured cables would be directly buried for their entire length.

The following three techniques may be employed for the installation and burial of the two integrated offshore power and FO cables:

- Jetting (simultaneous post-lay trenching and burial);
- Ploughing (simultaneous post-lay trenching and burial); and
- Mechanical cutting (simultaneous post-lay trenching and burying).

In terms of cable post-lay trenching, ploughing could be utilised for cables in the presence of softer sediments such as sand and clay and would cause the least amount of disturbance to the surrounding environment. However, a more precautionary approach will be taken by this WFD assessment, wherein it will be assumed that cable installation would be achieved via jetting for the whole length of the WFD assessment area (i.e. 1 nm).

The key activities to be undertaken to prepare for the installation of subsea cables would include:

- Excavation of trench across West Hoyle Bank for cable shore pull;
- Cable shore pull-in from cable lay vessel to onshore location;
- Cable positioning on intermediate rollers;
- Pull-in through conduits;
- Offshore cable laying along pre-defined route;
- Cable burial (simultaneous post-lay trenching and burial);
- Cable termination and pull-in at OP side;
- ROV operations;
- Vessel operations (material transfer, crew change, logistics);
- Survey (pre-construction, post lay, and as-built); and
- Pre-commissioning of the system.

1.4.3 Operation and maintenance

1.4.3.1 Repurposing of existing pipelines

As discussed in section 1.4.1, there are no additional modifications needed within 1 nm of MHWS for the purpose of transporting CO_2, however, compression of CO_2 at the PoA terminal during the operation and maintenance phase will increase the temperature of the gas. There is the potential for this to increase the temperature of the surrounding environment of the foreshore and offshore pipeline, with potential for effects upon the benthic species associated with the sediment.

1.4.3.2 Offshore power and fibre optic cables

The subsea power cables associated with the Proposed Development can generate heat through resistive heating. This is caused by energy loss as electrical currents flow, resulting in heating of the cable surface and potential warming of the surrounding environment. High voltage cables are used to minimise the amount of energy lost as heat, thus minimising the warming effect.

1.4.4 Decommissioning

Existing UK legislation requires that when an offshore Carbon Capture, Usage, and Storage (CCUS) site is closed, the installations and injection facilities must be removed when decommissioned. In addition, all other items of equipment, infrastructure and materials that have been installed or drilled are expected to be entirely removed for disposal onshore in accordance with the government's aim to achieve a clear seabed.

The full details of the decommissioning phase activities will be determined closer to the time of decommissioning, but it is anticipated that the parameters for decommissioning will be lower or equal to that of the construction phase as sand wave clearance will not be required in advance of cable removal. The current planned activities will involve the removal of all foundations, cables, and cable crossing protection, while rock dump will be left *in situ*, constituting permanent habitat loss. To ensure minimisation of potential impacts from activities during this phase, an Environmental Management Plan (EMP) will be developed to reduce the impact from pollutant spills are far as reasonably practicable. Also, a decommissioning plan will be developed and adhered to throughout this phase, adhering to existing UK and international legislation and guidance to ensure that the decommissioning of the infrastructure associated with the Proposed Development will result in the minimum amount of long-term disturbance to the environment.

1.4.5 Proposed measures adopted as part of the Proposed Development

To minimise the environmental impact of the Proposed Development throughout the construction, operation and maintenance, and decommissioning phases, various embedded mitigation measures have been proposed and will be put in place where appropriate. All mitigation techniques will be adopted in line with legislative requirements, or adopted standard industry practice where relevant.

For the purposes of the EIA process, the term 'Embedded Mitigation' is used to include the following measures (adapted from IEMA, 2016):

- Measures included as part of the Proposed Development design. These include modifications to the location or design envelope of the Proposed Development which are integrated into the application for consent. These measures are secured through the consent itself throughout the description of the development and the parameters secured in the Town and Country Planning Act (TCPA) and/or marine licence (referred to as 'primary mitigation' in IEMA, 2016).
- Measures required to meet legislative requirements, or actions that are standard practice used to manage commonly occurring environmental effects and are secured through the TCPA requirements and/or the conditions of the marine licences (referred to as 'tertiary mitigation' in IEMA, 2016).

A number of embedded mitigation measures (primary and tertiary) have been adopted as part of Proposed Development to reduce the potential for impacts on marine biodiversity. These are outlined in Table 1.4 below. As there is a secured commitment to implementing these measures, they are considered inherently part of the design of the Proposed Development. Therefore, these measures have been considered in the assessment of significance, presented in section 1.8 below. This means that the determination of magnitude and therefore significance assumes implementation of these measures.

Table 1.4: Embedded Mitigation Measures Adopted as Part of the Proposed Development

Embedded Mitigation	Justification
Primary Mitigation: Measures Embedded into the Project Design	
Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent which will include cable burial where possible (in accordance with the specific policies set out in the North West Inshore and North West Offshore Coast Marine Plans (MMO, 2021)) and cable protection, as necessary.	The CSIP will set out appropriate cable burial depth in accordance with industry good practice, minimising the risk of cable exposure. The CSIP will also ensure that cable crossings are appropriately designed to mitigate environmental effects, these crossings will be agreed with relevant parties in advance of CSIP submission. The CSIP will include a detailed Cable Burial Risk Assessment (CBRA) to enable informed judgements regarding burial depth to maximise the chance of cables remaining buried whilst limiting the amount of sediment disturbance to that which is necessary. Measures will seek to reduce the amount of Electro Magnetic Fields (EMF) which benthic and fish and shellfish receptors are exposed to during the operations and maintenance phase by increasing the distance between the seabed surface and the surface of the cables.
No external cable protection in the intertidal area	To minimise potential impacts on intertidal habitats within the Dee Estuary SAC and SPA.
The HDD exit pit will be 3 m below seafloor	Embedded mitigation to ensure no materials are placed on the seafloor of the intertidal zone.
Development of and adherence to an Environmental Management Plan (EMP) that will be prepared and implemented during the construction, operational and maintenance and decommissioning phases of the Project. The EMP will include appendices detailing actions to minimise Invasive Non-Native Species (INNS) (the INNSMP), and a MPCP will be developed which will include planning for accidental spills, address all potential contaminant releases and include key emergency contact details (e.g. Environmental Protection Agency (EPA)).	Measures will be adopted to ensure that the potential for release of pollutants from construction, operational and maintenance and decommissioning plant is minimised. These will likely include: designated areas for refuelling where spillages can be easily contained, storage of chemicals in secure designated areas in line with appropriate regulations and guidelines, double skinning of pipes and takes containing hazardous substances, and storage of these substances in impenetrable bunds. All vessels will be required to comply with the standards set out in the International Convention for the Prevention of Pollution from Ships (MARPOL).
Implementation of piling initiation, soft-start, and ramp-up measures within the Marine Mammal Mitigation Protocol (MMMP). An initiation stage and soft starts will be used during the installation of pin piles. This involves the implementation of an initial low hammer energy with a low number of strikes, followed by lower hammer energies at a higher strike rate at the beginning of the piling sequence before energy input is 'ramped up' (increased) over time to required higher levels.	This measure will minimise the risk of injury to some fish, marine mammal, and marine turtle species in the immediate vicinity of piling activities, allowing individuals to move away from the area before noise levels reach a level at which injury may occur.
Inclusion of low order techniques as a unexploded ordnance UXO clearance option noting, however, that it is not possible to fully commit to this measure at this stage. Low order techniques are not always possible and are dependent upon the individual situations surrounding each UXO. Given that high order detonation may be required, the MMMP will also include mitigation to reduce the risk of injury from UXO clearance.	Low order techniques generate less underwater noise than high order techniques and therefore present a lower risk to sound-sensitive receptors such as fish, marine mammals, and marine turtles during UXO clearance.
Ongoing liaison with fishing fleets will be maintained via an appointed Fisheries Liaison Officer (FLO) and Fishing Industry Representative. Prior to construction, a Fisheries Liaison and Coexistence Plan (FLCP) will be developed, setting out in detail the planned approach to fisheries liaison and means of delivering any other relevant mitigation measures.	To maintain effective communications between the Proposed Development and fishers and appropriate liaison with relevant fishing interests to ensure that they are fully informed of development planning and any offshore activities and works. To provide warnings to the fishing community and advance warning of Proposed Development activities and associated Safety Zones and advisory safety distances.
A dropped objects plan will be developed for reporting and recovery of dropped objects where they pose a potential hazard to other marine users.	For the reporting and recovery of dropped objects.
Tertiary Mitigation: Measures Embedded into the Proposed Development Design	
Actions to minimise INNS, including a Biosecurity Plan (BP) to limit spread and introduction of INNS.	These measures will aim to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable to best protect the biological integrity of the local natural environment and communities.
Material arising from drilling and/or sand wave clearance will be deposited in close proximity to the works.	To retain material within sediment cell and maintain sediment transport regimes.
Development of, and adherence, to a Construction Method Statement (CMS).	This measure will confirm the actual methodology that will be employed to construct the Proposed Development, provide details on aspects of the methodology not known at the application stage and

Embedded Mitigation	Justification
	confirm that the methodology falls within the parameters assessment in the ES.
Development of, and adherence to a Decommissioning Plan	The aim of this plan is to adhere to the relevant UK and international legislation and guidance in place at the time, with decommissioning industry practice applied to reduce the amount of long-term disturbance to the environment so far as reasonably practicable.
Development of and adherence to a MMMP, based on a draft MMMP submitted alongside the ES. The MMMP will present measures for Piling UXO clearance and some types of geophysical activities. The MMMP will be developed on the basis of the most recent published statutory guidance and in consultation with key stakeholders.	**Piling**: for the purpose of developing the MMMP, a mitigation zone of 500 m will be applied, following the JNCC (2010a) guidance. The Draft MMMP will set out the measures to apply in advance of and during piling activity including the use of Marine Mammal Observers (MMObs), Passive Acoustic Monitoring (PAM), and Acoustic Deterrent Devices (ADD), thereby following the latest JNCC guidance (JNCC, 2010a). **UXO Clearance**: Measures including visual and acoustic monitoring (MMObs and PAM), the use of an ADD, and soft start charges will be applied to deter animals from the mitigation zone as defined by sound modelling for the largest possible UXO following the latest JNCC (2010b) guidance. **Geophysical and Seismic Surveys**: Mitigation for injury during high resolution geophysical and seismic site-investigation surveys using a sub-surface sensor from a conventional vessel will involve the use of MMObs and PAM to ensure that the risk of injury over the defined mitigation zone is reduced in line with JNCC (2017) guidance (500 m). Soft start is not possible for SBP equipment but will be applied for other high-resolution surveys where possible. It should be noted that some multi-beam surveys in shallow waters (<200m) are not subject to the requirements of mitigation.
Where practicable, any requirements for cable protection will be compliant with MGN 654.	Following further survey and detailed engineering, if areas are identified where external protection is required and the MCA condition of no more than 5% reduction in water depth is not achievable, a location specific review of impacts to shipping and consultation with the MCA will be carried out and additional mitigations agreed as required.
Development and adherence to a Pipeline Specification and Installation Plan which will include pipeline burial where possible and pipeline protection as necessary.	To ensure that the pipeline remains secure, is not a hazard to other sea users.

1.5 Zone of Influence and WFD assessment area

The Zone of Influence for the potential effects of operations associated with the Proposed Development 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 (defined below) being assessed. This distance is based upon the requirement for protected areas within 2 km of an activity being scoped in for assessment. Similarly, the MMO '*Marine Conservation Zones and Marine Licensing*' guidance (MMO, 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. Since WFD assessment should consider the potential impacts upon any protected area within 2 km of an activity (Environment Agency, 2017), this approach has been adopted in determining an appropriate buffer zone (i.e. the Zone of Influence) to the features under consideration for this WFD assessment.

The WFD sets chemical and ecological objectives for all water bodies, and as discussed in section 1.1, and as advised in '*Clearing the Waters for All*', assessment of an activity for compliance with the requirements of the WFD should consider the potential impact upon WFD transitional and coastal receptors out to 1 nm. This stipulation is based on 'coastal water' being defined in the 2017 Regulations as extending to "*a distance of one nautical mile on the seaward side from the nearest point of the baseline*" (i.e. MHWS). However, following consultation with NRW (see Table 1.1), the assessment for WFD receptors associated with the chemical status of a water body has considered impacts of chemical quality elements out to 12 nm (Table 1.1), as per the definition of surface water in the 2017 Regulations.

The route for the offshore integrated power and FO cable is proposed to broadly follow the alignment of the existing offshore pipelines connecting the PoA Terminal to Douglas OP. However, the precise route has not yet been determined, so a precautionary approach has been taken in defining the WFD assessment area, applying an appropriate buffer to the Eni Development Area, rather than to the proposed cable route.

The WFD assessment area is therefore defined as the area within 2 km of the Eni Development Area (i.e. the Zone of Influence), out to 1 nm from MHWS for ecological receptors, and out to the offshore boundary of the relevant water body for chemical receptors, as illustrated in Figure1.2. The footprint of the activity (defined in section 1.6) has been calculated out to 1 nm (as per '*Clearing the Waters for All*' guidance) and out to the boundary of the North Wales water body (as per 2017 Regulations definitions).

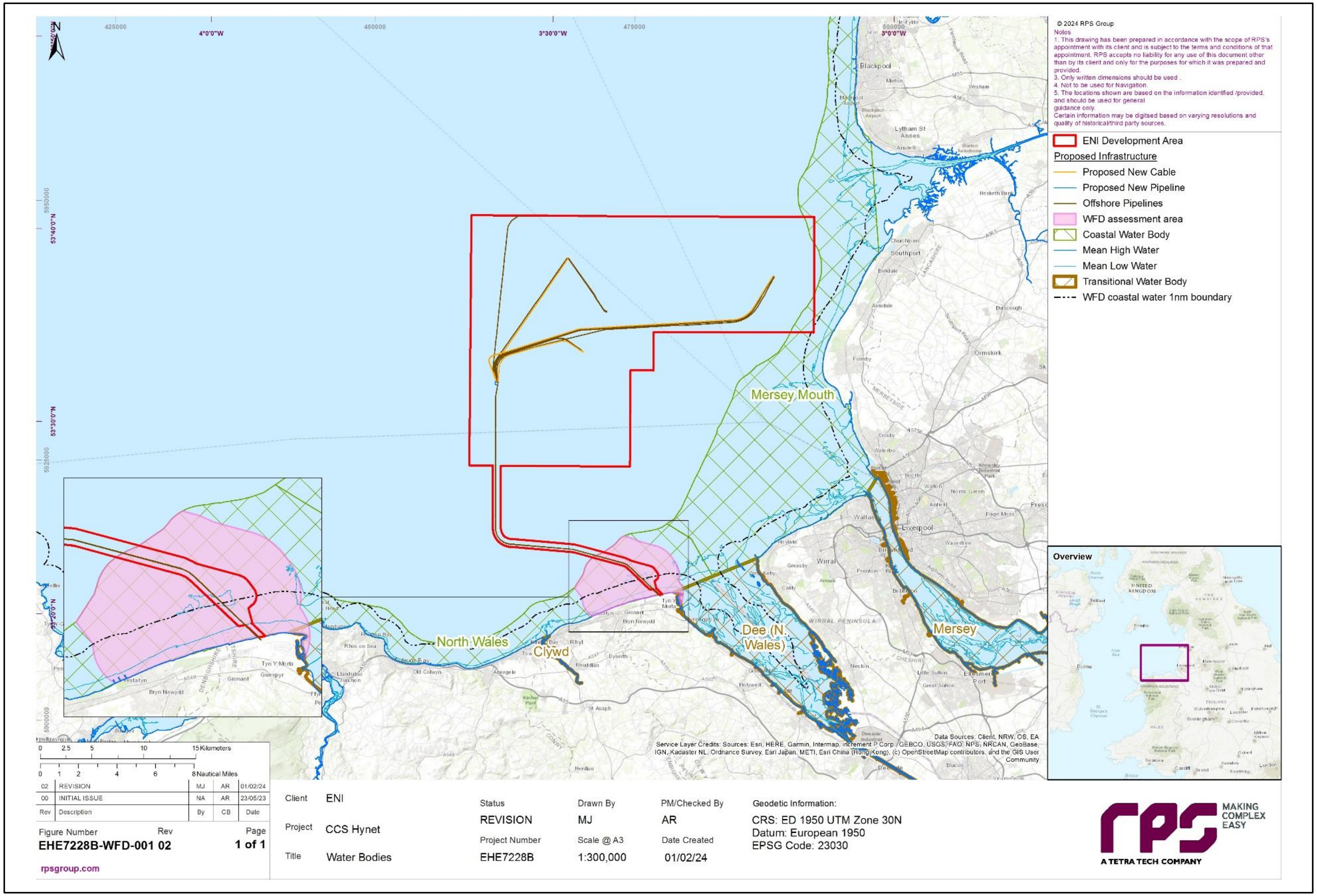

Figure1.2: WFD Assessment Area and Water Bodies in the Vicinity of the Proposed Development

1.6 Methodology

The '*Clearing the Waters for All*' guidance stipulates that the footprint of an activity should be considered when assessing its potential impact upon WFD water bodies and protected areas (as defined in section 1.6.2).

In the context of this WFD assessment, 'activity' refers to the following features of the Proposed Development, described in section 1.4, that are proposed to occur within the WFD assessment area:

- the construction, operation and maintenance, and decommissioning of two offshore integrated power and fibre optic (FO) cables connecting the PoA Terminal to Douglas OP; and
- the operation and maintenance of the repurposed existing offshore pipelines connecting the PoA Terminal to Douglas OP.

In the context of this WFD assessment, 'footprint' refers to the area of habitat potentially affected by the activity, which may also comprise a temperature or sediment plume, and for a dredging activity, a footprint is defined as 1.5 times the dredge area (Environment Agency, 2017). However, dredging is not anticipated to be required within the WFD assessment area, nor is the activity expected to produce a temperature or sediment plume.

1.6.1 Screening

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 taken forward for assessment. Screening excludes any activities that do not need to go through the scoping or impact assessment stages. Activities which can be excluded from scoping include those which are considered to be low risk, such as:

- a self-service marine licence activity (MMO, 2018) or an accelerated marine licence activity that meets specific conditions, namely dredging (MMO, 2017);
- maintaining pumps at pumping stations;
- removing blockages or obstacles like litter or debris within 10m of an existing structure to maintain flow;
- replacing or removing existing pipes, cables or services crossing over a water body, but not including any new structure or supports, or new bed or bank reinforcement; or
- 'over water' replacement or repairs to, for example bridge, pier and jetty surfaces, so long as bank or bed disturbance is minimised.

The Proposed Development 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 Proposed Development should proceed to the scoping stage.

1.6.2 Scoping

The aim of the scoping stage is to identify elements (receptors) within water bodies which may be impacted as a result of the Proposed Development. Any identified receptors, both chemical and ecological, will then be taken forward for a detailed impact assessment (section 1.8). A scoping assessment has been undertaken for each water body potentially affected by the Proposed Development, as presented in Table 1.8. Where robust justification could be provided, impacts on water bodies were scoped out from further consideration.

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

- Hydromorphology;
- Biology – habitats;
- Biology – fish;
- Water quality;

- Protected areas; and
- INNS.

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 are considered for each receptor in section 1.7 of this document, using the recommended scoping template (Environment Agency, 2016a).

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. The aim of the WFD is to maintain and improve surface waters and water bodies out to 1 nm. As per the definitions in the 2017 Regulations, impacts associated with chemical quality elements have been considered out to 12 nm. Sediment sampling has been undertaken throughout the Eni Development Area, and results of these surveys out to 12 nm from MHWS are discussed, particularly in relation to polycyclic aromatic hydrocarbons (PAHs), total hydrocarbons (THC), polychlorinated biphenyls (PCBs) and heavy metals.

As discussed in section 1.5 WFD assessment is intended to focus on the potential for an activity (as defined in section 1.6) to prevent a water body achieving good status. While the focus of this WFD assessment is on those elements of the Proposed Development from MHWS out to approximately 1.8 nm to 3.5 nm, corresponding to the minimum and maximum distances of the WFD assessment area from MHWS (Figure1.2), consideration has been given to those activities out to 12 nm that could influence chemical status.

1.6.2.1 Hydromorphology

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

1.6.2.2 Biology – habitats

Biological habitats (both those designated as higher or lower sensitivity habitats[2], summarised in Table 1.5) will be 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% or more of the waterbody's area;
- Within 500 m of any higher sensitivity habitat; **or**
- 1% or more of any lower sensitivity habitat.

Note that impact assessment for biological habitats would be required if *any* of these criteria are met.

[2] Higher sensitivity habitats have a low resistance to, and recovery rate, from human pressures. Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures.

Table 1.5: Sensitivity of WFD Biological Habitats 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[3]	Subtidal soft sediments like sand and mud
Saltmarsh	
Subtidal kelp beds	
Subtidal seagrass	

1.6.2.3 Biology – fish

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;
- Fish could become entrained (for example being drawn into mechanical plant like cooling systems or tidal turbines); or
- Impingement could occur (for example fish becoming trapped against debris screens).

1.6.2.4 Water quality

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; or
- Whether the water body/water bodies have a history of harmful algae.

The water quality assessment assessed the potential for the release of chemicals (on the Environmental Quality Standards Directive (EQSD) list) and sediment bound contaminants (above Cefas Action Level 1) as a result of the proposed activities.

1.6.2.5 Protected areas

The ZoI for the impact of activities on WFD protected areas, following the '*Clearing the Waters for All*' guidance, is considered to be within 2 km of the activity being assessed. This approach has been adopted for this WFD assessment, and any protected areas within the 2 km ZoI of the activity were scoped in for a detailed impact assessment. For the purposes of this assessment, protected areas are defined as:

[3] Polychaete reef includes biogenic reef structures formed by the aggregation of species such as *Sabellaria* spp. and *Serpula* spp.

- Special Areas of Conservation (SAC);
- Special Protection Areas (SPA);
- Shellfish waters;
- Bathing waters;
- Nutrient sensitive areas (under the Urban Waste Water Treatment Directive);
- Nitrate Vulnerable Zones (NVZ) - polluted or sensitive; and
- Drinking Water Protected Areas (Surface and Ground).

1.6.2.6 Invasive Non-Native Species

The impacts resulting from an activity should be scoped in for assessment if it has the potential to introduce or spread INNS.

1.6.3 Impact Assessment

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.

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. Where relevant, designed-in measures were included to avoid or minimise risks of deterioration (section 1.4.5).

Temporary effects due to short-duration activities such as construction and maintenance are not considered, in the ‘*Clearing the Waters for All*’ guidance, to cause deterioration if the waterbody would recover in a short time without any restoration measures. However, it was noted that works that are temporary in nature may have longer term effects on aspects such as ecology. This assessment focussed upon identifying effects that may lead to non-temporary deterioration, which is defined here as occurring over a period of time that is greater than the recommended monitoring period interval as stated by the WFD, and are summarised in Table 1.6.

Table 1.6: Recommended Monitoring Period for WFD Quality Elements, Adapted from Annex V, Section 1.3.4 of the WFD

Quality element	Monitoring period	
	Transitional water bodies	Coastal water bodies
Biological		
Phytoplankton	6 months	6 months
Other aquatic flora	3 years	3 years
Macro-invertebrates	3 years	3 years
Fish	3 years	n/a
Hydromorphological		
Morphology	6 years	6 years
Physico-chemical		
Thermal conditions	3 months	3 months
Oxygenation	3 months	3 months
Salinity	3 months	n/a
Nutrient status	3 months	3 months

Quality element	Monitoring period	
	Transitional water bodies	Coastal water bodies
Other pollutants	3 months	3 months
Priority substances	1 month	1 month

The '*Clearing the Waters for All*' guidance, stipulates that if the activity could cause deterioration or hinder the 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.

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.

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.

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.

1.7 Scoping

1.7.1 Overview

The following sections detail the findings of the Scoping stage of the WFD Assessment. As per the '*Clearing the Waters for All*' guidance, and adopts the structure outlined in the Environment Agency WFD scoping template (Environment Agency, 2016a). The potential risks of the activity to each of the key receptor groups are considered in the sections below.

Taking into consideration the WFD assessment area, as described in 1.5, water bodies that have the potential to be impacted have been identified, and are summarised in Table 1.7. Further details on these water bodies are presented in section 1.7.2 and Table 1.8 of this document.

Table 1.7: Water Bodies Screened into the WFD Assessment

Water body name	Type	Reason for including in scoping
North Wales (GB641011650000)	Coastal	Proposed route for integrated offshore power and FO cables overlaps with this water body.
Dee (N. Wales) (GB531106708200)	Transitional	This water body overlaps with the WFD assessment area, as described in section 1.5.

1.7.2 Status of the potentially affected WFD water bodies

The WFD assessment area (as illustrated in Figure1.2) overlaps with the North Wales water body (GB641011650000) and the Dee (N. Wales) water body (GB531106708200) (hereafter referred to as simply 'Dee water body'). These water bodies are therefore screened in for their potential to be affected by the activity. Table 1.8 summarises the statuses of the screened-in water bodies,

Table 1.9 presents the qualifying features of relevant National Network Sites and shellfish waters, and overlap with the screened-in water bodies, and Table 1.10 summarises the status of the bathing waters relevant to this WFD assessment. The protected areas relevant to this WFD assessment are illustrated in Figure 1.3.

Table 1.8: Status of WFD Water Bodies Screened in for Potential Impact from the Activity

Parameter	North Wales	Dee (N. Wales)
ID	GB641011650000	GB531106708200
Type	Coastal	Transitional
Year of assessment	2021 (Cycle 3)	2021 (Cycle 3)
Waterbody area (km^2)	146.25	109.29
Overall current status	Moderate	Moderate
Current status (ecological)	Moderate	Good
Current status (chemical)	Moderate	Moderate
Target	Good by 2033	Good by 2027
Driving ecological quality element	Mercury	Brominated diphenylether (BDPE) Calc, Polyaromatic hydrocarbons (PAH)
Is the waterbody heavily modified?	Yes	Yes
WFD phytoplankton classification	Moderate	Good
Dissolved inorganic nitrogen	Good	Good
Hydromorphology	Not Assessed	Not High

Table 1.9: Qualifying Features of SPAs, SAC and Shellfish Water within the WFD Assessment Area, and Overlap with WFD Water Bodies

<table>
<tr><th rowspan="2">Site</th><th rowspan="2">Primary qualifying features/relevant species</th><th colspan="2">Spatial overlap with water body?</th></tr>
<tr><th>North Wales</th><th>Dee</th></tr>
<tr><td>Liverpool Bay SPA (UK9020294)</td><td>• Red-throated diver Gavia stellata;
• Little gull Larus minutus;
• Common scoter Melanitta nigra;
• Little tern Sterna albifrons;
• Common tern Sterna hirundo; and
• Waterbird assemblage</td><td>Yes</td><td>No</td></tr>
<tr><td>The Dee Estuary SPA (UK9013011)</td><td>• Pintail Anas acuta;
• Teal Anas crecca;
• Dunlin Calidris alpina alpina;
• Knot Calidris canutus;
• Eurasian oystercatcher Haematopus ostralegus;
• Bar-tailed godwit Limosa lapponica;
• Black-tailed godwit Limosa limosa islandica;
• Eurasian curlew Numenius arquata;</td><td>Yes</td><td>Yes</td></tr>
</table>

Site	Primary qualifying features/relevant species	Spatial overlap with water body?	
		North Wales	Dee
	• Grey plover *Pluvialis squatarola*; • Little tern *Sterna albifrons*; • Common tern *Sterna hirundo*; • Sandwich tern *Sterna sandvicensis*; • Shelduck *Tadorna tadorna*; • Redshank *Trianga tetanus*; and • Waterbird assemblage		
Dee Estuary SAC (UK0030131)	• Mudflats and sandflats not covered by seawater at low tide; • Salicornia and other annuals colonizing mud and sand; and • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*).	Yes	Yes
Dee (West) shellfish water	• Mussel *Mytilus* spp. • Cockle *Cerastoderma edule*	Yes	Yes

Table 1.10: Information and Status of Identified Bathing Waters Relevant for WFD Assessment

Parameter	Detail
Site name	Prestatyn
Identifier	40700
Local authority	Sir Dinbych - Denbighshire
Year of designation	1988
Distance from activity (km)	0.61
2022 Classification	Excellent
2021 Classification	Excellent
2020 Classification	Excellent
2019 Classification	Excellent

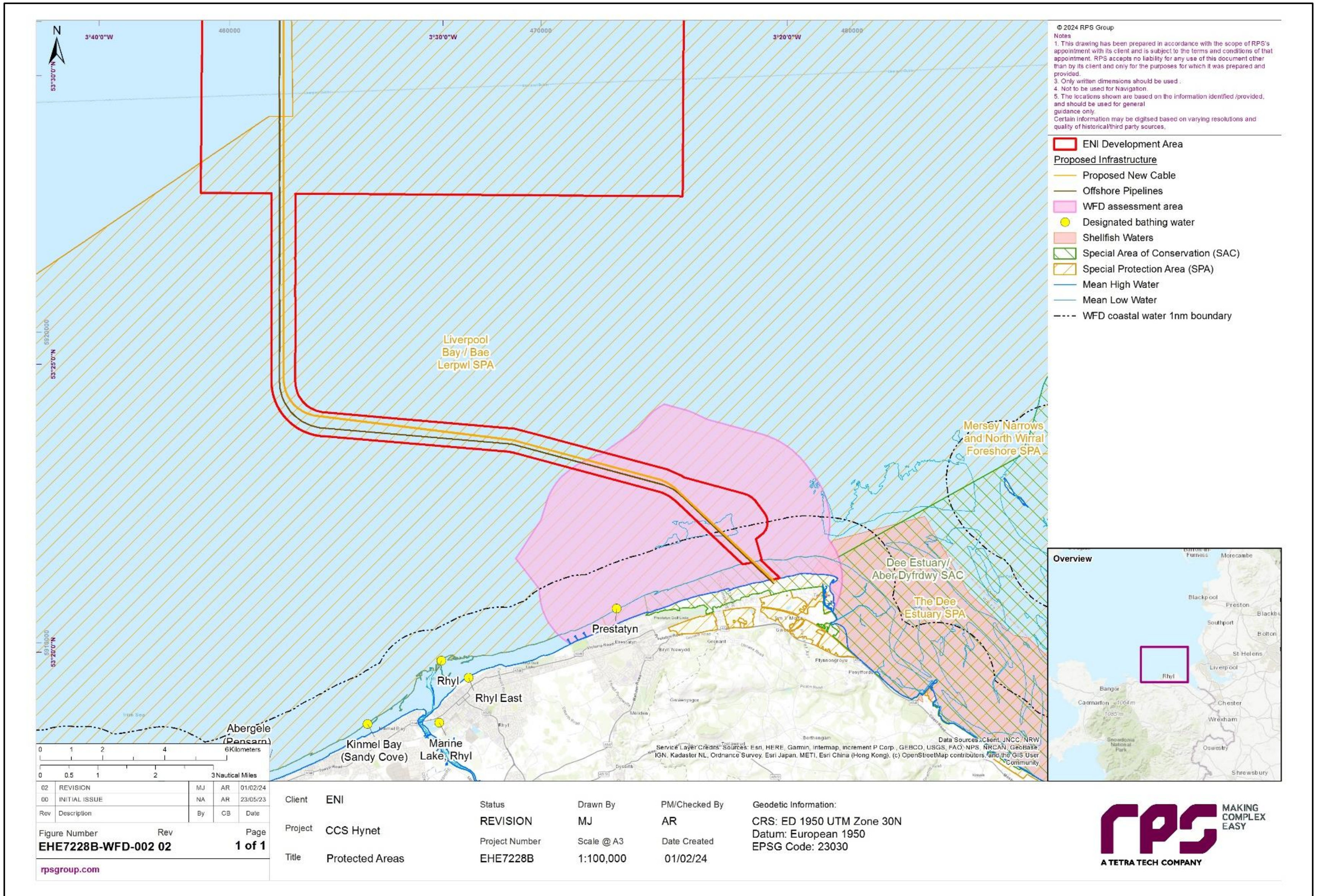

Figure 1.3: WFD Protected Areas Located within the WFD Assessment Area for the Proposed Development

1.7.3 North Wales water body

1.7.3.1 Hydromorphology

Hydromorphology influences the health of aquatic habitats and ecosystems. Changes to hydromorphology can drive fragmentation and loss of habitat, changes in the flow regime and disturbance of natural dynamics of sediment transport. Water bodies at 'high' hydromorphological status may therefore be more sensitive to human pressures, with potential for subsequent effects to overall ecological status. Table 1.11 provides the specific risk information for hydromorphology receptors.

Table 1.11: Specific Risk Information for Hydromorphology Receptors in the North Wales Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could impact on the hydromorphology (for example morphology or tidal patterns) of a water body 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.
Activity could significantly impact the hydromorphology of any water body	Numerical modelling presented within the Offshore ES at volume 3, Physical Processes Technical Report (RPS Group 2024a) , indicates that hydromorphology would not be significantly impacted by the proposed activity. Effects of all cable installation activities will be temporary and reversible and would be highly localised.	No: Impact assessment not required.
Activity is in a water body that is heavily modified for the same use as your activity	The North Wales water body has been designated as a heavily modified water body for "*Coast protection use*" (NRW, 2022a). This designation is for coastal protection, which is not for the same use as the activity.	No: Impact assessment not required.

1.7.3.2 Biology – habitats

The Environment Agency scoping template provides a list of habitats which have a sensitivity to human pressures; split into higher and lower sensitivities. Table 1.12 is a reproduction of the list of sensitive habitats from the scoping template and Table 1.13 presents the specific risk information for biology habitat receptors.

Table 1.12: Habitat Sensitivity to Human Pressures. Habitats Present within the WFD Study Area are Highlighted in Bold Text, and Habitat Areas are Estimated from EMODnet Habitat Classifications

Habitat	Area within North Wales water body (km^2)	Area with 500 m of activity footprint (km^2)
Higher sensitivity habitats		
Chalk reef	0.00	0.00
Clam, cockle and oyster beds	0.00	0.00
Intertidal seagrass	0.00	0.00
Maerl	0.00	0.00
Mussel beds, including blue and horse mussel	0.00	0.00
Polychaete reef	0.00	0.00
Saltmarsh	0.00	0.00
Subtidal kelp beds	0.00	0.00

Habitat	Area within North Wales water body (km^2)	Area with 500 m of activity footprint (km^2)
Subtidal seagrass	0.00	0.00
Lower sensitivity habitats		
Cobbles, gravel and shingle	**21.71**	n/a
Intertidal soft sediments like sand and mud	0.00	n/a
Rocky shore	0.00	n/a
Subtidal boulder fields	0.00	n/a
Subtidal rocky reef	**0.01**	n/a
Subtidal soft sediments like sand and mud	**38.62**	n/a

Table 1.13: Specific Risk Information for Biological Habitat Receptors in the North Wales Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Footprint is 0.5 km^2 or larger	The footprint for cable installation will be assumed to be achieved via jetting for the full 1 nm from MHWS. For two cables, with an anticipated disturbance width of 15 m per cable and a disturbance length of 1,852 m (i.e. 1 nm), with 1 km of dredging across West Hoyle Bank, the footprint, as described in Table 1.3, would be 72,060 m^2 (0.072 km^2). For two cables, with an anticipated disturbance width of 15 m per cable and a disturbance length of 7,300 m (i.e. the length of the cable route within the WFD assessment area), with 1 km of dredging across West Hoyle Bank, the footprint, as described in Table 1.3, would be 204,500 m^2 (0.205 km^2). The estimated maximum footprint of the activity would not exceed 0.5 km^2 if measured to 1 nm or if measured to the boundary of the WFD assessment area (i.e. the boundary of the North Wales water body).	No to all: Impact assessment not required
Footprint is 1% or more of the water body's area	North Wales water body area = 146.25 km^2 Maximum footprint (to boundary of North Wales water body) = 0.205 km^2 Footprint as percentage of North Wales water body = 0.14%. The estimated maximum footprint of the activity would not exceed 1% of the area of the North Wales water body.	
Footprint is within 500m of any higher sensitivity habitat	As detailed in Table 1.12, there are no higher sensitivity habitats located within 500 m of the activity footprint.	
Footprint is 1% or more of any lower sensitivity habitat	The maximum footprint (0.205 km^2) is estimated to be greater than the total area of 'Subtidal rocky reef' habitat within the North Wales water body (0.01 km^2). However, no 'Subtidal rocky reef' is located within the WFD assessment area. For lower sensitivity habitats that may be present within the WFD assessment area: Area of 'Cobbles, gravel and shingle' = 21.71 km^2 Footprint as percentage of 'Cobbles, gravel and shingle' = 0.94% Area of 'Subtidal soft sediments like sand and mud' = 38.62 km^2	

Consideration	Key risk issues and justification	Scoped into assessment?
	Footprint as percentage of 'Subtidal soft sediments like sand and mud' = 0.53%. The estimated maximum footprint of the activity would not exceed 1% of any lower sensitivity habitat.	

1.7.3.3 Biology – fish

The '*Clearing the Waters for All*' scoping template provides a list of criteria which may impact fish species within relevant water bodies. Table 1.14 presents the specific risk information for biology fish receptors.

Table 1.14: Specific Risk Information for Fish Receptors in the North Wales Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	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. The assessment presented in the Offshore ES at volume 2, chapter 7 predicted that installation or operation of the offshore power and FO 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.
Activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	The installation and operation of the offshore power and FO cables 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 intertidal cable installation via HDD, but the magnitude is not likely to constitute an impact upon normal fish behaviour. The assessment presented in the Offshore ES at volume 2, chapter 7, predicted that installation or operation of the offshore power and FO cables would not significantly affect fish and shellfish movement, migration or spawning within this WFD waterbody.	No: Impact assessment not required.
Activity could cause entrainment or impingement of fish	The activity does not include any mechanical systems that could cause fish to become entrained, and no surfaces or screens against which fish could become impinged.	No: Impact assessment not required.

1.7.3.4 Water quality

The risk to water quality is split between specific risks to water quality in relation to phytoplankton and harmful algae (Table 1.15), those in relation to the use or release of chemicals (Table 1.16) and those risks in the mixing zone (Table 1.17).

Table 1.15: Specific Risk Information for Water Quality Receptors in the North Wales Water Body in Relation to Phytoplankton and Harmful Algae

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	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 sand wave 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, with SSC returning to pre-installation levels within a couple of days. SSC would not disperse to a significant level outside the footprint of the activities. A full characterisation of sediment displacement is presented in the Offshore ES at volume 3, Physical Processes Technical Report (RPS Group 2024a), and an assessment of activities affecting the surrounding water quality is presented within the Offshore ES at volume 2, chapter 6. Resistive heating of power cables and compression of CO_2 in pipeline have the potential to increase the temperature of the surrounding sediment. Any temperature increase is expected to be minimal, and due to the natural fluctuations in temperature throughout the year, benthic subtidal and intertidal receptors are expected to be tolerant to small temperature increases. The impact of increased temperature to benthic ecology receptors has therefore been assessed as minor (the Offshore ES at volume 2, chapter 7).	No: Impact assessment not required.
Activity is in a water body 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: Requires impact assessment.**
Activity is in a water body with a history of harmful algae	This water body does not have a history of harmful algae.	No: Impact assessment not required.

Table 1.16: Specific Risk Information for Water Quality Receptors in the North Wales Water Body in Relation to the Use or Release of Chemicals

Consideration	Key risk issues and justification	Scoped into assessment?
Activity uses or releases chemicals on the Environmental Quality Standards Directive (EQSD) list	This activity does not involve the release of chemicals and the only substance which may be used is bentonite, during HDD within the intertidal area. Bentonite is an inert, non-toxic, natural clay mineral (<63 μm particle diameter) which is not on the EQSD list (Environment Agency, 2016b). 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, 2021).	No: Impact assessment not required.

Consideration	Key risk issues and justification	Scoped into assessment?
	OSPAR BAC was exceeded for anthracene, benzo[k]fluoranthene, benzo[a]pyrene, and fluoranthene at a number of sites, all of which are on the EQSD list. Any potential risk of accidental release of contaminants will be minimised through the use of temporary prefabricated steel containment sumps to capture any drilling fluid emitted and implementation of an approved EMP during the construction, and operation and maintenance phases (see section 1.4.5). No deterioration of the status of any sites designated under the WFD is therefore anticipated, should bentonite be used during HDD operations.	
Activity disturbs sediment with contaminants above Cefas Action Level 1	Sediment sampling has been conducted throughout the Eni Development Area, including within the North Wales water body and WFD Assessment area. No sediment contamination by PAHs or heavy metals was observed above Cefas Action Level 1 in samples taken within the North Wales water body, within the WFD assessment area, or at any sediment sampling stations within 12 nm of MHWS. Similarly, THCs and PCBs were below detectable limits at all sampling stations within 12 nm of MHWS. Full details of sediment sampling are presented in the Offshore ES at volume 3 Marine Biodiversity Technical Report (RPS Group 2024b).	No: Impact assessment not required.

Table 1.17: Specific Risk Information for Water Quality Receptors in the North Wales Water Body in Relation to Mixing Zones

Consideration	Key risk issues and justification	Scoped into assessment?
Activity has a mixing zone (such as a discharge pipeline or outfall) and 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.

1.7.3.5 Protected areas

This WFD assessment considers if WFD protected areas, as defined in section 1.6.2 are at risk from the proposed activity. Five WFD protected areas overlap with the WFD assessment area: Liverpool Bay SPA, The Dee Estuary SPA, Dee Estuary SAC, Prestatyn bathing water and Dee (West) Shellfish water. Details of the qualifying features of these protected areas are summarised in

Table 1.9. The Dee Estuary Ramsar site coincides spatially with Dee Estuary SAC, however the '*Clearing the Waters for All*' guidance does not require Ramsar sites to be included as part of the WFD assessment (Environment Agency, 2017). Table 1.18 outlines the potential risk issues for these protected areas.

Table 1.18: Specific Risk Information for WFD Protected Areas Coinciding with the North Wales Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity is within 2 km of any WFD protected area[4]	The North Wales water body overlaps with five WFD protected areas, of which the following are located within the 2 km buffer for the activity (i.e. within the WFD assessment area): • Liverpool Bay SPA; • The Dee Estuary SPA; • Dee Estuary SAC; • Prestatyn bathing water; and • Dee (West) shellfish water. No 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: Requires impact assessment.**

1.7.3.6 Invasive non-native species

Table 1.19 outlines the risk of the introduction of INNS.

Table 1.19: Specific Risk Information for INNS in the North Wales Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could introduce or spread INNS	There is little evidence of adverse effects on fish and shellfish receptors resulting from colonisation of other offshore wind farms by INNS, and the risk of introduction and spread of INNS to benthic ecology receptors has been assessed as minor (the Offshore ES at volume 2, chapter 7). Furthermore, an EMP, and an INNS Management Plan (INNSMP), will be adopted and implemented to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable. All vessels will also operate in accordance with a BP, prepared in accordance with NRW Biosecurity Plan template. A draft BP has been included with the Marine License, and Carbon Dioxide Storage Permit applications, which shall be finalised following appointment of the EPC contractor, and submitted to NRW for prior approval, before the commencement of any works	No: Impact assessment not required.

1.7.4 Dee (N. Wales) water body

1.7.4.1 Hydromorphology

Table 1.20 provides the specific risk information for hydromorphology receptors.

[4] Note that a regulator can extend the 2 km boundary if the activity has an especially high environmental risk

Table 1.20: Specific Risk Information for Hydromorphology Receptors in the Dee Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	The hydromorphology status of the Dee water body has been classified as "*Not High*" (NRW, 2021)	No: Impact assessment not required.
Activity could significantly impact the hydromorphology of any water body	Numerical modelling presented in the Offshore ES at volume 3, Physical Processes Technical Report (RPS Group 2024a). Technical Report indicates that hydromorphology would not be significantly impacted by the proposed activity, particularly given that the activity is expected to be of low magnitude and would not occur within this water body.	No: Impact assessment not required.
Activity is in a water body that is heavily modified for the same use as your activity	The Dee water body has been designated as a heavily modified water body for "*Navigation, ports and harbours use*" (NRW, 2022a). This designation is not for the same use as the proposed activity, and the activity does not overlap with this water body.	No: Impact assessment not required.

1.7.4.2 Biology – habitats

The Dee water body has been included in this WFD assessment due to its proximity to the Proposed Development (1.2 km). However, given that no works are planned to occur within the Dee water body, and the footprint of the activity will not occur within 500 m of any higher sensitivity habitat (as stipulated in the '*Clearing the Waters for All*' guidance) located within the Dee water body, no effect pathway is considered to exist for this receptor. Nonetheless, the scoping process for biological habitats in the Dee water body is presented in Table 1.21.

Table 1.21: Specific Risk Information for Biological Habitat Receptors in the Dee Water Body

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

1.7.4.3 Biology – fish

Table 1.22 presents the specific risk information for biology fish receptors.

Table 1.22: Specific Risk Information for Fish Receptors in the Dee Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary	The activity is not located within an estuary, but the Dee water body is an estuary. The activity will not delay or prevent fish from entering or migrating through the Dee water body. The assessment presented in the Offshore ES at volume 2, chapter 7 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.
Activity could impact on normal fish behaviour like movement, migration or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	The presence of the offshore power and FO cables beneath the seabed will not cause a change in depth or flow and will not create a physical barrier to the Dee 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 intertidal cable installation, but given the distance to this water body, the magnitude is not likely to constitute an impact upon normal fish behaviour. The assessment presented in the Offshore ES at volume 2, chapter 7 predicted that installation or operation of the offshore power and FO cables would not significantly affect fish and shellfish movement, migration or spawning within this WFD waterbody.	No: Impact assessment not required.
Activity could cause entrainment or impingement of fish	The activity does not include any mechanical systems that could cause fish to become entrained, and no surfaces or screens against which fish could become impinged.	No: Impact assessment not required.

1.7.4.4 Water quality

The risk to water quality is split between specific risks to water quality in relation to phytoplankton and harmful algae (Table 1.23), those in relation to the use or release of chemicals (Table 1.24) and those risks in the mixing zone (Table 1.25).

Table 1.23: Specific Risk Information for Water Quality Receptors in the Dee Water Body in Relation to Phytoplankton and Harmful Algae

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	Given the distance of the Dee water body from the proposed activity it is not anticipated that water temperature or salinity would be affected as a result of offshore power and FO 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 sand wave 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 Dee	No: Impact assessment not required.

Consideration	Key risk issues and justification	Scoped into assessment?
	water body. A full characterisation of sediment displacement is presented in the Offshore ES at volume 3, Physical Processes Technical Report (RPS Group 2024a) and an assessment of the activities affecting the surrounding water quality is presented in the Offshore ES at volume 2, chapter 6.	
Activity is in a water body with a phytoplankton status of moderate, poor or bad	The phytoplankton status of the Dee water body is 'good' (NRW, 2021) and the proposed activity does not lie within the Dee water body.	No: Impact assessment not required.
Activity is in a water body with a history of harmful algae	The Dee water body does not have a history of harmful algae.	No: Impact assessment not required.

Table 1.24: Specific Risk Information for Water Quality Receptors in the Dee Water Body in Relation to the Use or Release of Chemicals

Consideration	Key risk issues and justification	Scoped into assessment?
Activity uses or releases chemicals on the Environmental Quality Standards Directive (EQSD) list	This activity does not involve the release of chemicals and the only substance which may be used is bentonite, during HDD within the intertidal area. Bentonite is an inert, non-toxic, natural clay mineral (<63 μm particle diameter) which is not on the EQSD list (Environment Agency, 2016b). 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, 2021). Any potential risk of accidental release of contaminants will be minimised through use of temporary prefabricated steel containment sumps to capture any drilling fluid emitted and the implementation of an approved EMP during the construction, and operation and maintenance phases (see section 1.4.5). No deterioration of the status of any sites designated under the WFD is therefore anticipated, should bentonite be used during HDD operations.	No: Impact assessment not required.
Activity disturbs sediment with contaminants above Cefas Action Level 1	Sediment sampling has not been conducted within the water body as the footprint of the activity lies entirely outside the waterbody. However, sediment sampling has been conducted throughout the Eni Development Area, including much of the WFD assessment area. No sediment contamination by PAHs or heavy metals was observed above Cefas Action Level 1 in samples taken within the WFD assessment area, in the neighbouring North Wales water body, or at any sediment sampling stations within 12 nm of MHWS. Similarly, THCs and PCBs were below detectable limits at all sampling stations within 12 nm of MHWS.	No: Impact assessment not required.

Table 1.25: Specific Risk Information for Water Quality Receptors in the Dee Water Body in Relation to Mixing Zones

Consideration	Key risk issues and justification	Scoped into assessment?
Activity has a mixing zone (such as a discharge pipeline or outfall) and 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.

1.7.4.5 Protected areas

Three WFD protected areas overlap with the WFD assessment area: The Dee Estuary SPA, Dee Estuary SAC, and Dee (West) Shellfish water. Details of these protected areas is summarised in Table 1.26 and qualifying features of these protected areas are presented in Table 1.9.

Table 1.26: Specific Risk Information for WFD Protected Areas Coinciding with the Dee Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity is within 2 km of any WFD protected area[5]	The Dee water body overlaps with three protected areas, of which the following are located within the 2 km buffer for the activity (i.e. within the WFD assessment area): • The Dee Estuary SPA; • Dee Estuary SAC; • Dee (West) shellfish water. No bathing 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: Requires impact assessment.**

1.7.4.6 Invasive non-native species

Table 1.27 outlines the risk of the introduction of INNS.

Table 1.27: Specific Risk Information for INNS in the Dee Water Body

Consideration	Key risk issues and justification	Scoped into assessment?
Activity could introduce or spread INNS	There is little evidence of adverse effects on fish and shellfish receptors resulting from colonisation of other offshore wind farms by INNS and the risk of introduction and spread of INNS to benthic ecology receptors has been assessed as minor, and (the Offshore ES at volume 2, chapter 7). The distance between the cable corridor and the Dee water body will also naturally reduce the likelihood of the introduction or spread of INNS. Furthermore, an EMP and INNSMP will be adopted and implemented to manage and reduce the risk of potential introduction and spread of INNS so far as reasonably practicable. All vessels will also operate in accordance with a BP, prepared in accordance with NRW Biosecurity	No: Impact assessment not required.

[5] Note that a regulator can extend the 2 km boundary if your activity has an especially high environmental risk

Consideration	Key risk issues and justification	Scoped into assessment?
	Plan template. A draft BP has been included with the Marine License, and Carbon Dioxide Storage Permit applications, which shall be finalised following appointment of the EPC contractor, and submitted to NRW for prior approval, before the commencement of any works	

1.7.5 Summary of scoping

Table 1.28 presents a summary of the WFD scoping for the North Wales and Dee water bodies.

Table 1.28: Summary of Scoping for WFD Receptors in the North Wales and Dee Water Bodies

WFD receptor	Potential risk?	Reason/features affected	Risk issue(s) for impact assessment
North Wales water body			
Hydromorphology	No	n/a	n/a
Biology: habitats	No	n/a	n/a
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.	Is within a waterbody with a phytoplankton status of moderate, poor or bad.
Protected areas	Yes	Liverpool Bay SPA The Dee Estuary SPA Dee Estuary SAC Prestatyn Bathing Water Dee (West) Shellfish water	Within 2 km of any WFD protected area.
INNS	No	n/a	n/a
Dee water body			
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	Yes	The Dee Estuary SPA Dee Estuary SAC Dee (West) Shellfish water	Within 2 km of any WFD protected area.
INNS	No	n/a	n/a

1.8 Impact assessment

Based on the WFD scoping for the North Wales and Dee water bodies presented in sections 1.7.3 and 1.7.4, the receptors scoped in for assessment are summarised in Table 1.29.

Table 1.29: Summary of WFD Receptors Scoped In or Out for Assessment, for Each of the North Wales and Dee Water Bodies

WFD receptor	Scoped in for assessment?	
	North Wales	Dee
Hydromorphology	No	No
Biology: habitats	No	No
Biology: fish	No	No
Water quality	**Yes**	No
Protected areas	**Yes**	**Yes**
INNS	No	No

All impacts scoped in for assessment are considered in the context of the embedded mitigation measures described in section 1.4.5.

1.8.1 Water quality

The offshore power and FO cable route crosses the North Wales coastal waterbody and consideration of the potential for a deterioration in water quality within this waterbody is required. This includes the potential for the effects of the 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 the installation or operation of cables, however this has been scoped in due to the 'moderate' phytoplankton status of this waterbody, as outlined in section 1.7.3.

Liverpool Bay is fed by numerous rivers along the coast of north Wales and north-west England, including three large estuaries associated with urban development and industrialisation: the Dee, the Mersey and the Ribble. Alongside these inputs, the eastern Irish Sea has a history of oil and gas extraction which may have contributed to the current chemical status of Liverpool Bay (Dickson, 1987; Cefas, 2005). Seabed disturbance and an increase in SSC associated with the installation of the offshore power and FO cable and landfall works may result a reduction in water quality and may cause sediment-bound contaminants and nutrients to be released into the water column. When nutrient loading 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 (NRW, 2023a).

The North Wales water body does not have a history of harmful phytoplankton blooms (NRW, 2021) and no nutrients are anticipated to be released in significant concentrations from the seabed as a result of the activity, beyond those expected in typical storm conditions. There are no outfalls or discharges associated with the Proposed Development so the proposed activities are not expected to cause a reduction in DO in the water column.

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 such as *E. coli* may increase (Bashwari *et al*., 2020). Since bacterial counts within the water column are a determinant of water quality at designated bathing waters, this may represent a potential impact to bathing water status at the Prestatyn bathing water (located approximately 0.6 km from the boundary of the Eni Development Area).

Numerical modelling of SSC presented in the Offshore ES at volume 3, Physical Processes Technical Report (RPS Group 2024a) indicated that increases in SSC will be greatest close to the site of 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.

Sediment sampling has been undertaken throughout the Eni Development Area, and no sediment contamination by PAHs or heavy metals was observed above Cefas Action Level 1 at any sampling stations within 12 nm of MHWS. This includes all samples taken within the North Wales water body, all those within the WFD assessment area, and all those within the 1 nm WFD assessment boundary stipulated in the '*Clearing the Waters for All*' guidance. Similarly, THCs and PCBs were below detectable limits at all sampling stations within 12 nm of MHWS. The installation of offshore integrated power and FO cables is therefore not considered to result in the mobilisation of sediment-bound contaminants that could affect either the biological or chemical status of the waterbody.

The construction, operation and maintenance and decommissioning of the offshore power and FO cables and landfall works is not predicted to cause a deterioration in the either the biological or chemical 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 and phytoplankton is not expected to bloom in response to nutrient availability. The effects of the activity are therefore expected to be of negligible significance, which is not significant in EIA terms. The Proposed Development is therefore considered, in this respect, to be compliant with the requirements of the WFD.

1.8.2 Protected areas

All protected areas that have been scoped in for assessment for the Dee water body are common to the North Wales water body, and as such these have been considered for both water bodies together. The WFD assessment area (as defined in section 1.5) overlaps with the following five WFD protected areas:

- Liverpool Bay SPA;
- The Dee Estuary SPA;
- Dee Estuary SAC;
- Prestatyn Bathing Water; and
- Dee (West) Shellfish water.

A detailed assessment has been undertaken on all SPAs and SACs within the Offshore ES at volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c). This provides a summary of the results of the HRA Stage 1 Screening for Likely Significant Effects (LSE) 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 Proposed Development alone or in-combination with other plans or projects.

Liverpool Bay SPA and The Dee Estuary SPA

A total of 37.02 km^2 of the Proposed Development overlaps the Liverpool Bay SPA (1.47% of the SPA), and 0.209 km^2 of the Proposed Development is situated within The Dee Estuary SPA (0.146% of the SPA). The RIAA (Offshore ES volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c)) assessed the following relevant impacts to the Liverpool Bay SPA and the Dee Estuary SPA conservation objectives:

- Indirect impacts from changes in prey availability; and
- Accidental pollution in the surrounding area.

Indirect impacts to birds from changes in prey availability may result from activities such as seabed disturbance and associated increases in SSC, and was assessed against two conservation objectives for the Liverpool Bay SPA and The Dee Estuary SPA:

- Objective 4: To maintain or restore the population of each of the qualifying features; and
- Objective 5: To maintain or restore the distribution of the qualifying features within the site.

Impacts from changes in prey availability are predicted to be short term and of high reversibility, lasting only for the duration of construction and decommissioning, and therefore considered to apply only to these phases.

No significant impact on fish receptors is concluded within the Offshore ES at volume 2, chapter 7 and volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c), and both fish and birds are predicted to move away from project activities similarly, therefore AEoI to the Liverpool Bay SPA and The Dee Estuary SPA are not expected for most species in terms of populations or distributions of qualifying features. For little tern *Sternula albifrons*, 8.6% of the foraging range during the breeding season (limited to 5 km) may be affected, leading to a conclusion of a potential moderate adverse impact on the population and distribution of qualifying features during construction and decommissioning, and on the site integrity for both Liverpool Bay SPA and The Dee Estuary SPA.

There is a risk of pollutants being accidentally released during the construction, operation and maintenance and decommissioning phases of the Proposed Development from sources including vessels/vehicles and equipment/machinery; the likelihood of an accidental release of pollutants is extremely low. This impact was assessed against the same two conservation objectives described above for the impacts from changes in prey availability.

Impacts from accidental pollution in the surrounding area during all Proposed Development phases are expected to be limited both temporally and spatially, with the necessary action plans in place to prevent AEoI to the Liverpool Bay SPA and The Dee Estuary SPA. If an event were to occur, the distributional impacts would be short-term and reversible. The assessment within the Offshore ES at volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c) concluded negligible adverse effects on the distribution of qualifying features within the site, and no adverse effects on the populations of qualifying features, with no adverse effect on site integrity overall.

Dee Estuary SAC

The Proposed Development sits within 0.21 km^2 of the Dee Estuary SAC (0.13% of the SAC) which is designated for the following relevant qualifying features:

- Annex I habitats and habitats of qualifying features:
  - Mudflats and sandflats not covered by seawater at low tide;
  - *Salicornia* and other annuals colonising mud and sand;
  - Atlantic salt meadows *Glauco – Puccinellietalia maritimae*; and
  - Estuaries.
- Diadromous fish
  - Sea lamprey *Petromyzon marinus*; and
  - River lamprey *Lampetra fluviatilis*.

The following impacts assessed within the Offshore ES at volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c) were considered relevant to the WFD assessment:

- Increased suspended sediment concentrations and associated deposition;
- Increased temperature impacting benthic and marine communities (Annex I habitats and habitats of qualifying species only);
- Impacts resulting from the release of sediment bound benthic contaminants (Annex I habitats and habitats of qualifying species only); and
- Underwater noise impacting fish receptors (Annex II diadromous fish only).

Impacts to Annex I habitats and habitats of qualifying features were assessed against four conservation objectives, and Annex II diadromous fish against five conservation objectives which are described in full in the Offshore ES at volume 3, Habitats Regulations Assessment Stage 2 Report (RPS Group 2024c).

Increased SSCs can impact water quality, and may occur through sand wave clearance and cable laying, including trenching, with plumes within the water column extending up to 15 km from the source to the west during the construction and decommissioning phases, and therefore may extend into the Dee Estuary. However, levels of SSCs within the plume are expected to be within the range of background levels (i.e. 30 mg/l). This impact is therefore highly unlikely to adversley affect natural processes within the estuarine environment, mudflat and sandflat communities, *Salicornia* and other annuals colonising mud and sand and Atlantic salt meadows. No adverse effects on the qualifying Annex I habitats as or habitats of qualifying features which undermine the conservation objectives of the Dee Estuary SAC are expected to occur as a result of increases in SSCs and associated deposition.

Further, for Annex II diadromous fish, Natural England and Countryside Council for Wales (2010) identified both species of lamprey as not vulnerable to changes in turbidity or siltation due to their mobility. The subtidal zone of the Dee is believed to provide an important breeding, sheltering and nursery area for coastal fish species, which may be important prey for river and sea lamprey. However, given that the sediment plumes resulting from activities along the cable route will stay within background levels of the naturally turbid system of the Dee Estuary, it can be anticipated that this pressure will not alter the availability of prey species during any of the phases of the Proposed Development and therefore have no effect on the population of the Annex II diadromous fish. No adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objectives of the Dee Estuary SAC will occur through impacts resulting from increased SSCs and associated deposition.

There is potential for increased temperatures from the subsea pipeline and power cables to impact the immediate environment, in-turn affecting the benthic species associated with the sediment, and temperature changes can affect water quality. Natural gas currently flows into the PoA terminal from offshore production. As the natural gas reaches the foreshore pipeline, having travelled through the marine environment, it is at or near equilibrium with the sea temperature. With the Proposed Development, CO_2 will flow from the PoA terminal out through the foreshore pipeline to the Douglas Process OP. Compression at the PoA terminal could potentially increase the temperature of the gas. However, the temperature of the subsea pipelines is expected to be lower than when the pipelines were used for natural gas transportation and impacts are predicted to be minimal. Intertidal mudflats and sandflats were not recognised as vulnerable to changes in thermal regime (Natural England and Countryside Council for Wales, 2010). This impact is highly unlikely to adversely affect natural processes within the estuarine environment. Given the very narrow footprint of potential temperature increases as a result of pipeline operation, as well as natural temperature fluctuations, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by the seawater at low tide. No adverse effects on the qualifying Annex I habitats as or habitats of qualifying features which undermine the conservation objectives of the Dee Estuary SAC are expected to occur as a result of increases temperatures from the subsea pipeline or power cables.

Seabed disturbances due to construction and decommissioning activities could potentially lead to the remobilisation of previously sediment bound contaminants which could impact the surrounding benthic communities and water quality associated with the supporting habitat. However, the assessment presented in the Offshore ES at volume 2, chapter 7, based on the site-specific physical processes modelling, suggested that the nature of the construction activities is not likely to result in any remobilisation of previously sediment bound contaminants due to the already turbid and dynamic nature of the intertidal zone. As such, this pressure is not expected to adversely affect the extent and distribution of habitats of qualifying species as well as mudflats and sandflats not covered by seawater at low tide, *Salicornia* and other annuals, Atlantic salt meadows and estuaries. No adverse effects on the qualifying Annex I habitats as or habitats of qualifying features which undermine the conservation objectives of the Dee Estuary SAC are expected to occur as a result of impacts resulting from the release of sediment bound benthic contaminants.

Underwater noise can potentially have an adverse impact on fish species, such as behavioural effects, and physical injury and/or mortality through activities such as pile driving (construction only), UXO clearance (construction only) and geophysical or seismic survey (all Proposed Development phases) and can create a barrier to migration. Auditory injury can occur either as a Temporary Threshold Shift (TTS) where an animal's auditory system can recover, or Permanent Threshold Shift (PTS), where there is no hearing recovery in the animal. Lamprey are considered to have a low vulnerability to underwater noise impacts overall, due to their relatively simple ear structure, and are understood to detect sound in the environment through particle motion. Based on maximum peak experience (SPL_{pk}) and maximum hammer energy (i.e. 3,000 kJ), mortality and recoverable injury to lampreys may occur within a maximum of 184 m of the piling activity, a range of tens to hundreds of metres for UXO clearance and up to 26 m for vertical seismic profiling (VSP). Behavioural responses due to piling may occur up to 33 km from the source, although this is considered highly conservative. Piling represents the largest potential impact and will take place over a short duration (up to 13.5 hours, based upon up to 100 m minutes of piling at each of eight pin piles), intermittently and is therefore unlikely to adversely affect the population of river and sea lamprey. No adverse effects on the qualifying Annex II diadromous fish which undermine the conservation objectives of the Dee Estuary SAC will occur through impacts resulting from underwater noise.

Prestatyn bathing water

The Prestatyn bathing water is located approximately 4.2 km from the proposed route of the integrated offshore power and FO cables, and approximately 0.6 km from the Eni Development Area (Figure 1.3), and has received an annual classification of 'Excellent' between 2018 and 2022. There was a total of eight warnings of a pollution risk forecast due to heavy rain during the 2022 bathing water season, although no samples were collected on a day that coincided with these warnings.

Given that bathing water status is determined in part by bacterial sampling, the consistent 'Excellent' classification of the Prestatyn bathing water suggests that levels of bacteria within nearby sediments do not result in a reduction in water quality when disturbed and mobilised during storm events. Moreover, the short-term nature of any sediment plumes associated with cable installation suggests that any relative increase in bacteria would be negligible in terms of WFD compliance. No deterioration or non-compliance at the Prestatyn bathing water is anticipated to occur as a result of the Proposed Development.

Dee (West) shellfish water

The Dee (West) shellfish water is located approximately 1 km from the Eni Development Area, and approximately 1.1 km from the proposed route of the offshore power and FO cables. The site was designated for the harvesting of mussel (*Mytilus* spp.) and cockle (*Cerastoderma edule*): two largely sedentary species, which may be more sensitive to increased SSC than more mobile species. Similarly, microbial sampling is a determinant of compliance for shellfish waters, and bacterial levels may be at risk of increase following mobilisation of sediment (see section 1.8.1). As for the Prestatyn bathing water, however, disturbance of sediments during storm events does not result in a reduction in water quality (NRW, 2023b) and given that the installation of the offshore power and FO cables is not proposed to overlap spatially with the Dee (West) shellfish water, no deterioration or non-compliance is anticipated to occur here as a result of the Proposed Development.

1.9 Summary

Based on the WFD Scoping presented in section 1.7 and the assessment of effects presented in section 1.8 there is no potential for deterioration of the North Wales or Dee water bodies. In most instances, the relevant activities for the construction, operation and maintenance and decommissioning of the integrated offshore power and FO cables associated with the Proposed Development have been scoped out of the assessment as they are below the thresholds set by the '*Clearing the Waters for All*' guidance.

In the context of water quality, one criterion was 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*". Increased SSC from installation and decommissioning of the power and FO cables is expected to disperse rapidly (i.e. within four days) at distances of hundreds of metres from cable installation works and phytoplankton is not expected to bloom in response to nutrient availability. Sediment-bound contaminants are not considered likely to increase in bioavailability or eco-toxicological effects, within the 1 nm WFD assessment boundary described in the '*Clearing the Waters for All*' guidance, within the WFD Assessment Area (as described in section 1.5), or within 12 nm of MHWS for 'chemical status'. The effects of the activity are expected to be of negligible significance in the EIA, and do not represent a deterioration in either the biological or chemical status of this WFD element of the North Wales water body. The Dee water body was not scoped in for assessment as no water quality elements were considered to be at risk of deterioration.

The Eni Development Area lies "*within 2 km of any WFD protected area*", as defined by the '*Clearing the Waters for All*' guidance: Liverpool Bay SPA, The Dee Estuary SPA, Dee Estuary SAC, Prestatyn bathing water; and Dee (West) shellfish water. The qualifying features of the SPA and SAC, and the parameters for classification of the bathing water and shellfish, were considered to the potential to be impacted by the activities, particularly during the construction and decommissioning phases. The construction, operation and maintenance and decommissioning of the offshore power and FO cables are not predicted to jeopardise the conservation objectives or status of the scoped-in WFD protected areas. The effects of the activity are therefore not predicted to represent a deterioration in the status of this WFD element of the North Wales or Dee water bodies.

Based on the assessment of effects related to the integrated offshore power and FO cables for the Proposed Development, there is no potential for significant impacts on the habitats - biology, water quality or WFD protected areas associated with the North Wales or Dee water bodies. The activity is not anticipated to 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, operation and maintenance and decommissioning of the Proposed Development is therefore considered to be compliant with the requirements of the WFD.

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