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NORTH CHANNEL WIND 1 AND 2 PROJECTS

OFFSHORE EIA SCOPING REPORT

Approval for issue			
For and on behalf of NCW			*Rev 05 - Final*
For and on behalf of RPS	James McCrory	*Technical Director*	*03.05.2023*

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Glossary

Term	Definition
Bathymetry	The measurement of water depth in oceans, seas and lakes.
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.
Circalittoral	The subzone of the rocky sublittoral below that dominated by algae (i.e. the infralittoral) and dominated by animals.
Cumulative Impacts	'The addition of many minor or significant effects, including effects of other projects, to create larger, more significant effects' (EPA, 2017*)*.
DAERA Marine Strategy & Licensing Branch	The competent permitting authority in the marine environment of Northern Ireland
Designated Landscape	Areas of landscape identified as being of importance at international, national or local levels, either defined by statute of identified in local development plans.
The Developer	North Channel Wind
"Do Nothing" Scenario	The environment as it would be in the future should the proposed project not be developed.
"Do Something" Scenario	The environment should the proposed project be developed.
SONI	State-owned electric power transmission operator in Northern Ireland.
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 Impact Assessment Report referred to as an Environmental Statement (ES) in Northern Ireland.
EIA Regulations	• in respect to a marine licence application: The Marine Works (Environmental Impact Assessment) Regulations (Northern Ireland) 2007 as amended; and • in respect to a terrestrial planning application: The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017, as amended.
Foreshore	The area of the land and seabed between the high water mark of ordinary or medium tides and the 12 nautical mile limit.
Habitats Regulations	• the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended); and/or • the Conservation of Offshore Marine Habitats and Species Regulations 2017, as amended).

Term	Definition
Indirect Impact	‘Impacts on the environment, which are not a direct result of the project, often produced away from (the site) or as a result of a complex pathway’ (EPA, 2017).
Infauna	The animals living in the sediments of the seabed.
Landscape Character Area	Distinct types of landscape which are generic in character in that they may occur in different parts of the country, but wherever they are they share broadly similar combinations of geology, topography, drainage patterns, vegetation and historical land use and settlement pattern.
Landfall	The area in which the offshore export cables make landfall and is the transitional area between the offshore cabling and the onshore cabling.
Land Use	The use and management of the natural, semi-natural and built environment.
Magnitude	Size, extent and duration of an impact.
Mitigation Measure	Measure which would avoid, reduce, or remediate an impact.
NCW	North Channel Wind
NCW 1 / NCW 2	North Channel Wind Project Area 1 / 2
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.
Polychaete	A class of segmented worms often known as bristleworms.
Profound Impact	An impact which obliterates sensitive characteristics.
The Project	The proposed North Channel Wind project.
The Proposed Development	The proposed North Channel Wind project.
Project Design Envelope (PDE)	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.
rms	Root Mean Square – square root of the mean value of the square of the quantity taken over a given time interval.
SBM	Single Buoy Moorings Inc.
SEL	Sound Exposure Level – a measure of the total sound energy of an event normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like-for-like basis.
Sensitive Receptor	Physical or natural resource, special interest or viewer group that may experience an impact.
Sensitivity	Vulnerability of a sensitive receptor to change.

Term	Definition
Subtidal	Area extending from below low tide to the edge of the continental shelf.
Water Body	A surface water body as defined under the Water Framework Directive (WFD) i.e., a river/stream, lake, transitional, coastal or groundwater body.

ACRONYMS

Term	Definition
AA	Appropriate Assessment
ACL	Atlantic Container Line
ADDs	Acoustic Deterrent Devices
AEZs	Archaeological Exclusion Zones
AFBI	Agri-Food and Biosciences Institute
AGAs	Aerodrome and Grounds Aids
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
amsl	Above Mean Sea Level
ANSP	Air Navigation Service Provider
AON	Apparently Occupied Nest
AONB	Area of Outstanding Natural Beauty
AoS	Area of Search
ATC	Air Traffic Control
ATS	Air Traffic Service
BAP	Biodiversity Action Plan
BDMPS	Biologically Defined Minimum Population Scale
BGS	British Geological Survey
CAA	Civil Aviation Authority
CAP	Civil Aviation Publication
CCS	Carbon Capture System

Term	Definition
CD	Chart Datum
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CFSR	Climate Forecast System Reanalysis
CGNS	Celtic and Greater North Seas
CIEEM	Chartered Institute of Ecology and Environmental Management
CIL	Commissioners of Irish Lights
CIS	Celtic and Irish Seas
COLREGS	International Regulations for Preventing Collisions at Sea
CRM	Collision Risk Model
CSO	Central Statistics Office
CSTP	Celtic Sea Trout Project
CV	Coefficient Variable
CWSH	Coastal West Scotland and the Hebrides
DAA	Development Array Area
DAERA	Department of Agriculture, Environment and Rural Affairs
DCCAE	Department of Communications, Climate Action and Environment
DETI	Department of Enterprise, Trade and Investment (Northern Ireland). Replaced b DfE in 2016.
DfC	Department for Communities (Northern Ireland)
DfE	Department for the Economy (Northern Ireland)
DIO	Defence Infrastructure Organisation
DMRB	Design Manual for Roads and Bridges
dNMPF	draft National Marine Planning Framework
DoD	Department of Defence
EBA	European Boating Association
EC	European Commission
ECC	Export Cable Corridor
ECMWF	European Centre for Medium-range Weather Forecast
EEA	European Economic Area

Term	Definition
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EIS	Environmental Impact Statement
EMF	Electromagnetic Field
EMODnet	European Marine Observation and Data Network
EMP	Environmental Management Plan
EPA	Environmental Protection Agency
ERCoP	Emergency Response and Cooperation Plan
ES	Environmental Statement
ESAS	European Seabirds at Sea
ESCA	European Subsea Cables UK Association
EU	European Union
EUNIS	European Nature Information System
EUSeaMap	EMODnet broad-scale seabed habitat map for Europe
FAD	fish aggregation device
FCS	favourable conservation status
FL	Fisheries Liaison (or) Foreshore Licence (or) Flight Level
FLO	Fisheries Liaison Officer
FLOWW	Fishing Liaison with Offshore Wind and Wet Renewables Group
FMMS	Fisheries Management and Mitigation Strategy
FOW	Floating Offshore Wind
FSA	Formal Safety Assessment
GHG	Greenhouse Gases
GPS	Global Positioning System
GVA	Gross Value Added
HDD	Horizontal Directional Drilling
HOOW	Harnessing Our Ocean Wealth

Term	Definition
HLV	Heavy Lift Vessels
HMR	Helicopter Main Route
HRA	Habitats Regulations Assessment
HVAC	High Voltage Alternating Current
HWM	High Water Mark
IAQM	Institute of Air Quality Management
IAIP	Integrated Aeronautical Information Package
IAMMWG	Inter-Agency Marine Mammal Working Group
ICES	International Council for the Exploration of the Sea
IEMA	The Institute of Environmental Management and Assessment
IEF	Important Ecological Feature
IEP	Industry Evidence Programme
IFR	Instrument Flight Rules
IMC	Instrument Meteorological Conditions
IMO	International Maritime Organisation
INFOMAR	Integrated Mapping for the Sustainable Development of Ireland's Marine Resource
INNS	Invasive Non-Native Species
INSPIRE	Infrastructure for Spatial Information in Europe
IS	International Standard / Irish Sea
IUCN	International Union for Conservation of Nature
IWEA	Irish Wind Energy Association
JNCC	Joint Nature Conservation Committee
LAT	Lowest Astronomical Tide
LCA	Landscape Character Area
LCT	Landscape Character Type
LSE	Likely Significant Effect
LWM	Low Water Mark
LVIA	Landscape and Visual Impact Assessment

Term	Definition
MAIB	Marine Accident Investigation Branch
MarESA	Marine Evidence based Sensitivity Assessment
MarLIN	Marine Life Information Network
MARPOL	International Convention for the Prevention of Pollution from Ships
MAST	Marine Alliance for Science and Technology
MCA	Maritime and Coastguard Agency
MCAA	Marine and Coastal Act 2009
MCZ	Marine Conservation Zone
MDS	maximum design scenario
MEABC	Mid and East Antrim Borough Council
MEC	Maximum Export Capacity
MEDIN	Marine Environmental Data Information Network
MIDA	Marine Irish Digital Atlas
MHWM / MHWS	Mean High Water Mark / Mean High Water Springs
MLWM / MLWS	Mean Low Water Mark / Mean Low Water Springs
MMMP	Marine Megafauna Mitigation Plan
MMO	Marine Management Organisation
MMMU	Marine Mammal Management Unit
MNR	Marine Nature Reserve
MPA	Martine Protected Area
MPNI	Marine Plan for Northern Ireland
MPS	Marine Policy Statement
MSA	Minimum Safe Altitude
MS-LOT	Marine Scotland Licensing Operations Team
MUs	Management Units
NATS	National Air Traffic Services
NECD	National Emission Ceilings Directive
NECP	National Energy and Climate Plan

Term	Definition
NICP	Northern Ireland Conservation Priority
NIRLCA	Northern Ireland Regional Landscape Character Area
NISS	Northern Ireland Sublittoral Survey
NIEA	Northern Ireland Environment Agency
NLB	Northern Lighthouse Board
nm	Nautical mile
NMFS	National Marine Fisheries Service
NOTAM	Notice to Airmen
NPWS	National Parks and Wildlife Service
NRA	Navigation Risk Assessment
NSR	Noise Sensitive Receptor
NtM	Notice to Mariners
NTS	Non-Technical Summary
OEM	Original Equipment Manufacturer
NUC	Not Under Command
OFLO	Offshore Fisheries Liaison Officer
GA	General Arrangement
OGI	Onshore Grid Infrastructure
OMF	Operations and Maintenance Facility
OREDP	Offshore Renewable Energy Development Plan
OSNI	Ordnance Survey Northern Ireland
OSP	Offshore Substations Platforms
OSPAR	Oslo andParis Conventions
O&M	Operations and Maintenance
PEXA	Practice and Exercise Areas
PMF	Priority Marine Feature
PSR	Primary Surveillance Radar
PINS	UK Planning Inspectorate

Term	Definition
PTS	Permanent Threshold Shift
Racon	Radar Beacon
RAM	Restricted in their Ability to Manoeuvre
RDS	Regional development Strategy for Northern Ireland
RESS	Renewable Electricity Support Scheme
RIAA	Report to Inform Appropriate Assessment
RLCA	Regional Landscape Character Areas
RNLI	Royal National Lifeboat Institution
Ro-Ro	Roll on Roll off
RPO	Regional Policy Objective
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Search and Rescue
SAS	Surfers Against Sewage
SCA	Seascape Character Area
SCANS	Small Cetacean Abundance in the North Sea
SCOS	Special Committee on Seals
SMP	Seabird Monitoring Programme
SMUs	Seal Management Unit
SNCB	Statutory Nature Conservation Body
SONI	System Operator Northern Ireland
SPA	Special Protection Area
SPL	Sound Pressure Level
SPM	Suspended Particulate Matter
SPSS	Strategic Planning Policy Statement for Northern Ireland
SSC	Suspended Sediment Concentrations
SSNI	Sublittoral Survey Northern Ireland
SSR	Secondary Surveillance Radar

Term	Definition
SSSI	Site of Special Scientific Interest
STECF	Scientific, Technical and Economic Committee for Fisheries
SWISS	South West Irish Sea Survey
TCE	The Crown Estate
TLP	Tension Leg Platform
TSS	Traffic Separation Scheme
UHF	Ultra-High Frequency
UKFEN	UK Fisheries Economic Network
UKCS	United Kingdom Continental Shelf
UKGA	UK General Aviation
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
VHF	Very High Frequency
VMP	Vessel Management Plan
VMS	Vessel Monitoring System
WS	West Scotland
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generators
XLPE	Cross-linked Polyethylene
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility

UNITS

Term	Definition
CO_{2eq}	Carbon dioxide equivalent
dB	Decibel (unit used to measure the intensity of sound)
d	Depth
ft	Feet
km	Kilometres
kV	Kilovolt (electrical potential)
<	Less than
m	Metre
m/s	Metres per second (wind speed)
mt	Million tonnes
mg/l	Milligrams per litre
MW	Megawatt (power; equal to one million watts)
>	More than
nm	Nautical Mile (distance; equal to 1.852 km)
%	Percentage
SEL	Sound Exposure Level

1. INTRODUCTION

1.1 BACKGROUND

In Northern Ireland's 2021 Executives report, Energy Strategy for Northern Ireland, NI aims to have 70% of its electricity from renewable sources by 2030, with offshore wind being necessary to do so.[1] The Climate Change Act of 2022 upped this target to 80%[2]. The Clean Revolution (BVG Associates 2022) assumes 1.5 GW offshore wind will be built by 2032.

North Channel Wind Limited (NCW) is proposing the development of two Floating Offshore Wind (FOW) Farms in the North Channel. They are to be called North Channel Wind 1 (NCW 1) Project and North Channel Wind 2 (NCW 2) Project. Each project is to be brought forward independently of each other by NCW as Project Developer.

The offshore array areas of NCW 1 and NCW 2 Projects are located in the North Channel (refer Figure 1.1 and **Figure 1.2**) in Northern Ireland territorial waters. The north-east boundary of the NCW 1 array area marks the outer limit of Northern Ireland's territorial waters and boundary between Scottish territorial waters and Northern Ireland's territorial waters.

The NCW 1 Project array area will be located between the co-ordinates outlined in table 2.1, with the nearest turbine located 8.6 km from the Co. Antrim coast in approximately 120-130 m of water depth. North Channel Wind 1 has a site area of approximately 176 km^2 and is anticipated to accommodate 46-68 turbines depending on the turbines size selected.

The NCW 2 Project array area will be located between the co-ordinates outlined in table 2.1, with the nearest turbine located 13 km from the Co. Down coast in approximately 125 m of water depth. North Channel Wind 2 has a site area of approximately 38 km^2 and is anticipated to accommodate 19-28 turbines depending on the turbines size selected.

1.2 PROJECT OVERVIEW

The NCW 1 and NCW 2 Projects are floating offshore wind development, with an estimated maximum installed capacity of up to 1,020 MW and 420 MW respectively. The Projects will include both the offshore wind turbine generators (WTGs) and associated offshore infrastructure, as well as onshore grid connection and associated infrastructure.

Key components of the Proposed Development (i.e. the offshore components of the Projects) include:

- Wind Turbine Generators (WTG);
- Floating Platforms;
- Moorings and Anchors;
- Offshore Inter-Array Cabling;
- Offshore Export Cable/s;
- Offshore substation (potentially).

There are two potential Export Cable Corridor (ECC) Areas of Search (AoS) for export of generated electricity for NCW 1 and NCW 2. Option 1 represents a connection between NCW 1/NCW 2 and Ballylumford Power Station, and Option 2 represents a connection between NCW 1/NCW 2 and Kilroot Power Station (refer Figure 1.3).

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1 https/www.economy-ni.gov.uk/publication/energy-strategy-path-net-zero-energy
2 https://www.legislation.gov.uk/nia/2022/31/enacted

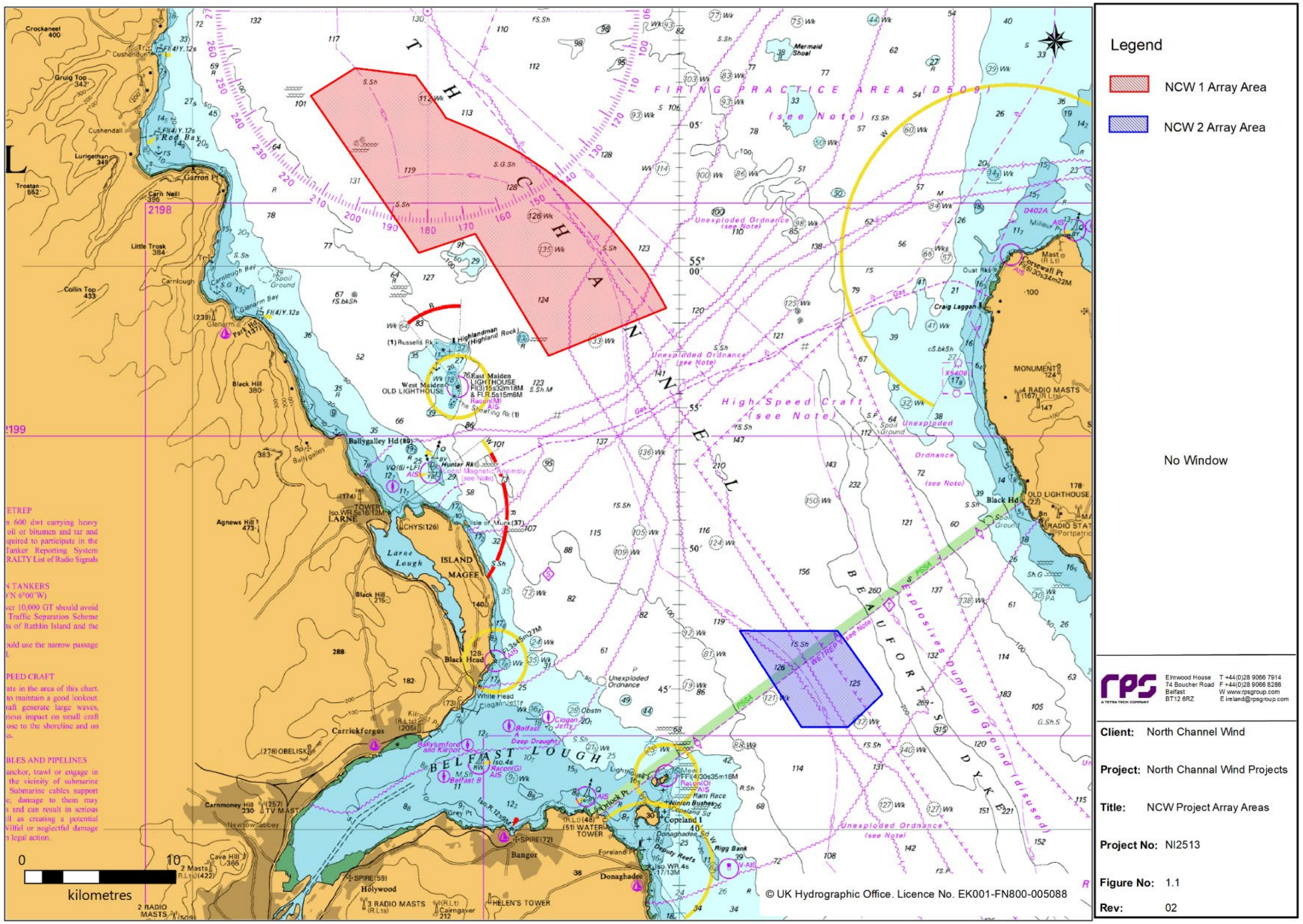

Figure 1.1: North Channel Wind 1 and North Channel Wind 2 Proposed Offshore Array Areas

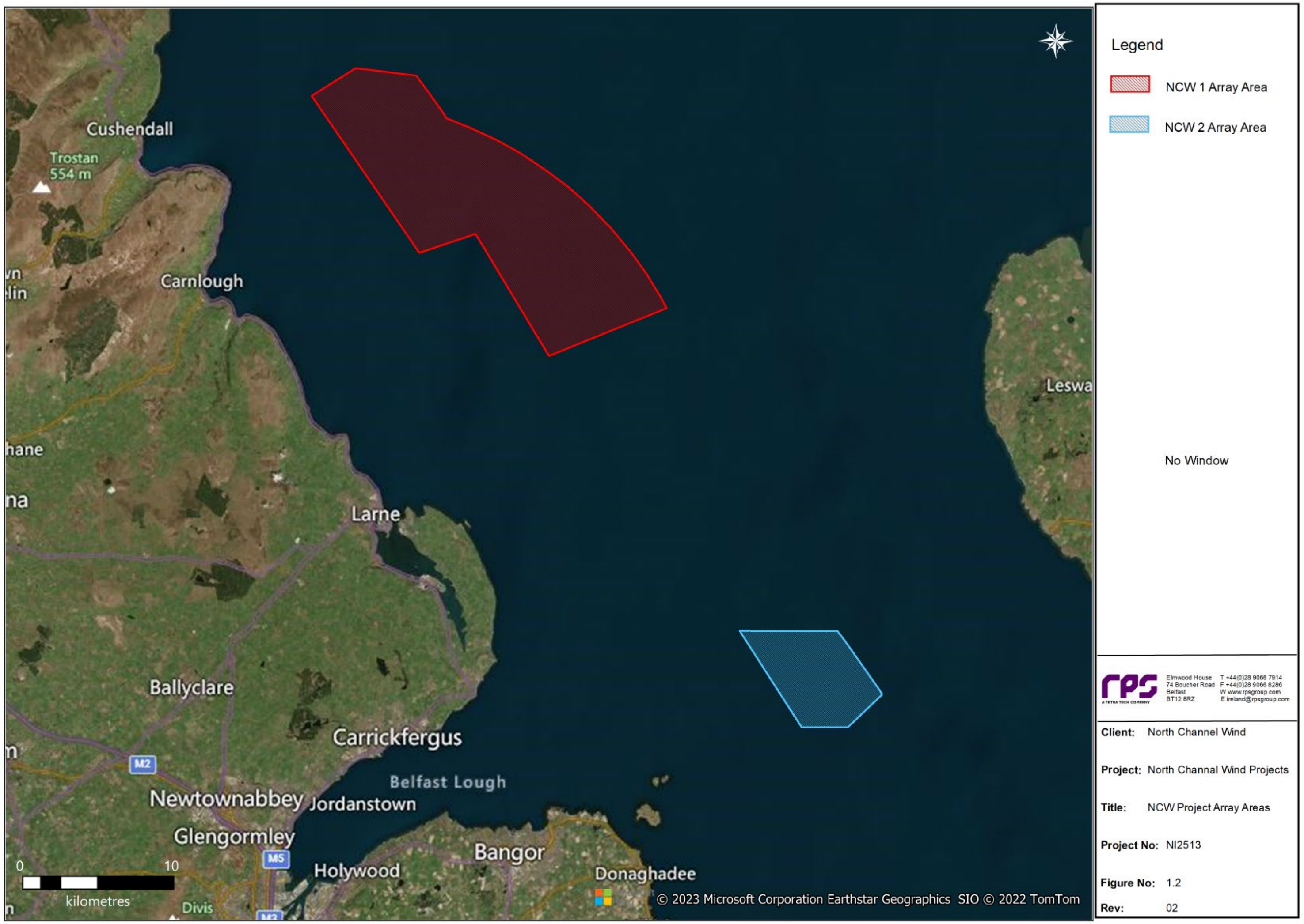

Figure 1.2: North Channel Wind 1 and 2 Project Offshore Array Areas

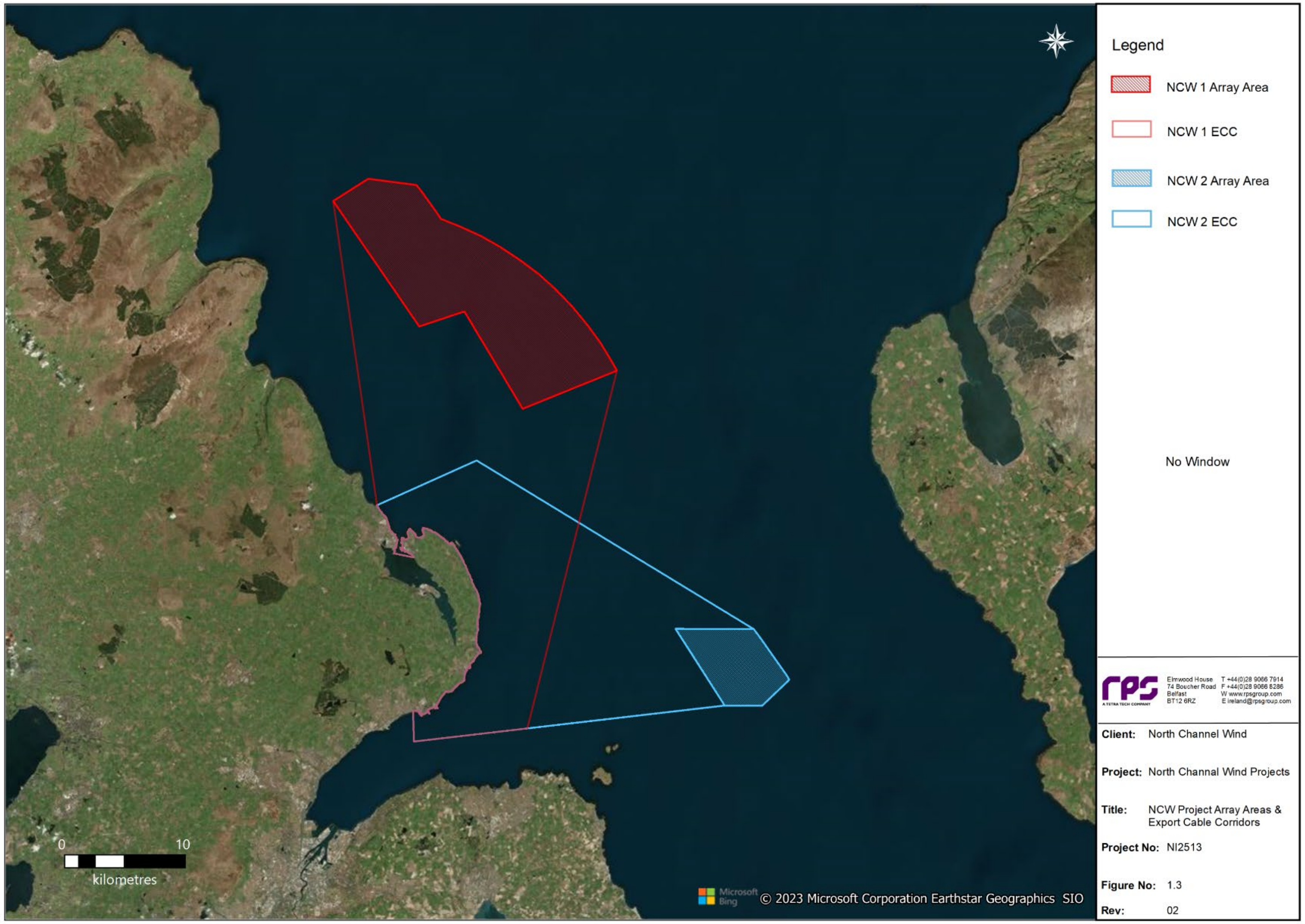

Figure 1.3: North Channel Wind 1 and 2 Project Offshore Array Areas & Export Cable Corridor (ECC) Areas of Search (AoS)

North Channel Wind is currently assessing the feasibility of various selected landfall locations on the East Antrim coast, designed to tie into either Ballylumford or Kilroot to enable grid connection with minimal impact onshore.

The electricity generated from the wind turbines will be transmitted to the landfall via buried High Voltage (HV) cables.

The Project offshore array areas and associated export cable corridors may be refined following both engineering and environmental considerations.

Further details regarding the selection of the offshore array areas and export cable corridors of the proposed NCW Projects is provided in Chapter 3.

1.3 SITE SELECTION

A comprehensive programme of work was undertaken to appropriately identify and assess the project site and boundary selection for each element of the proposed development infrastructure. The offshore wind development areas in the sea around Northern Ireland are already very constrained and North Channel Wind has undertaken exhaustive work to determine the optimum area for development of financeable floating offshore wind projects. Potential grid availability and offshore wind resource were identified in the region and the project was tasked with assessing all considerations and outlining the project in order to optimise project deliverability.

Appropriate aspects relating to each element of infrastructure required for the projects were assessed across a range of studies and reports commissioned on behalf of the projects. These studies covered the initial identification of the array areas (including consideration of alternative sites), assessment of the offshore sections of the export cable routes, and options for export cable landfall sites. Initial studies that were undertaken as part of the first phase of this project include:

1. Offshore Array Area:
   - Site identification and boundary work
   - Initial wind-farm layout option study
   - Shipping and Navigation assessment
   - Review of current and historical fishing activity in site area
2. Offshore Export Cable Routing
3. Landfall Site Selection
4. Grid Connection & Onshore Cable Routing:
   - Review of existing and future grid connection and capacity options
   - Identification and investigation of potential onshore cable routing options

1.4 OTHER ASSOCIATED DEVELOPMENTS

An operation and maintenance (O&M) base will be required to service the Offshore North Channel Wind farms throughout the operational phase of the projects. This facility will be situated at a suitable location in the vicinity of the project (generally at a port facility) and will comprise an O&M building and associated storage facilities as well as a number of berths for the vessels required to access the wind farms. This facility may also allow for tow to shore maintenance operations. A number of facilities are currently being assessed in terms of their suitability for this facility.

Port infrastructure will be required for construction, assembly and integration of the floating units, along with associated wet storage (sheltered anchorage for integrated units), prior to final deployment. Each of these project activities may be undertaken at one or more port facilities, depending on available port capacity and capability. This port infrastructure may include elements of the O&M Building.

There may be a requirement for onshore grid upgrade works to connect the project to the Northern Ireland Electricity Transmission Network. Existing substations may require new bays, existing transmission lines may require uprating or upvolting and there may be a need for new transmission circuits.

1.5 OFFSHORE SCOPING REPORT

North Channel Wind intends to submit a development consent application for the offshore (seaward of Mean High Water Spring tide mark (MHWS) and onshore (landward of Mean Low Water Spring tide mark (MLWS)) infrastructure required for the Project.

This report is an Environmental Impact Assessment (EIA) Offshore Scoping Report for the NCW 1 and NCW 2 Projects. The proposed NCW 1 and NCW 2 Projects each require development consent both in the offshore and nearshore marine waters of Northern Ireland in the form of a marine licence, and also planning permission for land-based or terrestrial infrastructure required to transport the generated electricity to the high voltage electrical transmission network in Northern Ireland.

This Offshore Scoping Report considers all of the offshore infrastructure of the Project, seaward of MHWS. An Onshore Scoping Report shall be prepared for all onshore infrastructure of the Project landward of MLWS when the necessary land required to construct and operate the onshore infrastructure can be identified.

Potential environmental effects of the construction, operation and maintenance and decommissioning of onshore infrastructure are not discussed further in this Offshore Scoping Report. Only the offshore components of the NCW 1 and NCW2 Projects are hereafter referred to as the Proposed Development.

It is understood that the Proposed Development requires the following consents, licences and permissions:

- Article 39 consent under the Electricity Order 1992;
- Marine Construction Licence under Part 4 of the Marine and Coastal Access Act (MCAA) 2009;
- Planning Permission under the Planning Act (Northern Ireland) 2011 for all Project infrastructure located landward of MLWS.

Any consents or licences required for site investigation surveys which are to be undertaken during the pre-application design development phase of the Projects will be sought separately as and if required and have therefore not been considered further within this Offshore Scoping Report.

The Proposed Development is EIA development, and an Environmental Statement (ES) is required to be prepared and submitted to support the relevant applications for development consent (see section 1.5). EIA is required to fulfil the requirements of the following regulations:

- ***in respect of a marine licence application:*** The Marine Works (Environmental Impact Assessment) Regulations (Northern Ireland) 2007 as amended; and
- ***in respect of a planning application:*** The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.

These regulations are referred to as the EIA Regulations.

In support of the necessary marine consents, licenses and permissions for the Proposed Development (i.e. all works seaward of MWHS), the Offshore ES will detail, and will be informed by, stakeholder consultation on this Offshore Scoping Report. Details of the proposed approach to Stakeholder Consultation is outlined in section 4.3. The project timeline currently anticipates that development consent applications, supported by an ES, will be submitted to Department of Agriculture, Environment and Rural Affairs (DAERA) Marine Strategy & Licensing Branch and the relevant planning authority in 2025

North Channel Wind is seeking a 35-year operational period for the projects. If, in the future, the applicant sought to repower the wind farm then they would only be able to do so through subsequent consents, licences and permissions allowing the construction, operation and maintenance and decommissioning of any proposed future infrastructure.

1.6 ABOUT THIS REPORT

1.6.1 PURPOSE

This Offshore Scoping Report has been prepared in order to support a request for formal Scoping Opinions in relation to the proposed NCW 1 Project and NCW 2 Project from DAERA Marine Strategy & Licensing Branch.

It is anticipated that the Scoping Opinions will be based on responses to this Offshore Scoping Report from key statutory and non-statutory consultees, which will help guide North Channel Wind in progressing an Offshore ES for each project.

The purpose of this Offshore Scoping Report is to provide stakeholders with information on the proposed NCW 1 and NCW 2 Projects and allow for engagement with stakeholders on the key topics to be addressed in the Offshore ES for each project, as well as the baseline data sources and assessment methodologies to be used to inform the Offshore ES for each project. Table 1.1 summarises the information requirements set out in the EIA Regulations and where these can be found in this Offshore Scoping Report.

Table 1.1: Scoping Requirements of the EIA Regulations and Where the Information is Included in the Offshore Scoping Report.

EIA Regulation Topic Requirement	Summary content
A plan sufficient to identify the land	Chapter 2 includes a plan.
A brief description of the nature and purpose of the Proposed Development and of its likely significant effects on the environment	Chapter 2 includes a description of the nature and purpose of the Proposed Development, and chapters 5 to 7 include a description of the possible effects on the environment from the Proposed Development.
Information on the Proposed Development and the associated environmental impacts in order to sufficiently define the potential effects and therefore extent of the EIA	Chapters 5 to 7 and include a description of the potential effects on the environment and therefore the extent of the EIA.

Within this Offshore Scoping Report, a number of potential environmental impacts are considered. These include impacts which are proposed to be scoped into EIA due to likely significant effects in EIA terms and identified effect-receptor pathways, and also impacts proposed to be scoped out of EIA due to no likely significant effects in EIA terms or no effect-receptor pathways identified.

Consultation with stakeholders will be conducted to determine the impacts to be scoped in and scoped out of the ES.

North Channel Wind welcomes the opportunity for engagement with stakeholders and feedback on the Proposed Development and the scope (proposed content) of the Environmental Statement (ES) for each project.

1.6.2 APPROACH

This section sets out the approach to scoping that has been taken in the preparation of this Offshore Scoping Report with the aim of achieving the following objectives:

- providing a high-level overview of the baseline environment and the data collection and survey methodologies that will be implemented to inform the EIA baseline characterisation for each technical assessment;
- proposing impacts to be scoped out of the Proposed Development EIA if applicable and where there is clear justification for doing so; and
- proposing impacts to scope into the Proposed Development EIA, draw upon the existing evidence base where appropriate.

This approach will allow the ES to focus on those potential impacts which either have the potential to lead to a significant environmental effect in an EIA sense, or where significant uncertainty exists on potential effects, thereby supporting the development of a proportionate ES.

Each of the topic specific sections of this Offshore Scoping Report provides:

- an overview of the survey area and baseline characterisation;
- identifies potential impacts to be scoped in and scoped out the Proposed Development EIA;

- a list of identified designed in measures;
- an overview of the proposed approach to the EIA;
- identifies potential cumulative and in combination effects;

Further information on the approach to the Offshore Scoping Report is set out in Chapter 3.

1.6.3 STRUCTURE

This Offshore Scoping Report relate to those impacts and receptors associated with the offshore environment, including potential impacts of offshore infrastructure on offshore receptors (and onshore receptors where relevant). It is currently anticipated that a separate Onshore Scoping report relating to impacts of onshore infrastructure on onshore receptors (and offshore receptors where relevant) and the subsequent ES for both offshore and onshore will be submitted in support of the proposed development consent application. The Offshore Scoping Report relates to those impacts from infrastructure seawards of MHWS.

In due course, the Onshore Scoping Report will identify potential impacts from infrastructure landwards of MLWS and therefore there is an overlap in assessment within the intertidal area (between MHWS and MLWS). Where there is an overlap in jurisdiction in the intertidal area between MHWS and MLWS of the offshore and onshore consenting and regulatory regimes, both the Offshore ES and the Onshore ES for each project will identify and describe those applicable significant environmental effects.

Within this Offshore Scoping Report, 'offshore' generally refers to the receptors on the seaward side of MHWS and 'onshore' refers to the receptors on the landward side of MHWS.

The structure of the Offshore Scoping Report is set out in Table 1.2 below. For the technical assessment in Chapters 5 - 17, baseline, potential effects and scope of EIA is set out firstly for NCW 1 Project, and then NCW 2 Project for each environmental topic in turn before moving to the next topic. The data sources are common to NCW 1 and 2 and therefore are listed at the start of each chapter 5 – 17.

It is intended that the Offshore ES for each project will in due course follow the same general layout as presented in Table 1.2.

Table 1.2: Topics within the Offshore Scoping Report

Topic	Summary of content	Section	Author
Introductory Chapters			
Introduction	Background to and overview of the Proposed Development and site selection and outlines the purpose and approach of the Offshore Scoping Report.	Chapter 1	RPS
Proposed Development Description	Description of the design for the Proposed Development, based on preliminary conceptual design information and current understanding of the baseline environment from initial site investigation studies.	Chapter 2	NCW and RPS
EIA Process and Approach to Scoping	Description of the proposed principles of the EIA process and the approach that will be applied in the ES to identify and evaluate the likely impacts and, subsequently, evaluate the significance of effects, associated with the Proposed Development.	Chapter 3	RPS
Stakeholder Engagement and Consultation	Overview of stakeholder engagement and consultation undertaken to date, and proposed approach to stakeholder engagement and consultation going forward.	Chapter 4	NCW
Offshore Physical Environment			
Marine Processes	Overview of the offshore physical environment (tidal elevations, current, waves, bathymetry, geology and seabed sediments, suspended sediments and sediment transport) within the Proposed Development. Required for understanding of potential impacts to the offshore	Chapter 5	RPS

Topic	Summary of content	Section	Author
	physical environment from construction, operation and maintenance and decommissioning.		
Subsea Noise	Overview of ambient subsea noise within the Proposed Development. Required for understanding of potential impact to subsea noise sensitive receptors such as marine mammals and fish from construction, operation and maintenance and decommissioning.	Chapter 6	RPS
Offshore Biological Environment			
Benthic Ecology	Overview of the ecology of the seabed within the Proposed Development. Required for understanding of potential impacts to seabed ecology from construction, operation and maintenance and decommissioning.	Chapter 7	RPS
Fish and Shellfish Ecology	Overview of the fish and shellfish ecology of the seabed within the Proposed Development. Required for understanding of potential impact to fish and shellfish ecology from construction, operation and maintenance and decommissioning.	Chapter 8	RPS
Marine Mammals	Overview of the marine mammals within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine mammals from construction, operation and maintenance and decommissioning.	Chapter 9	RPS
Offshore and Intertidal Ornithology	Overview of the ornithology features within the vicinity of the Proposed Development. Required for understanding of potential impacts to ornithology from construction, operation and maintenance and decommissioning.	Chapter 10	RPS
Offshore Human and Socio-Economic Environment			
Commercial Fisheries	Overview of commercial fisheries within the vicinity of the Proposed Development. Required for understanding of potential impacts to commercial fisheries from construction, operation and maintenance and decommissioning.	Chapter 11	RPS
Shipping and Navigation	Overview of the baseline shipping and navigation within the vicinity of the Proposed Development. Required for understanding of potential impacts to shipping and navigation from construction, operation and maintenance and decommissioning.	Chapter 12	Nash Maritime
Aviation, Military and Communications	Overview of aviation, military and communications within the vicinity of the Proposed Development. Required for understanding of potential impacts to aviation, military and communications from construction, operation and maintenance and decommissioning.	Chapter 13	RPS
Marine Archaeology	Overview of marine archaeology within the vicinity of the Proposed Development. Required for understanding of potential impacts to marine archaeology from construction, operation and maintenance and decommissioning.	Chapter 14	ADCO
Seascape, Landscape and Visual Resources	Overview of the seascape and visual resources within the vicinity of the Proposed Development. Required for understanding of potential impacts to seascape and visual resources from construction, operation and maintenance and decommissioning.	Chapter 15	RPS
Infrastructure and Other Users	Overview of infrastructure and other users within the vicinity of the Proposed Development. Required for understanding of potential impacts to infrastructure and	Chapter 16	RPS

Topic	Summary of content	Section	Author
	other users from construction, operation and maintenance and decommissioning.		
Population and Human Health	Overview of the population within the vicinity of the Proposed Development. Required for understanding of potential impacts to Human Health from construction, operation and maintenance, and decommissioning.	Chapter 17	RPS
References	Includes a list of all references included in the Offshore Scoping Report.	Chapter 18	RPS

1.7 THE APPLICANT AND THE PROJECT TEAM

1.7.1 THE APPLICANT

SBM Offshore is the owner of North Channel Wind Limited and recognised as a leading global contractor. It designs, builds, installs and operates offshore floating facilities for the offshore energy industry. As a leading technology provider, SBM Offshore put marine expertise at the service of a responsible energy transition by reducing emissions from fossil fuel production, while developing cleaner solutions for renewable energy sources. SBM has identified Northern Ireland as a key target market for the development of Floating Offshore Wind ('FOW') Projects.

SBM Offshore has partnered with Irish based developer NMK Renewables to carry out the front-end development work for North Channel Wind. NMK is a niche project development company focused on delivering floating offshore wind projects in the UK & Ireland.

SBM Offshore believe the oceans will provide the world with safe, sustainable and affordable energy for generations to come. Offshore renewable energy projects require strong offshore experience. SBM Offshore, as market leader in floating offshore solutions, is the natural choice of contractor to deliver proven expertise and a full range of engineering, procurement, construction and installation (EPCI) products to accompany the growth of the energies of the future.

SBM Offshore focus on developing innovative solutions backed up by the reliability that only an experienced player in the offshore energy market with unrivalled expertise in developing, installing and operating floating solutions can provide.

1.7.2 THE PROJECT EIA TEAM

RPS has been instructed by North Channel Wind to lead the offshore EIA Scoping phase for the Proposed Development. This includes a review of the key environmental issues associated with the construction, operation and maintenance, and decommissioning of the Projects as part of the Offshore Scoping Report.

RPS[3] is an established, leading provider of professional services to the offshore wind industry since its inception in Europe in the early 2000s.

1.8 POLICY AND LEGISLATION

The current overarching marine policy is the draft Marine Plan for Northern Ireland, published in 2018. This Marine Plan is underpinned by the Marine Act (Northern Ireland) 2013 and the Marine and Coastal Access Act (MCAA) 2009. This legislation requires DAERA as the Marine Plan Authority, to prepare marine plans. The draft Marine Plan for Northern Ireland has been developed within the framework of the UK Marine Policy Statement (2011). This will facilitate the sustainable development of the marine area. The draft MPNI will inform and guide the regulation, management, use and protection of the marine area. The Marine Plan will primarily be used by public authorities taking decisions which affect or might affect the marine area. It will also be used by anyone who has an interest in the marine area, including those bringing forward proposals and stakeholders who wish to comment on such proposals.

[3] https://www.rpsgroup.com/sectors/energy-consultants/renewable-energy/renewable-energy-markets/offshore-wind/

Key legislation and policy in relation to offshore renewable energy development in Northern Ireland waters is set out below.

Marine & Planning Legislation

- Marine Act (Northern Ireland) 2013
- Planning Act (Northern Ireland) 2011;
- Marine and Coastal Access Act (MCAA) 2009;
- Climate Change Act 2008;

Planning Policy

- UK Marine Policy Statement (2011)
- Draft Marine Plan for Northern Ireland (2018)
- DETI Strategic Energy Framework (2010)
- DETI Offshore Renewable Energy Strategic Action Plan 2012-2020 (2012)
- DfE Energy Strategy – Path to Net Zero Energy (2021);
- DfE Energy Strategy Action Plan 2022 & 2023
- Regional Development Strategy 2035 (RDS) (2012);
- The Strategic Planning Policy Statement (SPPS) (2015);
- Carrickfergus Area Plan 2001;
- Draft Belfast Metropolitan Area Plan 2015 (2014 version); and
- Mid and East Antrim Draft Plan Strategy.

1.9 IS THE PROJECT AN EIA DEVELOPMENT?

When applying for a marine licence or planning permission, an ES is required to be prepared and submitted to support these applications if they are likely to have a significant effect on the environment due to factors such as their size or location. An EIA is specifically required (Schedule 2) for installations for the harnessing of wind power for energy production (wind farms) if:

- the development involves the installation of more than two wind turbines; or
- the hub height of any wind turbine or height of any other structure exceeds 15 m.

The Proposed Development will consist of more than two wind turbines, with a hub height over 15 m, and therefore requires an EIA to be undertaken.

The EIA must fulfil the requirements of the following regulations:

- in respect to a marine licence application: The Marine Works (Environmental Impact Assessment) Regulations (Northern Ireland) 2007 as amended; and
- in respect to a planning application: The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.

1.10 THE HABITATS AND BIRDS DIRECTIVES AND ASSOCIATED REGULATIONS

Council Directive 92/43/EEC (the Habitats Directive) was adopted in 1992, providing a means for the EU to meet its obligations under the Bern Convention. The aim of the Directive is to maintain or restore natural habitats and wild species listed on the Annexes at a favourable conservation status. This protection is granted through the designation of European Sites and European Protected Species (EPS). The European Directive (2009/147/EC) on the conservation of wild birds (The Birds Directive) provides a framework for the conservation and management of wild birds within Europe. The Directive affords rare and vulnerable species listed under Annex I of the Directive, and regularly occurring migratory species, protection through the identification and designation of Special Protection Areas (SPAs).

The Directives have been transposed into Northern Irish Law by various regulations, those of relevance to the Project include:

- the Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended); and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended).

These are hereafter referred to as the Habitats Regulations. These regulations transpose *inter alia* Articles 6(3) and 6(4) of Council Directive 92/43/EEC and remain relevant following the UK's departure from the EU, taking into account the effect of the Conservation (Natural Habitats, etc.) Regulations (Amendment) (Northern Ireland) (EU Exit) Regulations 2019.

1.11 BENEFITS OF THE NORTH CHANNEL WIND PROJECT

A 2022 report by BVG Associates examined the potential benefits to Northern Ireland of installing 1.5 GW of offshore wind by 2032. It concluded that offshore wind can help Northern Ireland achieve its decarbonisation goals while realising economic benefits through the involvement of its supply chain. The emergence of floating offshore wind technology provides a unique opportunity for NI businesses. (Ref Renewable NI The clean revolution The-Clean-Revolution-–-Building-Northern-Irelands-Offshore-Wind-Industry.pdf (renewableni.com). As set out in Chapter 17 a detailed socio-economic impact assessment will form part of the ES.

2. PROPOSED DEVELOPMENT

2.1 INTRODUCTION

This section of the Offshore Scoping Report provides an outline description of the Proposed Development and describes activities associated with the construction, operation and maintenance, and decommissioning of the offshore element of the Proposed Development. It summarises the design and components for the Proposed Development infrastructure, and current understanding of the baseline environment.

As detailed in 1.3, North Channel Wind intends to submit combined development consent applications for the offshore (seaward of Mean High Water Spring tide mark (MHWS)) and onshore (landward of Mean Low Water Spring tide mark (MLWS)) infrastructure required for the Projects.

This Offshore Scoping Report considers all of the offshore infrastructure of the Projects, seaward of MHWS. An Onshore planning application shall be prepared for all onshore infrastructure of the Project, landward of MLWS when the necessary land required to construct and operate the onshore infrastructure can be identified.

Potential environmental effects of the construction, operation and maintenance and decommissioning of onshore infrastructure are not discussed further in this Offshore Scoping Report

2.2 DESIGN ENVELOPE APPROACH

A Project Design Envelope (PDE) approach is being adopted for the NCW 1 and NCW 2 Projects. The PDE concept is routinely utilised in applications for development consent for both onshore and offshore wind farms to allow for some flexibility in design options, particularly offshore, and more particularly for foundations and turbine types, where the full details of a project are not known by the offshore renewable supply chain at the point of submission of an application for development consent. The PDE does however provide sufficient detail to enable all likely significant environmental effects to be identified, considered and mitigated as part of the Environmental Impact Assessment.

This approach is referred to in European Commission Notice C(2020) 7730 'Guidance document on wind energy developments and EU nature legislation' (EC, 2020), the Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (MS, 2018) and the Department of Communications, Climate Action and Environment Guidance on EIS and NIS Preparation for Offshore Renewable Energy Projects (DCCAE, 2017).

2.3 PROPOSED DEVELOPMENT SUMMARY

2.3.1 PROJECT DEVELOPER

North Channel Wind Ltd is the developer of the proposed NCW 1 and NCW 2 Projects in the North Irish Sea.

2.3.2 PROPOSED DEVELOPMENT BOUNDARIES

This Proposed Development Description refers to NCW 1 and NCW 2 projects. The proposed projects are located off the east coast of Co. Antrim in an area of approximately 176 km^2 and 38.3 km^2 for NCW 1 and NCW 2 respectively. Figure 2.1 shows the NCW 1 offshore array area. Figure 2.2 shows the NCW 2 offshore array area. The offshore array area is the area in which the offshore infrastructure (WTGs, offshore substation etc.) will be located. Also shown are the export cable corridor areas of search, but they are subject to refinement and finalisation once landfall and onshore connection points have been identified. The coordinates for the offshore array area site boundaries are outlined in Table 2.1.

Table 2.1: Coordinates of North Channel Wind 1 and North Channel Wind 2 Offshore Array Areas

NCW 1 Array Area	Easting (m)	Northing (m)
A	316 340	6 109 773
B	319 307	6 111 470
C	323 244	6 110 818
D	325 119	6 107 962
E	339 125	6 094 952
F	331 260	6 092 097
G	326 753	6 100 300
H	322 995	6 099 205

NCW 2 Array Area	Easting (m)	Northing (m)
A	343 210	6 073 528
B	349 690	6 073 282
C	352 482	6 069 011
D	350 132	6 066 917
E	347 067	6 067 046

Coordinate system: EPSG 32630 (WGS84 UTM 30N)

The final offshore array area boundaries and coordinates will be determined following award of lease from The Crown Estate (TCE).

The final offshore array area site boundaries are therefore anticipated to be contained entirely within the site boundaries presented in Figure 2.1 and Figure 2.2.

2.3.3 WATER DEPTHS AND SEABED WITHIN THE OFFSHORE ARRAY AREA

The water depths throughout the array areas re between -79 m and -167 m relative to LAT, as illustrated in Figure 2.3 below.

No particular constraint is anticipated with regards to the feasibility of this depth range for accommodating floating wind turbine platforms, and the relatively narrow depth range of the majority of the array areas is advantageous, as it allows for increased homogeneity between substructure designs.

A desk-based analysis of seabed data available through the British Geological Survey (BGS) observed that a wide range of soil types are present throughout the site. Generally, the soils appear to be granular in nature, predominantly from sand to gravelly sand to sandy gravel. In some places notable fine content has been observed. Rock and coarse-grained substrate (cobbles, boulders) may also be present in some areas. Detailed geophysical and geotechnical surveys will fully establish seabed conditions and guide design of offshore infrastructure.

Figure 2.1:North Channel Wind 1 Offshore Array Area

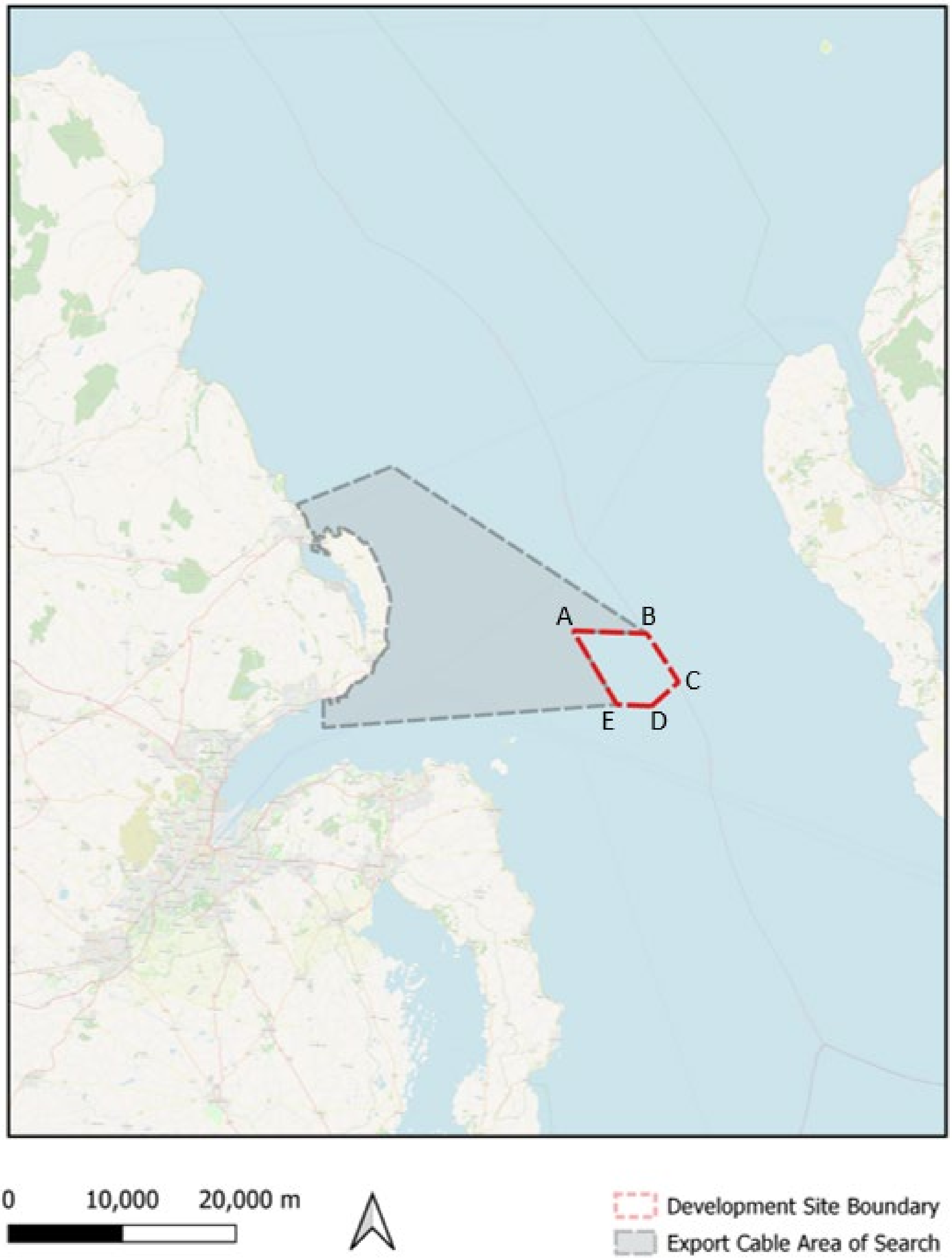

Figure 2.2: North Channel Wind 2 Offshore Array Area

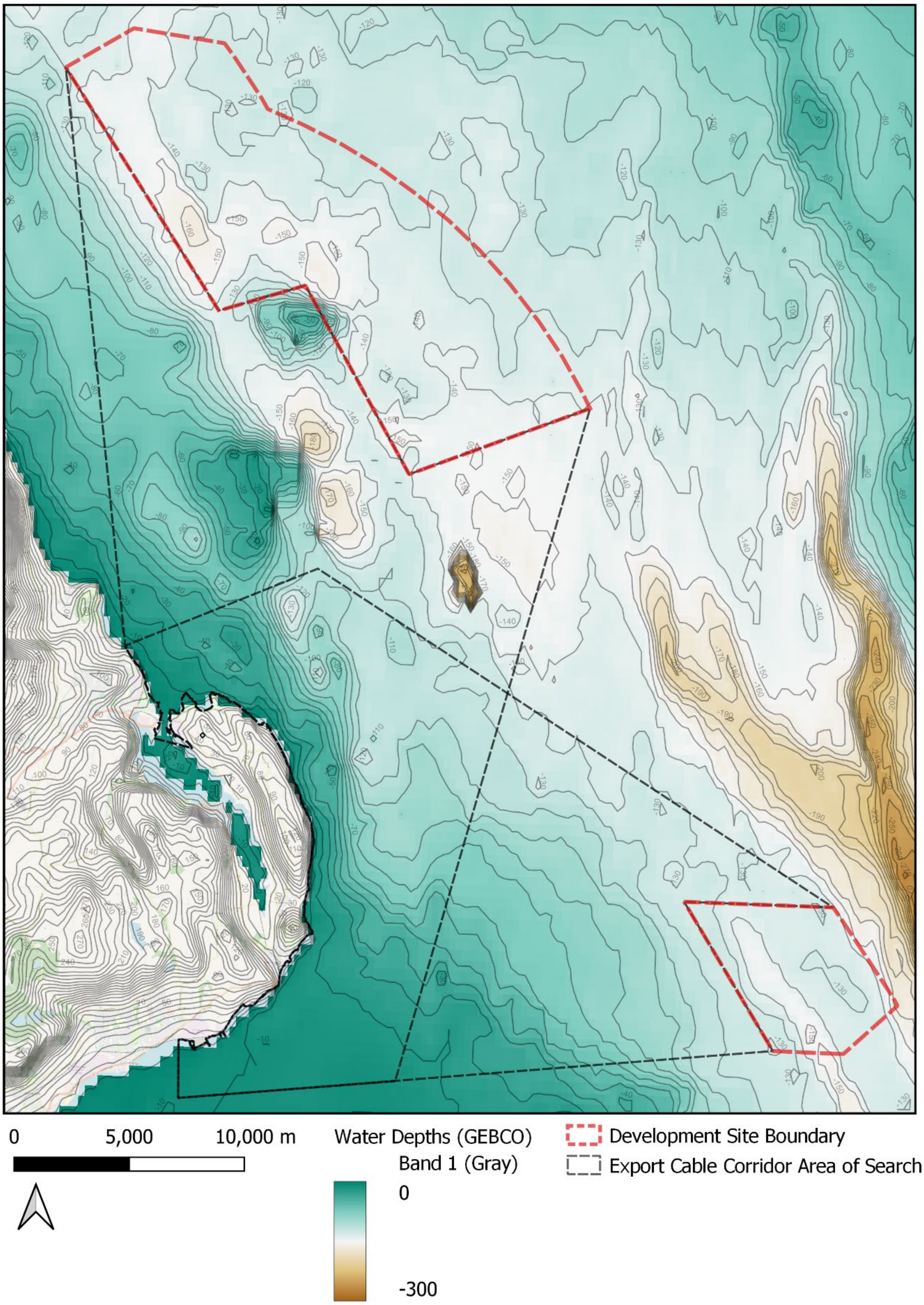

Figure 2.3: North Channel Wind 1 and 2 Water Depths (GEBCO)

2.4 OFFSHORE PROPOSED DEVELOPMENT INFRASTRUCTURE OVERVIEW

It is anticipated that the project would be operational for a period of 35 years from final commissioning, followed by a decommissioning process.

The key offshore project infrastructure of will be:

- Wind Turbine Generators (WTGs) of total combined capacity of up to 1,020 MW for NCW 1 and 420 MW for NCW 2;
- Floating Platforms;
- Mooring Infrastructure;
- Inter-array cables;
- Offshore substation(s);
- Offshore export cables to landfall;
- Scour and cable protection;
- Other associated infrastructure such as meteorological and navigational buoys.

The main project components are illustrated in figure 2.4

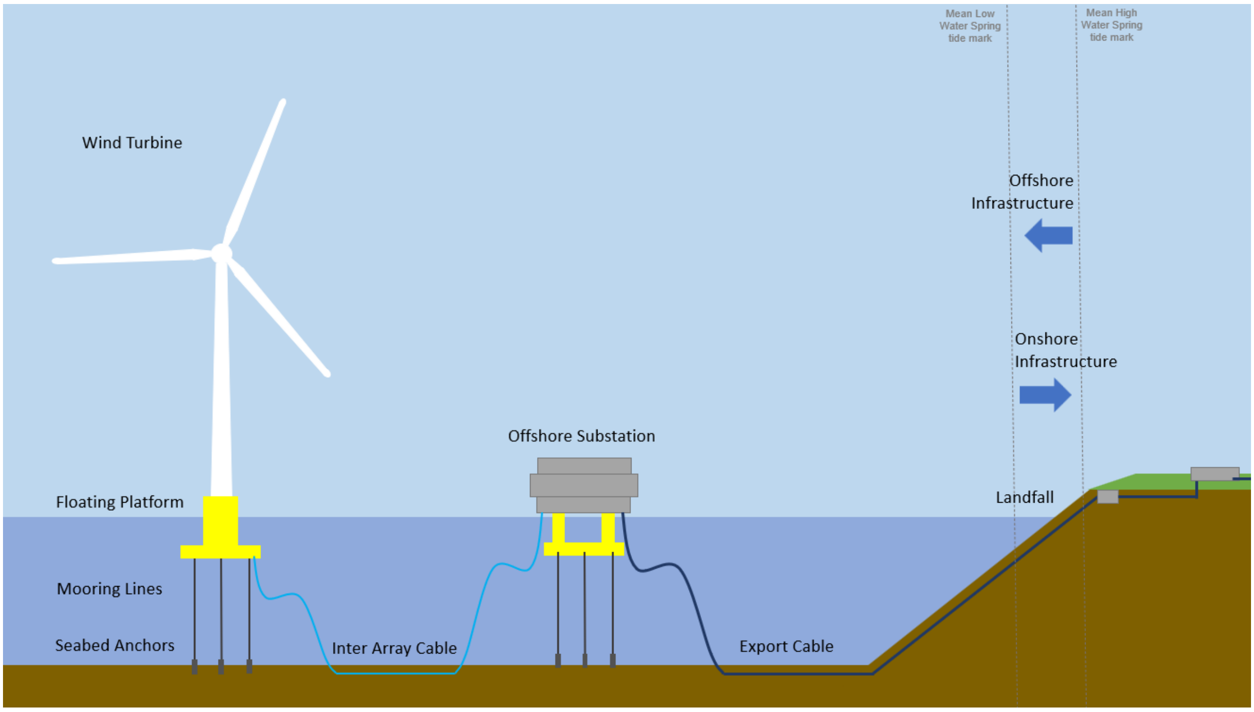

Figure 2.4: Illustration of principal project components

2.4.1 WIND TURBINE GENERATORS

The WTGs will comprise of a tower, nacelle, and rotor with up to three blades in a horizontal axis configuration, as illustrated in Fig 2.5. The water depths at the site are unsuitable for turbine foundations fixed directly to the seabed, therefore the turbines will be attached to a floating foundation held in position with mooring lines and seabed anchors. A transition piece may be used, which acts as an interface between the turbine and the foundation.

The final dimensions and rated power of the turbines to be used are currently unknown. The average size of offshore wind turbines has steadily increased in the past number of years as projects capitalise on stronger economies of scale with larger turbine sizes. At present there are several pre-commercial turbine models with maximum power ratings of up to 16 MW and maximum rotor diameters of up to 242 m. Several models of this size range from leading original equipment manufacturer (OEMs) are anticipated to have type certification in 2024. The earliest construction date for North Channel Wind is anticipated to be 2027/2028, at which point it is possible that a larger generation of turbines will be available.

For this reason, the PDE will allow for turbine size increases, and it is anticipated that the final selection of turbines are likely have a rated capacity of between 15MW to 22MW, with rotor diameters of between 240 and 290m respectively.

For NCW 1, a total project capacity in the range of 1,020MW will require 68 x 15MW turbines, or 46 x 22MW turbines. For NCW 2, a total project capacity in the range of 420MW will require 28 x 15MW turbines, or 19 x 22MW turbines. The maximum physical characteristics WTGs are given in Table 2.2 below.

Table 2.2: Indicative Maximum Parameters of Wind Turbine Generator

Feature	Indicative Parameter
Capacity	Up to 22MW
Tower Type	Steel Tube
Maximum Rotor Diameter (m)	290
Maximum Swept Area (m^2)	66,052
Maximum Tip Height Above Sea Level (m)	325
Minimum Blade clearance Above Sea Level (m)	22

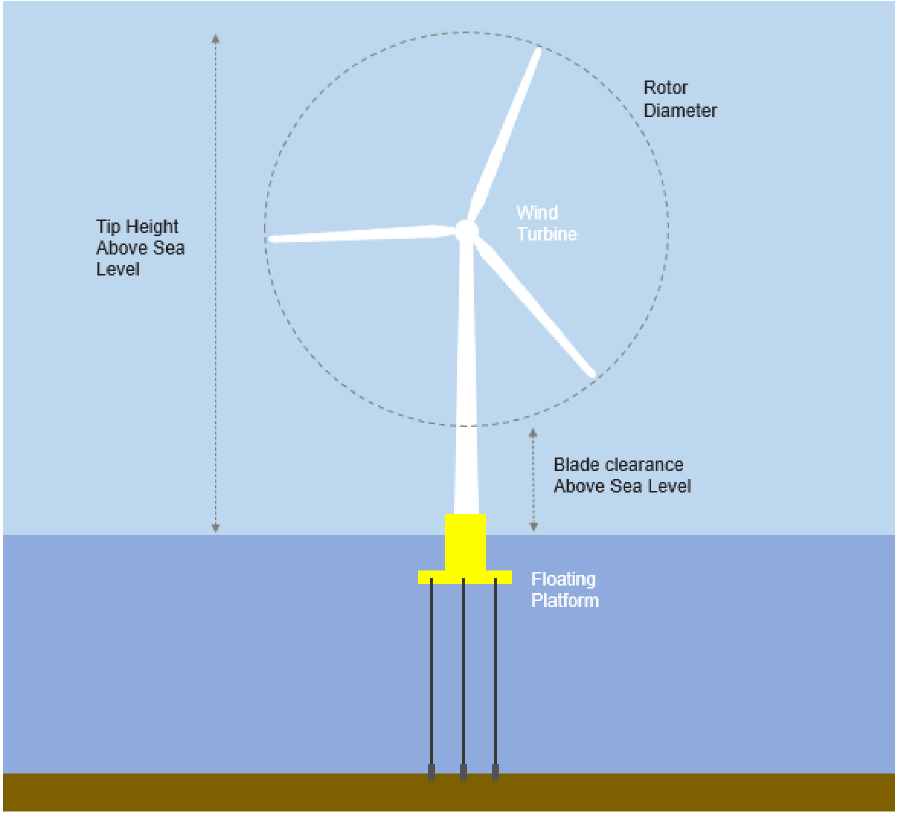

Figure 2.5: Example floating wind turbine

2.4.2 FOUNDATIONS

The WTGs will be supported by floating foundations selected for their suitability to the site conditions. A number of foundation types and associated installation methods will form part of the PDE, to provide flexibility in final design once the sites have been fully characterised.

The foundations will be composed of the following elements:

- A substructure – a floating structure supporting the wind turbine
- A transition piece providing the connection between the substructure and the wind turbine tower
- A mooring system which anchors the structure to the seabed
- Floating foundations are required, as the alternative fixed foundation typology is not suited to the water depths at the sites.

2.4.3 FLOATING PLATFORMS

Floating platforms will support and provide stability to the wind turbine generator. There are several alternative types with the method of stabilisation varying from concept to concept. The final selection of platform will depend on several factors and will be determined through detailed site assessment and engineering design. The proprietary platform designed by SBM Offshore is a tension leg platform, however all foundation types will be considered to ensure that the most economically and technically feasible options is selected for the project.

Floating platforms can be broadly classified as ballast, mooring or buoyancy stabilised. The platform types to be included in the PDE are listed below and illustrated in Figure 2.6.

- Tension-leg platform (TLP), where most of the hull is submerged, and the stability is provided by tension of the mooring lines. Structures are typically smaller and lighter than other concepts, with greater stability.

- Semi-submersible platform, with typically between 3 to 4 vertical columns piercing the free surface with interconnecting members to provide structural integrity. The platform stability is provided principally by a combination of buoyancy and ballast.
- Barge type platforms predominantly achieve stability through buoyancy and the large footprint of the structure. There are several different barge technologies under development including steel and concrete construction, with incorporation of a moonpool.

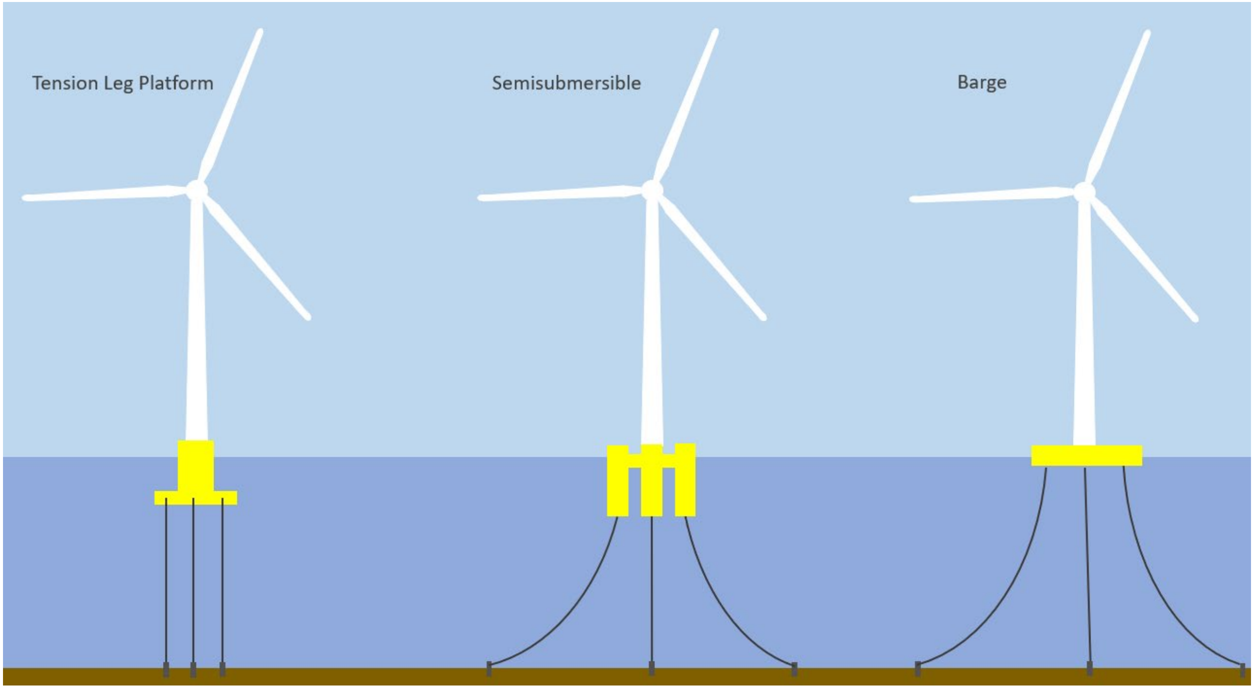

Figure 2.6: Illustration of Floating Platforms

Floating foundations may be built with steel or concrete or a combination of both materials. Steel structures will require corrosion protection. This will be primarily provided through the use of paint and cathodic protection in the form of sacrificial anodes, or potentially, an impressed current system. Biofouling of the structures will occur over time, and the nature of this fouling will be considered in platform design. Floating platforms by their nature are not stationary and will experience rotational motion (pitch, roll, yaw) and linear motion (sway, surge, heave) depending on environmental conditions. The platform and mooring system will be designed to limit these motions to within certain allowable limits. Platform excursion (movement) from its neutral position can be expected to be in the range of 30 metres. Indicative parameters of the floating wind turbine substructure elements are listed in Table 2.3 below.

Table 2.3: Indicative Parameters of Floating Platform Substructures

Feature	Indicative Parameter
Substructure length (metres)	50 - 120
Substructure width (metres)	50 - 120
Operating draft (distance from keel to sea surface)	12 - 40
Platform Excursion Distance (metres)	30
Access	Boat landing & Walk to Work platform

2.4.4 MOORING SYSTEM

Mooring lines (typically between 3 to 6), either in catenary or taut configurations will be used to maintain the position and orientation of the floating structures. Mooring lines are anchored to the seabed and may be connected to the substructure below or above mean sea level. Typical materials used are chain, steel wire or polyester ropes. Combinations of material types for different sections of the line may be used to achieve desired properties. Mooring lines may also include additional clump or buoyancy elements. Other connection equipment and hardware may include triplets, shackles and splices.

- Tensioned Moorings
- Tensioned (or taut) moorings will typically consist of a group of tethers or tendons, each linking to one anchor. Tensioned moorings require a smaller seabed footprint. Tension is maintained through a combination of platform buoyancy and anchor strength. Platform motion is limited when compared to other mooring/platform solutions. Certain anchor types are required to withstand the uplift force. The mooring line can incorporate synthetic fibres or steel wire.
- Catenary Spread Moorings
- This system typically consists of 3-4 line and anchor combinations arranged radially around the platform, of a weight to suit the design load. The weight and curvature of the mooring line is designed to hold the floating platform in place. The lines can be manufactured from chain, steel wire or synthetic rope.
- Additional buoyancy elements can be used to prevent damage to synthetic sections. Concrete or steel clump weights may be used to reduce the size of the mooring lines.

Indicative parameters of the floating wind turbine mooring system are listed in Table 2.4 below.

Table 2.4: Indicative Parameters of Moorings

Feature	Indicative Parameter
Mooring radius (metres)	100 – 1,000
Number of mooring legs per substructure	3 – 6
Rope diameter (millimetres)	80 – 300
Chain diameter (millimetres)	100 – 200

2.4.5 ANCHORS

Mooring lines will be secured to the seabed by anchors. The final anchor solution will depend on several factors, including the seabed condition, required holding capacity and the mooring configuration. The following anchor types are being considered figure 2.7 to 2.9), and may comprise a combination of solutions depending on how conditions vary across the site:

- Driven piles
- Driven piles are typically steel tube or H sections, which are driven mechanically by a hammer or vibrated into the ground. Various types of hammers are available with different impact energy, frequency, noise and vibration profiles.
- Drag anchors

Drag embedment anchors use a drag and penetration arrangement, where the anchor is installed by dragging along the seabed until it reaches the required depth and holding capacity. The anchor is then held in place by soil resistance.

- Gravity anchors

Gravity anchors use a heavy structure to provide a safe capacity force in the vertical or horizontal directions. The design is simple but can incorporate more complex features such as shear keys to reduce sliding risk. Gravity based anchors can be made from steel or reinforced concrete.

- Suction Caissons
- Suction Caissons anchors comprise of a steel cylinder skirt, shaped like an upturned bucket. The weight of the structure allows the anchor to penetrate the seabed, from which a suction vacuum is applied until the bucket is fully submerged. The vacuum is created by pumping out the water from inside the bucket, creating a negative pressure which pulls the anchor to the ground. The size and diameter of the suction bucket varies according to the soil and sediment conditions of the seabed.
- Drilled piles

Drilled piles are typically inserted into an oversized borehole constructed with a rotary drill and then grouted with cement. As an alternative to grouting, the anchor may be held in position by mechanical means. The diameter of any piles used will be dependent on the specific design.

- Micro piles (acting as a group)
- At each anchor location a number of smaller diameter piles are bored or drilled and grouted (or fixed by mechanical means) into the seabed, topped by a template manufactured from steel or concrete, to tie the piles together so they act as a group to carry the mooring line loads.

The selection of the anchor type will depend upon the substructure technology chosen and the nature of the soil as determined during the geophysical and geotechnical campaigns.

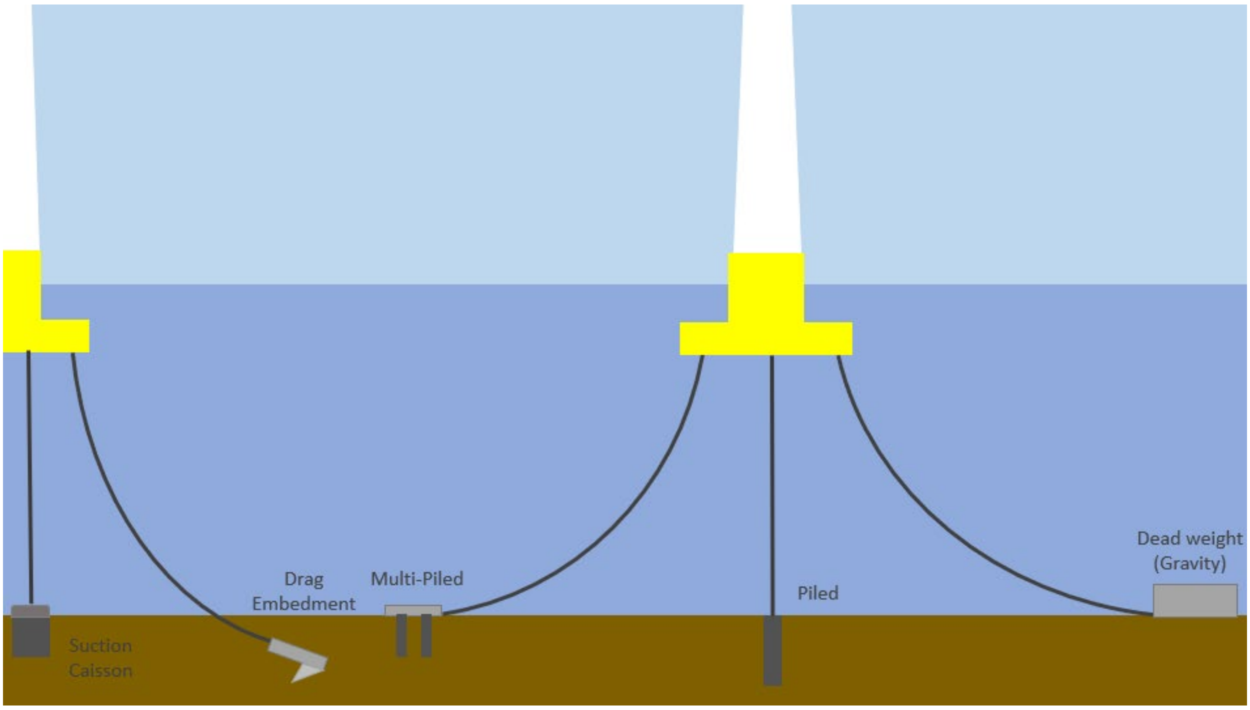

Figure 2.7: Illustration of typical anchor types

Figure 2.8: **Example of suction caissons (Source: Vattenfall)**

Figure 2.9: **Example of pile (Source: Recharge)**

Indicative parameters of the anchors are listed in Table 2.5 below.

Table 2.5: Indicative Parameters of Anchors

Feature	Indicative Parameter
Number of anchors per mooring	1
Maximum footprint per anchor (m^2)	225
Maximum dragged area for drag anchor, per anchor (m^2)	2,250
Depth range of caisson anchors (metres)	10 - 20
Depth range of pile anchors (metres)	Up to 50

2.4.6 INTER-ARRAY CABLES

Inter-array cables will connect groups of wind turbines into arrays or 'strings' and will also connect the wind turbines to the offshore substation(s).

Inter-array cables will be partially suspended from the floating substructure – this suspended section being called \`dynamic\` (refer Figure 2.10). The dynamic section may be arranged in catenary or lazy-wave configuration. In the latter case, buoyancy elements will be attached to the cable. This is to decouple the motion from the static portion of the cable on the seabed. The proposed cables will be 3-core HVAC subsea cable rated at 66 – 132kV. Sub-sea cables will typically consist of copper (or aluminium) conductors, with steel wire armour protection, extruded lead sheath to prevent water intrusion and XLPE insulation. Fibre optic cores will also typically be included for data transmission and monitoring.

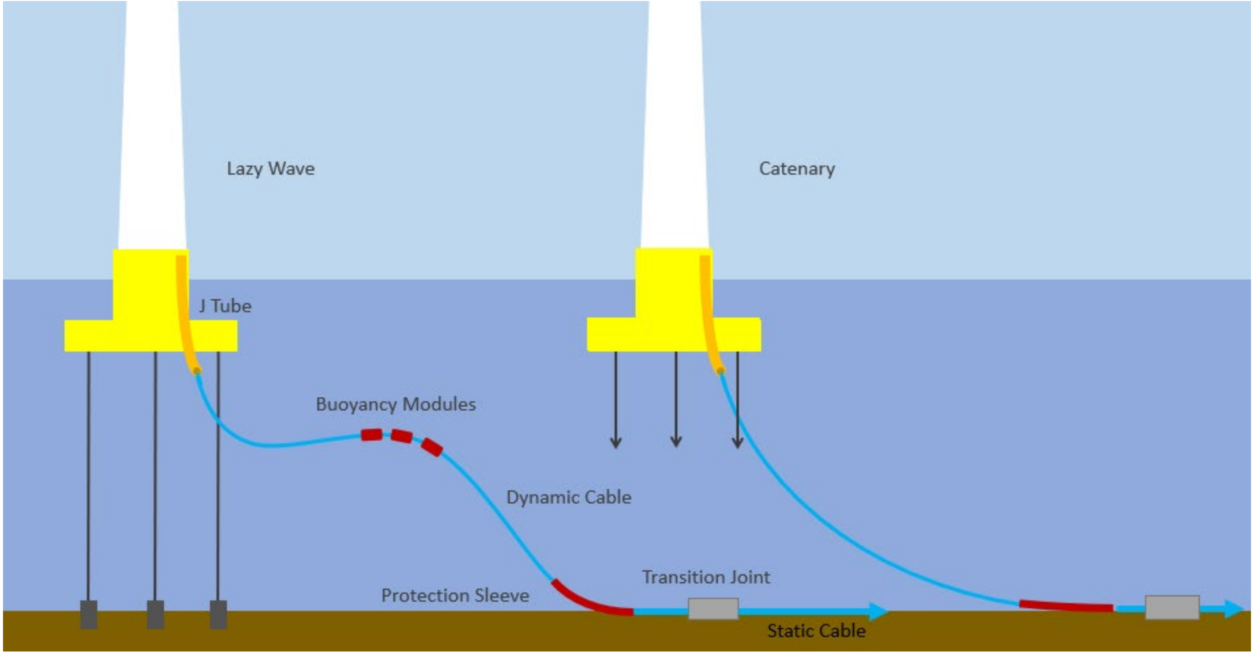

Figure 2.10: Illustration of typical cable configurations

Cables will be connected to the substructure through a I or J tube; entry of the tube will be underwater.

Static sections of the inter-array cables will be buried wherever possible at a typical target depth of 0.5 – 3.0m, as determined by seabed conditions and cable risk assessment study. Ploughing is a typical burial technique, where the cable is simultaneously laid and buried using a plough to lift seabed deposits and place the cable below.

Jetting is an alternative method where remotely operated vehicles create a narrow trench using high pressure water jets to fluidise the seabed, with disturbed material setting back on the laid cable. Modifications to these techniques can be a requirement depending on seabed, which can include mechanical cutting or removal of upper sections of sand waves.

A minimum sediment depth is required for satisfactory burial. If this cannot be achieved, rock placement or other protection measures may be considered depending on outcome of pre installation risk assessment. These techniques can include concrete mattresses, grout bags or articulated ducting.

Indicative parameters of the inter-array cabling are listed in Table 2.6 below.

Table 2.6: Indicative Parameters of Inter-Array Cabling

Feature	Indicative Parameter
Number of turbines per array string	3 – 10
Voltage (kW)	66 - 132
Dynamic configuration	Catenary or Lazy wave
Maximum total inter-array cable length (km)	180

There are several telecommunications cables transecting both NCW 1 and NCW 2 which may have to be crossed by inter-array cables depending on final site layout. Cable operators will be consulted to agree adequate separation and protection details for crossing points to ensure integrity of existing assets and the health and safety of other users of the sea.

Common options for cable crossings include concrete mattresses, rock placement, and high-density polyethylene casing. Crossing angle and electromagnetic field strength will also be carefully considered.

2.4.7 OFFSHORE SUBSTATION

Inter-array cables will likely be rated at 66kV – 132kV. The power may be further converted offshore to a voltage of 220- 400kV for transmission onshore. Either one or two offshore substations will be housed on fixed or floating substructures. In both cases, the substructures will support a topside hosting the electrical transformers, switchgear and ancillary equipment. The substation(s) will be located within the wind farm boundaries. Platforms will be accessible by boat or helicopter, and while typically unmanned, may include emergency offshore accommodation for O&M personnel.

All inter-array cable strings will be routed to the substation(s) through I or J tubes running alongside the substructure.

Export cables will also exit through I or J tubes running alongside the substructure and on to the landfall point and the onshore infrastructure.

Fixed and floating foundation and subsea options are under consideration for the substation.

Fixed substructure

For this option, the substructure will likely be a steel jacket (refer Figure 2.11), with three to four legs, fixed to the seabed through steel piles or suction caissons. The design will be similar to the one used in bottom fixed offshore wind, albeit with increased jacket leg lengths.

Floating substructure

Under this option, the topsides will be supported by a floating structure, which will be either a semi-submersible (refer Figure 2.12), Tension leg platform or barge type structure.

The substructure will be secured to the seabed by a number of mooring lines connected to anchors, with similar characteristics to elements discussed earlier in this section.

If a single offshore substation is constructed the top side may be up to 50m wide and 80m long. In the event that more than one substation is deployed, these will be smaller, in the region of 50m by 50m.

Indicative parameters of the floating substation are listed in Table 2.7 below.

Table 2.7: Indicative Parameters of Offshore Substation

Feature	Indicative Parameter
Substructure type	Fixed Jacket, Floating Semi-submersible, TLP or barge
Number of mooring legs (Floating)	4 to 8
Number of anchor points (Floating)	At most 1 per leg
Number of Legs (Jacket)	6
Maximum Topside dimensions (metres)	80 x 50

Subsea Substation

A subsea substation is a type of electrical substation that is designed to be installed on the seabed (refer Figure 2.13). The substation serves the same function as a more typical offshore platform mounted solution, and will consist of similar main electrical components, e.g. oil-insulated transformers, switchgear, reactive power compensation and protection & control systems. A seabed mounted system is less accessible, and therefore will be designed for high reliability, with fewer components. Subsea substations have the advantage of natural cooling and temperature stability (increasing reliability), and remove requirement for dynamic HV export cables. A more reliable system should reduce the volume of maintenance vessels compared to a offshore platform. Similar subsea technology has been successfully utilised in the Oil and Gas industry for the past number decades.

The subsea substation will be designed to withstand the harsh offshore environment, including the effects of seawater, waves, and currents. It is installed on a foundation that is designed to keep it stable and secure on the seabed. The foundation can be a gravity-based, which uses the weight of the structure to keep it in place, or a piled foundation, consisting of a single, or multiple steel piles driven, or drilled into the seabed.

The weight and dimensions of a subsea substation can vary depending on the specific requirements of the project. As a rough estimate, for a 1,000MW project, a typical substation may be of modular construction and have overall dimensions of around 30 to 40 metres in length, 20 to 30 metres in width and 10 to 15 metres in height. Alternatively, several smaller units of lower capacity could be distributed throughout the site. For example, a single 300MVA module might measure 15m x 10m x 10m, with 3 – 4 total positions within the development area.

Figure 2.11: Example of offshore substation- Topside sitting on a jacket foundation

(Source: Beatrice Offshore Windfarm Limited)

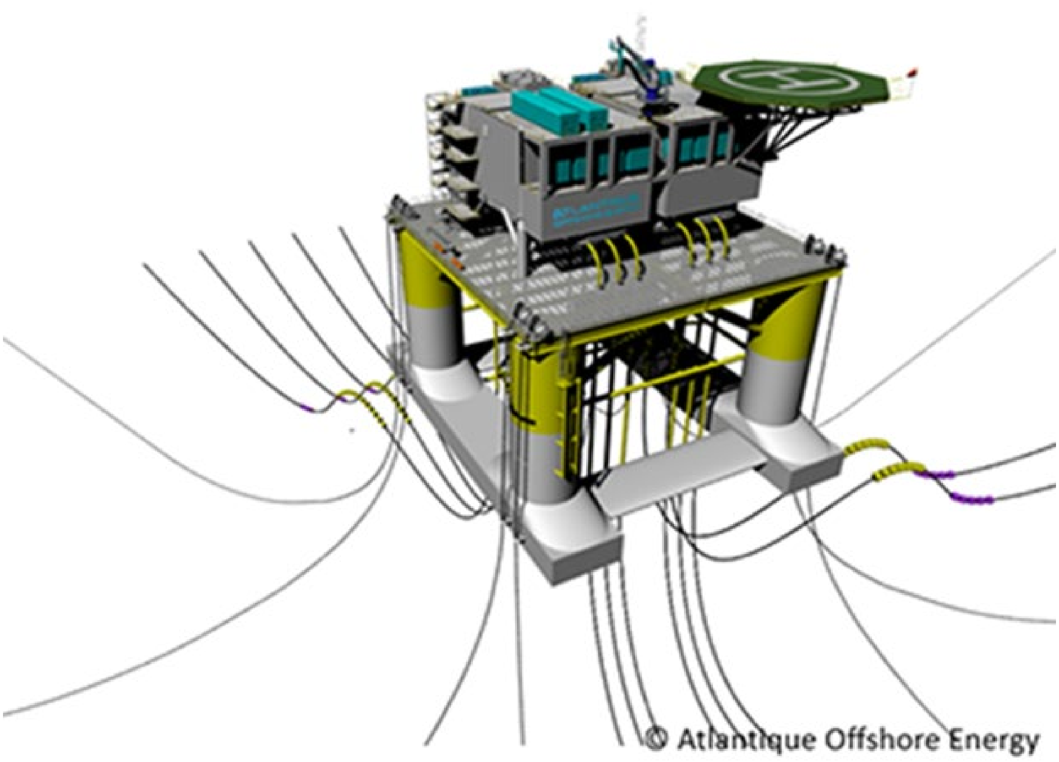

Figure 2.12: Visualisation of a floating semi-submersible offshore substation

(Source: Atlantique Offshore Energy)

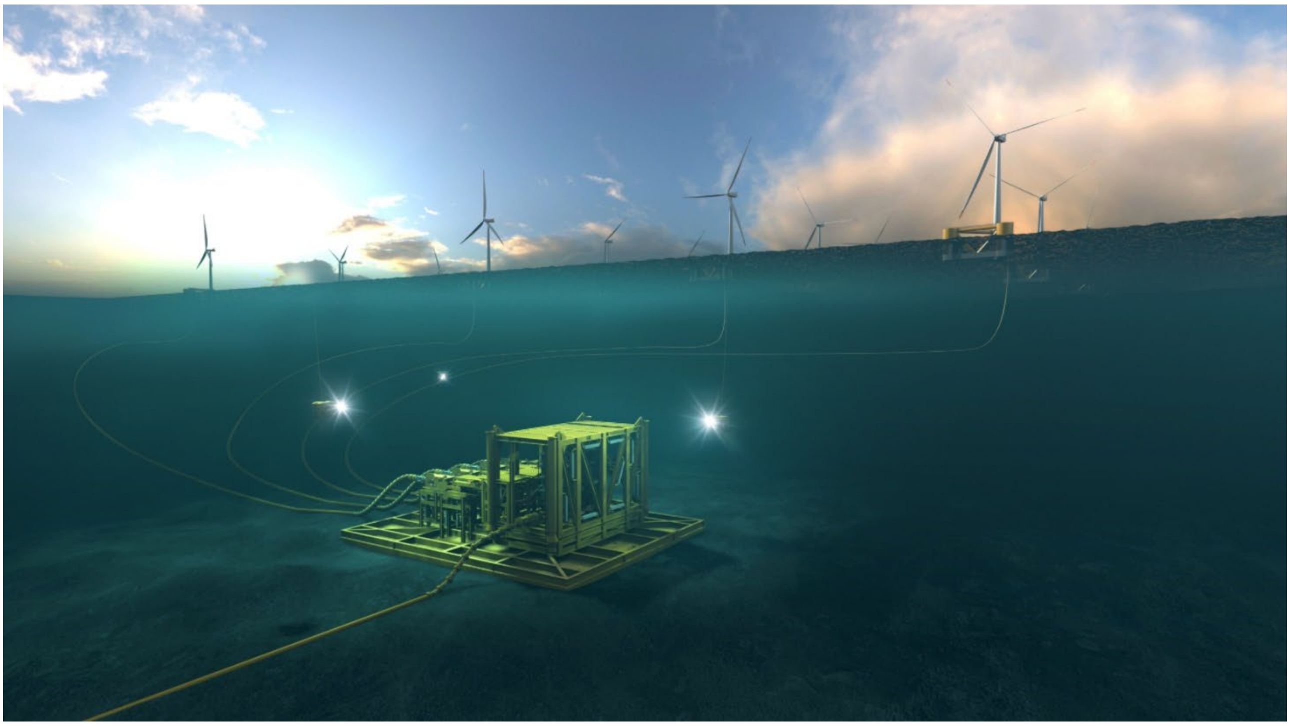

Figure 2.13: Visualisation of a Subsea substation (source Aker Offshore Wind)

2.4.8 EXPORT CABLES

The offshore wind farms will be connected to the selected onshore connection point via export cables laid within the proposed export corridor areas of search as illustrated in Figure 2.14 below.

It is anticipated that approximately two to four 220kV export cables will be required transmit the power from each wind farm to the onshore connection point. Alternatively, the turbine array strings may connect directly to shore at 66 – 132kV kV, though this is dependent on the final capacity and design considerations. The precise cable route will depend on a number of factors which include seabed conditions, landfall locations, other users of the sea or seabed and transmission network connection point.

Cable type, burial and protection techniques are similar to those discussed previously in this section concerning inter-array cables. The length of offshore export cable corridors is expected to be in the range of 15 – 30 kilometres. The precise distance will be determined as part of a cable routeing survey.

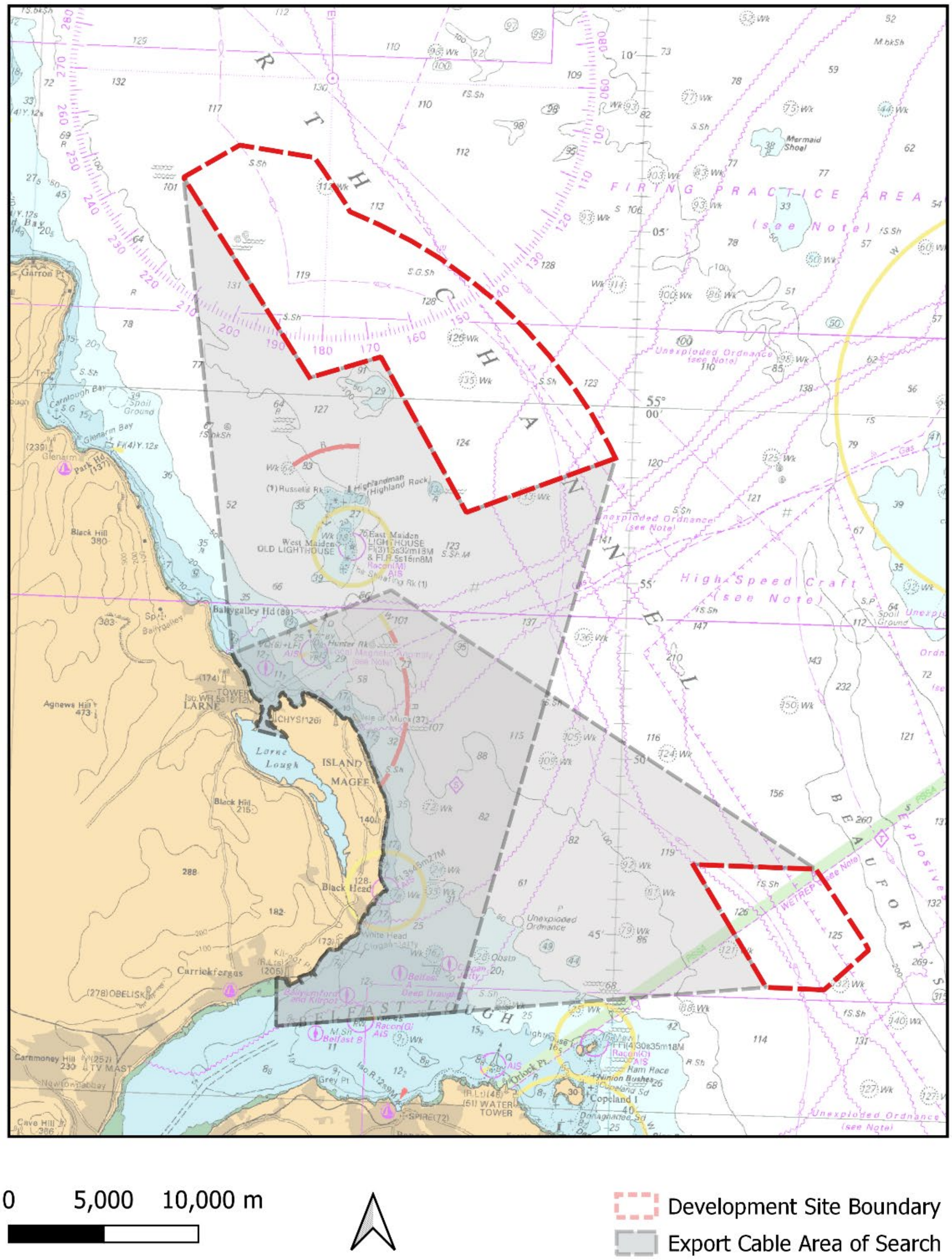

Figure 2.14: North Channel Wind 1 & 2 Export Cable Corridor Regions

The offshore export cables will come on shore at suitable locations (to be finalised) and connect to the onshore cables in an underground transition joint bay above the mean high-water level. Methods for bringing the offshore cable ashore may include horizontal directional drilling, or traditional open cut trenching.

2.4.9 SCOUR AND CABLE PROTECTION

Hydrodynamic scour is the removal of soft sediment from around the base of obstructions due to the flow of water. Scouring can result in depression which can compromise structural integrity of offshore infrastructure and can also increase environmental impacts.

It is assumed that scour protection will be required at all foundation locations. The final specification is dependent on project design and full scour risk assessment. Typical mitigation can include rock placement; frond mats; concrete mattressing; or the use of integrated skirts /aprons.

2.4.10 METEOROLOGICAL STATIONS AND NAVIGATION MARKERS

It is likely that two or three floating LiDAR buoys(s) will be deployed pre-construction to collect wind profile data as well as other metocean information. The buoys will be anchored to the seabed and will likely remain on site during the operational phase of the project.

During the operational phase of the proposed Project, the array will be marked with appropriate navigational marker buoys to provide adequate warning to mariners of the presence of the site. The exact type and number of buoys will be determined through consultation with MCA and other stakeholders and will also be led by outcomes of the Navigational Risk Assessment (NRA). The site, including turbine positions, mooring and anchor locations and inter array and export cable routes will be marked on the UK hydrographic charts and through Kingfisher Information Service - Offshore Renewable & Cable Awareness (KIS-ORCA) to manage fisheries awareness. Additional consideration will be given to fog signals where appropriate.

2.5 OTHER ASSOCIATED DEVELOPMENTS

2.5.1 O&M BASE

A dedicated onshore Operation and Maintenance facility will be required for remote monitoring and operation of the wind farms. The facility may include offices, stores, welfare, and berthing facilities for transfer vessels.

The facility will ideally be located as close as practical to the wind farms to minimise steaming time from the base to the sites. Location selection and design are subject to detailed review of potential locations and will tie in with the O&M strategy once developed as the project design progresses.

Ports and Wet Storage

Ports and harbours will be required at all phases of the project life cycle, including pre-construction survey bases, construction and operational phases, and decommissioning of the projects. Facilities in relative proximity to the wind farms are desirable to maximise programme and reduce vessel costs. Access is a critical factor, with unrestricted tidal access a large consideration. Large landside areas are also desirable to facilitate storage and assembly of major components.

The exact port requirements for floating wind assembly will be dictated by the nature of the substructure proposed in addition to project logistics. If the turbines are to be mated to the substructure at the quayside a certain level of shelter will be desirable.

North Channel Wind will identify and agree which ports and harbours will be used during the lifetime of project prior to construction. The project has the advantage of having several well equipped facilities in close proximity to the development area including the Port of Belfast and Port of Larne.

2.5.2 GRID UPDATE WORKS

The point of connection of the project to the Northern Ireland electricity network has not been finalised and is the subject of ongoing study and discussion with the transmission network operator (SONI). However, the anticipated cable land fall points are proximate to the largest load centres in NI, and the region has good transmission infrastructure, with several large power stations operational in the area.

The following 275kV substations are currently under consideration:

- Ballylumford 275kV substation located close to the coast, adjacent to Ballylumford natural gas fired power station at the tip of the Islandmagee peninsula.
- Kilroot 275kV substation is also located at the coast near Carrickfergus, adjacent to the Kilroot Coal (and oil) fired power station.

The substations(s) may require additional infrastructure to facilitate the transmission of electricity from new renewable energy generation capacity (as determined by SONI studies and requirements).

2.6 DESCRIPTION OF CONSTRUCTION WORKS

Prior to the offshore installation, components are designed and manufactured offsite, to be delivered to the onshore assembly area at the selected port. Components are then assembled according to installation strategy and transported to the wind farm site. In some instances, equipment can be delivered directly to the site, such as the inter-array and export cables which typically arrive on fully loaded vessels.

In addition to the assembly and load-out port, floating substructures may need to be stored in an offshore location, referred to as “wet storage”. The potential location of temporary wet storage is subject to detailed assessment, but is dependent on factors such as available area, shelter, draught, proximity to site and onshore assembly and load out areas.

Once the layout has been finalised and ground conditions fully assessed, some degree of seabed preparation will precede construction. This could include seabed levelling, ground reinforcement, and the removal of debris. The installation process then typically entails the following activities.

- Pre installation of anchors and mooring lines with scour protection at site
- Onshore assembly of wind turbines onto floating platform moored at quayside
- Towing of fully, or partially assembled turbine and platform from quayside to site and hook-up of mooring lines
- Installation and burial of inter-array cables and associated protection
- Installation of offshore substation
- Installation of export cable

A Tension Leg Platform installation methodology is similar but more involved during final hook-up. Typically, the TLP is stationed above the desired location and lowered to the target water depth using temporary pulling lines or addition of ballast to the platform. The permanent mooring lines are then hooked up, and pulling lines or ballast removed, with stability now provided via holding force of the anchors and buoyancy of the platform. Bespoke barges can be used for transportation and positioning of the TLP.

Prior to energisation all components of the wind farm will be subject to testing and commissioning to ensure proper functionality and that the wind farm can be connected to the grid as a stable power plant. These will include;

- Factory acceptance tests where all component certifications will be reviewed and approved
- Site acceptance tests are typically carried out on the SCADA system to ensure proper communication between wind turbines and electrical infrastructure of the wind farm. As well as other aspects including aviation lights, UPS and automation modules.

Commissioning tests are performed on wind turbines, foundations and electrical systems components to demonstrate safe and proper operation. After connection to the grid, further testing is carried out.

Completion tests can be performed when all commissioning tests are carried out successfully, and are done for wind turbines individually and the wind farm as a whole to demonstrate proper functionality

Performance tests are carried out during the warranty period of the wind farm to check whether the wind farm is functioning and producing power as stated in the contact terms.

2.7 OPERATION AND MAINTENANCE

Once operational, the floating offshore wind farms will require regular maintenance throughout its lifetime. This will require a support team who will be based at a dedicated Operations and Maintenance facility. This team will be responsible for surveillance and monitoring of all aspects of the windfarm assisted with information gathered via SCADA and condition monitoring.

The typical in-service inspection, maintenance and monitoring procedures for the wind turbines will be in keeping with normal practice and in accordance with manufacturers service requirements. Access to the floating substructures from vessels will typically be by ladder. For major repair work which cannot reasonably be completed on site, towing to port may be required. To allow for this, the mooring system, and inter-array cables will be designed to enable safe and efficient disconnection of the structure.

During the operation period the following categories of maintenance will be required:

- **Periodic overhauls** are carried out in accordance with original equipment manufacturer requirements and will be scheduled for periods to minimise operational impact and capitalise on benign weather conditions.
- **Scheduled maintenance** involves inspection testing and correction of minor faults and is conducted at planned intervals typically every 6 to 12 months
- **Unplanned maintenance** is work required outside of scheduled interventions in response to unforeseen defects. This can include correction of minor defects to replacement of major components.

Inspections of the mooring lines, anchors and cables will also be required periodically. These will be undertaken by ROV's in as far as possible.

Due to the proximity of the wind farms to the shore, the majority of O&M activities will be carried out by small work and crew transfer vessels, which will operate from local ports or the O&M base. There may occasionally be requirement for larger vessels to visit the site for more involved scheduled maintenance or unplanned remedial works.

2.8 DECOMMISSIONING

The North Channel Wind Projects are expected to have an operational lifetime of 35 years, following which, it is anticipated that the Projects will be decommissioned, life extended or repowered. The final decision will depend on thorough review of the site and condition of assets and obtaining the relevant licences and consents at the time.

A detailed Decommissioning Programme (DP) will be developed and agreed with relevant authorities prior to construction. The DP will include a description of the assets to be removed, methodology, cost estimates and details of securities to be put in place to fund the decommissioning activities and conduct appropriate surveying and monitoring. The decommissioning programme will be updated as required over the lifetime of the project in keeping with relevant guidelines and best practice and decommissioning activities will be compliant with the relevant legislation at that time.

As a baseline, decommissioning will mirror the installation process in reverse. However, innovations over the next several years as more industry experience is gained may result in more effective and cost-efficient methodologies. Any proposed updates to methodologies will be formally documented and agreed. Platforms and moorings will be removed from the wind farm and transported to local ports for disassembly and proper disposal, and the site will made safe for navigation and other seabed users according to the requirements detailed in decommissioning guidance adopted by Northern Ireland. Engagement with regulators and stakeholders will be undertaken through the process.

3. EIA PROCESS AND APPROACH TO SCOPING

3.1 INTRODUCTION

This section describes the methodology that will be used in the Environmental Statement (ES) prepared in support of the development consent application(s) for the proposed Project. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects (as defined in the EIA Regulations and presents the proposed methodology for the identification and evaluation of potential cumulative and inter-related impacts, which includes due consideration of potential transboundary effects. A systematic and auditable evidence-based approach will be followed to evaluate and interpret the potential effects on physical, biological and human receptors.

3.2 BASIS OF ASSESSMENT

3.2.1 EIA LEGISLATIVE BASIS AND GUIDANCE DOCUMENTS

In compliance with the EIA Regulations in Northern Ireland and the EU Directive on the assessment of the effects of certain public and private projects on the environment (EIA Directive) (2011/92/EU, as amended by Directive 2014/52/EU) as applied by The Environment, Food and Rural Affairs (Environmental Impact Assessment) (Amendment) (EU Exit) Regulations 2019 in the marine environment and The Planning (Environmental Assessments and Technical Miscellaneous Amendments) (EU Exit) Regulations (Northern Ireland) 2020 on land, when applying for a marine license or planning permission, an ES is required to be prepared and submitted to support these applications if they are likely to have a significant effect on the environment due to factors such as their size nature or location.

An EIA is required to fulfil the requirements of the following regulations:

- in respect of a marine licence application: The Marine Works (Environmental Impact Assessment) Regulations (Northern Ireland) 2007 as amended; and
- in respect of a planning application: The Planning (Environmental Impact Assessment) Regulations (Northern Ireland) 2017.

Environmental Impact Assessment of applications for consents likely to have a significant effect on the environment by virtue of factors such as their nature, size and location under Article 39 or 40 of the Electricity (Northern Ireland) Order 1992 is required under the Marine Works (Environmental Impact Assessment) Regulations 2007, as amended.

- In addition, the following Regulations will also be considered in the production of the Project ES:
- The Conservation (Natural Habitats, etc.) Regulations (Northern Ireland) 1995 (as amended);
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to marine licenses);
- the Wildlife Order (Northern Ireland) 1985; and
- the Wildlife and Natural Environment Act (Northern Ireland) 2011.
- In addition to the legislative requirements, guidance and best practice documents will be developed to assist with the production of a 'fit for purpose' ES. These include:
- Northern Ireland Guidance on Marine Licensing – construction (including renewables) and removals, under Part 4 of the Marine and Coastal Access Act 2009;
- Northern Ireland Guidance on Marine Licensing – Overview and Process, Under Part 4 of the Marine and Coastal Access Act 2009
- EPA Guidelines on the information to be contained in Environmental Impact Assessment Reports (EPA, 2022);

- Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (MS, 2020)
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland – Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Environmental impact assessment for offshore renewable energy projects (British Standards Institute (BSI), (2015));
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Centre for Environment, Fisheries and Aquaculture Science (Cefas), 2012);
- A Review of Assessment Methodologies for Offshore Wind Farms (Collaborative Offshore Wind Research into The Environment (COWRIE) METH-08-08) (Maclean *et al.*, 2009);
- IEMA Environmental Impact Assessment Guide to Shaping Quality Development (IEMA, 2015);
- Consenting, EIA and HRA Guidance for Marine Renewable Energy Developments in Scotland: Part Three – EIA and HRA Guidance. A Report to the Scottish Government (EMEC & Xodus Group, 2012); and
- Advice Note Seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects (The Planning Inspectorate, 2019).

3.2.2 THE ENVIRONMENTAL IMPACT ASSESSMENT PROCESS

The EIA process can be broadly summarised as consisting of:

- Scoping: The Applicant produces an Offshore Scoping Report (this document) and onshore scoping document and requests a formal Scoping Opinion from the competent authority, DAERA in case of offshore)
- Consultation: The Applicant is required to undertake community consultation and the competent authority is required to consult statutory consultees;
- EIA Report Preparation: The ES will be prepared, considering the responses to the consultation process and outcomes of the assessment of likely significant environmental effects of the Proposed Development during the construction, operation and maintenance, and decommissioning stages of the project lifecycle;
- EIA Report Consultation: The ES (and the application to which it relates) must be publicised, and the consultation bodies and the public must be given an opportunity to give their views about the Proposed Development and the ES;
- Determination: The competent authority must examine all the environmental information, including the ES and any comments and representations received, and must reach their reasoned conclusion on the significant effects of the development on the environment. The environmental information, and the conclusions reached, must be taken into account by the competent authority in deciding whether or not to give consent for the development. The competent authority must also consider whether any monitoring measures are appropriate; and
- Decision notice: The competent authority must inform the public and the consultation bodies of the decision and must publish a ‘decision notice’ which incorporates the authority’s reasoned conclusion on the significant effects of the development on the environment.

3.3 KEY PRINCIPLES OF EIA

3.3.1 OVERVIEW

Within the ES, the assessment of each topic e.g., physical processes, marine mammals, infrastructure and other users etc.) will be included in a separate chapter.

A list of the topic chapters that will be included in the Offshore section of the ES is outlined in Table 1.2. Within each of the topic chapters, the following matters will be considered:

- identification of the study area for the topic-specific assessments;
- description of the planning policy and guidance context;
- summary of construction activity, including comments received in the DAERA Scoping Opinion;
- description of the environmental baseline conditions; and
- presentation of impact assessment, which includes:
  - identification of the maximum design scenario for each impact assessment;
  - a description of the measures adopted as part of the Proposed Development, including mitigation and design measures which seek to prevent, reduce or offset environmental effects;
  - identification of likely impacts and assessment of the significance of identified effects, taking into account any mitigation measures adopted as part of the Proposed Development;
  - identification of any further mitigation measures required in respect of LSE (in addition to those measures adopted as part of the Proposed Development), together with consideration of any residual effects;
  - identification of any future monitoring required;
  - assessment of any cumulative effects with other major developments, including those that are proposed, consented and under construction (including, where applicable, those projects, plans or activities that are currently operational that were not operational when baseline data was collected); and
  - assessment of any transboundary effects; i.e., effects on other devolved administrations in the UK (e.g Scotland) or self-governing Crown Dependencies (e.g. Isle of Man) or neighbouring European Community (EC) or European Economic Area (EEA) member states (e.g. Republic of Ireland).

Inter-related effects (i.e., inter-relationships between environmental topic areas) will be assessed in a separate standalone chapter which will consider the impacts of the Proposed Development on each of the identified receptor groups.

Within each topic chapter a number of key principles will be applied, and these are detailed below.

3.3.2 PROPORTIONATE EIA

The importance of delivering EIAs which are proportionate and accessible to a wide range of stakeholders has been acknowledged by EIA practitioners, with a recent drive for improved quality of ESs from a number of organisations (e.g., IEMA, 2017). The topic of proportionate EIA has been a particular focus for the offshore wind industry with TCE's Industry Evidence Programme (IEP) (Crown Estate *et al*., 2018) making a series of strategic recommendations for the industry and stakeholders.

The aim of producing a proportionate EIA has been a key consideration in the development of this Offshore Scoping Report. A number of tools and processes will be used to aid the proportionality of the Proposed Development EIA, both within this Offshore Scoping Report, and that will be subsequently considered in the ES. This includes:

- application of the existing evidence basis; and
- commitment to embedded mitigation measures.

Existing Evidence Basis

The Proposed Development is located in the North Channel, DAERA and its expert consultees have been consulted to determine what existing data/knowledge there is. Where possible in this Offshore Scoping Report, the Applicant has made use of these data to:

- provide an initial high-level overview of the baseline environment and the availability of existing data to support the ES;
- support scoping out of impacts where there is clear evidence of lack of a receptor-impact pathway; and
- where impacts are proposed to be scoped in for further assessment in the ES, to draw upon the pre-existing evidence base where appropriate.
- Where this Offshore Scoping Report identifies, that additional data is required to inform the Proposed Development EIA, it is intended that the ES will provide the additional data.

Mitigation Measures

The EIA can influence the design of a project in many ways, including:

- amending the layout and extent of a development site to avoid key sensitive receptors;
- amending the design of a specific aspect of the development to manage impacts;
- specifying construction techniques to avoid effects on particular receptors; and
- changing materials to reduce volume and/or transport impacts (IEMA, 2016).

There are three distinct forms of mitigation which include:

- **primary mitigation** (inherent): "Modification to the location or design of the development made during the pre-application phase that are an inherent part of the project, and do not require additional action to be taken" (IEMA, 2016);
- **secondary mitigation** (foreseeable): "Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the ES" (IEMA, 2016); and
- **tertiary mitigation** (inexorable): "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 requirement, or actions that are considered to be standard practices used to manage commonly occurring environmental effects" (IEMA, 2016).

Primary Mitigation (Embedded Mitigation Measures)

Primary mitigation has been referred to as "Embedded Mitigation Measures" within this report. The iterative approach to the impact assessment process has been utilised to inform the design of the Proposed Development (through the identification of likely significant environmental effects and development of embedded mitigation measures to address these). The incorporation of such measures within the design demonstrates commitment to implementing the identified measures. These measures will be referred to throughout the ES as 'embedded mitigation measures.

By employing this approach, the significance of effect to be presented in the ES is considered representative of the maximum residual effect that the Proposed Development will have, should the application for consent be approved and the Proposed Development be constructed.

Both primary and tertiary measures can be 'embedded' into the project design. EIA can therefore be undertaken on the basis that these measures will definitely be delivered and therefore any effects which might arise without these mitigation measures do not need to be identified as potential effects as there is no potential for them to arise (IEMA, 2016).

Throughout this Offshore EIA Scoping Report, a range of 'embedded' mitigation measures have been applied and are detailed in the technical assessments. Mitigation measures will evolve whilst the EIA progresses and in response to stakeholder engagement.

3.3.3 DESIGN ENVELOPE APPROACH AND MAXIMUM DESIGN SCENARIO

The Design Envelope approach (also known as the Rochdale Envelope approach) will be adopted for the assessment of the Proposed Development, in accordance with current best practice (refer section 2.2) and the "Rochdale Envelope Principle[4]". The Design Envelope concept allows for some flexibility in project design options, particularly for foundations and wind turbine type, where the full details of a project are not necessarily known at time of application submission.

Chapter 2 sets out the Design Envelope approach and identifies the maximum or range of potential project design values for relevant components of the Proposed Development. For each of the topic chapters within the ES and for each of the impacts assessed, the Design Envelope considered will be the scenario which would give rise to the greatest potential impact (hereafter referred to as the maximum design scenario).

An example of the Design Envelope approach would be where several types of floating offshore wind turbine anchor are being considered. The assessment in this case would be based on the foundation known to have the greatest potential for impact on a given receptor. In this instance, the Design Envelope for the foundation with the greatest seabed disturbance potential would be the foundation with the largest footprint. If, after undertaking the impact assessment, it is shown that no significant effect is anticipated, it can be assumed that any project parameters equal to or less than those assessed will have environmental effects of the same level or less and will therefore also have no significant effect upon the receptors for the topic under consideration.

By employing the Design Envelope approach, North Channel Wind retains flexibility in design of the offshore wind farm and associated offshore and onshore infrastructure, within certain maximum scenarios, all of which are fully assessed in the ES.

It is North Channel Wind's intention to refine the Design Envelope throughout the EIA process as further technical, environmental and design information becomes available so that the assessment presented in the final application is based on as refined and focussed Design Envelope as is practical whilst still retaining flexibility for new technology or design solutions in the post-consent phase.

3.3.4 IMPACTS AND EFFECTS

The Proposed Development has the potential to create a range of impacts and effects with regard to the physical, biological and human environment, for both terrestrial and marine receptors. For the purposes of the offshore EIA, the term 'impact' is defined as a change that is caused by an action. For example, the laying of an inter-array cable (action) is likely to result in seabed disturbance (impact). Impacts can be defined as direct, indirect, temporary, irreversible, secondary, cumulative and inter-related. They can also be either positive or negative, although the relationship between them is not always straightforward.

The term 'effect' is defined as the consequence of an impact. Using the inter-array cable laying example again, the laying of an inter-array cable (action) results in seabed disturbance (impact), with the potential to disturb benthic habitats and species (effect). The significance of effects is determined by consideration of the magnitude of impact alongside the sensitivity of each receptor/receptor group.

The magnitude of an impact is the consideration of the extent, duration, frequency and reversibility of an impact. Receptors can be defined as the physical or biological resource or user group that could be affected by the potential impacts. In defining the sensitivity for each receptor/receptor group, the vulnerability, recoverability and value/importance of that receptor will be taken into consideration.

In order to ensure consistency in defining the significance of an effect, a matrix approach will be adopted in the Offshore ES as presented in Table 3.1.

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[4] Case law (i.e. R v Rochdale MBC ex parte Tew (1999) and R v Rochdale MBC ex parte Milne (2000)). In respect of S36 consent, whichever scheme is ultimately built must have been covered by the scope of the EIA.

Table 3.1: Matrix Used for the Assessment of the Significance of the Effect

Sensitivity of Receptor	Magnitude of Impact			
	Negligible	Low	Medium	High
Negligible	Negligible	Negligible to Minor	Negligible to Minor	Minor
Low	Negligible to Minor	Negligible to Minor	Minor	Minor to Moderate
Medium	Negligible to Minor	Minor	Moderate	Moderate to Major
High	Minor	Minor to Moderate	Moderate to Major	Major
Very High	Minor	Moderate to Major	Major	Major

In cases where a range is suggested for the significance of effect, there remains the possibility that this may span the significance threshold (i.e., the range is given as minor to moderate). In such cases the final significance is based upon the expert's professional judgement as to which outcome delineates the most likely effect, with an explanation as to why this is the case.

3.3.5 APPROACH TO ASSESSMENT OF SIGNIFICANCE

A level of effect of moderate or greater will be considered a 'significant' effect for the purposes of the EIA. A level of effect of minor or less will be considered 'not significant'. Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

The matrix approach is consistent with the general approach described in Environmental Impact Assessment for Offshore Renewable Energy Projects – Guide (BSI, 2015). A number of modifications have however been made in the interest of proportionality, including:

- a magnitude of impact of 'no change' will not be assessed since it will always lead to a non-significant effect;
- a negligible magnitude impact will not be considered further because it will always lead to a non-significant effect; and
- receptors of negligible importance, value or sensitivity will not be considered further because it will always lead to a non-significant effect.

Where significant effects are initially identified, the EIA will follow a "feedback loop" methodology, as illustrated within Figure 3.1. Through this process, an impact is initially assessed to determine the significance of the potential environmental effect. If the effect of an impact presents a major or substantial significant adverse outcome, changes are typically made to the Proposed Development design (primary mitigation) in order to reduce or offset the magnitude of impact. If the effect of an impact presents a moderately significant adverse outcome, mitigation such as engineering controls or construction methods (secondary and tertiary mitigation) are employed in order to reduce or offset the magnitude of the impact.

This process is repeated, as illustrated within Figure 3.1 until the EIA practitioner is satisfied that:

- the effect is reduced to a level that is not significant in EIA terms; or
- no further changes can be made to the Proposed Development design to reduce the magnitude of impact and therefore the significance of the effect. In these cases, an overall effect that is still significant in EIA terms may be presented.

Following this iterative approach ensures that the significance of effect presented for each identified impact may be presumed to be representative of the maximum residual adverse effect the Proposed Development may have on the receiving environment.

Mitigation measures will evolve whilst the EIA progresses and in response to stakeholder engagement, as described above and included as part of the ES.

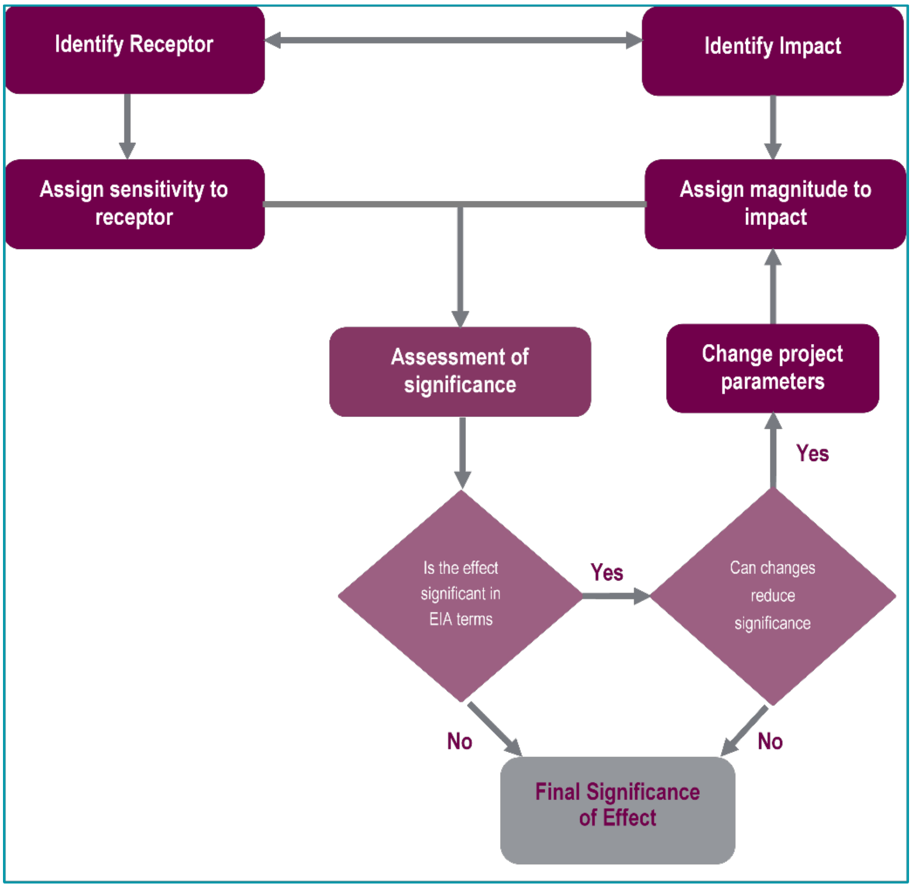


Figure 3.1: Proposed Iterative Approach to Mitigation Within the Proposed Development EIA

3.3.6 INTER-RELATED EFFECTS

The EIA Regulations require consideration of inter-related effects. Inter-related effects refer to the inter-relationships between EIA topics that may lead to environmental effects. There are two categories of inter-related effects:

- project lifetime effects: effects that occur throughout more than one phase of the project (construction, operational and maintenance, or decommissioning) interacting to potentially create a more significant effect upon a receptor than if just assessed in isolation in a single phase; and
- receptor-led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor. For example, the effect upon subsea noise on marine mammals may be greater when multiple sources of impact interact or combine to produce a different or greater effect upon this receptor than when single sources of impact are considered in isolation. Receptor-led effects might be short term, temporary or transient effects, or incorporate longer term effects.

Within the EIA, assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups. The term ‘receptor group’ is used to highlight the fact that the proposed approach to inter-relationships assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors.

Where the significance of an effect within the topic-specific assessment has been identified as ‘no effect across all stages of the project’, the assumption has been made that these effects can not contribute to any inter-related effects. These effects will therefore not be included in the inter-related effects assessment as there will be no effect from the Proposed Development over the lifetime of the project.

The inter-related assessment will consider only effects from the Proposed Development and not those from other projects, which will be considered in the Cumulative Effect Assessment (CEA) (see section 4.3.7).

3.3.7 CUMULATIVE EFFECTS ASSESSMENT

Overview

A Cumulative Effect Assessment (CEA) is a legal requirement under the EIA Regulations. A CEA provides consideration of the impacts arising from the Proposed Development alone and cumulatively with other relevant plans, projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects, on the same receptor or resource.

A fundamental requirement of undertaking the CEA is to identify those foreseeable developments or activities with which the Project may interact to have the potential to result in a cumulative impact. All phases (construction, operation and maintenance, and decommissioning) of the Proposed Development may have the potential to lead to cumulative impact.

The CEA will consider all other relevant plans, projects and activities that are publicly available six months prior to the Proposed Development application.

Screening Stage

To ensure a thorough and comprehensive approach to identification of potential projects to be considered in the CEA, an initial 'long list' of projects within a defined Zone of Influence (ZOI) will be developed based on the above listed criteria. The ZOI will be large enough to encompass all technical ES assessment study areas.

The initial long list will then be reduced following a consideration of potential for cumulative effects for each potential impact-receptor pathway staged process as set-out below:

- conceptual overlap – An impact has the potential to directly or indirectly affect the receptor(s) in question. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap;
- physical overlap – Ability for impacts arising from the Proposed Development to overlap with those from other projects/plans on a receptor basis. This means that an overlap of the physical extents of the impacts arising from the two (or more) projects/plans must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors that may move between, and subject to, two or more separate physical extents of impact from two or more projects; and
- temporal overlap – In order for a cumulative effect to arise from two or more projects, a temporal overlap of impacts arising from each must be established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. The absence of a strict overlap however may not necessarily preclude a cumulative effect, as receptors may become further affected by additional, non-temporally overlapping projects.

The screening exercise will be based on the experience and knowledge of technical specialists, and the current guidance and regulations. The projects or plans that remain after review of the long list are taken forwards to the assessment stage.

Assessment Stage

Following the screening stage, information is gathered on the projects, plans or activities to be taken forwards into the CEA. Where the potential significant effect for the proposed development alone is assessed as negligible, or where an impact is predicted to be highly localised, these will not be considered within the Proposed Project CEA, as there is not considered to be a potential for cumulative effects with other plans, projects or activities.

When undertaking the CEA of the Proposed Development, a tiered approach will be adopted. This provides a framework for placing relative weight upon the potential for each project/plan to be included in the CEA to ultimately be realised, based upon the project/plan's current stage of maturity and certainty in the projects' parameters. The tiered approach which will be utilised within the Proposed Development CEA employs the following tiers:

- **Tier 1 assessment** – Proposed Development (NCW 1 and NCW 2 - offshore and onshore);
- **Tier 2 assessment** – All plans/projects assessed under Tier 1, plus projects which are operational, under construction, those with consent and 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 projects where a TCE Agreement for Lease (AfL) or regional equivalent has been granted.

All projects/plans that have been screened into the CEA via the screening process will be allocated into one of the above Tiers and assessed in the CEA.

The CEA will consider all other relevant plans, projects and activities that are publicly available six months prior to the Proposed Development application.

Where practicable, the CEA methodology then follows the outline of the stand-alone assessment methodology as described in section 3.3 This approach allows consistency throughout the EIA.

3.3.8 TRANSBOUNDARY EFFECTS

Transboundary effects arise when impacts from the Proposed Development within one devolved UK region affects the environment of another devolved UK region, self-governing Crown Dependency or EC or EEA member state(s). The need to consider such transboundary effects has been embodied by the United Nations Economic Commission for Europe Convention on EIA in a Transboundary Context (commonly referred to as the 'Espoo Convention'). The Convention requires that assessments are extended across borders between Parties of the Convention when a planned activity may cause significant adverse transboundary impacts.

Article 7 of the amended EIA Directive provides the basis for consultation between sovereign States in relation to the likely significant environmental effects of proposed development in one State on the environment in another State. The principal obligation is in respect of information and consultation and is imposed by Article 7(4) of the amended Directive:

"The Member States concerned shall enter into consultations regarding, inter alia, the potential transboundary effects of the project and the measures envisaged to reduce or eliminate such effects and shall agree on a reasonable timeframe for the duration of the consultation period. Such consultations may be conducted through an appropriate joint body."

Under Regulations 27 and 28 of the EIA Regulations, for any project that is likely to cause significant transboundary effects, the Department must send information about the development to the relevant government department of the affected State and invite them to participate in the consultation procedures.

Transboundary impacts between Northern Ireland and Scotland are most likely to arise for the offshore elements of the proposal. Therefore, it is proposed that a copy of the Scoping Request will be issued to Marine Scotland - Licensing Operations Team (MS-LOT) for consideration.

Where it is felt there may be potential for likely significant transboundary effects to arise, this will be clearly highlighted to Marine Scotland who will be asked to relay the information to the appropriate Scottish statutory bodies and key stakeholders to facilitate a combined response both in Northern Ireland and Scotland.

The possibility of transboundary effects with Republic of Ireland and other neighbouring devolved UK regions will also be considered.

4. STAKEHOLDER ENGAGEMENT & CONSULTATION

4.1 INTRODUCTION

NCW is committed to transparent and meaningful engagement with all stakeholders, and believes consultation is an integral part of the development process. Listening to and addressing the views of interested parties helps to ensure a better project and a robust EIA, that takes into account all potential environmental and socio-economic receptors that could be affected by the Proposed Development.

This chapter sets out NCW's approach to consultation, describes the engagement activities that have occurred to date, and details the future consultation activities that will take place through the EIA process.

4.2 POLICY, LEGISLATION AND GUIDANCE

Section 1.5 sets out the key policy, legislation and regulations relating to the Proposed Development. All statutory requirements for consultation at the pre-application stage will be followed. NCW will also take account of advice relating to consultation and stakeholders provided by statutory consultees, such as DAERA, during the EIA process.

NCW supports the Aarhus Convention, which was created to empower the role of citizens and civil society organisations in environmental matters and is founded on the principles of participative democracy. The Aarhus Convention establishes a number of rights to individuals and civil society organisations with regard to the environment. This includes the public's right to receive environmental information held by public authorities, the right to participate in decision-making regarding the environment and the right to review procedures and challenge decisions that have been made without due regard to public review or input.

4.3 APPROACH TO STAKEHOLDER ENGAGEMENT

NCW is committed to finding effective ways to engage with stakeholders, and to refine the process in response to feedback received. Our approach to stakeholder engagement involves the following key elements:

- Identify: identification of those stakeholders with an interest in, or who might be impacted by, the Proposed Development;
- Communicate: provide information on the Proposed Development to the stakeholders. This should include both potential positive or negative impacts that the Proposed Development may have, and information about the consultation and development process.
- Consult: provide the opportunity for stakeholders to give information and feedback, record views and potential concerns about the project and the consultation process.
- Communicate feedback: provide information to stakeholders detailing the results of the consultation and provide responses to any concerns raised, along with follow up actions as appropriate.
- Repeat and refine - Stakeholder engagement is an ongoing process. The process will be refined in response to feedback received.

4.4 PRELIMINARY ENGAGEMENT

NCW understands the value of building and maintaining strong relationships with stakeholders throughout the life of a project, and this is maximised by engagement at an early stage. NCW has begun consulting with statutory and non-statutory consultees including DAERA and DfE, to introduce the project and provide regular updates on progress.

NCW has also begun engaging with the fishing industry. Meetings have been held with NIFPO and ANIFPO to introduce the project, gain feedback on the impact of the proposals to the fishing community and discuss communication going forward. This resulted in the agreement of a scope of works for a Fisheries Liaison Officer (FLO), a role which has subsequently been appointed. A number of subsequent introductory meetings have been held with fishermen from the ports of Ardglass, Bangor, Kilkeel, Larne and Portavogie, and the Clyde Fishermen's Association.

A full list of the engagement to date in included in Table 4.1. With regard to regulatory bodies, the project team have had regular engagement since 2021

Table 4.1: Project Engagement to Date

Stakeholder	Purpose of stakeholder engagement
DAERA	To provide an overview and introduction to the project, with subsequent meetings to update on progress of the NCW project. Pre-Application Meetings Planning meetings for the proposed scoping report. Planning meeting to agree methodology for the digital aerial survey.
Department for the Economy	To provide an overview and introduction to the project and regular project updates. Discussions on barriers to the development of offshore wind in Northern Ireland. Discuss progress of the OREAP Steering Committee and Working Groups.
Utility Regulator for Northern Ireland	To provide an overview and introduction to the project and regular project updates. Discussions on barriers to the development of offshore wind in Northern Ireland
SONI	To provide an overview and introduction to the project and regular project updates. Discussions on barriers to the development of offshore wind in Northern Ireland. Discussions about progressing a grid connection application for North Channel Wind.
Northern Ireland Electricity	To provide an overview and introduction to the project and regular project updates. Discussions on barriers to the development of offshore wind in Northern Ireland
ANIFPO	To provide an overview and introduction to the project, gain feedback on the impact of the proposed projects to the fishing community, discuss communication and engagement going forward
NIFPO	To provide an overview and introduction to the project, gain feedback on the impact of the proposed projects to the fishing community, discuss communication and engagement going forward
Invest NI	Discuss Invest NI plans to support offshore sector and options for joint projects of common interest.
RSPB	Initial meeting to introduce the project.
Ulster Wildlife Trust and NIMTF	Meetings to discuss joint projects to support environmental enhancement and introduce the wind farm project.
National Energy Action	Initial meeting to introduce the project and discuss potential community benefits.
AFBI	To provide an introduction to the project and discuss AFBI's marine research.
Fishing engagement meeting - Larne	Initial stakeholder meeting to introduce the project to the fishermen and listen to feedback.

Stakeholder	Purpose of stakeholder engagement
Fishing engagement meeting - Kilkeel	Initial stakeholder meeting to introduce the project to the fishermen and listen to feedback.
Fishing engagement meeting - Ardglass	Initial stakeholder meeting to introduce the project to the fishermen and listen to feedback.
Fishing engagement meeting - Bangor	Initial stakeholder meeting to introduce the project to the fishermen and listen to feedback.
Clyde Fishermen's Association	Initial stakeholder meeting to introduce the project, gather initial feedback and learn about the CFA's activities.
Maritime Coastguard Agency	To provide an overview and introduction to the project, gain feedback on the potential shipping and navigation impacts of the proposed projects.
Fishing engagement meeting - Portavogie	Initial stakeholder meeting to introduce the project to the fishermen and listen to feedback.
Invest Northern Ireland Maritime Cluster	Presentation delivered to introduce the project to cluster members.
Causeway Coast & Glens Council – Planning Department	Meeting to introduce the project and listen to feedback.
Mid & East Antrim Council – Development Plan Department	Meeting to introduce the project and listen to feedback.
Ards & North Down Council – Place Directorate	Meeting to introduce the project and listen to feedback.
Ards & North Down Council – Place & Prosperity Committee	Presentation delivered to introduce the project to committee members and answer questions.
Elected representatives	Meeting to introduce the project, listen to feedback and discuss community engagement.

4.5 PLANNED ENGAGEMENT

NCW will build on and expand this engagement through the scoping process initially, and subsequently will engage with relevant stakeholders throughout all stages of the Proposed Development including scoping, EIA preparation (pre-application), post EIA/application submission, pre-construction, construction, operation, decommissioning.

A comprehensive stakeholder database has been compiled, including:

- National and local authorities
- Local community organisations
- Elected representatives
- Local and transboundary interest organisations (environmental, recreational, social, technical, economic)
- Supply chain/industry
- Electricity transmission and distribution operators

- Other users of the sea, including fishing industry
- The Crown Estate
- Other developers

It is recognised that stakeholders will have different interests and requirements, which will vary at different stages over the lifetime of the Proposed Development, but NCW is committed to finding effective ways to communicate and consult with all stakeholders. Similarly, our database of stakeholders will evolve over time as the development progresses and in response to feedback received.

In addition, consultation will also take place in relation to onshore development.

4.5.1 SCOPING

In addition to the statutory consultation performed by DAERA, NCW will undertake the following activities surrounding the formal submission, publication and consultation period of this Scoping Report and Request for Scoping Opinion:

- At least 3 in-person public consultation exhibitions, providing information about the Proposed Development and giving the opportunity for attendees to ask questions of the project team and provide feedback
- A virtual public consultation exhibition providing online information about the Proposed Development, including the opportunity to request calls with members of the project team and provide feedback
- Meetings with elected representatives, community organisations, fishing communities and other interested parties, to provide information and seek feedback
- Project newsletter
- Project website

Following the consultation, a Consultation Report will be prepared summarising the results of the scoping consultation, providing responses to concerns raised and outlining next steps. This will be shared with stakeholders.

4.5.2 EIA PREPARATION (PRE-APPLICATION)

NCW is planning a further round of consultation activities at an appropriate point during the preparation of the EIA, providing another opportunity for the local community and other interested parties to give their views as the Proposed Development evolves. These activities are likely to mirror the scoping engagement detailed in the previous section however it is recognised that consultation is an iterative process, and engagement methods may evolve over time in response to feedback received.

A further Consultation Report will be prepared and shared with stakeholders, to summarise the consultation that took place, the information and views received, and responses to concerns raised, including the proposed mitigation measures to reduce impacts.

5. MARINE PROCESSES

5.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore EIA Scoping Report has identified several baseline datasets.

Table 5.1: Summary of key reports and datasets

Source	Coverage	Data Provision
Marine Environmental Data Information Network (MEDIN)	UK Waters	Bathymetry data.
European Centre for Medium-range Weather Forecast (ECMWF)	European Waters	Historic and contemporary pressure, wind speed and wave datasets.
European Marine Observation and Data Network (EMODnet)	European Waters	Bathymetry, geology; and seabed substrate and classifications.
British Geological Survey (BGS)	UK Waters	Geology and seabed substrate.
Cefas Offshore observation data	UK Waters	Salinity, seawater temperature and turbidity.
Cefas Climatology Report (Cefas, 2016)	UK Waters	Suspended sediment concentrations (SSC).
British Oceanographic Data Centre (BODC) UK tide gauge network. Database of current observation	UK Waters	Tidal levels, current speed and current direction.
United Kingdom Hydrographic Office (UKHO) - Published Charts and Tide tables	UK Waters	Charts such and 1409/7 1:200000 and 210 1:75000 include tidal diamonds with current stream data.
DAERA mapping data (https://www.opendatani.gov.uk/dataset/special-areas-of-conservation)	UK Waters	Spatial data for SAC zones in Northern Ireland.
DAERA protected areas (https://www.daera-ni.gov.uk/protected-areas)	UK Waters	Protected areas data in Northern Ireland.
JNCC mapping data (https://jncc.gov.uk/mpa-mapper/)	UK Waters	Spatial data for marine protected areas incl. SPA, SSSI and conservation zones.
UK Renewables Atlas (https://www.renewables-atlas.info/explore-the-atlas/)	UK Waters	Wave, wind and tidal information.

5.2 NCW 1 PROJECT

5.2.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the marine processes of relevance to the proposed NCW 1 Project. Considering the potential effects, the development could have on those marine processes identified below during the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the Mean High-Water Spring (MHWS) mark.

For the purposes of this Offshore Scoping Report and subsequent Offshore ES, marine processes are defined as encompassing the following elements:

- tidal elevations and currents;
- waves;
- bathymetry;
- geology and seabed sediments;
- suspended sediments; and
- sediment transport.

The parameters listed above are collectively referred to as ‘marine processes’ through the remainder of this Offshore EIA Scoping Report.

5.2.2 STUDY AREAS

The NCW 1 Project in the North Channel is illustrated in Figure 5.1 and shows:

- The proposed Development Array Area (DAA) the proposed Export Cable Corridor (ECC) Areas of Search (AoS);
- landfall area options; and
- seabed and coastal areas within the proposed study area that may be influenced by changes to marine processes due to the Proposed Development.

The Marine Processes Study Area extends beyond one tidal excursion from the Proposed Development boundary and would therefore include the distance suspended sediment is transported prior to being carried back on the returning tide. It is however noted that the study area forms the focus for the assessment and that the numerical model extent is not limited to this region. The modelling study would therefore also identify potential impacts beyond the study area.

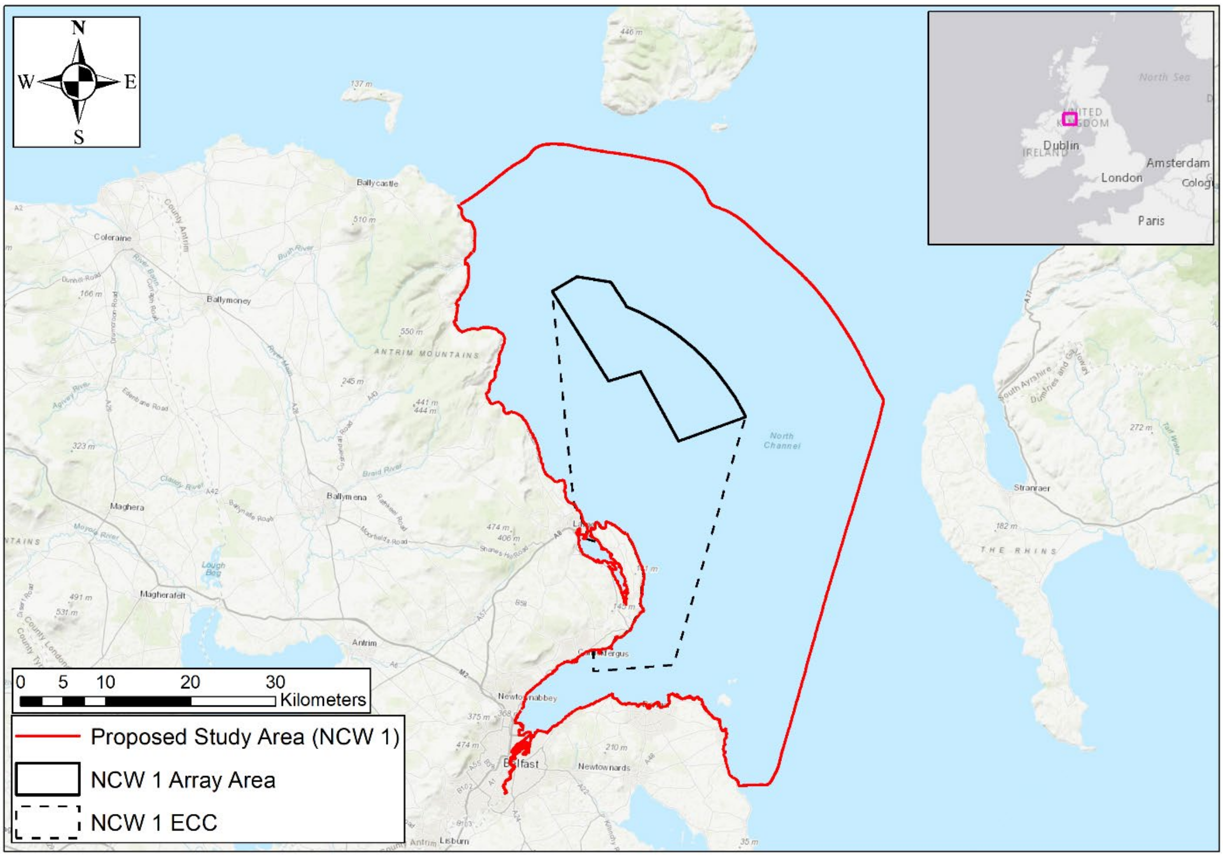


Figure 5.1: North Channel Wind 1 (NCW 1) Proposed Array Area, Export Cable Corridors (ECC) Area of Search (AoS) and Study Area

5.2.3 BASELINE ENVIRONMENT

This section provides a concise summary of the baseline environment of the proposed NCW 1 Project making reference to a more detailed description provided as in Annex A. This baseline is established based on a review of bathymetry, tidal regime, meteorological information, wave climate and seabed sediments from a desktop study on key reports and datasets available.

Tidal elevation and currents

An understanding of the tidal currents provides an insight into the patterns and rates of naturally occurring sediment transport. United Kingdom Hydrographic Office (UKHO) states that the mean tidal range at the Larne Standard Port is approximately 2.4 m, however, this may vary significantly due to the location of the UKHO gauging station and the Proposed Development.

Semi-diurnal tides are dominant within the North Channel with strong tidal currents >1 ms^{-1} causing strong mixing (Horillo-Caraballo, et al., 2021).

The tide stream nearest the northern Proposed Development (55°08'.8N, 6°00'.6W) is strongly bi-directional, with north flowing ebb and south flowing flood tides, characterised by peak current speeds ranging from 4.0 kn and 2.8 kn during spring and neap tides respectively.

Wind and waves

Wind parameters were extracted between the years of 1979-2019 from the Climate Forecast System Reanalysis (CFSR) model at an offshore wave point in the North Channel. For the same location in the North Channel, offshore wave data from 1979-2019 were extracted from a deterministic atmospheric model which is coupled with a wave model allowing two-way interaction between wind and waves. This model is run by the European Centre of Medium Range Weather Forecasts (ECMWF), a research institute and a 24/7 operational service, that produces global numerical weather data for the European Union and broader community.

Conditions within the North Channel are dominated by swell waves from the Atlantic approaching from the north-west and also wind waves from the south generated by the large open fetch within the Irish Sea.

The greatest wave heights are observed during winter in December and January when the average significant wave heights of c.1.20 m are c.36% greater than the annual average wave height of c.0.88 m.

A summary analysis of the offshore wave conditions near the Proposed Array Area is presented in Annex A.

Bathymetry

The bathymetry of the proposed NCW 1 DAA is described as highly irregular, influenced by an undulating seabed (OWC, 2022). The water depth of the Proposed Development Array Area ranges between c.79 m to 167 m relative to the Lowest Astronomical Tide (LAT).

In the proposed ECC AoS region, the bathymetry is highly variable ranging from the LAT at both landfall locations to c.310 m below LAT at the offshore terminus, as shown in Figure 5.2.

Geology

Information regarding the geology of the Proposed Development allows for an understanding of the origin and stability of the seabed, and the conditions which will be encountered during the installation of offshore floating foundation, array cables, offshore export cables or any other elements associated with this development.

The general geology of the North Channel consists of Permo-Triassic bedrock which has irregular cover of mobile Quaternary sediments due to the action of strong currents on the seabed (BSG, 1985).Pre-Quaternary and Quaternary sediments are displayed in Figure 5.3 and Figure 5.4 below.

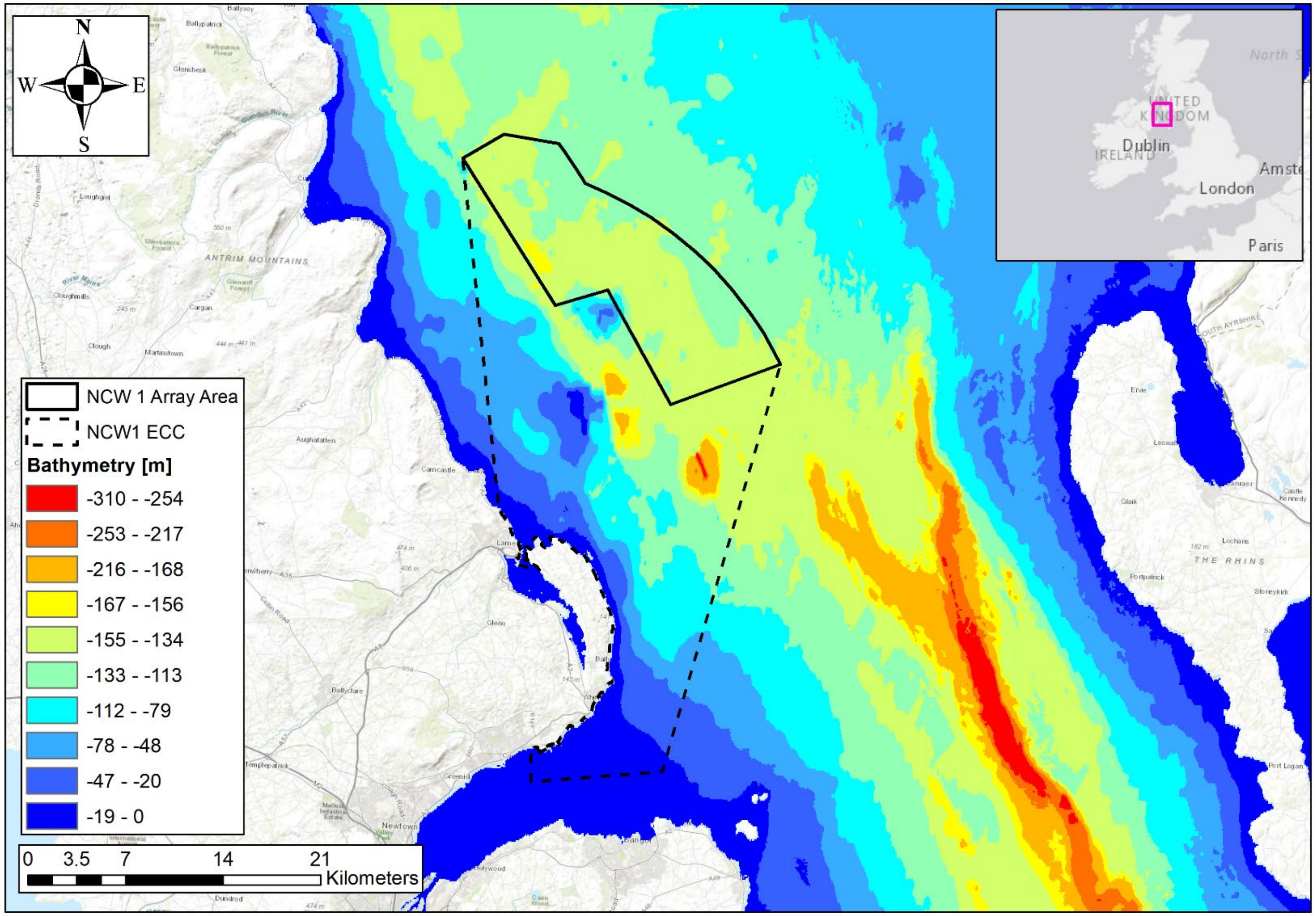


Figure 5.2: Bathymetry at NCW 1 Proposed Array Area and Export Cable Corridors relative to LAT

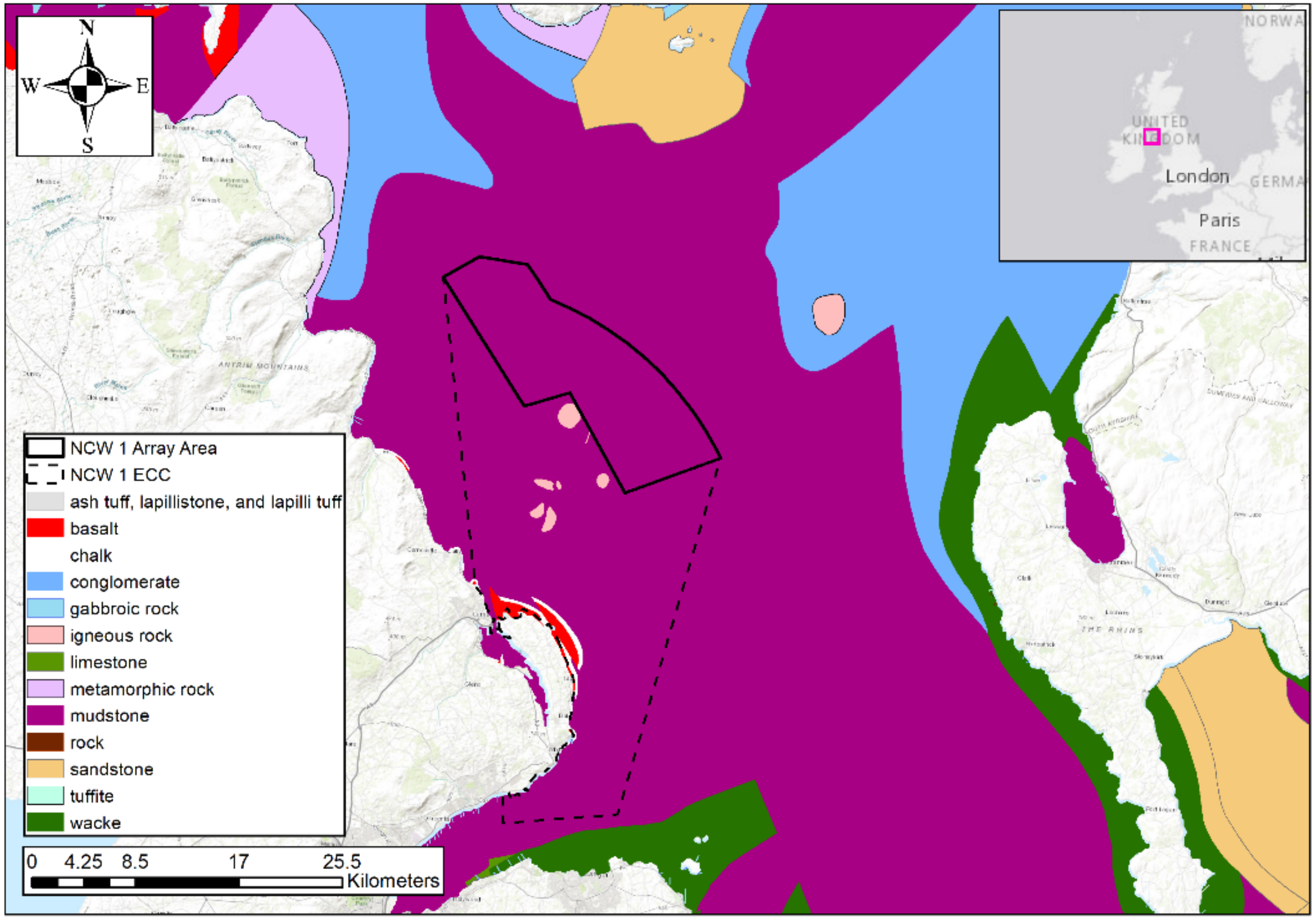


Figure 5.3: Coverage of pre-Quaternary sediments at NCW 1 DAA and ECC AoS

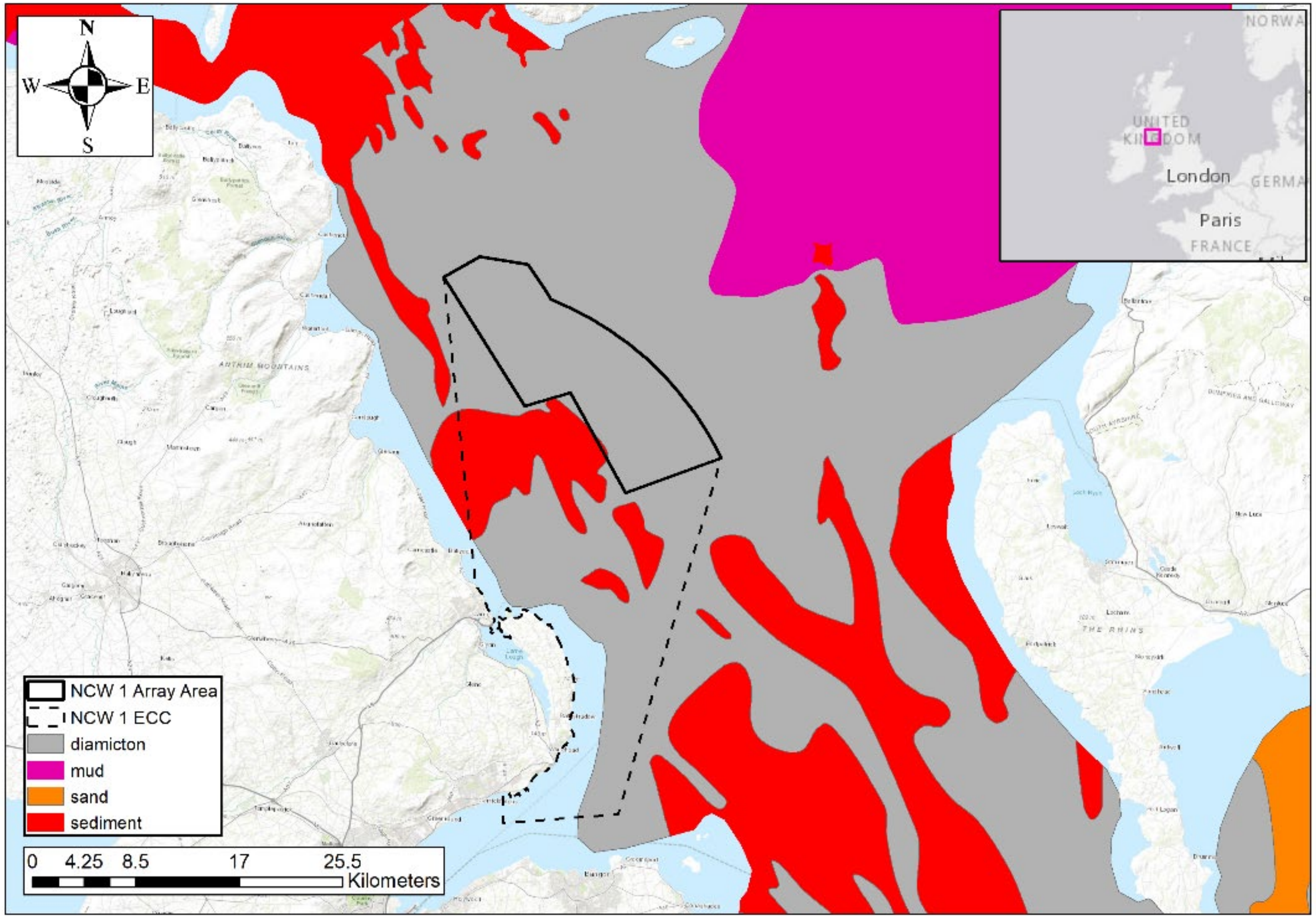


Figure 5.4: Coverage of Quaternary sediments at NCW 1 DAA and ECC AoS

Seabed substrate

Seabed substrate information taken from the EMODnet geology portal is displayed in Figure 5.5

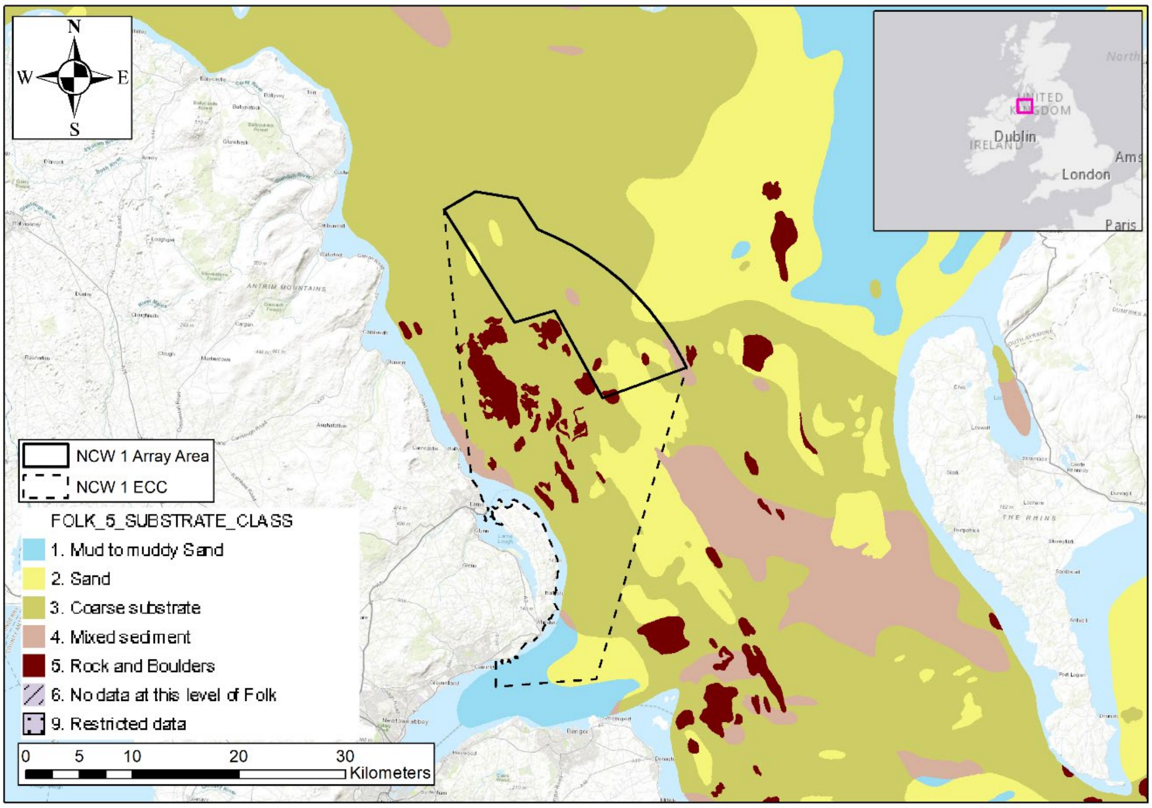


Figure 5.5: Seabed sediment classification at NCW 1 DAA and ECC AoS

Proposed NCW 1 DAA

In the DAA there are areas of coarse surface sediment throughout and small isolated patches of rock and sand are identified in the lower half of the array area (Figure 5.5) (EMODnet, 2022).

Proposed NCW 1 ECC AoS

For each ECC AoS, both routes cover vast patches of coarse surface sediment (cobbles and boulders) and rocks. However, the sediment substrate underlying the ECC AoS proposed routes are predominantly granular in nature ranging from sandy gravel to mud closer inshore (Figure 5.5) (EMODnet, 2022).

Landfall

Ballylumford and Kilroot are two onshore grid connection options associated with NCW 1. Ballylumford landfall is south-west of the NCW 1 DAA with superficial sediments comprised of till (diamicton) deposits on a bedrock of mafic lava and mafic tuff (EMODnet, 2022). The landfall option at Kilroot is comprised of mudstone, sandstone and limestone bedrock with marine sediment (clay, silt and sand) and till (diamicton) deposits (EMODnet, 2022).

Suspended Sediment

The Cefas Climatology Report 2016 (CEFAS, 2016) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) for most of the UK continental shelf (UKCS).

This study indicates that within the vicinity of the proposed NCW 1 DAA the SPM has been estimated to range between 0 mg/l to 5 mg/l over the 1998 to 2005 period, with higher levels of SPM more common in the winter months.

Conservation sites

Conservation sites and relevant qualifying interest features identified for the Marine Processes chapter are described in Table 5.2 and presented in Figure 5.6. Relevant qualifying features included in Table 5.3 highlight the receptors which would be assessed as part of the Marine Processes chapter (e.g., sandbanks) and also receptors that Marine Processes support such as marine mammals.

All conservation sites within and surrounding the area of the Proposed Development including qualifying features that could be affected by the construction, operation and maintenance, and decommissioning phases of the Proposed Development were identified using resources from Northern Ireland's Department of Agriculture, Environment and Rural Affairs (https://www.daera-ni.gov.uk/protected-areas) and the Joint Nature Conservation Committee (https://jncc.gov.uk/mpa-mapper/).

Table 5.2: Conservation sites and relevant qualifying features within the study area of the NCW 1 Proposed Array Area

Conservation Site	Relevant Qualifying Features
Red Bay Special Area of Conservation (SAC)	Sandbanks composed of maerl, sub-fossil maerl, coarse sand, gravels and cobbles; and unique to the site is a 2-3m mega ripple of sub-fossil maerl
The Maidens (SAC)	Sandbanks, reefs; and Grey seals *Halichoerus grypus*
North Channel (SAC)	Harbour porpoise *Phocoena phocoena*
East Coast Marine proposed Special Protection Area (pSPA)	Important populations of Sandwich, Common and Arctic Tern that feed there during the breeding season
Belfast Lough Open Water Special Protection Area (SPA)	Wintering population of great crested grebe
Belfast Lough (SPA)	Supporting internationally important numbers of redshank in winter
Larne Lough (SPA)	Supporting internationally important numbers of light-bellied Brent geese in winter
Outer Ards (SPA)	Supporting nationally important populations of Arctic tern and golden plover
Copeland Islands (SPA)	Supporting nationally important populations of Arctic tern and internationally important Manx shearwater
Waterfoot (MCZ)	Seagrass beds on subtidal (sublittoral) sands
Ramsar sites	Belfast Lough Larne Lough Outer Ards
Areas of Special Scientific Interest (ASSI)	Ballymacormick Point (flora/fauna) Galboly (geology/flora/fauna) Larne Lough (geology/flora/fauna) Outer Ards (geology/flora/fauna) Outer Belfast Lough (geology/flora/fauna) The Gobbins (geology/flora/fauna) The Maidens (flora/fauna)

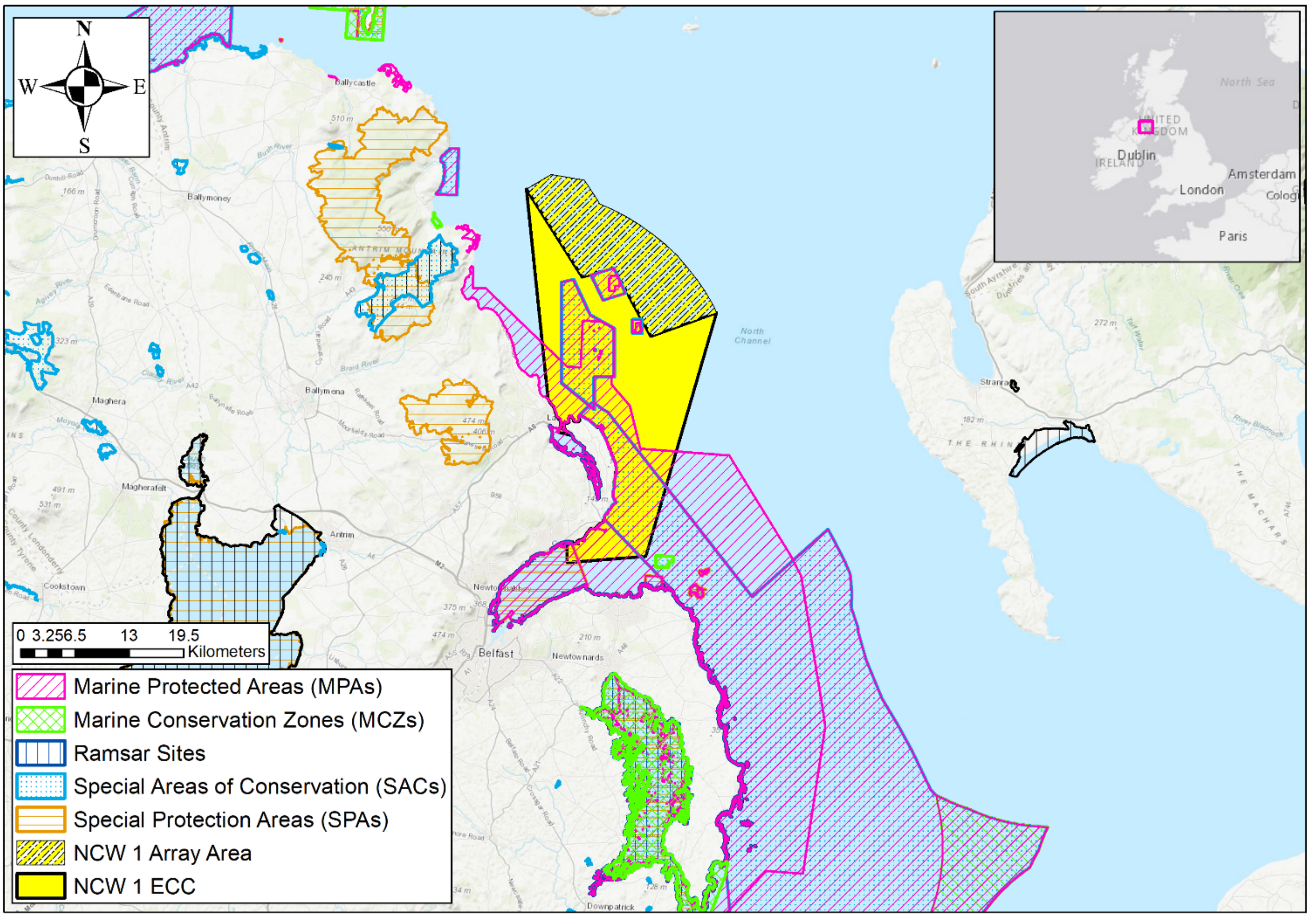


Figure 5.6: Conservation Sites in the NCW 1 Project Study Area

5.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine processes have been identified which may occur during the construction, operation and maintenance, and/or decommissioning phases of the Proposed Development in the absence of designed in measures:

Construction

- Increase in suspended sediments and the potential impact to physical features within the proposed DAA and ECC AoS. Increase in suspended sediments due to construction related activities such as possible seabed preparation activities if required, wind turbine mooring lines/ floating substructure installation (foundations), offshore substation moorings or inter-array and export cable installation and the potential impact to physical features within the proposed DAA and ECC AoS;
- Impacts to hydrodynamics, littoral currents and sediment transport due to cable installation activities and potential impact to physical features at landfall.

Operation and Maintenance

- Impacts to the hydrodynamics (wave/ tidal regime) due to presence of infrastructure in the marine processes study area and the associated potential impacts along adjacent shorelines;
- Impacts to sediment transport and sediment transport pathways due to presence of infrastructure in the marine processes study area and associated potential impacts to physical features (e.g. seabed scour);

- Impacts to hydrodynamics and sediment transport (littoral drift) due to operation and maintenance activities and potential impact to physical features at landfall;
- Ongoing physical disturbance through project life (e.g., scour, maintenance) - Ongoing seabed disturbance may be generated by moorings, scour around cables, anchors and foundations, and the need to remediate issues. Such disturbance would be a function of localised hydrographic and sedimentary process changes around the structures and the nature of the seabed sediments and be limited to the immediate area around the infrastructure.

Decommissioning

- Increase in suspended sediments due to decommissioning related activities such as cable removal and the potential impact to physical features within:
  - the proposed DAA;
  - the proposed ECC AoS
- Impacts to hydrodynamics, littoral currents, and sediment transport due to any retained infrastructure and potential impact to physical features at landfall.

Table 5.3: Potential Impacts Proposed to be scoped into the Proposed Development Assessment for Marine Processes

Potential Impact	Project Phase C	Project Phase O	Project Phase D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Increased suspended sediment concentrations and associated deposition on physical features as a result of the following activities: • seabed preparation; • foundation installation; • cable installation; • and decommissioning.	✓		✓	There is potential for increased SSCs, and associated deposition associated with seabed preparation activities, foundation installation and cable installation activities, and associated deposition associated with decommissioning activities. This assessment will consider the potential impacts arising due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments also have the potential to result in adverse and indirect impacts on a variety of receptor groups which lie in other Offshore ES topics, such as benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals, marine archaeology and infrastructure and other users. For these receptor groups, a significance of	Site specific surveys are required as described in Annex A which will be used to develop, calibrate and validate the models however data collected from previous metocean surveys may also be utilised. In particular, to define parameters in the sediment transport models a survey would help classify the sediment substrata in the proposed development. Further, a detailed desktop data review has been undertaken to gather other relevant data which will support the baseline characterisation and assessment.	Numerical modelling (see details in section 5.1.9) will be undertaken to provide an overview of the potential impacts to marine processes relating to the various activities of the Proposed Development. Further details of this modelling are presented in section 5.1.9 below.

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
				effect will not be assigned within the marine processes assessment.		
Presence of infrastructure may lead to changes to tidal currents, wave climate, littoral currents and sediment transport. Infrastructure may also result in changes to sediment transport pathways.	✓	✓	✓	Infrastructure relating to the Proposed Development includes wind turbine structures, mooring lines/ floating substructure installation (foundations), export cables and associated scour protection. The interaction of the wind turbine infrastructure and the wave/ tidal regime may result in a reduction to wave energy and changes to hydrography. This in turn has the potential to impact upon adjacent physical coastal features and sediment transport patterns supporting marine morphology. Cable protection at the landfall has the potential to impact on the physical environment at the shoreline. Infrastructure retained following decommissioning activities at the landfall have the potential to impact on the physical environment at the shoreline.	As above.	The potential impact of the Proposed Development on coastal features and will be informed by the Marine Processes numerical modelling outlined in the proposed approach to EIA. A qualitative assessment of impact on key coastal features will be presented within the Marine Processes section of the ES.

5.2.5 POTENTIAL IMPACTS AFTER THE IMPLEMENTATION OF DESIGNED IN MEASURES

A range of potential impacts on marine processes have been identified which may occur during the construction, operation and maintenance, and/or decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in insert reference

At this stage, no potential impacts have been scoped out of the assessment.

5.2.6 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

Specific to the marine processes EIA, the following guidance documents will also be considered:

- Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Marine Processes Numerical Modelling Assessments (Pye, Blott, & Brown, 2017);
- Guidance on Best Practice for Marine and Coastal Marine Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects (Brooks, Whitehead, & Lambkin , 2018);
- Collaborative Offshore Wind Energy Research into the Environment (COWRIE) - Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide (Lambkin, Harris, Cooper, & Coates, 2009); and
- Guidelines in the use of metocean data through the lifecycle of a marine renewable's development (Cooper, Saulter, & Hodgetts, 2008).
- RPS (2019). Review of cable installation, protection, mitigation and habitat recoverability.

To support the development of the marine processes EIA, a numerical modelling study is planned. This model will be used to assess the magnitude and significance of changes to several processes, including:

- tidal currents;
- wave climate;
- littoral currents;
- sediment transport; and
- potential increases in suspended sediment concentrations.

The numerical modelling study will be used to model baseline wave climate, tidal flows and sediment transport, using a model which, whilst providing sufficient detail to simulate the necessary parameters, is also computationally efficient by utilising a flexible mesh comprised of the most up-to-date bathymetric data including project specific survey data and published datasets (Table 5.1). The computational model applied in the baseline study will be amended to include the impact of the wind turbine offshore floating platforms with associated scour and cable protection to quantify the change in sediment transport and wave climate.

Similarly, sediment will be released into the water column to replicate the construction phase works during the installation of the inter-array and offshore export cabling and the sediment dispersion and fate will be gauged. This also extends to the material released into the water column from the cable laying. There will be plume models associated with cable and foundation installation.

Modelling will be validated using all available data sources, including site specific bathymetry survey, and met ocean data as noted in Annex A.

The computational modelling will quantify the potential impacts of the installation (including seabed preparation activities) and ongoing operational effects on the tide, wave and sediment transport processes. It will also provide the transport and fate of any material released into the water column as part of the installation works.

The results of this numerical modelling will be used to support the impact assessments within the ES for the topics below:

- benthic subtidal and intertidal ecology;

- fish and shellfish ecology;
- marine mammals;
- marine archaeology and ordnance; and
- Infrastructure and other users.

5.2.7 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development on Marine Processes are considered to be localised to within the footprint of the Proposed Development, there is potential for the predicted impacts to interact with impacts from other projects and activities in the regional benthic subtidal and intertidal ecology study area and lead to a cumulative effect on receptors. Therefore, a cumulative effects assessment will be carried out in a 30 km envelope around the Proposed Development as part of the ES. This 30 km envelope is approximately double the size of a typical tidal excursion in this area.

5.2.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

5.2.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of marine processes?
- Do you agree that all receptors and impacts have been identified for marine processes?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

5.3 NCW 2 PROJECT

5.3.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of the marine processes of relevance to the proposed NCW 2 Project. Considering the potential effects, the development could have on those marine processes identified below during the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the Mean High-Water Spring (MHWS) mark.

For the purposes of this Offshore Scoping Report and subsequent Offshore ES, marine processes are defined as encompassing the following elements:

- tidal elevations and currents;
- waves;
- bathymetry;
- geology and seabed sediments;
- suspended sediments; and
- sediment transport.

The parameters listed above are collectively referred to as ‘marine processes’ through the remainder of this Offshore EIA Scoping Report.

5.3.2 STUDY AREA

The NCW 2 Project in the North Channel is illustrated in Figure 5.7 and shows:

- The proposed Development Array Area (DAA)
- the proposed ECC AoS;
- landfall area; and
- seabed and coastal areas within the proposed study area that may be influenced by changes to marine processes due to the Proposed Development.

The Marine Processes Study Area extends in excess of one tidal excursion from the Proposed Development boundary and would therefore encapsulate the distance suspended sediment is transported prior to being carried back on the returning tide, however the numerical modelling model domain would extend further and identify any potential impacts which may arise beyond the study area.

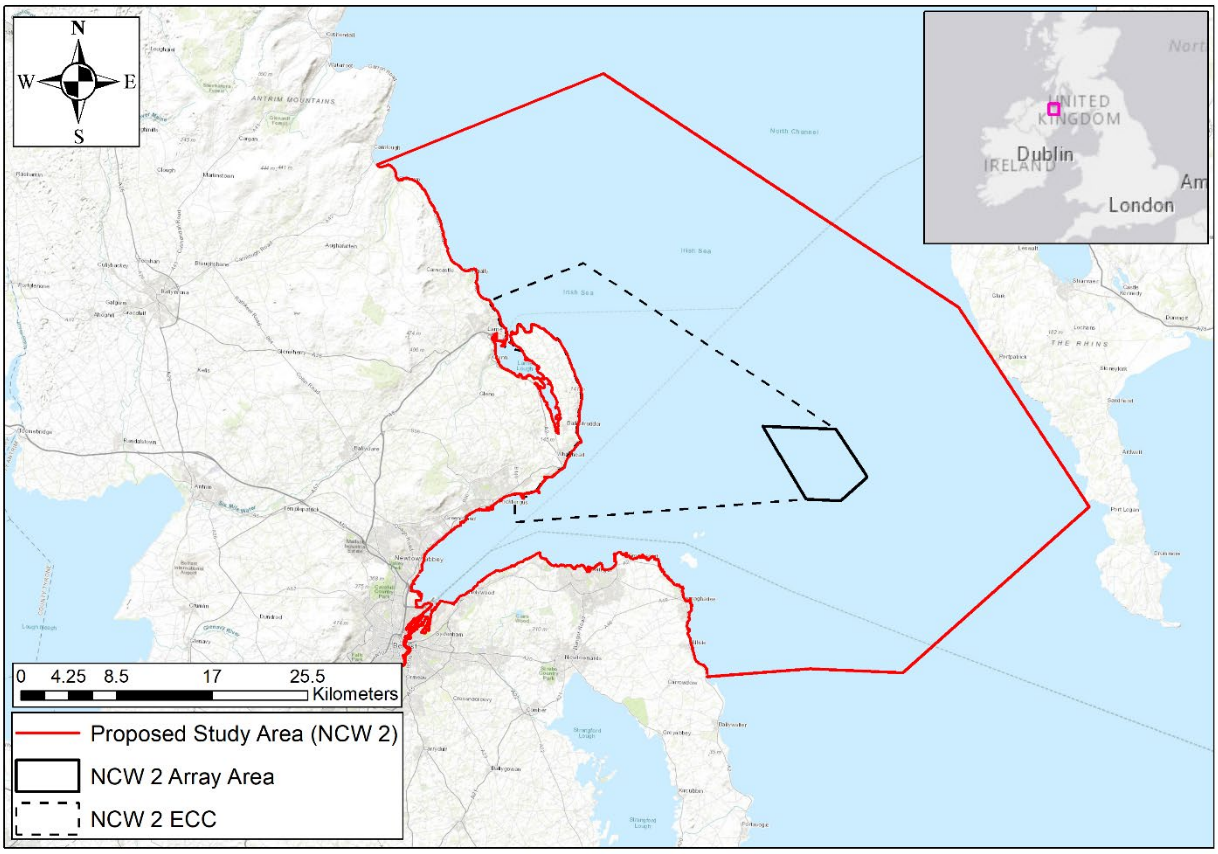


Figure 5.7: North Channel Wind 2 (NCW 2) Proposed Development Array Area, Export Cable Corridors (ECC) Areas of Search (AoS) and Study Area

5.3.3 BASELINE ENVIRONMENT

This section provides a concise summary of the baseline environment of the proposed NCW 2 Project. This baseline is established on a review of bathymetry, tidal regime, meteorological information, wave climate and seabed sediments from a desktop study on key reports and datasets available.

Tidal elevation and currents

The UKHO states that the mean tidal range at the Carrickfergus Standard Port is approximately 2.9 m, however, this may vary significantly due to the location of the UKHO gauging station and the Proposed Development.

Tidal stream conditions as per Admiralty charts (54°41'.7N, 5°28'.2W) near the NCW 2 Project are characterised by peak current speeds of 3.5 kn during spring and 2.4 kn during neap tides. With the ebb tide flowing in the north westerly direction and the flood tide in a south easterly direction.

Wind and waves

Wind parameters were extracted between the years of 1979-2019 from the Climate Forecast System Reanalysis (CFSR) model at an offshore wave point in the North Channel. For the same location in the North Channel, offshore wave data from 1979-2019 were extracted from a deterministic atmospheric model which is coupled with a wave model allowing two-way interaction between wind and waves. This model is run by the European Centre of Medium Range Weather Forecasts (ECMWF), a research institute and a 24/7 operational service, that produces global numerical weather data for the European Union and broader community.

Conditions within the North Channel are dominated by swell waves from the Atlantic approaching from the north-west and also wind waves from the south generated by the large open fetch within the Irish Sea.

The greatest wave heights are observed during winter in December and January when the average significant wave heights of c.1.20 m are c.36% greater than the annual average wave height of c.0.88 m.

A summary analysis of the offshore wave conditions near the Proposed Array Area is presented in Annex A.

Bathymetry

The bathymetry of the NCW 2 DAA is described as a smooth seabed however there is a single deep channel 15 m to 20 m that extends from the north-west to the south-east of the DAA (OWC, 2022). To the east of the DAA is Beaufort's Dyke, a natural trench 200 m to 300 m deep within the Northern Channel running parallel between Northern Ireland and Scotland (OWC, 2022). The water depth of the proposed DAA ranges between c.114 m to 183 m relative to LAT, averaging 140 m to 150 m in the single channel.

As illustrated in Figure 5.8, the proposed ECC AoS is situated at LAT on the landside and reaching a depth of c.156 m below LAT at the offshore terminus.

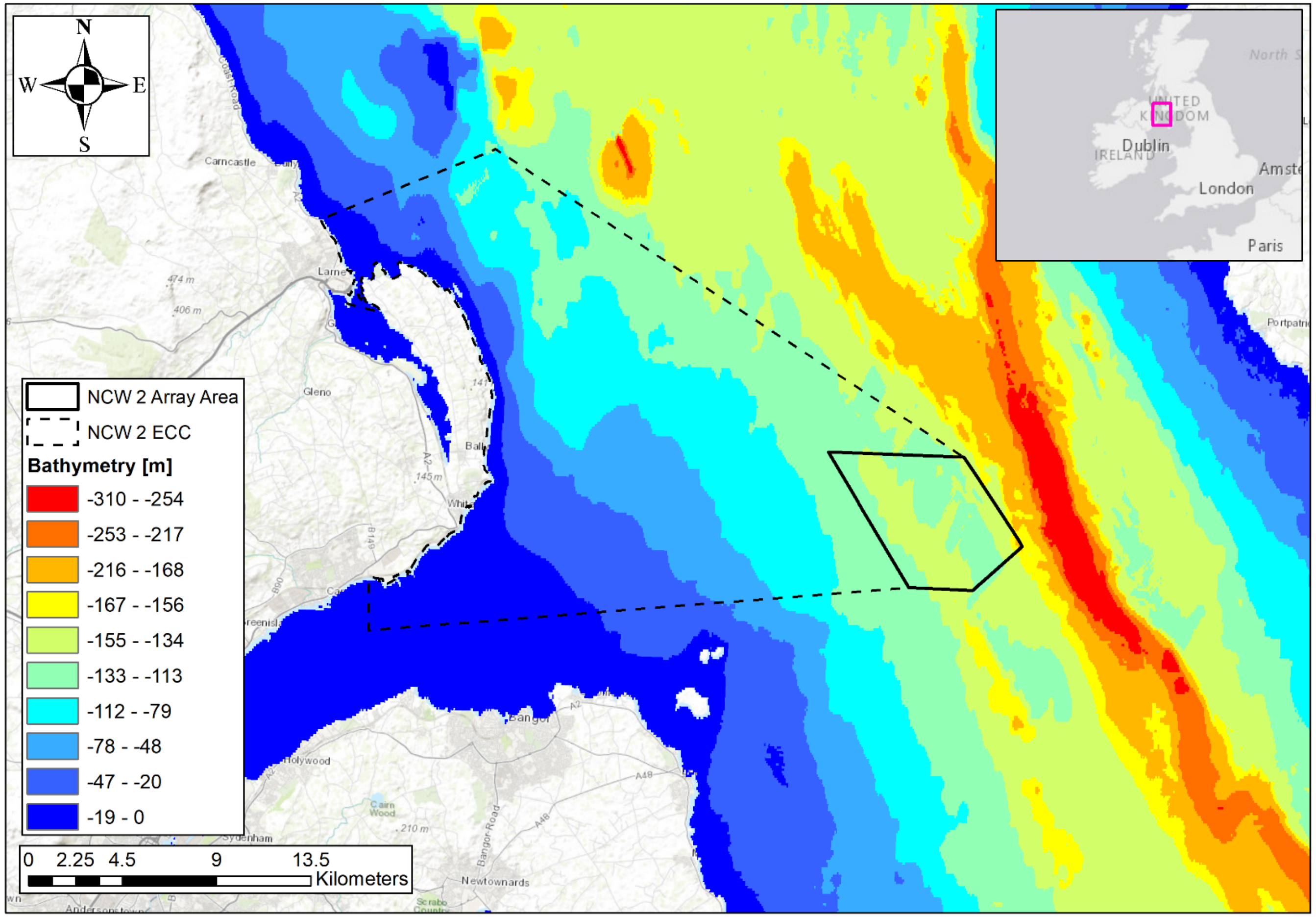


Figure 5.8: Bathymetry at NCW 2 Proposed Development Array Area and Export Cable Corridors relative to LAT

Geology

Information regarding the geology of the Proposed Development allows for an understanding of the origin and stability of the seabed, and the conditions which will be encountered during the installation of offshore floating foundation, array cables, offshore export cables or any other elements associated with this development.

The general geology of the North Channel consists of Permo-Triassic bedrock which has irregular cover of mobile Quaternary sediments due to the action of strong currents on the seabed (BSG, 1985).Pre-Quaternary and Quaternary sediments are displayed in Figure 5.9 and Figure 5.10 below.

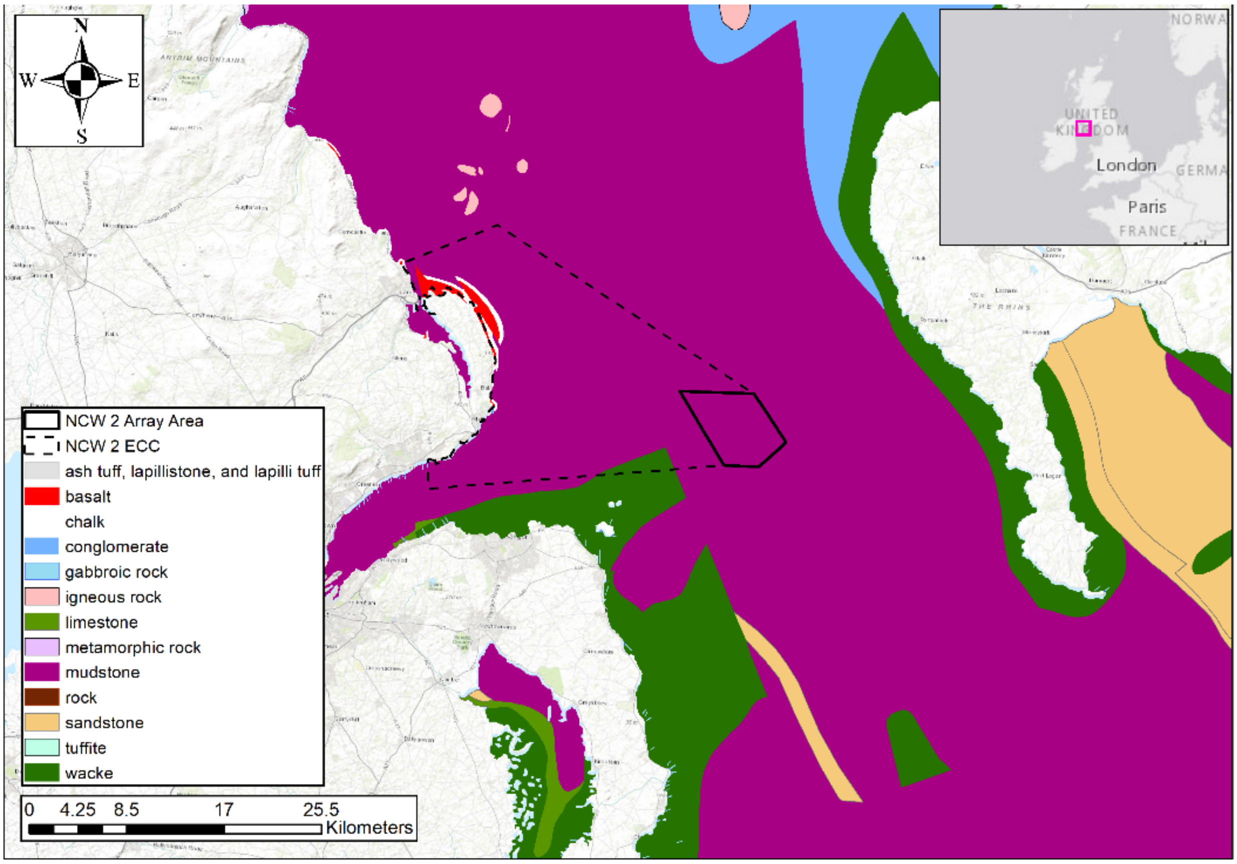


Figure 5.9: Coverage of pre-Quaternary sediments at NCW 2 DAA and ECC AoS

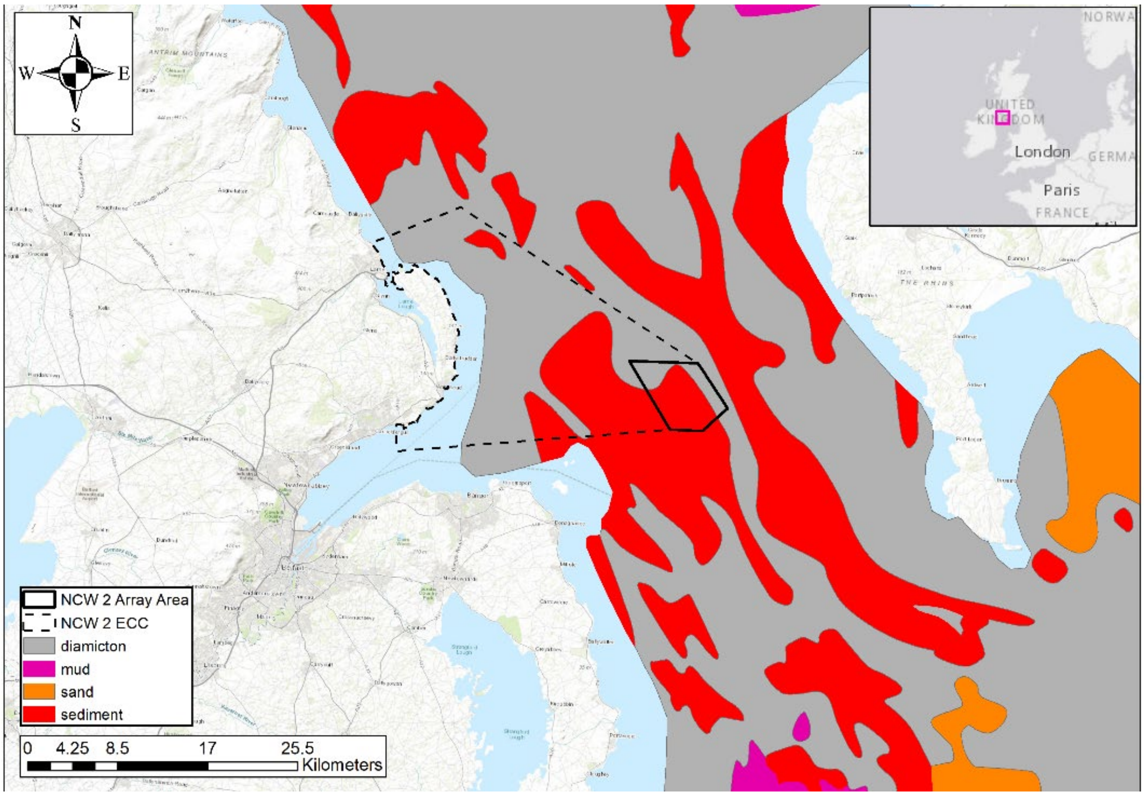


Figure 5.10: Coverage of Quaternary sediments at NCW 2 DAA and ECC AoS

Seabed substrate

Seabed substrate information taken from the EMODnet geology portal is displayed in Figure 5.11.

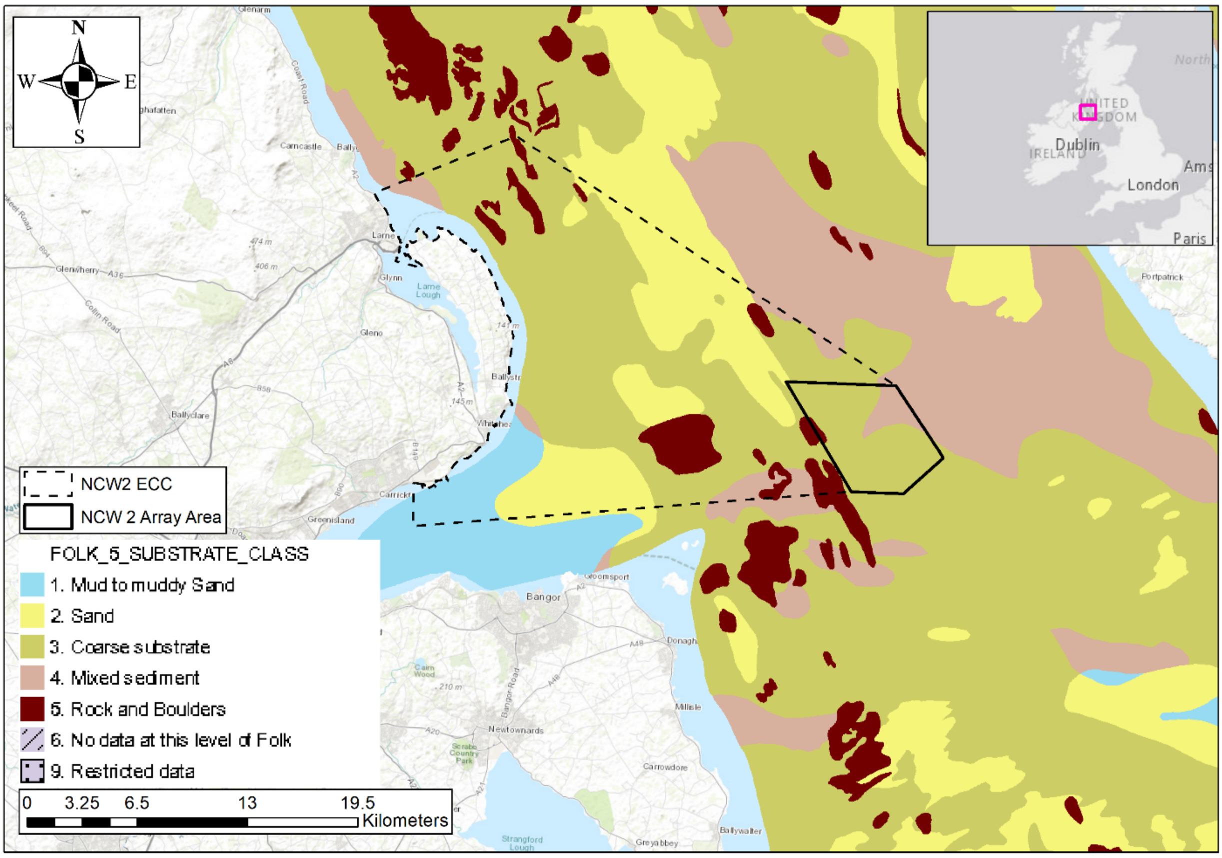


Figure 5.11: Seabed sediment classification at NCW 2 DAA and ECC AoS

<u>Proposed NCW 2 DAA</u>

In the proposed DAA there are isolated patches of rock within the south-west section of the array area including other coarse sediments such as cobles and boulders.

<u>Proposed NCW 2 ECC AoS</u>

The proposed ECC AoS passes through vast patches of coarse surface sediment (e.g., cobbles and boulders) and rocks. However, the sediment substrate underlying the ECC AoS region is predominantly granular in nature ranging from sandy gravel to mud closer inshore.

<u>Landfall</u>

Ballylumford and Kilroot are two onshore grid connection options associated with NCW 2. Ballylumford landfall is south-west of the NCW 2 DAA with superficial sediments comprised of till (diamicton) deposits on a bedrock of mafic lava and mafic tuff (EMODnet, 2022). The landfall option at Kilroot is comprised of mudstone, sandstone and limestone bedrock with marine sediment (clay, silt and sand) and till (diamicton) deposits (EMODnet, 2022).

Suspended Sediment

The Cefas Climatology Report 2016 (CEFAS, 2016) provides the spatial distribution of average non-algal Suspended Particulate Matter (SPM) for most of the UK continental shelf (UKCS).

This study indicates that within the vicinity of the proposed NCW 2 DAA the SPM has been estimated to range between 0 mg/l to 5 mg/l over the 1998 to 2005 period, with higher levels of SPM more common in the winter months.

5.3.4 CONSERVATION SITES

Conservation sites and relevant qualifying interest features identified for the Marine Processes chapter are described in Table 5.4 and presented in Figure 5.12 Relevant qualifying features included in Table 5.4 highlight the receptors which would be assessed as part of the Marine Processes chapter (e.g., sandbanks) and also receptors that Marine Processes support such as marine mammals.

All conservation sites within and surrounding the area of the Proposed Development including qualifying features that could be affected by the construction, operation and maintenance, and decommissioning phases of the Proposed Development were identified using resources from Northern Ireland's Department of Agriculture, Environment and Rural Affairs (https://www.daera-ni.gov.uk/protected-areas) and the Joint Nature Conservation Committee (https://jncc.gov.uk/mpa-mapper/).

Table 5.4: Conservation sites and relevant qualifying features within the study area of the NCW 2 Project

Conservation Site	Relevant Qualifying Features
Red Bay Special Area of Conservation (SAC)	Sandbanks composed of maerl, sub-fossil maerl, coarse sand, gravels and cobbles; and unique to the site is a 2-3m mega ripple of sub-fossil maerl
The Maidens (SAC)	Sandbanks, reefs; and Grey seals
North Channel (SAC)	Harbour porpoise
East Coast Marine proposed Special Protection Area (pSPA)	Important populations of Sandwich, Common and Arctic Tern that feed there during the breeding season
Belfast Lough Open Water Special Protection Area (SPA)	Wintering population of great crested grebe.
Belfast Lough (SPA)	Supporting internationally important numbers of redshank in winter.
Larne Lough (SPA)	Supporting internationally important numbers of light-bellied Brent geese in winter.
Outer Ards (SPA)	Supporting nationally important populations of Arctic tern and golden plover.
Copeland Islands (SPA)	Supporting nationally important populations of Arctic tern and Internationally important Manx shearwater.
Waterfoot (MCZ)	Seagrass beds on subtidal (sublittoral) sands
Ramsar sites	Belfast Lough Larne Lough Outer Ards
Areas of Special Scientific Interest (ASSI)	Ballymacormick Point (flora/fauna) Larne Lough (geology/flora/fauna) Outer Ards (geology/flora/fauna) Outer Belfast Lough (geology/flora/fauna) The Gobbins (geology/flora/fauna) The Maidens (flora/fauna)

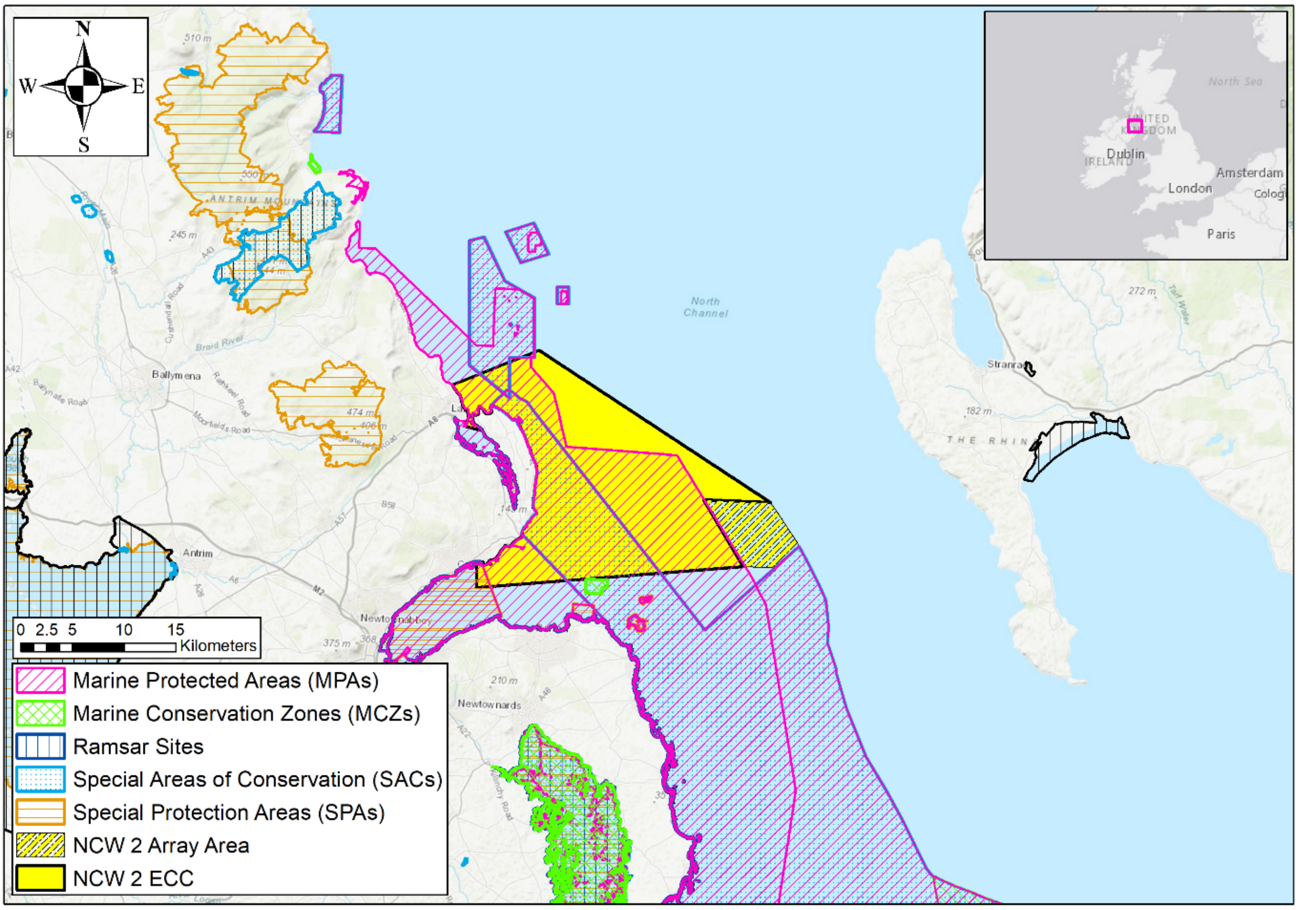


Figure 5.12: Conservation sites in the NCW 2 Project Study Area

5.3.5 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine processes have been identified which may occur during the construction, operation and maintenance, and/or decommissioning phases of the Proposed Development in the absence of designed in measures:

Construction

- Increase in suspended sediments and the potential impact to physical features within the proposed DAA and ECC AoS. Increase in suspended sediments due to construction related activities such as possible seabed preparation activities if required, wind turbine mooring lines/ floating substructure installation (foundations), offshore substation moorings or inter-array and export cable installation and the potential impact to physical features within the proposed DAA and ECC AoS;
- Impacts to hydrodynamics, littoral currents and sediment transport due to cable installation activities and potential impact to physical features at landfall.

Operation and Maintenance

- Impacts to the hydrodynamics (wave/ tidal regime) due to presence of infrastructure in the marine processes study area and the associated potential impacts along adjacent shorelines;
- Impacts to sediment transport and sediment transport pathways due to presence of infrastructure in the marine processes study area and associated potential impacts to physical features (e.g. seabed scour);

- Impacts to hydrodynamics and sediment transport (littoral drift) due to operation and maintenance activities and potential impact to physical features at landfall;
- Ongoing physical disturbance through project life (e.g., scour, maintenance) - Ongoing seabed disturbance may be generated by moorings, scour around cables, anchors and foundations, and the need to remediate issues. Such disturbance would be a function of localised hydrographic and sedimentary process changes around the structures and the nature of the seabed sediments and be limited to the immediate area around the infrastructure.

Decommissioning

- Increase in suspended sediments due to decommissioning related activities such as cable removal and the potential impact to physical features within:
  - the proposed DAA;
  - the proposed ECC AoS
- Impacts to hydrodynamics, littoral currents, and sediment transport due to any retained infrastructure and potential impact to physical features at landfall.

Table 5.5: Potential Impacts Proposed to be scoped into the Proposed Development Assessment for Marine Processes

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
Increased suspended sediment concentrations and associated deposition on physical features as a result of the following activities: • seabed preparation; • foundation installation; • cable installation; • maintenance activity; and decommissioning.	✓	✓	✓	There is potential for increased SSCs, and associated deposition associated with seabed preparation activities, foundation installation and cable installation activities, and associated deposition associated with decommissioning activities. This assessment will consider the potential impacts arising due to changes in SSC and deposition, to physical coastal features and marine morphology. Elevations in SSC and subsequent deposition of disturbed sediments also have the potential to result in adverse and indirect impacts on a variety of receptor groups which lie in other Offshore ES topics, such as benthic subtidal and intertidal ecology, fish and shellfish ecology, marine mammals, marine archaeology and infrastructure and other users. For these receptor groups, a significance of effect will not be assigned within the marine processes assessment. The designed in measures discussed within section 2 will reduce the potential impact arising from this impact pathway.	Site specific surveys are required as described in Annex A which will be used to develop, calibrate and validate the models however data collected from previous metocean surveys may also be utilised. In particular, to define parameters in the sediment transport models a survey would help classify the sediment substrata in the proposed development. Further, a detailed desktop data review has been undertaken to gather other relevant data which will support the baseline characterisation and assessment.	Numerical modelling as set out in the proposed approach to EIA will be undertaken to provide an overview of the potential impacts to marine processes relating to the various activities of the Proposed Development. Further details of this modelling are presented below.
Presence of infrastructure may lead to changes to tidal currents, wave climate, littoral currents and sediment transport. Infrastructure may also result in changes to sediment transport pathways.	✓	✓	✓	Infrastructure relating to the Proposed Development includes wind turbine structures, mooring lines/ floating substructure installation (foundations), export cables and associated scour protection. The interaction of the wind turbine infrastructure and the wave/ tidal regime may result in a reduction to wave energy and changes to hydrography. This in turn has the potential to impact upon adjacent physical coastal features and sediment transport patterns supporting marine morphology.	As above.	The potential impact of the Proposed Development on coastal features and will be informed by the Marine Processes numerical modelling to be undertaken as set out in the proposed approach to EIA . A qualitative assessment of impact

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
				Cable protection at the landfall has the potential to impact on the physical environment at the shoreline. Infrastructure retained following decommissioning activities at the landfall have the potential to impact on the physical environment at the shoreline.		on key coastal features will be presented within the Marine Processes section.

5.3.6 POTENTIAL IMPACTS AFTER THE IMPLEMENTATION OF DESIGNED IN MEASURES

A range of potential impacts on marine processes have been identified which may occur during the construction, operation and maintenance, and/or decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 5.6.

At this stage, no potential impacts have been scoped out of the assessment.

5.3.7 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

Specific to the marine processes EIA, the following guidance documents will also be considered:

- Advice to Inform Development of Guidance on Marine, Coastal and Estuarine Marine Processes Numerical Modelling Assessments (Pye, Blott, & Brown, 2017);
- Guidance on Best Practice for Marine and Coastal Marine Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects (Brooks, Whitehead, & Lambkin , 2018);
- Collaborative Offshore Wind Energy Research into the Environment (COWRIE) - Coastal Process Modelling for Offshore Wind farm Environmental Impact Assessment: Best Practice Guide (Lambkin, Harris, Cooper, & Coates, 2009); and
- Guidelines in the use of metocean data through the lifecycle of a marine renewable's development (Cooper, Saulter, & Hodgetts, 2008).
- RPS (2019). Review of cable installation, protection, mitigation and habitat recoverability.

To support the development of the marine processes EIA, a numerical modelling study is planned. This model will be used to assess the magnitude and significance of changes to several processes, including:

- tidal currents;
- wave climate;
- littoral currents;
- sediment transport; and
- potential increases in suspended sediment concentrations.

The numerical modelling study will be used to model baseline wave climate, tidal flows and sediment transport, using a model which, whilst providing sufficient detail to simulate the necessary parameters, is also computationally efficient by utilising a flexible mesh comprised of the most up-to-date bathymetric data including project specific survey data and published datasets. The computational model applied in the baseline study will be amended to include the impact of the wind turbine offshore floating platforms with associated scour and cable protection to quantify the change in sediment transport and wave climate.

Similarly, sediment will be released into the water column to replicate the construction phase works during the installation of the inter-array and offshore export cabling and the sediment dispersion and fate will be gauged. This also extends to the material released into the water column from the cable laying. There will be plume models associated with cable and foundation installation.

Modelling will be validated using all available data sources, including site specific bathymetry survey, and met ocean data such as those noted in Annex A.

The computational modelling will quantify the potential impacts of the installation (including seabed preparation activities) and ongoing operational effects on the tide, wave and sediment transport processes. It will also provide the transport and fate of any material released into the water column as part of the installation works.

The results of this numerical modelling will be used to support the impact assessments within the Offshore ES for the topics below:

- benthic subtidal and intertidal ecology;
- fish and shellfish ecology;

- marine mammals;
- marine archaeology and ordnance; and
- Infrastructure and other users.

5.3.8 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development on Marine Processes are considered to be localised to within the footprint of the Proposed Development, there is potential for the predicted impacts to interact with impacts from other projects and activities in the regional benthic subtidal and intertidal ecology study area and lead to a cumulative effect on receptors. Therefore, a cumulative effects assessment will be carried out in a 30 km envelope around the Proposed Development as part of the ES. This 30 km envelope is approximately double the size of a typical tidal excursion in this area.

5.3.9 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

5.3.10 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of marine processes?
- Do you agree that all receptors and impacts have been identified for marine processes?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

5.3.11 NEXT STEPS

In this section the proposed topic specific next steps are summarised below:

Define the baseline environment and assessment approach:

- Present evidence base, baseline characterisation (including coastal processes) to stakeholders and agree on impacts and receptors to be scoped in/out of the Offshore ES.

Assessment of Marine Processes potential impacts through the EIA process:

- Present Maximum Design Scenarios and impact assessment approach including sensitivity of receptors, method of quantifying impacts and approach to hydrodynamic and hydro-sedimentary modelling to stakeholders; and
- Discuss initial findings of impact assessment, appropriate mitigation and monitoring with stakeholders.

6. SUBSEA NOISE

6.1 NCW 1 & NCW 2 PROJECT

6.1.1 INTRODUCTION

This section of the Scoping Report identifies the elements of subsea noise of relevance to the proposed North Channel Wind 1 (NCW 1) and North Channel Wind 2 (NCW 2) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Study Area.

Sources of subsea noise and vibration during the construction phase may arise during foundation installation (e.g., piling or drilling), clearance of unexploded ordnance (UXO), cable installation activities (e.g., dredging or trenching), and vessel movements during all phases of the proposed development.

During construction, pin pile foundations installed by piling generates high amplitude, impulsive noise whilst installation using drilling or piling generates lower amplitude underwater noise (Aquatera, 2011). The installation procedure differs depending on the type of the floating offshore wind (FOW) used: floating wind platforms can be ballast stabilised, buoyancy stabilized, mooring stabilised or combinations of these (Leimeister *et al*. 2018, Banister 2017, Booij *et al*. 1999). At this scoping stage, precise details of the type of platform and installation approach are unknown. Pre-construction, there may be a requirement to undertake UXO clearance and the preferred approach will be via low-order techniques (e.g., deflagration) although noting that there is an inherent (low) risk that this could result in an accidental high order detonation. Other sources of noise during construction are those associated site preparation activities and installation of inter-array and export cables and include, for example, boulder clearance, sand wave clearance, trenching, and dredging.

For an operational turbine the primary source of underwater sound is vibration of the wind turbine's gear box and generator, which is transmitted down the tower and radiated as underwater sound from the tower wall. Sources of subsea noise during the decommissioning phase may include those associated with the removal of subsea structures.

Noise cavitation from marine vessel engines contribute to the potential for elevations in subsea noise during all phases of the Proposed Development. A range of different vessels are typically associated with offshore wind developments including main installation vessels, barges, tugs/anchor handlers, guard vessels, cable installation vessels, crew transfer vessels, and scour protection vessels.

This section also considers sources of noise which may originate in the intertidal area (between MLWS and MHWS), such as intertidal drilling associated with cable laying activities, which may impact offshore receptors.

A subsea noise technical appendix will be included in the ES and will provide an assessment of the level of subsea noise generated from the Proposed Development, and will be used within the impact assessment of the following receptor chapters:

- fish and shellfish ecology; and
- marine mammals.

6.1.2 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of baseline datasets in the form of both pre-existing specific datasets.

6.1.3 BASELINE ENVIRONMENT

Background or "ambient" subsea noise is created by several natural sources, such as rain, breaking waves, wind at the surface, seismic noise, biological noise and thermal noise. Biological sources include marine mammals (using sound to communicate, build up an image of their environment and detect prey and predators) as well as certain fish and shrimp.

Anthropogenic sources of noise in the marine environment include fishing boats, ships, industrial noise, seismic surveys and leisure activities, all of which add to ambient background noise. Anthropogenic noise within the vicinity of the Proposed Development (NCW 1 & 2)) is likely to arise primarily from shipping, which is discussed in Chapter12.

Research relating to both physiological effects and behavioural disturbance of noise on marine receptors is typically based on determining the absolute noise level for the onset of that effect. Consequently, the criteria for assessing the effects of noise on marine mammals and fish tend to be based on the absolute noise criteria, rather than the difference between the baseline noise level and the noise being assessed. The value of establishing the precise baseline noise level is somewhat diminished due to the lack of evidence-based studies on the effects of noise, relative to background on marine receptors.

Underwater noise modelling will determine the spatial extent of the impact area associated with sources of impulsive and non-impulsive subsea noise. For fish, the subsea noise assessment will reference the injury and behavioural thresholds described in Popper et al., (2014) which provide both quantitative and qualitative guidance in relation to difference fish hearing groups. Additional, topic specific guidance looking at the behavioural responses of fish and shellfish in literature include Hawkins (2006), Nedwell et al., (2007), Popper and Hastings (2009). For marine mammals, the subsea noise modelling will reference to the most up to date guidance and injury criteria described in Southall et al., (2019) using a dual metric approach (i.e., unweighted peak sound pressure and marine mammal hearing weighted cumulative sound exposure). Behavioural thresholds are not fully understood for marine mammals but options for assessing potential behavioural effects will be discussed and agreed through consultation and could typically be based on the National Marine Fisheries Service (NMFS) guidance for ‘Level B harassment (strong disturbance) (NMFS, 2005) or a proportional ‘dose-response’ approach based on empirical evidence from Beatrice Offshore Wind Farm (Graham et al., 2019). Both are widely accepted and applied approaches at UK offshore wind farms.

It is important to understand that baseline noise levels will vary significantly depending on multiple factors, such as seasonal variations and different sea states. Therefore, there is very limited value in establishing such values. However, when undertaking an appraisal of underwater noise, it can be helpful to understand the range of noise levels likely to be prevailing within an area so any noise predictions can be placed in the context of the baseline.

Further, it is important to note the lack of scientific understanding with regard to how various species distinguish anthropogenic sound relative to masking noise. Therefore, it is necessary to exercise considerable caution if attempting any comparison between subsea noise from the Proposed Development and the baseline noise level.

6.1.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 6.1 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to subsea noise that have been scoped out of the assessment are described in Table 6.2.

Table 6.1: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Subsea Noise. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Noise-related impacts to marine receptors associated with pile-driving including injury and behavioural effects.	✓			The Proposed Development may require pin-piled anchors as a part of the mooring systems of the FOW array. This activity would constitute the greatest noise source associated with construction. Piling noise can have important impacts on marine species habitat-use and distribution and in turn may impact predatory species and have impacts on the food chain. The evidence base suggests that the risk of injury is generally limited spatially, and any effects of disturbance are short-term and temporary. Additional mitigation (e.g., Acoustic Deterrent Devices (ADDs)) will be considered to further reduce injurious effects	Based on maximum adverse scenario (i.e., largest hammer energy and largest diameter pile) that could lead to the greatest area of effect for injury and disturbance	Noise modelling for maximum adverse scenario based on published and agreed thresholds required for this impact.
Noise-related impacts to marine receptors due to clearance of UXOs	✓			Underwater noise from clearance of UXOs may affect sensitive species, particularly in relation to physical or auditory injury. Additional mitigation will be applied to reduce these risks (e.g., ADDs and soft start charges)	Based on maximum size of UXO and maximum number likely to be encountered in site. Assumed to be cleared using low-order techniques with small, inherent risk of high-order detonation	Noise modelling for both low order and high order detonation as well as any mitigation and soft start based on published and agreed thresholds required for this impact.
Noise-related impacts to	✓		✓	Underwater noise from other construction or decommissioning activities may affect sensitive	Based on range of different activities	Noise modelling for range of activities based on published and

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
marine receptors associated with other activities during construction and decommissioning (e.g., drilling, trenching, dredging, cutting etc)				marine species. Most noise sources in this category will be low-level continuous noises and likely to result in localised, short-term and temporary effects.	associated with construction and decommissioning of the Proposed Development	agreed thresholds required for this impact
Noise-related impacts to marine receptors associated with vessel movements	✓	✓	✓	Underwater noise from a range of different vessel types may affect sensitive marine species.	Based on suite of different vessels typically used at each phase of Proposed Development	Noise modelling for range of vessels based on published and agreed thresholds required for this impact

Table 6.2: Potential Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Subsea Noise

Potential Impact	Justification
Operation and Maintenance	
Effects of operational noise on sensitive marine receptors (marine mammals and fish and shellfish)	Disturbance to marine mammal species and migratory fish populations, especially salmon and sea trout, caused by underwater noise generated by floating turbines is not likely to be at significant levels above ambient noise levels in the area. This area is a heavily used shipping channel and therefore the noise generated during operation and maintenance is not expected to surpass the existing ambient levels. Based on this the impact has been scoped out of further assessment.

6.1.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The subsea noise assessment will follow the methodology set out in Chapter 3. Specific to the subsea noise assessment, the following guidance documents will also be considered:

- Good practice guide to underwater noise measurement (National Physics Laboratory (NPL), 2014);
- Marine mammal noise exposure criteria: Updated scientific recommendations for residual hearing effects (Southall et al., 2019);
- 2018 Revision to: Technical guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. (NMFS, 2018).
- Sound exposure guidelines for Fishes and Sea Turtles (Popper et al., 2014);
- The EU Marine Strategy Framework Directive (Directive 2008/56/EC). This seeks to achieve good environmental status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include "Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment." This Directive has been transposed into UK law by the Marine Strategy Regulations 2010; and
- NPS EN-1 Section 5.11, noise and vibration (DECC, 2011a).

6.1.6 POTENTIAL CUMULATIVE EFFECTS

Consideration shall be given to cumulative effects from subsea noise, particularly during construction-related piling activities and other noise producing activities. Due to limitations on availability of data from other projects it will not be possible to undertake quantitative modelling of cumulative noise arising from the Proposed Development and other projects in the subsea noise assessment. However, the potential for cumulative effects will be considered in the relevant topic receptors chapters. For those other projects scoped into the CEA, relevant details from subsea noise assessments, including construction windows, will be compiled to inform the topic receptor chapters.

6.1.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential subsea noise effects beyond the footprint of the Proposed Development across boundaries.

6.1.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of subsea noise?
- Do you agree that all receptors and impacts have been identified for subsea noise?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

7. BENTHIC SUBTIDAL AND INTERTIDAL ECOLOGY

7.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of data sources which provide coverage of or relevance to the Proposed Development. These are summarised in Table 7.1

Table 7.1: Summary of Key Desktop Datasets and Reports

Title	Source	Year	Author
Northern Ireland Marine Map Viewer	Department of Agriculture, Environment and Rural Affairs (DAERA)	2022	Department of Agriculture, Environment and Rural Affairs (DAERA) (2022a)
Northern Ireland Sublittoral Survey (NISS) (1982- 1985)	Department of the Environment (Northern Ireland) (DOE)	1986	Erwin et al. (1986)
Northern Ireland Littoral Survey (NILS) 1984-1988	DOE	1988	Wilkinson et al. (1988)
Sublittoral Survey Northern Ireland (SSNI) (2006)	DAERA	2006-2008	Goodwin et al. (2011)
DAERA Waterfoot pMCZ support spyball surveys (2016).	DAERA	2016	No report provided.
Seasearch Northern Ireland volunteer dives (2008- 2012)	Seasearch	2008 - 2012	SeaSearch 2008; 2009, 2012.
Relevant documents for Outer Belfast Lough MCZ, Clyde Sea Sill MPA, Red Bay SAC, Maidens SAC, Waterfoot MCZ to be reviewed.	Various	Various	DAERA, NatureScot,
The Marine Scotland National Marine Plan Interactive (NMPi) maps	Marine Scotland	2019	Marine Scotland for the Scottish Government

Title	Source	Year	Author
Descriptions of Scottish Priority Marine Features (PMFs)	NatureScot (Formerly SNH)	2016	Scottish National Heritage
A synthesis of current information on the benthic environment and the benthic communities and associations of the SEA 6 area	Scottish Association for Marine Science (SAMS)	2005	Wilding et al. (2005)
A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed	Centre for Environment, Fisheries and Aquaculture Science (Cefas)	2017	Cooper and Barry
EUNIS Habitats from the EUSeaMap	EUSeamap	2021	EMODnet – Seabed Habitats
JNCC MPA mapper	Joint Nature Conservation Committee (JNCC)	2022	JNCC (2022a)
Benthic infaunal abundance and biomass from Belfast Lough dredge disposal monitoring operations 2017 and 2018.	Marine Environmental Data and Information Network (MEDIN)	2017 to 2018	Agri-Food and Biosciences Institute (AFBI) (2019)
Infaunal abundance and biomass data from surveys of the East Antrim Maerl bed in 2004	MEDIN	2004	Lear D (2019): Infaunal abundance and biomass data from surveys of the East Antrim Maerl bed in 2004. v1.0. Marine Biological Association. Dataset/Sampling event. https://doi.org/10.17031/mu7fpl
Synthesis of Information on Benthos of Area SEA 6 (Strategic Environmental Assessment area 6)	Department for Business, Energy & Industrial Strategy (BEIS)	2005	Department of Energy and Climate Change (Now BEIS)
UK Offshore Energy Strategic Environmental Assessment 3 (OESEA3)	Department for Business, Energy & Industrial Strategy (BEIS)	2016	Department of Energy and Climate Change (Now BEIS)
Marine Monitoring Method Finder	Joint Nature Conservation Committee (JNCC)	2016	JNCC
Review of environmental data associated with post-consent monitoring of	Marine Management Organisation (MMO)	2014	Marine Management Organisation (MMO)

Title	Source	Year	Author
licence conditions of offshore wind farms			
Benthic monitoring and sampling design and effort to detect spatial changes: a case study using data from offshore wind farm sites	https://hydra.hull.ac.uk/assets/hull:10951/content	2015	Anita Franco1, Victor Quintino , Michael Elliott
Guidance on Marine Baseline Ecological Assessments & Monitoring Activities for Offshore Renewable Energy Projects (Parts 1 and 2)	Department of the Environment, Climate and Communications	2020	Department of the Environment, Climate and Communications
Survey report detailing the distribution and extent of methane-derived authigenic carbonate within the SEA 6 area	Department of Trade and Industry (DTI) now Department for Business, Enterprise and Regulatory Reform (BERR) and Department for Innovation (DIUS)	2005	Judd (2005)

7.2 NCW 1 PROJECT

7.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the benthic subtidal and intertidal ecology of relevance to the proposed North Channel Wind 1 (NCW 1) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the benthic subtidal and intertidal ecology.

7.2.2 STUDY AREA

To support the development of the benthic subtidal and intertidal ecology EIA chapter, two study areas are defined, with both shown in Figure 7.1 :

- Proposed Development benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the Proposed Development – North Channel Wind 1 (North site). This is the area which will be directly impacted by the offshore infrastructure and the area within which site-specific surveys (drop-down video and grab sampling) are taken and will include baseline characterisation and identification of benthic receptors against which potential impacts associated with the Proposed Development will be assessed. It may be further refined during the EIA phase in response to the physical modelling, to encompass the maximum tidal excursion (estimated at 10-15 km); and
- Regional benthic subtidal and intertidal ecology study area: this is defined as the area from the headland of Strangford Loch to Mull of Galloway, and Fair Head to Mull of Kintyre. The regional benthic subtidal and intertidal ecology study area will be characterised by desktop data and will provide a wider context to the site-specific data collected within the Proposed Development benthic subtidal and intertidal ecology study area.

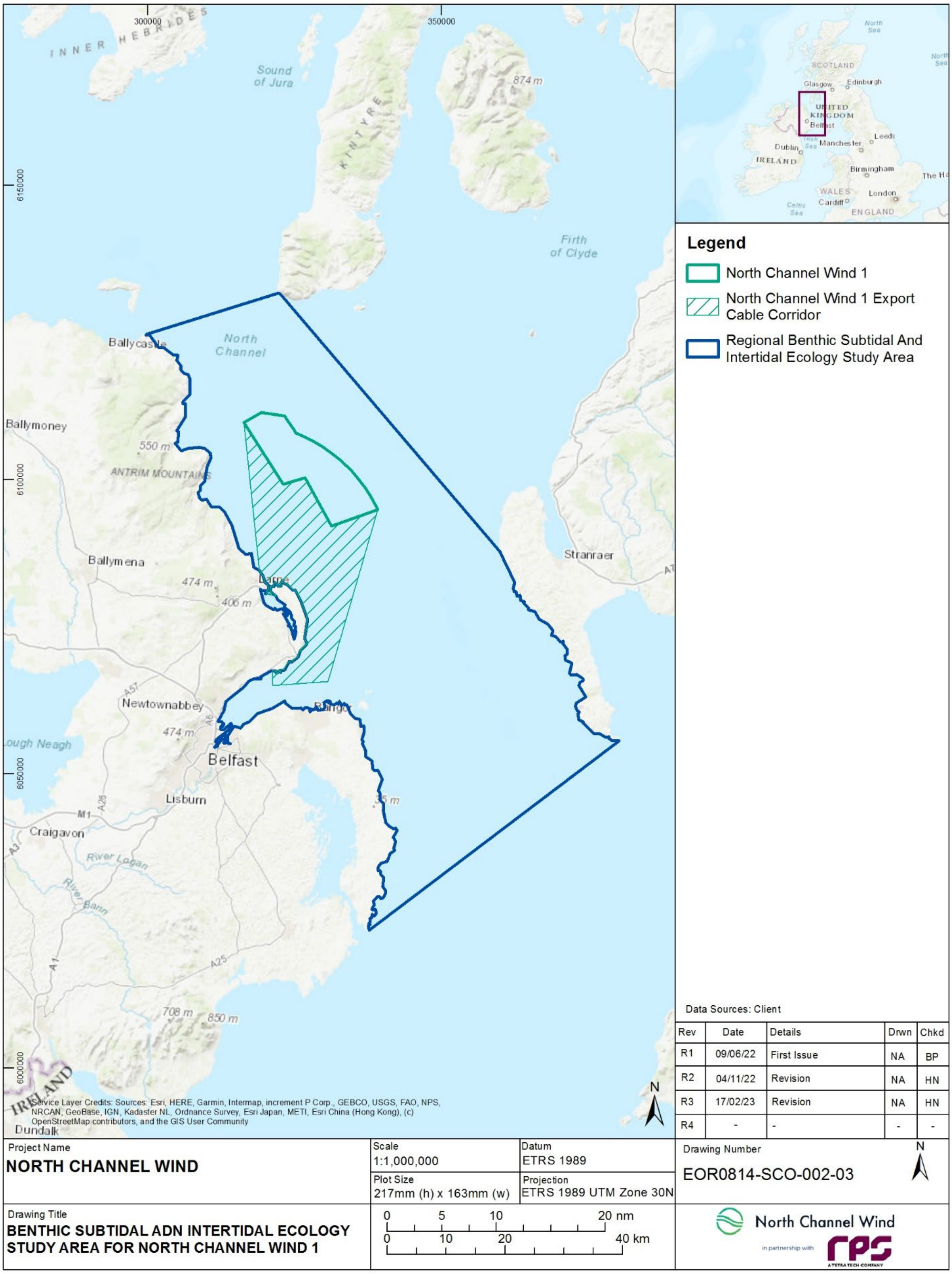


Figure 7.1: Benthic Subtidal and Intertidal Ecology Study Areas and North Channel Wind 1

7.2.3 BASELINE ENVIRONMENT

Regional benthic subtidal and intertidal ecology study area

Within the Regional benthic subtidal and intertidal ecology study area, the majority of the North Channel is between 10 and 40 metres deep but reaches 150 metres at its maximum depth. The seabed is predominantly hard with gravelly sediments, with rocky outcrops and localised enclosed deeps, notably Beaufort's Dyke. Based on the EUSeaMap data of EUNIS 2019 habitat types, the Regional benthic subtidal and intertidal ecology study area is dominated by regions of MD32: Atlantic offshore circalittoral coarse sediment, MD52: Atlantic offshore circalittoral sand and MD42: Atlantic offshore circalittoral mixed sediment. Further inshore towards the coast of Northern Ireland, there are areas of MD12: Atlantic offshore circalittoral rock and MC32: Atlantic circalittoral coarse sediment along the coastline. In Belfast Lough there are areas of MC62: Atlantic circalittoral mud, MD52: Atlantic offshore circalittoral sand, and MC52: Atlantic circalittoral sand. There are areas of biogenic reef, circalittoral rock and biogenic reef, infralittoral rock and biogenic reef off the coast of Northern Ireland. There are areas of hard substrate seabed throughout the North Channel.

Areas of subtidal seagrass Zostera marina are present in the Regional benthic subtidal and intertidal ecology study area – at the edge of Larne Lough Special Protection Area (SPA), to the north end of East Coast Marine pSPA and in Waterfoot Marine Conservation Zone (MCZ). Seagrass beds (both intertidal and subtidal) are currently included in the list of Priority Marine Features (PMFs) for Northern Ireland (DAERA, 2014), and is Priority Habitat under the UK Biodiversity Habitat Action Plan (BAP), on the OSPAR List of Threatened and/or Declining Species and Habitats (declining in Region II – North Sea and Region III – Celtic Sea, and threatened in Region V – Wider Atlantic), an important feature in estuarine sites of special scientific interest (SSSIs, and a sub-feature of Annex I habitats under the Habitats directive.

The Regional benthic subtidal and intertidal ecology study area contains several MCZs designated for benthic habitats. Outer Belfast Lough MCZ is designated for Subtidal (sublittoral) sand and Ocean quahog (Arctica islandica). It is a heterogeneous habitat which incorporates occasional small patches of gravelly muddy sand, which provides an ideal substrate for the ocean quahog (Arctica islandica) and other species such as the masked crab (Corystes cassivelaunus), king scallop (Pecten maximus) and sand burrowing brittlestar (Amphiura brachiata). Historical detailed benthic studies of Belfast Lough have recorded a high variety of species present (Kinahan, 1859) and recent studies have recorded over 580 taxa (Breen and Service, 2002), though some historical sewage inputs had severe impacts on fauna a few decades ago (Parker, 1980).

<u>Designated Sites</u>

Several designated sites with relevant benthic ecology features exist in the Regional benthic subtidal and intertidal ecology study area (refer Figure 7.2 and Table 7.2) including MCZs, MPAs and SACs. Waterfoot MCZ is located in a small embayment offshore from the village of Waterfoot on the east coast of Northern Ireland, located 11.11 km from the Proposed Development. Waterfoot MCZ is designated for Seagrass bed (*Zostera marina*) on Subtidal (sublittoral) sand. The seagrass bed in the MCZ is extensive and in good condition and has been surveyed to determine the boundary for the MCZ, made up of smaller seagrass meadows that appear to be reproductively viable (seed bearing). Records of seagrass meadows in Waterfoot were made during the Northern Ireland Sublittoral Survey (NISS) (1982- 1985), Sublittoral Survey Northern Ireland (SSNI) (2006), Seasearch Northern Ireland volunteer dives (2008- 2012), DOE Waterfoot pMCZ support spyball and diving surveys (2015) and DAERA Waterfoot pMCZ support spyball surveys (2016).

Scottish MPAs in the Regional benthic subtidal and intertidal ecology study area include Clyde Sea Sill MPA located 9.13 km from the Proposed Development, which is designated for circalittoral and offshore sand and coarse sediment communities, as well as marine geomorphology of the Scottish shelf seabed, fronts and black guillemot (*Cepphus grylle*). The seabed at the sill is a dynamic environment and is heavily influenced by the tide, with a distinct gradient in habitat type along the MPA. Coarse and mixed substrates exist off Kintyre, and then rippled fine-medium sands in the centre of the sill, and sandy-mud habitats on the Galloway side. The sands and gravels on the sea floor are moved around, creating sandbank ridges or extensive sand ribbon and sand wave fields.

SACs with relevant benthic components include Red Bay SAC and The Maidens SAC. Red Bay SAC (DAERA, 2017), located 8.36 km from the Proposed Development, is designated for Annex I sandbanks which are slightly covered by seawater at all times. The sandbanks are dominated by 2-3m high mega-ripples of maerl, with live maerl, gravel, cobbles and coarse to fine sand on the crests and sub-fossil maerl in the troughs. The site also supports three extremely rare species of algae which are endemic to maerl; *Cruoria cruoriaeformis*, *Halymenia latifolia* and *Gelidiella calcicola*. Red Bay SAC contains a relatively large area of the rare maerl biotope '*Phymatolithon calcarium* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand', which is listed in Annex V of the EC Habitats Directive (Directive 92/43/EEC). Maerl beds are considered of high conservation interest and PMF for Northern Ireland (DAERA, 2014).

The Maidens SAC (JNCC, 2022b) overlaps the Proposed Development and is designated for Annex I sandbanks which are slightly covered by sea water all the time and reef habitats. Maerl and other long-lived species have been found in the shallow stable sandy gravels. The reefs of the Maidens are in the strongly tidal North Channel and the reefs are Grade A/B in the area, meaning they are outstanding or excellent examples of reefs in a European context. Most of the reef area is bedrock reef with some stony reef areas. The Maidens were recognised during the NISS (Erwin *et al.,*1986) as an area of high biological importance, and a stronghold for several Northern Ireland Conservation Priority (NICP) and PMF species (*Diphasia alata, D. nigra*, *Lytocarpia myriophyllum* and *Halecium plumosum*). The area has been deemed a stronghold for hydroid gardens (containing PMF species *Polyplumaria flabellata* and *Disphasia alata*) and some deeper water sponges (e.g., *Clathria barleei*, *M. elliptichela*). NISS also found three unusual nudibranch species, including *Caloria elegans* and the NICP sea pen *Virgularia mirabilis*.

Table 7.2: Summary of Designated Sites with Relevant Benthic Ecology Features in Proximity to the Proposed Development (North Channel Wind 1).

Designated Site	Distance to the Proposed Development (NCW 1) (km)	Relevant Benthic Ecology Features
Outer Belfast Lough MCZ	26.25	Subtidal (sublittoral) sand. Ocean quahog.
Clyde Sea Sill MPA	9.13	Circalittoral and offshore sand and coarse sediment communities. Fronts.
Red Bay SAC	8.36	Sandbanks slightly covered by seawater at all times.
The Maidens SAC	0	Sandbanks slightly covered by seawater at all times. Reefs.
Waterfoot MCZ	11.11	Subtidal seagrass on subtidal sand.

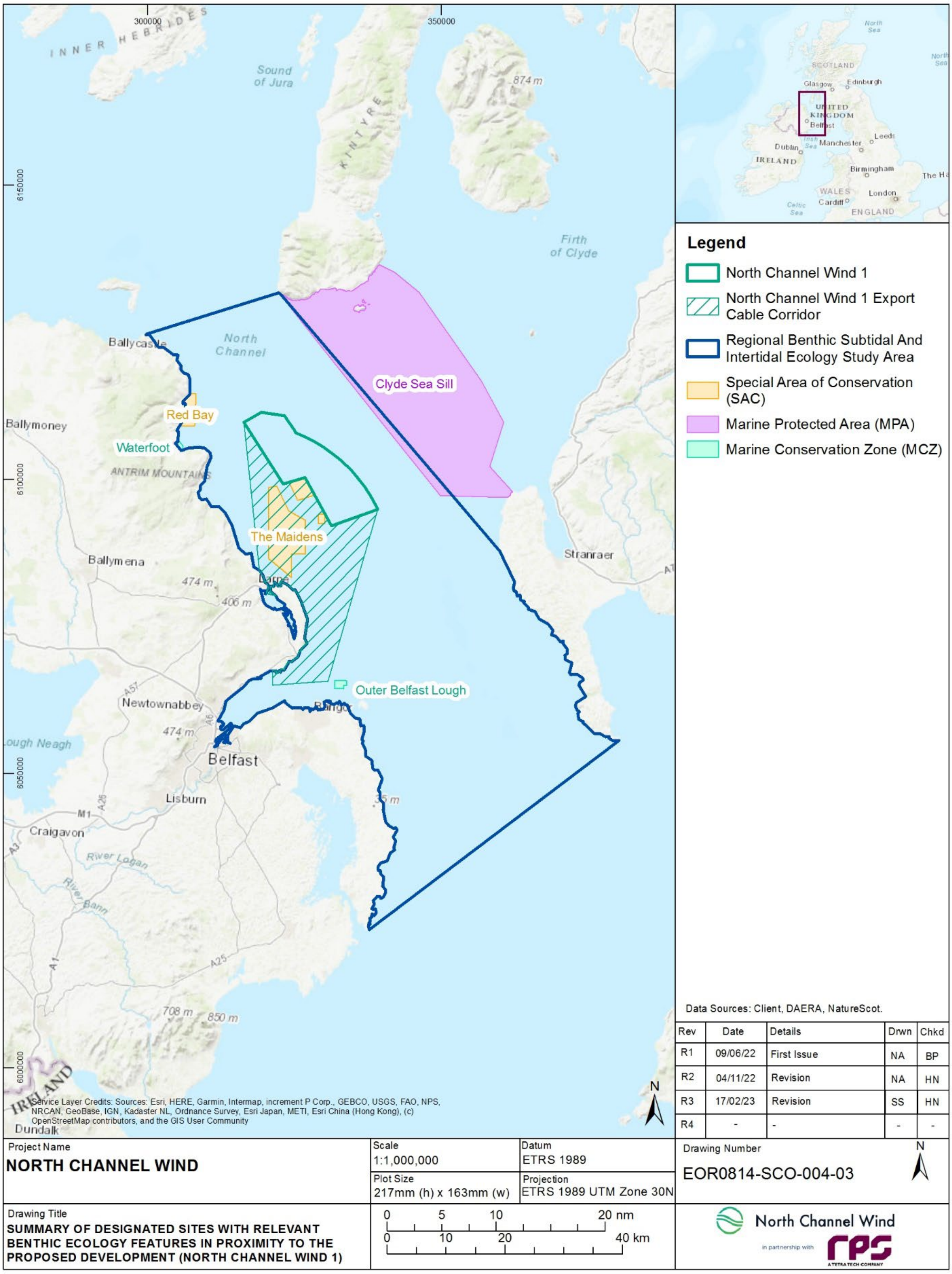


Figure 7.2: Summary of Designated Sites with Relevant Benthic Ecology Features in Proximity to North Channel Wind 1

Proposed Development (North Channel Wind 1) benthic subtidal and intertidal ecology study area

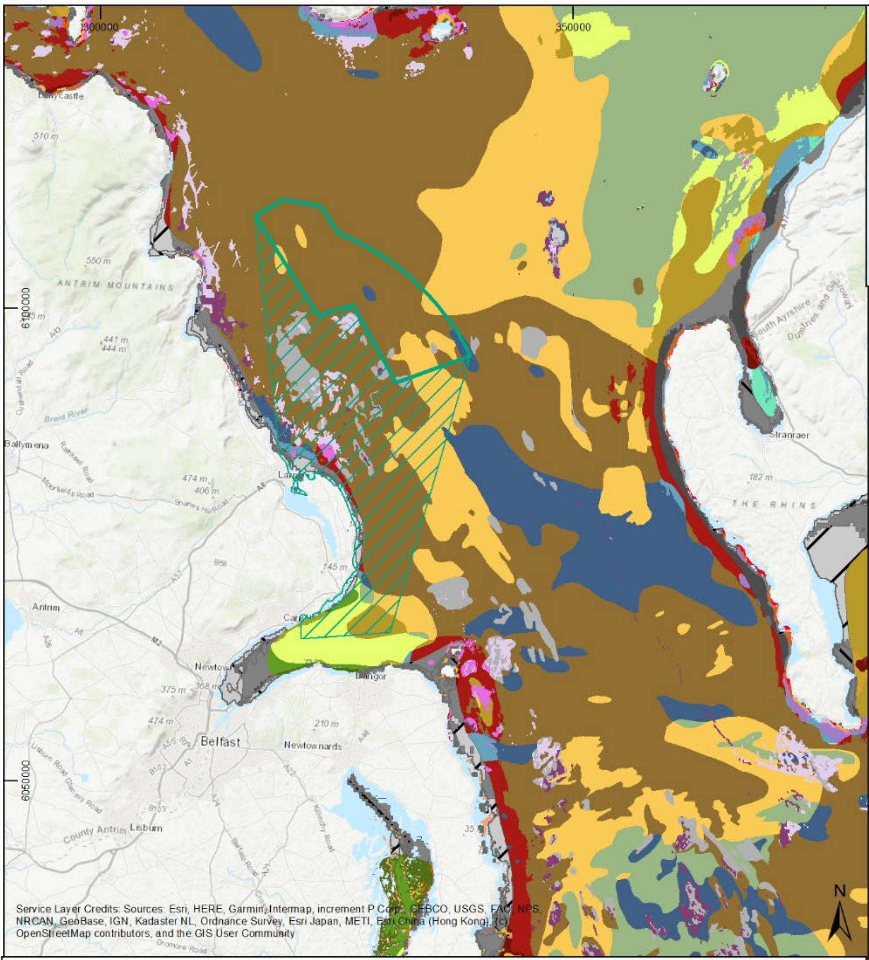
The predicted EUNIS habitats for North Channel Wind 1 Proposed Development benthic subtidal and intertidal ecology study area are illustrated in Figure 7.3. The majority of the substrate in the Proposed Development benthic subtidal and intertidal ecology study area comprises of deep circalittoral coarse sediment and deep circalittoral sand, with some regions of deep circalittoral mixed sediment and deep circalittoral sediment.

Nearer to the coast of Northern Ireland, within the areas of the North Channel Wind Export Cable Corridor are areas of Atlantic and Mediterranean moderate and low energy infralittoral rock, Atlantic and Mediterranean low and moderate energy circalittoral rock. Areas of faunal communities on deep low and moderate energy circalittoral rock are present. There are also areas of circalittoral fine sand or circalittoral muddy sand and deep circalittoral sand, with infralittoral and circalittoral sandy and fine mud.

7.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.3, together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to benthic subtidal and intertidal ecology that have been scoped out of the assessment are described in Table 7.4.



Legend

- North Channel Wind 1
- North Channel Wind 1 Export Cable Corridor

- A3: Infralittoral rock and other hard substrata
- A3.1: Atlantic and mediterranean high energy infralittoral rock
- A3.2: Atlantic and Mediterranean moderate energy infralittoral rock
- A3.3: Atlantic and mediterranean low energy infralittoral rock
- A4.12: Sponge communities on deep circalittoral rock
- A4.1: Atlantic and Mediterranean high energy circalittoral rock
- A4.27: Faunal communities on deep moderate energy circalittoral rock
- A4.2: Atlantic and Mediterranean moderate energy circalittoral rock
- A4.33: Faunal communities on deep low energy circalittoral rock
- A4.3: Atlantic and Mediterranean low energy circalittoral rock
- A4: Circalittoral rock and other hard substrata
- A5.13: Infralittoral coarse sediment
- A5.14: Circalittoral coarse sediment
- A5.15: Deep circalittoral coarse sediment
- A5.23 or A5.24: Infralittoral fine sand or infralittoral muddy sand
- A5.25 or A5.26: Circalittoral fine sand or circalittoral muddy sand
- A5.27: Deep circalittoral sand
- A5.33: Infralittoral sandy mud
- A5.34: Infralittoral fine mud
- A5.35: Circalittoral sandy mud
- A5.36: Circalittoral fine mud
- A5.37: Deep circalittoral mud
- A5.43: Infralittoral mixed sediments
- A5.44: Circalittoral mixed sediments
- A5.45: Deep circalittoral mixed sediments
- Circalittoral seabed
- High energy circalittoral seabed
- High energy deep circalittoral seabed
- High energy infralittoral seabed
- Infralittoral seabed
- Low energy circalittoral seabed
- Low energy deep circalittoral seabed
- Low energy infralittoral seabed
- Moderate energy circalittoral seabed
- Moderate energy deep circalittoral seabed
- Moderate energy infralittoral seabed
- Shallow circalittoral sediment
- Deep circalittoral sediment

Data Sources: Client, EMODnet.

Rev	Date	Details	Drwn	Chkd
R1	09/06/22	First Issue	NA	BP
R2	01/07/22	Revision	NA	HM
R3	04/11/22	Revision	NA	HN
R4	17/02/23	Revision	SS	HN

Project Name
NORTH CHANNEL WIND

Scale: 1:800,000
Plot Size: 217mm (h) x 163mm (w)
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N
Drawing Number: EOR0814-SCO-003-04

Drawing Title
PREDICTED EUNIS HABITATS FROM THE EUSEAMAP FOR THE ARRAY AREA (NORTH CHANNEL WIND 1) AND PROPOSED EXPORT CABLE CORRIDOR

0 5 10 nm
0 10 20 km

North Channel Wind in partnership with rps A TETRA TECH COMPANY

Figure 7.3: Predicted EUNIS Habitats from the EUSeaMap for the Array Area (North Channel Wind 1) and Proposed Export Cable Corridor (Source: EMODnet, 2014)

Table 7.3: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Increased suspended sediment concentrations (SSCs) and associated deposition	✓	✓	✓	Sediment disturbance arising from construction activities (e.g., foundation and cable installation, and seabed preparation works), maintenance operations (e.g., cable repair/reburial etc.) and decommissioning activities (e.g., cable and foundation removal) may result in indirect impacts on benthic communities as a result of temporary increases in SSCs and associated sediment deposition (i.e., smothering effects). Changes in SSCs can impact benthic receptors through changes in water clarity and reduced feeding due to increases in suspended solids and smothering and siltation rate changes.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. For the operation and maintenance phase, the magnitude is assumed to be no greater than for the construction phase therefore modelling carried out for the construction phase will be used to quantify the magnitude of effect. The significance of effects upon benthic receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for increases in SSC/associated deposition will be quantified and the assessment will present the areas of habitat potentially affected in the context of the size of the regional benthic subtidal and intertidal ecology study area. The sensitivity of benthic receptors will be determined using the Marine Evidence based Sensitivity Assessment (MarESA) tool.
Temporary habitat loss/disturbance	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of installation activities, cable installation activities (e.g., inter-array cables, mooring	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on

Potential Impact	Project Phase C	O	D	Justification consideration of (including embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				system for foundations such as mooring legs, anchoring legs), during operation and maintenance phase (e.g., cable repair/reburial) and decommissioning phase (e.g., array cable removal, removal of mooring/anchoring structures). It is likely the impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude.	Development benthic subtidal and intertidal ecology study area.	information derived from the Project Design Envelope (PDE).
Colonisation of hard structures		✓		Artificial structures placed on the seabed (i.e., cables, mooring anchors, foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures may also facilitate the spread of marine invasive and non-native species (INNS). Mitigation could include Designed-in measures including an INNS Management Plan, which will include measures to ensure that the risk of potential introduction and spread of INNS are minimised.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE. Invasive non-native species (INNS) will be considered, particularly in relation to colonisation of hard structures.
Long-term subtidal habitat loss	✓	✓		There is the potential for long-term habitat loss to occur directly under all foundation, anchoring and mooring	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				structures and chains, and associated scour protection, and under any cable protection required along the inter-array and offshore export cables. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase although this impact will largely occur throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the project lifetime.	video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE.
Increased risk of introduction and spread of INNS.	✓	✓	✓	Vessel movements during construction, operation and maintenance and decommissioning can result in the spread of invasive and non-native species. An Environmental Management Plan will include a specific INNS plan, which will demonstrate and ensure that all required measures are implemented so that the potential for introduction of INNS are minimised (e.g., adherence to relevant legislation and guidance). Through these measures the discharges of ballast waters and the biofouling of project vessels will be strictly controlled. Given the heavy vessel traffic through the area however, risk increase is minimal.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Changes in physical processes		✓		The presence of anchoring structures, mooring structures and associated scour protection and cable protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on benthic ecology.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	The outputs of numerical modelling undertaken for physical processes will inform this impact assessment. The significance of effects upon benthic receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor.
Removal of hard substrates			✓	The removal of foundations and any scour/cable protection during decommissioning has the potential to lead to loss of species/habitats colonising these structures.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE.
Release of sediment bound contaminants	✓		✓	Seabed disturbance associated with construction and decommissioning activities could lead to the remobilisation of sediment bound contaminants that may result in harmful and adverse effects on benthic communities.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.

Table 7.4: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology

Impact	Justification
Construction	
Accidental pollution during construction	There is a risk of pollution being accidentally released during the construction, operational and maintenance and decommissioning phases from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans (e.g., Environmental Management Plans, including Marine Pollution Contingency Plans). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), IMO and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. As such, it is intended that this impact is scoped out of further consideration within the Benthic Subtidal and Intertidal Ecology ES chapter.
Operation and Maintenance	
Accidental pollution during maintenance	As for construction
Impact to benthic communities from any thermal load or EMF arising from the cable during operation	EMF generated by subsea electrical cabling has the potential to affect benthic receptors in the site boundary in close proximity to cable infrastructure. However, there is limited information on the effects of EMF on benthic receptors, with the majority of research concentrated on fish. A recent study by Hutchinson et al., (2020) demonstrated behavioural changes in American lobsters Homarus americanus during the presence of EMFs, however, this species is not present within the regional benthic subtidal ecology study area. Similarly, other benthic invertebrates have been demonstrated to use the earth's magnetic fields for navigation, such as the amphipods Idotea baltica basteria and Gondogenia antarctica, and crustacean, the spiny lobster Panulirus argus (Herrnkind and McLean, 1971, Lohmann et al., 1995, Ugolini and Pezzani, 1995, Boles and Lohmann, 2003, Tomanová and Vácha, 2016). However, Bochert and Zettler (2006) studied the effects of EMF on the survival and physiology of various crustaceans, marine worms, and echinoderms in the context of cables associated with offshore wind farms in the Baltic Sea and demonstrated no significant effects for any species after three months of exposure. Furthermore, there were no differences between benthic community assemblages observed in visual surveys of wind farm subsea cables and their peripheral areas (Wilhelmsson et al., 2010). Finally, the presence of diverse and seemingly healthy benthic communities on existing offshore wind farm structures indicates that EMF is unlikely to cause a long-term significant effect upon benthic receptors (Linley et al,. 2007; Walker et al., 2009). In addition, a recent review of evidence of the effect of EMF on benthic receptors undertaken for Berwick Bank (SSER, 2022) indicated that any effects, should any occur at all, would affect a very limited area (e.g. in the immediate vicinity of electrical cables) and, therefore, would not lead to significant adverse effects. On the basis of the information presented here, it is proposed to scope this impact out of further consideration within the EIA for benthic subtidal ecology.

Impact	Justification
Decommissioning	
Accidental pollution during decommissioning	As for construction.

7.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The benthic subtidal and intertidal ecology chapter of the ES will follow the methodology set out in chapter 3. Specific to the benthic subtidal and intertidal ecology ES, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2022);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009);
- SNH guidance: Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland – Volume 5: Benthic Habitats (SNH, 2011); and
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012).

In addition, and specific to marine ecology topics, important ecological features (IEFs) will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.2.6 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development (North Channel Wind 1) on benthic subtidal and intertidal ecology are considered to be localised to within the footprint of the Proposed Development area, there is potential for the predicted impacts to interact with impacts from other projects and activities in the regional benthic subtidal and intertidal ecology study area and lead to a cumulative effect on receptors. To ensure cumulative effects are appropriately assessed, the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development will be considered. An overview of the projects or activities which will be considered for cumulative effects include:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e., telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

Near to the North Channel Wind 1 array area there are pipelines (Scotland to Northern Ireland Pipeline, Mutual Energy Ltd.) and lease marine cables (BT Openreach Scotland to NI 2 (Scot)), and Larne Lough offshore natural gas storage site agreement areas (1 and 2).

7.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

7.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of benthic subtidal and intertidal ecology?
- Do you agree that all receptors and impacts have been identified for benthic subtidal and intertidal ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?

- Do you agree with the proposed approach assessment?

7.3 NCW 2 PROJECT

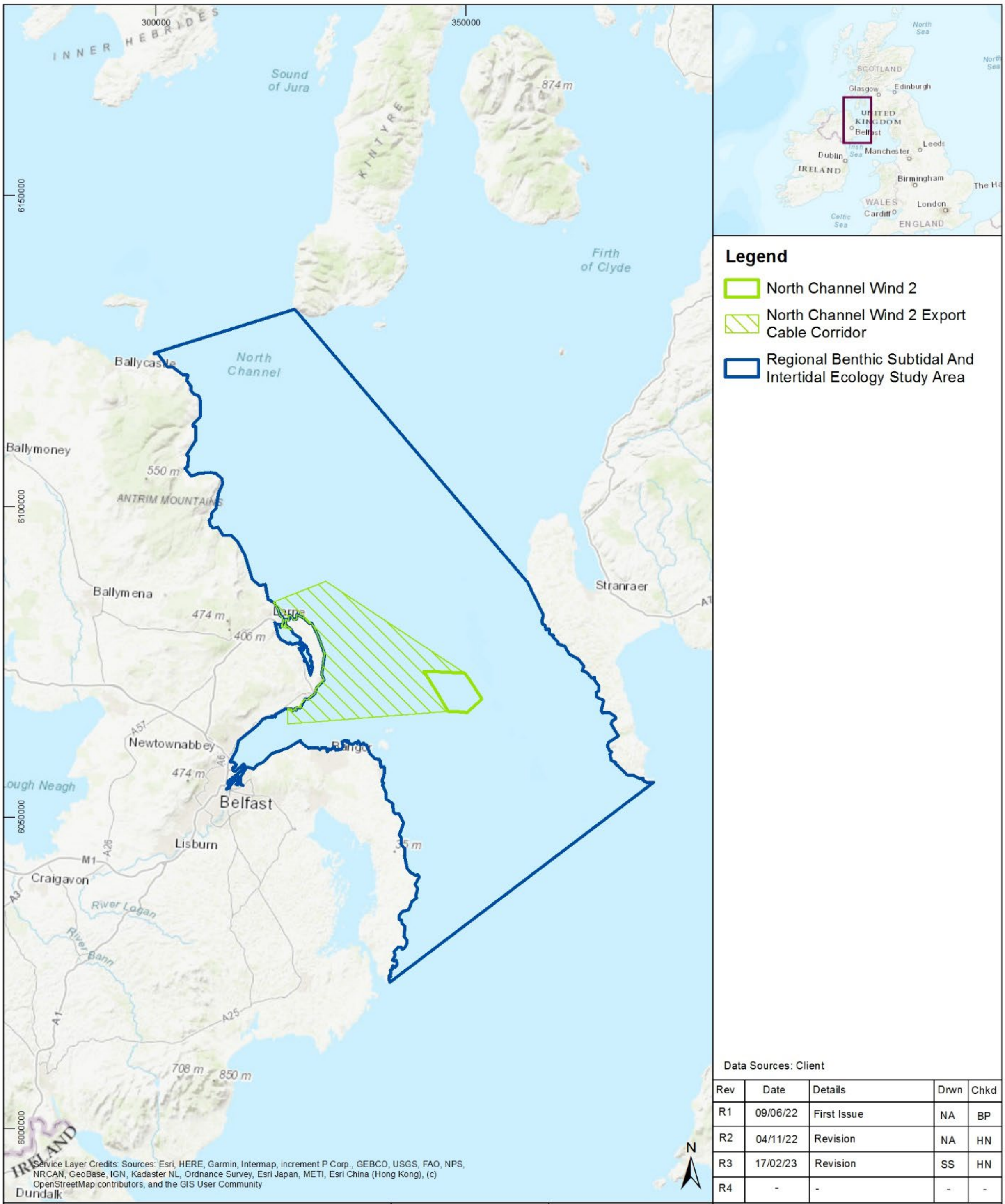
7.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the benthic subtidal and intertidal ecology of relevance to the proposed North Channel Wind 2 (NCW 2) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the benthic subtidal and intertidal ecology.

7.3.2 STUDY AREA

To support the development of the benthic subtidal and intertidal ecology EIA chapter, two study areas are defined:

- Proposed Development benthic subtidal and intertidal ecology study area: this is defined as the area encompassing the Proposed Development – North Channel Wind 2 (South site) (see Figure 7.4). This is the area which will be directly impacted by the offshore infrastructure and the area within which site-specific surveys (drop-down video and grab sampling) are taken and will include baseline characterisation and identification of benthic receptors against which potential impacts associated with the Proposed Development will be assessed. It may be further refined during the EIA phase in response to the physical modelling, to encompass the maximum tidal excursion (estimated at 10-15 km); and
- Regional benthic subtidal and intertidal ecology study area: this is defined as the area from the headland of Strangford Loch to Mull of Galloway, and Fair Head to Mull of Kintyre (Figure 7.4). The regional benthic subtidal and intertidal ecology study area will be characterised by desktop data and will provide a wider context to the site-specific data collected within the Proposed Development benthic subtidal and intertidal ecology study area.



Rev	Date	Details	Drwn	Chkd
R1	09/06/22	First Issue	NA	BP
R2	04/11/22	Revision	NA	HN
R3	17/02/23	Revision	SS	HN
R4	-	-	-	-

Project Name **NORTH CHANNEL WIND**	Scale 1:1,000,000	Datum ETRS 1989	Drawing Number EOR0814-SCO-005-03
	Plot Size 217mm (h) x 163mm (w)	Projection ETRS 1989 UTM Zone 30N	
Drawing Title **BENTHIC SUBTIDAL ADN INTERTIDAL ECOLOGY STUDY AREA FOR NORTH CHANNEL WIND 2**	0 5 10 20 nm 0 10 20 40 km		North Channel Wind in partnership with rps

Figure 7.4: Benthic Subtidal and Intertidal Ecology Study Areas for North Channel Wind 2

7.3.3 BASELINE ENVIRONMENT

Regional benthic subtidal and intertidal ecology study area

Within the Regional benthic subtidal and intertidal ecology study area, the majority of the North Channel is between 10 and 40m deep but reaches 150 metres at its maximum depth. The seabed is predominantly hard with gravelly sediments, with rocky outcrops and localised enclosed deeps, notably Beaufort's Dyke. Based on the EUSeaMap data of EUNIS 2019 habitat types, the Regional benthic subtidal and intertidal ecology study area is dominated by regions of MD32: Atlantic offshore circalittoral coarse sediment, MD52: Atlantic offshore circalittoral sand and MD42: Atlantic offshore circalittoral mixed sediment. Further inshore towards the coast of Northern Ireland, there are areas of MD12: Atlantic offshore circalittoral rock and MC32: Atlantic circalittoral coarse sediment along the coastline. In Belfast Lough there are areas of MC62: Atlantic circalittoral mud, MD52: Atlantic offshore circalittoral sand, and MC52: Atlantic circalittoral sand. There are areas of biogenic reef, circalittoral rock and biogenic reef, infralittoral rock and biogenic reef off the coast of Northern Ireland. There are areas of hard substrate seabed throughout the North Channel.

Areas of subtidal seagrass Zostera marina are present in the Regional benthic subtidal and intertidal ecology study area – at the edge of Larne Lough Special Protection Area (SPA), to the north end of East Coast Marine pSPA and in Waterfoot Marine Conservation Zone (MCZ). Seagrass beds (both intertidal and subtidal) are currently included in the list of Priority Marine Features (PMFs) for Northern Ireland (DAERA, 2014), and is Priority Habitat under the UK Biodiversity Habitat Action Plan (BAP), on the OSPAR List of Threatened and/or Declining Species and Habitats (declining in Region II – North Sea and Region III – Celtic Sea, and threatened in Region V – Wider Atlantic), an important feature in estuarine SSSIs, and a sub-feature of Annex I habitats under the Habitats directive.

The Regional benthic subtidal and intertidal ecology study area contains several MCZs designated for benthic habitats. Outer Belfast Lough MCZ is designated for Subtidal (sublittoral) sand and Ocean quahog (Arctica islandica). It is a heterogeneous habitat which incorporates occasional small patches of gravelly muddy sand, which provides an ideal substrate for the ocean quahog (Arctica islandica) and other species such as the masked crab (Corystes cassivelaunus), king scallop (Pecten maximus) and sand burrowing brittlestar (Amphiura brachiata). Historical detailed benthic studies of Belfast Lough have recorded a high variety of species present (Kinahan, 1859) and recent studies have recorded over 580 taxa (Breen and Service, 2002), though some historical sewage inputs had severe impacts on fauna a few decades ago (Parker, 1980).

Designated Sites

Several designated sites with relevant benthic ecology features exist in the Regional benthic subtidal and intertidal ecology study area (Figure 7.5, Table 7.6) including MCZs, MPAs and SACs. Waterfoot MCZ is located in a small embayment offshore from the village of Waterfoot on the east coast of Northern Ireland, located 48.89 km from the Proposed Development. Waterfoot MCZ is designated for Seagrass bed (*Zostera marina*) on Subtidal (sublittoral) sand. The seagrass bed in the MCZ is extensive and in good condition and has been surveyed to determine the boundary for the MCZ, made up of smaller seagrass meadows that appear to be reproductively viable (seed bearing). Records of seagrass meadows in Waterfoot were made during the Northern Ireland Sublittoral Survey (NISS) (1982-1985), Sublittoral Survey Northern Ireland (SSNI) (2006), Seasearch Northern Ireland volunteer dives (2008-2012), DOE Waterfoot pMCZ support spyball and diving surveys (2015) and DAERA Waterfoot pMCZ support spyball surveys (2016).

Scottish MPAs in the Regional benthic subtidal and intertidal ecology study area include Clyde Sea Sill MPA (Figure 7.5), located 24.02 km from the Proposed Development, which is designated for circalittoral and offshore sand and coarse sediment communities, as well as marine geomorphology of the Scottish shelf seabed, fronts and black guillemot (*Cepphus grylle*). The seabed at the sill is a dynamic environment and is heavily influenced by the tide, with a distinct gradient in habitat type along the MPA. Coarse and mixed substrates exist off Kintyre, and then rippled fine-medium sands in the centre of the sill, and sandy-mud habitats on the Galloway side. The sands and gravels on the sea floor are moved around, creating sandbank ridges or extensive sand ribbon and sand wave fields.

SACs with relevant benthic components include Red Bay SAC and The Maidens SAC. Red Bay SAC (DAERA, 2017), located 50.05 km from the Proposed Development, is designated for Annex I sandbanks which are slightly covered by seawater at all times. The sandbanks are dominated by 2-3m high mega-ripples of maerl, with live maerl, gravel, cobbles and coarse to fine sand on the crests and sub-fossil maerl in the troughs.

The site also supports three extremely rare species of algae which are endemic to maerl; *Cruoria cruoriaeformis*, *Halymenia latifolia* and *Gelidiella calcicola*. Red Bay SAC contains a relatively large area of the rare maerl biotope '*Phymatolithon calcarium* maerl beds with red seaweeds in shallow infralittoral clean gravel or coarse sand', which is listed in Annex V of the EC Habitats Directive (Directive 92/43/EEC). Maerl beds are considered of high conservation interest and PMF for Northern Ireland (DAERA, 2014).

The Maidens SAC (JNCC, 2022b) is located 21.19 km from the North Channel Wind 2 Export Cable Corridor of the Proposed Development and is designated for Annex I sandbanks which are slightly covered by sea water all the time and reef habitats. Maerl and other long-lived species have been found in the shallow stable sandy gravels. The reefs of the Maidens are in the strongly tidal North Channel and the reefs are Grade A/B in the area, meaning they are outstanding or excellent examples of reefs in a European context. Most of the reef area is bedrock reef with some stony reef areas. The Maidens were recognised during the NISS (Erwin *et al.,*1986) as an area of high biological importance, and a stronghold for several Northern Ireland Conservation Priority (NICP) and PMF species (*Diphasia alata, D. nigra*, *Lytocarpia myriophyllum* and *Halecium plumosum*). The area has been deemed a stronghold for hydroid gardens (containing PMF species *Polyplumaria flabellata* and *Disphasia alata*) and some deeper water sponges (e.g., *Clathria barleei*, *M. elliptichela*). NISS also found three unusual nudibranch species, including *Caloria elegans* and the NICP sea pen *Virgularia mirabilis*.

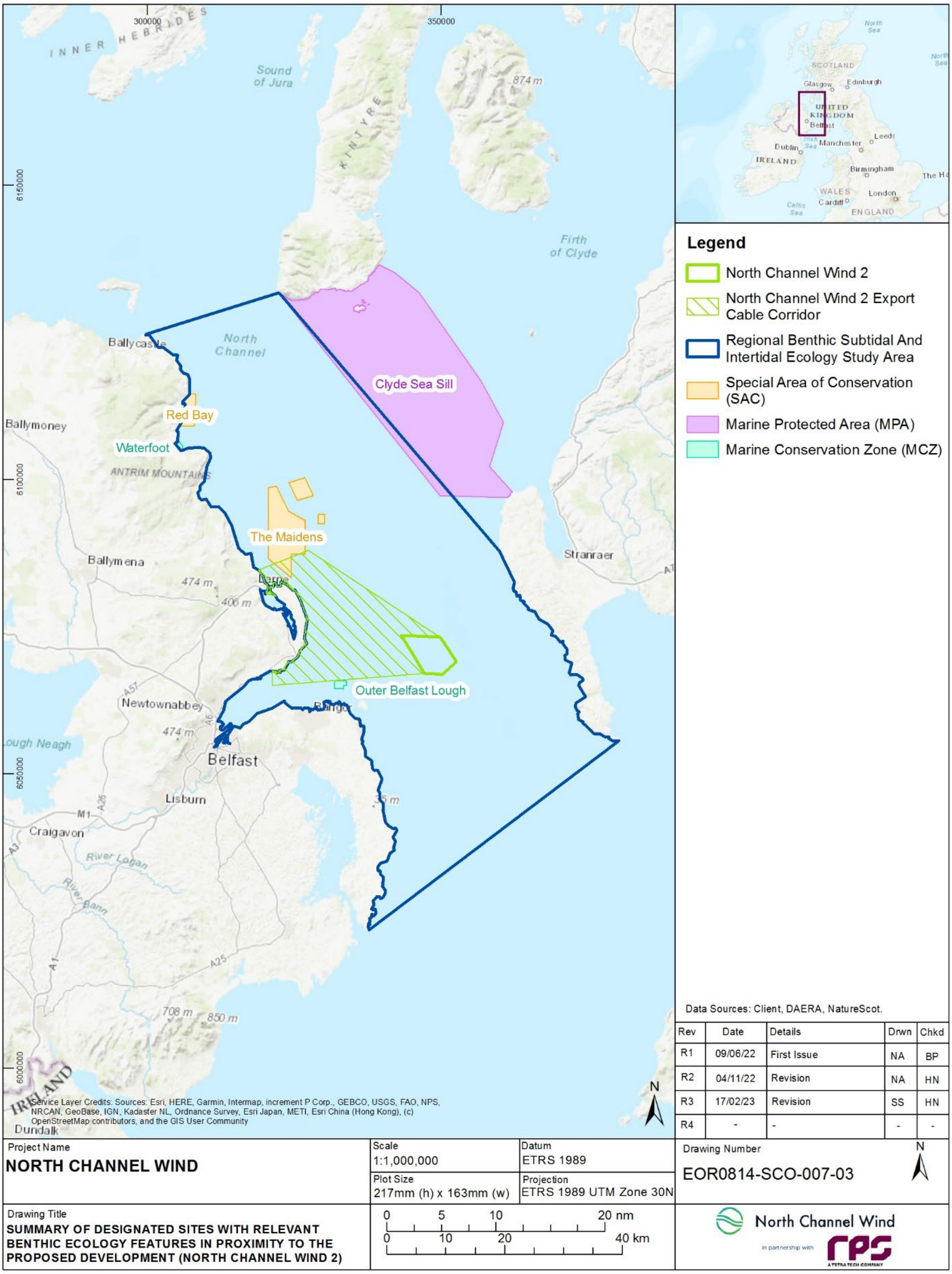


Figure 7.5: Summary of Designated Sites with Relevant Benthic Ecology Features in Proximity to the Proposed Development (North Channel Wind 2)

Proposed Development benthic subtidal and intertidal ecology study area

The predicted EUNIS habitats for North Channel Wind 2 Proposed Development benthic subtidal and intertidal ecology study area are given in Figure 7.6. The majority of the substrate in the Proposed Development benthic subtidal and intertidal ecology study area comprises of deep circalittoral coarse sediment and deep circalittoral sand, with some regions of deep circalittoral mixed sediment and sublittoral sediment.

Nearer to the coast of Northern Ireland, within the areas of the North Channel Wind Export Cable Corridor for North Channel Wind 2, are areas of deep circalittoral coarse sediment, circalittoral fine sand or Circalittoral muddy sand, deep circalittoral sand, deep circalittoral mud and infralittoral and circalittoral sandy or fine mud. There are areas of faunal communities on deep low or moderate energy circalittoral rock.

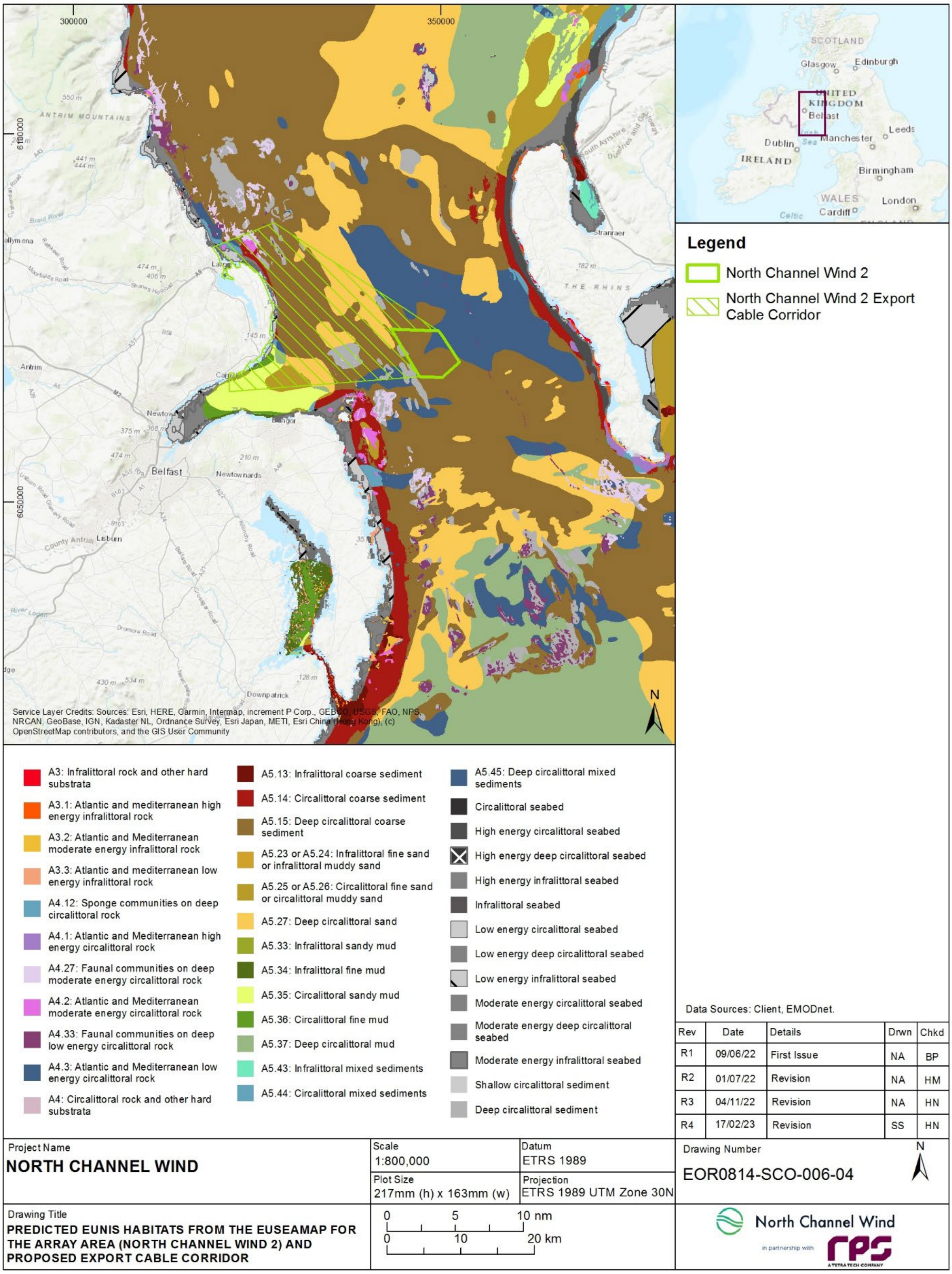


Figure 7.6: Predicted EUNIS Habitats from the EUSeaMap for the Array Area (North Channel Wind 2) and Proposed Export Cable Corridor (Source: EMODnet, 2014).

Table 7.5: Summary of Designated Sites with Relevant Benthic Ecology Features in Proximity to the Proposed Development (North Channel Wind 2).

Designated Site	Distance to the Proposed Development (NCW 2) (km)	Relevant Benthic Ecology Features
Outer Belfast Lough MCZ	12	Subtidal (sublittoral) sand. Ocean quahog.
Clyde Sea Sill MPA	24.02	Circalittoral and offshore sand and coarse sediment communities. Fronts.
Red Bay SAC	50.05	Sandbanks slightly covered by seawater at all times.
The Maidens SAC	21.19	Sandbanks slightly covered by seawater at all times. Reefs
Waterfoot MCZ	48.89	Subtidal seagrass on subtidal sand.

7.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 7.7 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to benthic subtidal and intertidal ecology that have been scoped out of the assessment are described in **Table 7.8**.

Table 7.6: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Increased suspended sediment concentrations (SSCs) and associated deposition	✓	✓	✓	Sediment disturbance arising from construction activities (e.g., foundation and cable installation, and seabed preparation works), maintenance operations (e.g., cable repair/reburial etc.) and decommissioning activities (e.g., cable and foundation removal) may result in indirect impacts on benthic communities as a result of temporary increases in SSCs and associated sediment deposition (i.e., smothering effects). Changes in SSCs can impact benthic receptors through changes in water clarity and reduced feeding due to increases in suspended solids and smothering and siltation rate changes.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. For the operation and maintenance phase, the magnitude is assumed to be no greater than for the construction phase therefore modelling carried out for the construction phase will be used to quantify the magnitude of effect. The significance of effects upon benthic receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for increases in SSC/associated deposition will be quantified and the assessment will present the areas of habitat potentially

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
						affected in the context of the size of the regional benthic subtidal and intertidal ecology study area. The sensitivity of benthic receptors will be determined using the Marine Evidence based Sensitivity Assessment (MarESA) tool.
Temporary habitat loss/disturbance	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance as a result of site preparation activities in advance of installation activities, cable installation activities (e.g., inter-array cables, mooring system for foundations such as mooring legs, anchoring legs), during operation and maintenance phase (e.g., cable repair/reburial) and decommissioning phase (e.g., array cable removal, removal of mooring/anchoring structures). It is likely the impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the Project Design Envelope (PDE).

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Colonisation of hard structures		✓		Artificial structures placed on the seabed (i.e., cables, mooring anchors, foundations and scour/cable protection) in the offshore environment are expected to be colonised by a range of marine organisms leading to localised increases in biodiversity. These structures may also facilitate the spread of marine invasive and non-native species (INNS). Mitigation could include Designed-in measures including an INNS Management Plan, which will include measures to ensure that the risk of potential introduction and spread of INNS are minimised.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE. Invasive non-native species (INNS) will be considered, particularly in relation to colonisation of hard structures.
Long-term subtidal habitat loss	✓	✓		There is the potential for long-term habitat loss to occur directly under all foundation, anchoring and mooring structures and chains, and associated scour protection, and under any cable protection required along the inter-array and offshore export cables. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase although this impact will largely occur	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the project lifetime.		
Increased risk of introduction and spread of INNS.	✓	✓	✓	Vessel movements during construction, operation and maintenance and decommissioning can result in the spread of invasive and non-native species. An Environmental Management Plan will include a specific INNS plan, which will demonstrate and ensure that all required measures are implemented so that the potential for introduction of INNS are minimised (e.g., adherence to relevant legislation and guidance). Through these measures the discharges of ballast waters and the biofouling of project vessels will be strictly controlled. Given the heavy vessel traffic through the area however, risk increase is minimal.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES. This assessment will be based on information derived from the PDE.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Changes in physical processes		✓		The presence of anchoring structures, mooring structures and associated scour protection and cable protection may introduce localised changes to the tidal flow and wave climate, resulting in potential changes to the sediment transport pathways and associated effects on benthic ecology.	Benthic subtidal and intertidal surveys (comprising grab sampling and drop-down video) are planned to collect site-specific data in order to characterise the baseline environment in the Proposed Development benthic subtidal and intertidal ecology study area.	The outputs of numerical modelling undertaken for physical processes will inform this impact assessment. The significance of effects upon benthic receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor.
Removal of hard substrates			✓	The removal of foundations and any scour/cable protection during decommissioning has the potential to lead to loss of species/habitats colonising these structures.	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE.
Release of sediment bound contaminants	✓		✓	Seabed disturbance associated with construction and decommissioning activities could lead to the remobilisation of sediment bound contaminants that may result in harmful and	As per temporary habitat loss / disturbance during construction phase.	No specific modelling is required to inform this impact assessment.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				adverse effects on benthic communities.		

Table 7.7 Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Benthic Subtidal and Intertidal Ecology

Impact	Justification
Construction	
Accidental pollution during construction	There is a risk of pollution being accidentally released during the construction, operational and maintenance and decommissioning phases from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans (e.g., Environmental Management Plans, including Marine Pollution Contingency Plans). These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR (Oslo-Paris), IMO and MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. As such, it is intended that this impact is scoped out of further consideration within the Benthic Subtidal and Intertidal Ecology ES chapter.
Operation and Maintenance	
Accidental pollution during maintenance	As for construction.
Impact to benthic communities from any thermal load or EMF arising from the cable during operation	EMF generated by subsea electrical cabling has the potential to affect benthic receptors in the site boundary in close proximity to cable infrastructure. However, there is limited information on the effects of EMF on benthic receptors, with the majority of research concentrated on fish. A recent study by Hutchinson et al., (2020) demonstrated behavioural changes in American lobsters Homarus americanus during the presence of EMFs, however, this species is not present

Impact	Justification
	within the regional benthic subtidal ecology study area. Similarly, other benthic invertebrates have been demonstrated to use the earth's magnetic fields for navigation, such as the amphipods Idotea baltica basteria and Gondogenia antarctica, and crustacean, the spiny lobster Panulirus argus (Herrnkind and McLean, 1971, Lohmann et al., 1995, Ugolini and Pezzani, 1995, Boles and Lohmann, 2003, Tomanová and Vácha, 2016). However, Bochert and Zettler (2006) studied the effects of EMF on the survival and physiology of various crustaceans, marine worms, and echinoderms in the context of cables associated with offshore wind farms in the Baltic Sea and demonstrated no significant effects for any species after three months of exposure. Furthermore, there were no differences between benthic community assemblages observed in visual surveys of wind farm subsea cables and their peripheral areas (Wilhelmsson et al., 2010). Finally, the presence of diverse and seemingly healthy benthic communities on existing offshore wind farm structures indicates that EMF is unlikely to cause a long-term significant effect upon benthic receptors (Linley et al,. 2007; Walker et al., 2009). In addition, a recent review of evidence of the effect of EMF on benthic receptors undertaken for Berwick Bank (SSER, 2022) indicated that any effects, should any occur at all, would affect a very limited area (e.g. in the immediate vicinity of electrical cables) and, therefore, would not lead to significant adverse effects. On the basis of the information presented here, it is proposed to scope this impact out of further consideration within the EIA for benthic subtidal ecology.
Decommissioning	
Accidental pollution during decommissioning	As for construction.

7.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The benthic subtidal and intertidal ecology chapter of the ES will follow the methodology set out in Chapter 3. Specific to the benthic subtidal and intertidal ecology ES, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater and Coastal (CIEEM, 2022);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009);
- SNH guidance: Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland – Volume 5: Benthic Habitats (SNH, 2011); and
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012).

In addition, and specific to marine ecology topics, important ecological features (IEFs) will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

7.3.6 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects from the Proposed Development on benthic subtidal and intertidal ecology are considered to be localised to within the footprint of the Proposed Development area, there is potential for the predicted impacts to interact with impacts from other projects and activities in the regional benthic subtidal and intertidal ecology study area and lead to a cumulative effect on receptors. To ensure cumulative effects are appropriately assessed, the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development will be considered.

An overview of the projects or activities which will be considered for cumulative effects include:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e., telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

Near to the North Channel Wind 2 array area there are pipelines (Scotland to Northern Ireland Pipeline, Mutual Energy Ltd.) and lease marine cables (BT Openreach Scotland to NI 2 (Scot)), and Larne Lough offshore natural gas storage site agreement areas (1 and 2).

7.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

7.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of benthic subtidal and intertidal ecology?
- Do you agree that all receptors and impacts have been identified for benthic subtidal and intertidal ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

8. FISH AND SHELLFISH ECOLOGY

8.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified a number of data sources which provide coverage of the Fish and Shellfish Ecology Study Area. These are summarised in Table 8.1 and will inform the fish and shellfish baseline characterisation. Poseidon Aquatic Resource Management have completed a commercial fisheries baseline report for North Channel Wind . In addition, the baseline will be characterised using desktop data and any site-specific data collected as part of benthic surveys will also be used to inform the fish and shellfish baseline characterisation. This is the area which will be directly impacted by the offshore infrastructure and the area within which site-specific surveys (drop-down video and grab sampling) are taken. This will include baseline characterisation and identification of fish and shellfish receptors against which potential impacts associated with the Proposed Development will be assessed.

Table 8.1: Summary of Key Desktop Reports for Fish and Shellfish Ecology.

Title	Source	Year	Author
International Bottom Trawl Surveys	International Council for the Exploration of the Sea (ICES)	2018	Boyle and New (2019)
ICES catch data 2006 - 2019	ICES Catch statistics	2022	ICES
International Herring Larvae Survey	Wageningen Marine Research, IJmuiden	2015	Wageningen Marine Research, IJmuiden
Mapping the spawning and nursery grounds of selected fish for spatial planning	Centre for Environment, Fisheries and Aquaculture Science (CEFAS)	2012	Ellis et al. (2012)
Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: implications for the development of marine renewables	Scottish Marine and Freshwater Science	2010	Malcolm et al. (2010)
British sea fishes	Underwater World Publications Ltd.	2001	Dipper
Fisheries sensitivity maps in British Waters	United Kingdom Offshore Operators Association (UKOOA) Ltd.	1998	Coull et al. (1998)

Title	Source	Year	Author
Fish and shellfish sensitivity reports	https://www.marlin.ac.uk/activity/pressures_report	n/a	Various
Salmon fishery statistics, including rod catch data	Marine Scotland	2019 (latest dataset)	Marine Scotland (2019)
Basking shark satellite tracking and tagging studies	Various authors		Dolton et al., 2020, Doherty et al., 2017a; 2017b.
Bass and Ray Ecology in Liverpool Bay	Bangor University Sustainable Fisheries and Aquaculture Group.	2020	Moore et al.
Fish and shellfish survey results for the east Irish Sea	Environment Agency	Various	Environment Agency
Updating Fisheries Sensitivity Maps in British Waters	Scottish Marine and Freshwater Science Report	2014	Aires et al. (2014)
Northern Irish Ground Fish Trawl Survey (NIGFS)	ICES	2013	ICES
Argyll Tidal Ltd.		2013	Nautricity (2013)
Herring larvae surveys of the northern Irish Sea	The Agri-Food and Biosciences Institute (AFBI)	1993-2021	AFBI
SMB Offshore NI Projects Commercial Fisheries Baseline Report	Poseidon Aquatic Resource Management	2022	Poseidon Aquatic Resource Management

8.2 NCW 1 PROJECT

8.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of fish and shellfish ecology of relevance to the Proposed Development (North Channel Wind 1 or NCW 1) and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on fish and shellfish ecology. Basking sharks (Cetorhinus maximus) are included within this fish and shellfish ecology section, but turtles are included in the marine mammal section.

8.2.2 STUDY AREA

The Proposed Development (North Channel Wind 1) includes areas within territorial waters of Ireland and Scotland and supports a range of fish and shellfish species. Fish and shellfish are known to be highly variable, both spatially and temporally, and so a broad and inclusive study area has been defined. The Fish and Shellfish Ecology Study Area is therefore defined as the area encompassing the International Council for the Exploration of the Sea (ICES) Statistical Rectangles (39E4, 38E4, 38E5, 39E5, 39E3 which covers the Proposed Development, offshore cable (up to the mean high water springs (MHWS)), and associated cables (Figure 8.1). This study area will allow for the characterisation of all fish and shellfish receptors within the area, accounting for the spatial and temporal variability of fish and shellfish populations, including fish migration. This study area was considered appropriate as it is sufficiently large to consider all direct (e.g., habitat loss/disturbance within project boundaries) and indirect impacts (e.g., underwater noise over a much wider area) of the Proposed Development on the identified fish and shellfish receptors.

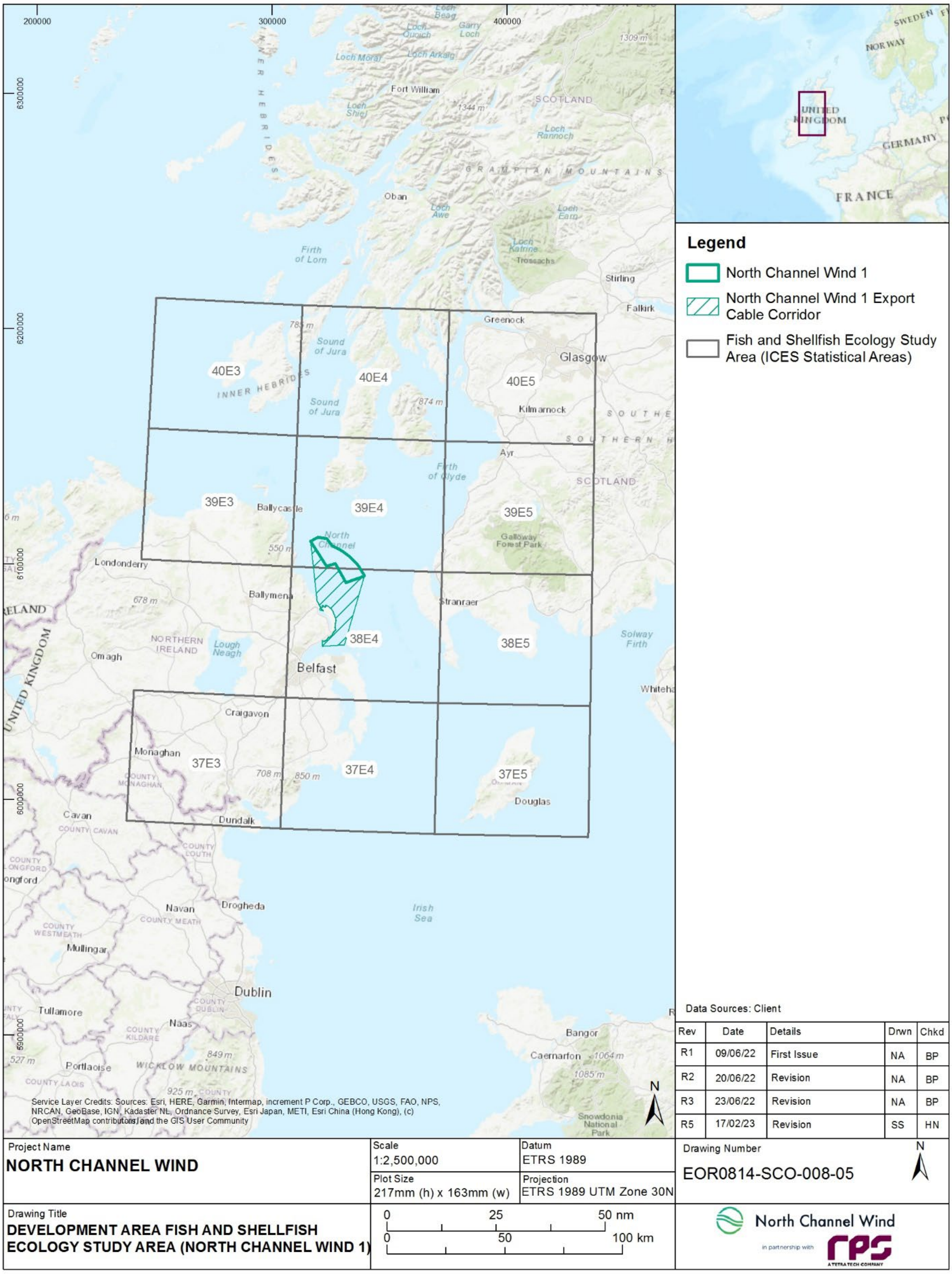


Figure 8.1: Fish and Shellfish Ecology Study Area and North Channel Wind 1

8.2.3 BASELINE ENVIRONMENT

Fish and Shellfish Designated Sites

The Proposed Development does not overlap with any European sites or Natura 2000 sites but there are several protected areas for fish and shellfish within the vicinity. Table 8.2 provides an early indication of the designated sites (international and national) that may be considered within the EIA and HRA. This list will be refined in the EIA to also include sites that fall within the potential zone of influence (ZOI) of the Proposed Development, which will be determined as part of the EIA process to include consideration of migratory fish species.

It is important to highlight that the North Channel area remains an Area of Search (AoS) due to the presence of the common skate (Dipturus batis) (DAERA, 2022), a priority marine feature (PMF), and evidence is currently being gathered to investigate the potential for parts of this site to be considered as a MCZ to complete the MPA network.

Table 8.2: Summary of designated sites for fish and shellfish in proximity to the Proposed Development (North Channel Wind 1)

Designated Site	Distance to Proposed Development area NCW 1 (km)	Qualifying Features and Site Description
Loch Sween (MPA)	86.32	Loch Sween, a fjordic sea loch situated on the west coast of Scotland near Lochgilphead, covers 41km^2.
		Native oysters occur patchily throughout Loch Sween, as evidenced by the shells on the beach discarded by feasting otters. Once common in Scotland and supporting a grand shellfish export industry, beds of native oysters now only exist in a few scattered locations. The population within Loch Sween is considered to be of national importance.
		Qualifying Features: Native oysters (Ostrea edulis)
		Designation features: Intertidal blue mussel (Mytilus edulis), European eel (Anguilla anguilla), **B**asking shark, plaice (spawning / nursery) (Pleuronectes platessa), sand eel (Ammodytes marinus)
Ramsey Bay MNR (Isle of Man)	92.95	Area of 97km^2
		Designation features: Intertidal blue mussel, Iceland clam (Arctica islandica), European eel, Common skate, Cod (Gadus morhua) (spawning / nursery), Sand eel, Seabass nursery (Dicentrarchus labrax)

Designated Site	Distance to Proposed Development area NCW 1 (km)	Qualifying Features and Site Description
Loch Sunart to the Sound of Jura (Scottish) MPA	97.13	The Marine Protected Area (MPA) covers from Loch Sunart to the Sound of Jura, covering 741km^2.
		Common skate remain in a relatively small geographical area year-round. Loch Sunart to the Sound of Jura Marine Protected Area has been shown to support a good number of resident mature common skate that may also be breeding in the area
		Qualifying Features: Flapper skate (Dipturus intermedius)
Port Erin Bay MNR (Isle of Man)	108.5	Area of 4km^2.
		Designation features: Flame shell (Limaria hians), iceland clam, basking shark, plaice (spawning / nursery)
Calf and Wart Bank MNR (Isle of Man)	110.17	Area of 20km^2.
		Designation features: spiny lobster (Palinuridae), flame shell, basking shark, sand eel

Fish assemblage

Distribution of fish is determined by a range of factors including abiotic parameters (e.g., water temperature, salinity, depth, local scale habitat features and substrate type), biotic parameters (e.g., predator prey interactions, competition), and anthropogenic factors (e.g. infrastructure and commercial fishing intensity). Fish present within the study area include pelagic, demersal, cartilaginous, and migratory species.

In the southern part of the Fish and Shellfish Ecology Study Area, to the south of the Proposed Development, the Irish Sea supports a variety of commercial fisheries for cod, plaice and sole (Solea solea), as well as significant fisheries for Nephrops, crabs, lobster, scallops, razor shells and whelks. Species identified in the Stock Book 2022 (Marine Institute, 2022) as being of commercial importance in the Irish Sea include cod, haddock (Melanogrammus aeglefinus), whiting (Merlangius merlangus), plaice, sole, Nephrops (Nephrops norvegicus), ray species (e.g., thornback ray (Raja clavate), spotted ray (Raja montagui), blonde ray (Raja brachyiura) and herring (Clupea harengus). In the wider Irish Sea region, demersal trawling for Nephrops dominates the fishing effort, whilst vessels operating inshore typically target shellfish with pots, or dredge for scallop. During CEFAS beam trawl surveys of the Irish Sea between 1993 and 2001, more than 100 species of marine fish were recorded (Parker-Humphreys, 2004). Within the Irish sea, deep-water fishing grounds west of the Isle of Man includes Norway pout (Trisopterus esmarkii), witch (Glyptocephalus cynoglossus) and long-rough dab (Hippoglossoides platessoides) (Ellis et al., 2002) whilst inshore waters of Dundrum Bay and Belfast have high abundance of clupeids. Sandy inshore areas of the Irish Sea support large numbers of juvenile flatfish and sand eels, with seasonal populations of sprat (Sprattus sprattus), herring and juvenile gadoids. Rockier areas have fish assemblages dominated by small species such as wrasse, gobies and blennies, as well as juvenile pollack (Pollachius pollachius) and saithe (Pollachius virens) (Pawson et al., 2002).

North of the Proposed Development, in the Fish and Shellfish Ecology Study Area, tagging has revealed that cod migrate in late summer and early autumn from the west coast of Scotland to the north coast and return in the late winter and early spring (Scottish Executive, 2007). Spawning can occur from January to April, usually peaking in February. Herring is widely distributed off the west coast of Scotland, with the main spawning area lying to the west of the Outer Hebrides and extends north along the North Coast of Scotland and an autumn spawning area around the Inner Hebrides. Although a pelagic species, they are demersal spawners, depositing sticky eggs on stone and gravel in waters down to 200 m and as such herring are considered particularly sensitive to seabed developments. Sprat is another short-lived pelagic species that is widely distributed off western Scotland, with nursery areas along the inshore west coast areas of Scotland. Mature fish often migrate inshore during the winter (September to March).

A number of fish surveys have been undertaken across the Fish and Shellfish Ecology Study Area for the surrounding offshore wind farm developments. Dover sole and cod were identified as species of key commercial importance in the area (Brown and May Marine Ltd, 2013). The Environmental Assessment (EA) for the Argyll Tidal Development, to the North of the Proposed Development, stated low intensity nursery grounds are recorded across the Argyll Tidal Development Site as part of a wider nursery area and higher intensity nursery grounds are located to the east of the Kintyre peninsula and in the Clyde (Naturicity, 2013). The Argyll Tidal Development site overlaps with low intensity nursery grounds for the following species: anglerfish (Lophius piscatorius), cod, common skate, European hake, mackerel and whiting; and high intensity nursery grounds for spurdog Squalus acanthias. It also overlaps with nursery grounds for Nephrops and saithe (noting that intensity of this was unknown). Herring nursery grounds occur to the east and west of the Kintyre peninsula, but do not overlap the Argyll Development Site. Spawning grounds for Nephrops and saithe are also recorded to overlap the Argyll Development Site.

Commercial landing data provides an overview of species present within the Fish and Shellfish Ecology Study Area (ICES, 2021). Within the Fish and Shellfish Ecology Study Area Nephrops, whelks, scallops, queen scallops (Aequipecten opercularis) and herring were the highest species in terms landed weight (tonnes) in all years from 2016 to 2020.

Elasmobranchs are also recorded in the waters around the Proposed Development. Basking sharks are commonly seen at the surface in the summer months, particularly around the western coasts of Great Britain and have been evidenced migrating through the Irish Sea, predominantly near the Isle of Man (Dolton et al., 2020, Doherty et al., 2017a; 2017b). Summer deployment of seventy satellite tags on basking sharks over four years (2012–2015) off the west coast of Scotland and the Isle of Man (Doherty et al., 2017a) showed high usage of the areas around the Proposed Development. Basking shark have been sighted in a density of 11-50 individuals sighted per 0.5 by 0.5° (degrees) (50 by 50km) to the north of the Isle of Man (Southall et al., 2005). Satellite tracking of individuals has shown that basking sharks typically have a north-south migration through the Irish Sea and therefore have the potential to be found within the Fish and Shellfish Ecology Study Area. Northerly movements have been exhibited by the species in early summer months while southerly movements have been found to take place during late summer and autumn (Sims et al., 2008; Wilson et al., 2020). Studies within the Fish and Shellfish ecology study area have reported other elasmobranch species including cuckoo ray (Raja naevus) and spotted ray (CMACS, 2010; Celtic Array Ltd, 2014). Additionally, two elasmobranch species were also recorded within the Gwynt y Mor offshore wind farm: thornback ray and blonde ray (CMACS, 2011).

Migratory species

Diadromous fish are species which migrate between freshwater and the sea during key life history stages (i.e., spawning). These may be anadromous (when fish spend most of their lives at sea but return to freshwater to spawn (e.g. Atlantic salmon Salmo salar) or catadromous (when fish spend most of their lives in freshwater but return to the sea to breed (e.g. European eel).There is the potential for migratory fish species to migrate to and from rivers in the vicinity of the Proposed Development and, therefore, they may migrate through the Proposed Development Fish and Shellfish Ecology Study Area to rivers during certain periods of the year (Malcolm et al., 2010).

Migratory species present in the area include salmon, European eel, sea trout (Salmo trutta), river lamprey (Lampetra fluviatilis), and sea lamprey (Petromyzon marinus) (Lockwood, 2005). Several rivers in the region are designated for their salmon populations, including River Bladnoch and the Firth of Clyde is also known to support salmonid populations. Important numbers of sea lamprey are present in the wider area, with several rivers designated for their sea lamprey populations. Sea lamprey have been recorded in the estuaries of the River Dee and the River Mersey, therefore may be present migrating in the Fish and Shellfish Ecology Study Area however these records are from the 1960s and 1970s (NBN Atlas, 2019).

For the purposes of the fish and shellfish assessment, it will be assumed that the aforementioned diadromous species have the potential to occur primarily during key migration periods (e.g., adult migration to spawning rivers and smolt/juvenile migration from natal rivers) in the vicinity of the Proposed NCW 1 Development. The timing of fish migration will therefore be an important element of the baseline characterisation, and this will be collected through a review of desktop data sources e.g., recent papers (e.g., Gardiner et al., 2018), local rod catches and fish stock reports (Cefas and Environment Agency, 2017).

Spawning and/or Nursery Grounds

Potential nursery and spawning areas in UK waters for a range of species were identified by Coull et al. (1998), based on larvae, egg and benthic habitat survey data. Ellis et al. (2012) reviewed this data for several finfish species, including herring, providing an updated understanding of areas of low and high intensity nursery and spawning grounds. Based on this data, spawning areas for several species overlap the fish and shellfish Proposed Development array area directly, and Fish and Shellfish Ecology Study Area (Figure 8.2 to Figure 8.7). Those species with known spawning periods are given in Table 8.4.

The Proposed Development directly overlaps low intensity spawning grounds for cod, ling, mackerel, whiting and common skate (Figure 8.2 to Figure 8.7, Table 8.3). Spawning grounds for Nephrops, that were not specified in intensity, also overlapped the Proposed Development. Within the Fish and Shellfish Ecology Study Area, high intensity areas are present for cod and plaice and high intensity grounds for herring in 1998 (Coull et al., 1998). Low intensity areas are present for ling (Molva molva), mackerel, whiting, hake, sandeel, skate and sole.

The Proposed Development directly overlaps high intensity nursery grounds for cod, spurdog, whiting (Figure 8.2 to Figure 8.7) and overlaps low intensity nursery grounds for anglerfish, hake, whiting, skate and mackerel. Nursery grounds for Nephrops, that were not specified in intensity, also overlapped the Proposed Development. Within the Fish and Shellfish Ecology Study Area, high intensity areas are present for cod, spurdog, whiting, and herring, and low intensity areas for hake, anglerfish, mackerel, skate, tope (Galeorhinus galeus), thornback ray, spotted ray, ling, sandeels, plaice, and sole. Nursery grounds for Nephrops also exist in the Fish and Shellfish Ecology Study Area.

Table 8.3: Key species with geographic spawning grounds located within and in proximity to the Proposed Development North Channel Wind 1 (Coull et al., 1998, Ellis et al. 2012)

Common name	Species name	Overlap with proposed Development area (North Channel Wind 1)	Fish and Shellfish Ecology Study Area
Cod	Gadus morhua	Low intensity areas present	High and low intensity areas present
Common skate	Dipturus batis-complex	Low intensity areas present	Low intensity areas present
European hake	Merluccius merluccius	None	Low intensity areas present
Herring	Clupea harengus	None	High intensity grounds in 1998
Ling	Molva molva	Low intensity areas present	Low intensity areas present

Common name	Species name	Overlap with proposed Development area (North Channel Wind 1)	Fish and Shellfish Ecology Study Area
Mackerel	Scomber scombrus	Low intensity areas present	Low intensity areas present
Nephrops	Nephrops norvegicus	Unspecified intensity areas present	Unspecified intensity areas present
Plaice	Pleuronectes platessa	None	High and low intensity areas present
Sandeel	Ammodytidae	None	Low intensity areas present
Sole	Solea solea	None	Low intensity areas present
Whiting	Merlangius merlangus	Low intensity areas present	Low intensity areas present

Table 8.4: Spawning times of key species, from Ellis et al. (2012)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spurdog	Viviparous species (gravid females can be found all year)											
Tope	Viviparous species (gravid females can be found all year)											
Common skate	Unknown											
Thornback ray												
Spotted ray												
Undulate ray	Unknown											
Herring (~NW Scotland)												
Cod												
Whiting												
Blue whiting												
Ling												
European hake												
Angler fish												
Horse mackerel												
Sandeels												
Mackerel												
Plaice												
Sole												

Table 8.5: Key species with geographic nursery grounds located within and in proximity to the Proposed Development North Channel Wind 1 (Coull et al., 1998, Ellis et al. 2012)

Common name	Species name	Proposed Development area (North Channel Wind 1)	Fish and Shellfish Ecology Study Area
Angler fish	Lophius piscatorius	Low intensity	Low intensity areas present
Cod	Gadus morhua	High and low intensity areas	High and low intensity areas present
Common skate	Dipturus batis-complex	Low intensity	Low intensity areas present
European hake	Merluccius merluccius	Low intensity	Low intensity areas present
Herring	Clupea harengus	None	High intensity areas present
Ling	Molva molva	None	Low intensity areas present
Mackerel	Scomber scombrus	Low intensity	Low intensity areas present
Nephrops	Nephrops norvegicus	Unspecified intensity areas present	Unspecified intensity areas present
Plaice	Pleuronectes platessa	None	Low intensity areas present
Sandeels	Ammodytidae	None	Low intensity areas present
Sole	Solea solea	None	Low intensity areas present
Spotted ray	Raja montagui	None	Low intensity areas present
Spurdog	Squalus acanthias	High intensity areas	High intensity areas present

Common name	Species name	Proposed Development area (North Channel Wind 1)	Fish and Shellfish Ecology Study Area
Thornback ray	Raja clavata	None	Low intensity areas present
Tope	Galeorhinus galeus	None	Low intensity areas present
Whiting	Merlangius merlangus	High intensity areas	High and low intensity areas present

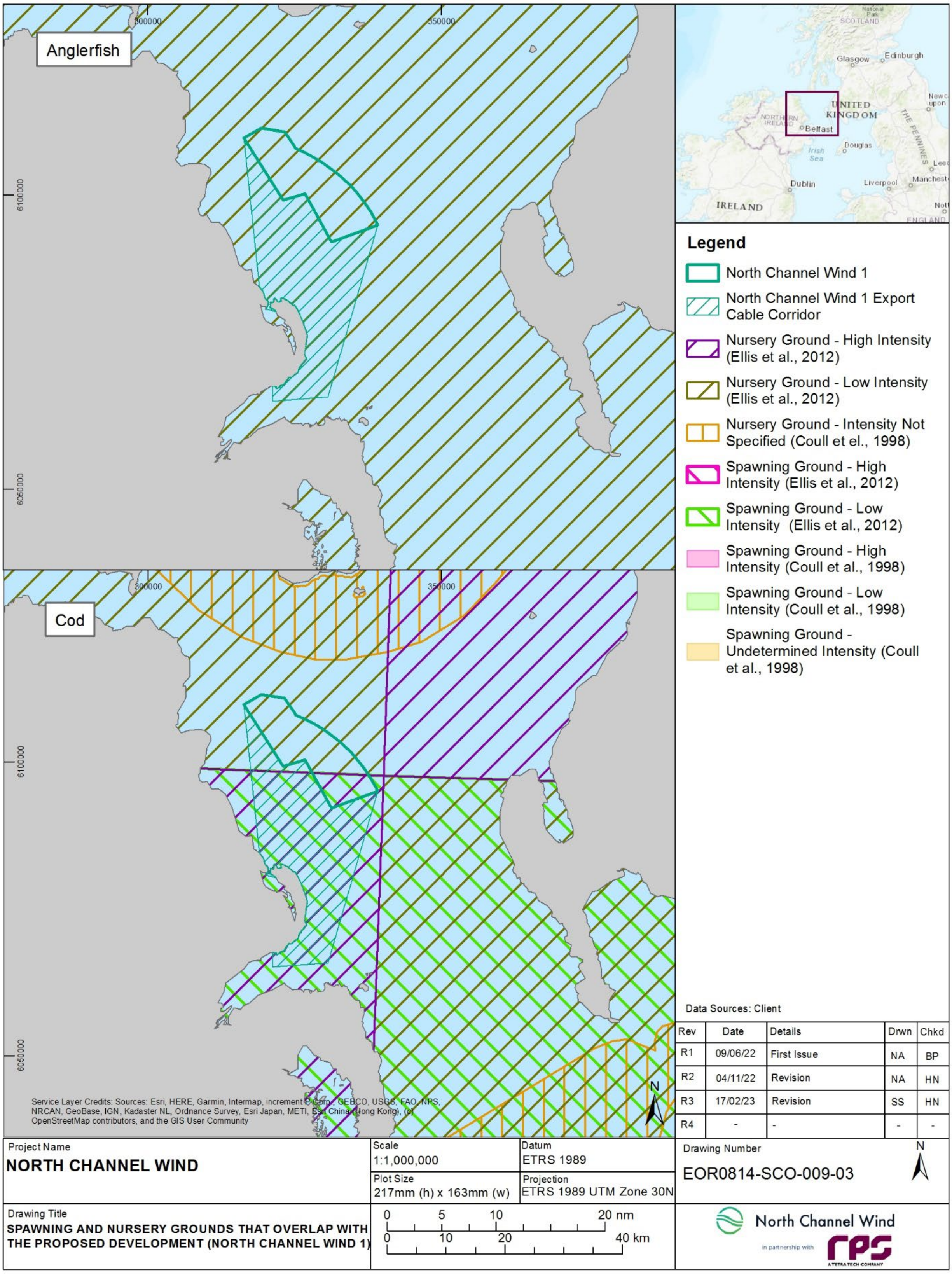
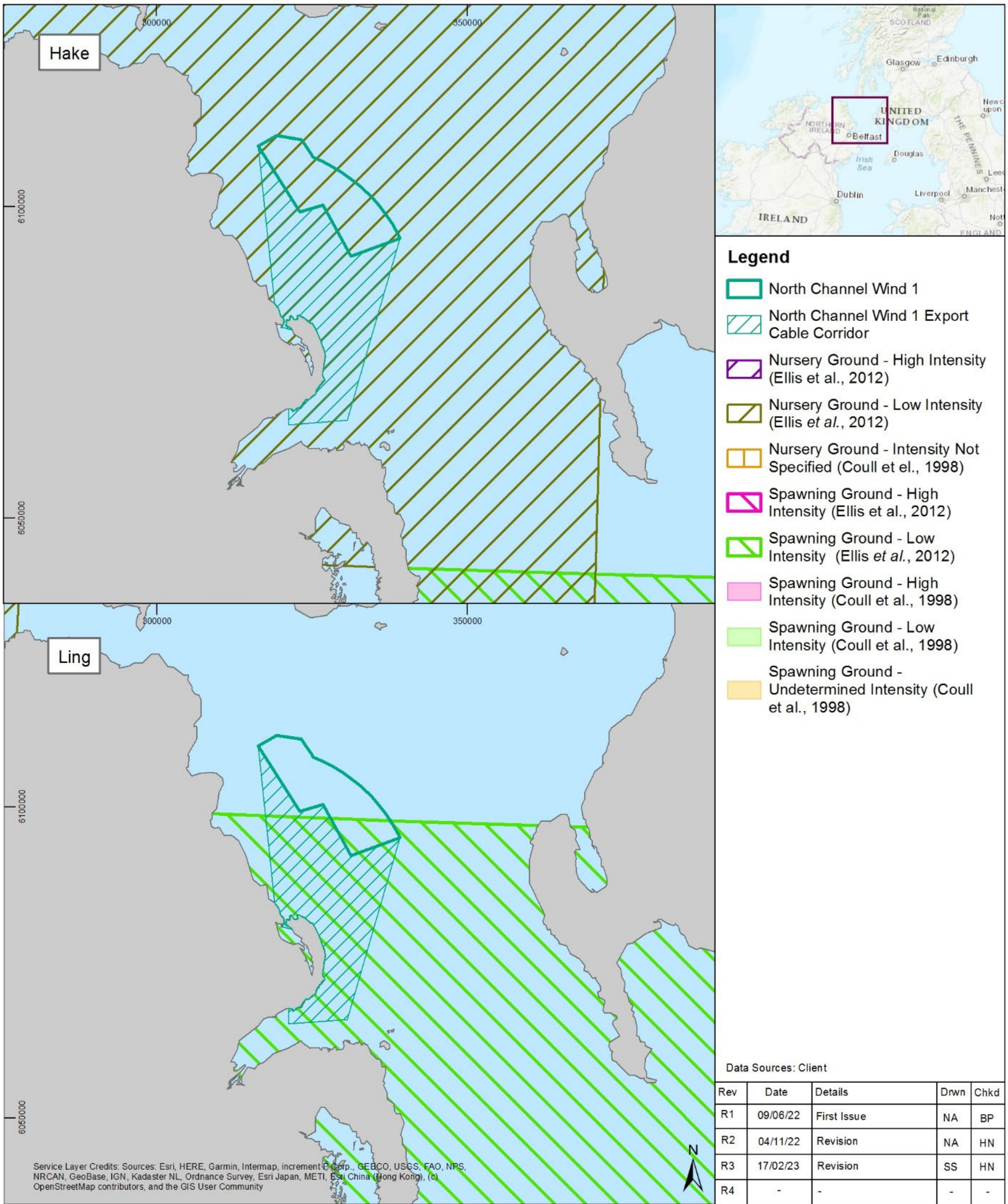


Figure 8.2: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 1) – Anglerfish and Cod



Rev	Date	Details	Drwn	Chkd
R1	09/06/22	First Issue	NA	BP
R2	04/11/22	Revision	NA	HN
R3	17/02/23	Revision	SS	HN
R4	-	-	-	-

Project Name	Scale	Datum	Drawing Number
NORTH CHANNEL WIND	1:1,000,000	ETRS 1989	EOR0814-SCO-010-03
	Plot Size: 217mm (h) x 163mm (w)	Projection: ETRS 1989 UTM Zone 30N	

Drawing Title
SPAWNING AND NURSERY GROUNDS THAT OVERLAP WITH THE PROPOSED DEVELOPMENT (NORTH CHANNEL WIND 1)

0 5 10 20 nm
0 10 20 40 km

North Channel Wind in partnership with rps

Figure 8.3: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 1) – Hake and ling

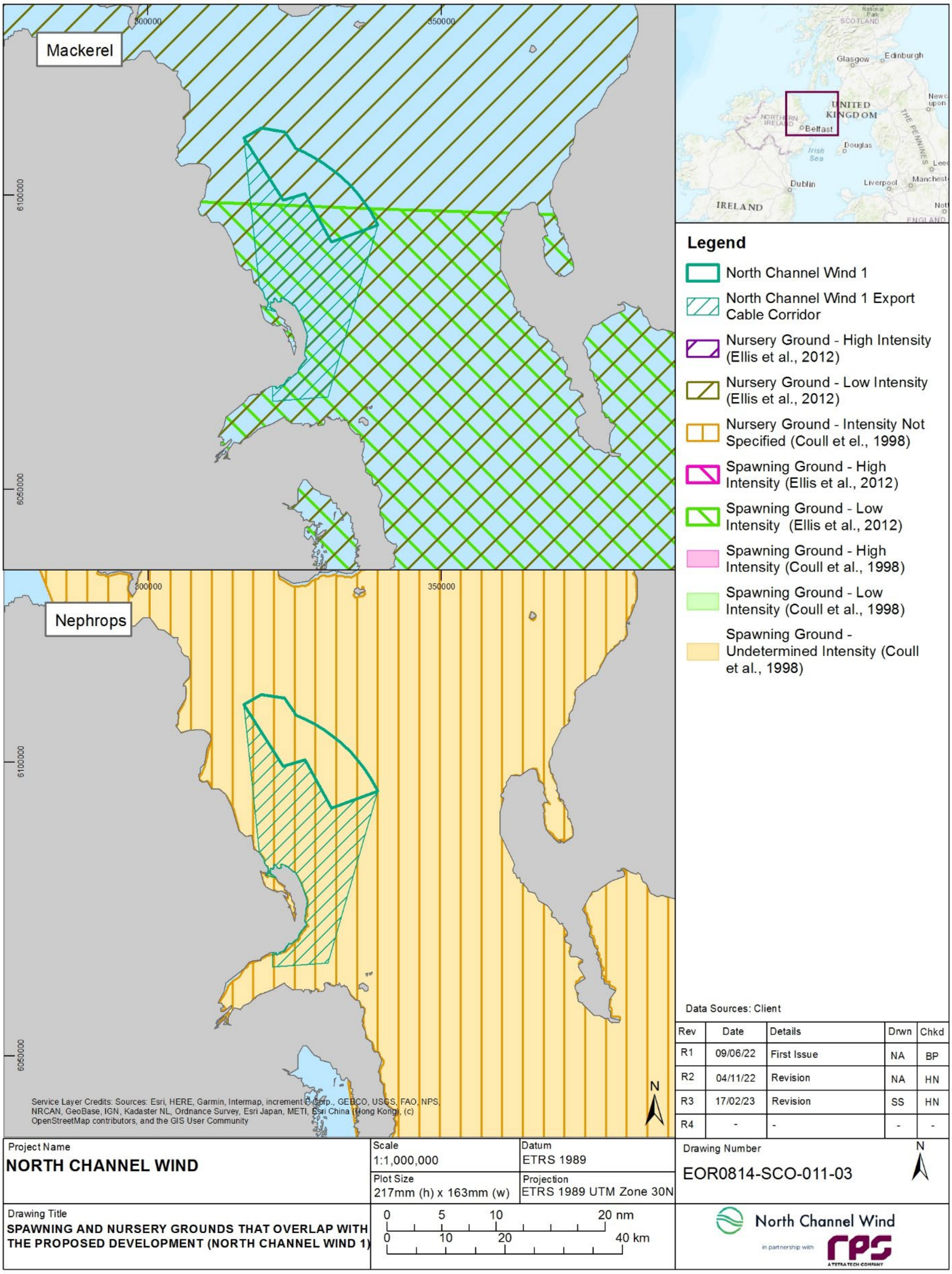
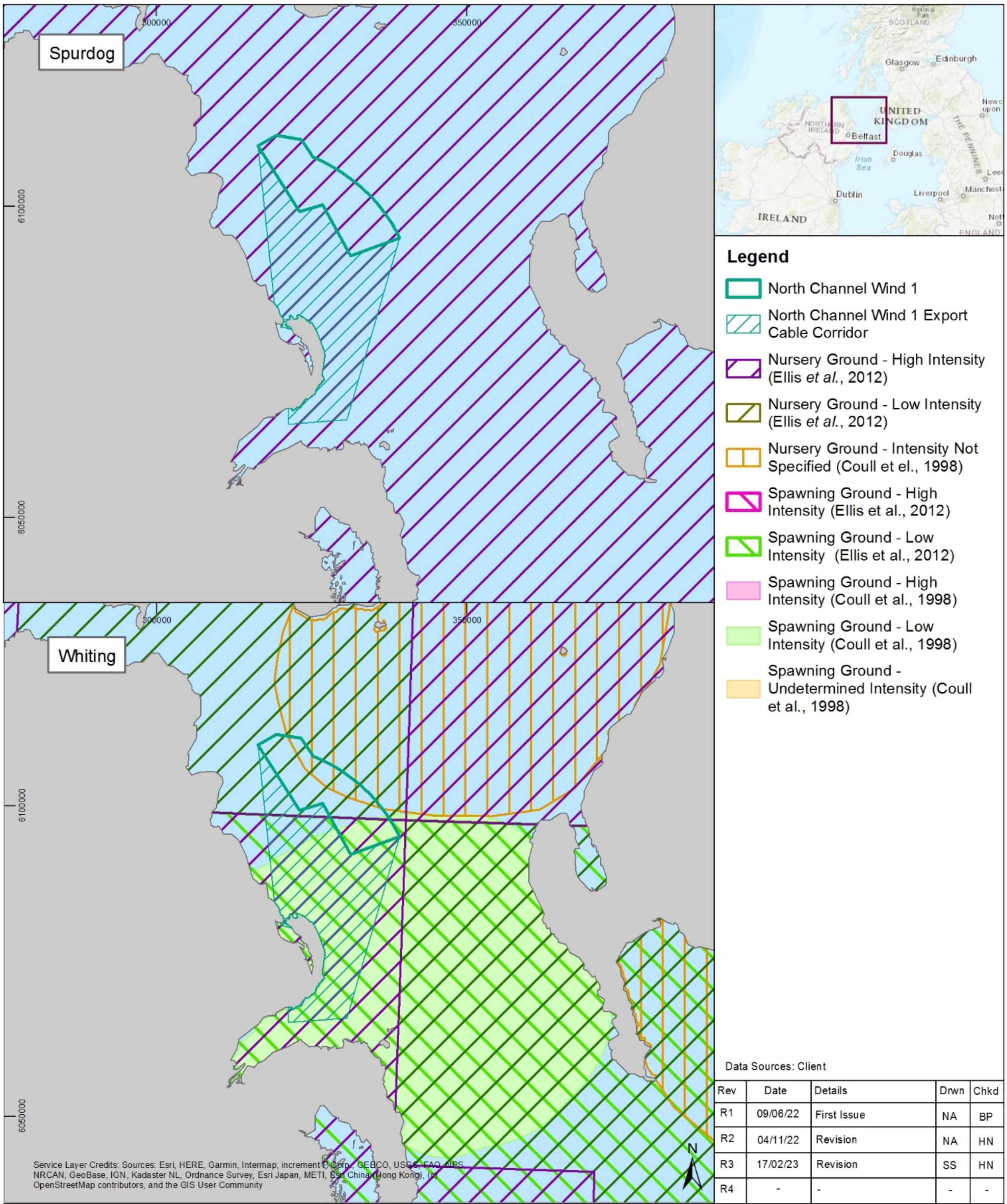


Figure 8.4: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 1) – Mackerel and Nephrops



Rev	Date	Details	Drwn	Chkd
R1	09/06/22	First Issue	NA	BP
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R3	17/02/23	Revision	SS	HN
R4	-	-	-	-

Project Name: NORTH CHANNEL WIND	Scale: 1:1,000,000	Datum: ETRS 1989	Drawing Number: EOR0814-SCO-012-03
	Plot Size: 217mm (h) x 163mm (w)	Projection: ETRS 1989 UTM Zone 30N	
Drawing Title: SPAWNING AND NURSERY GROUNDS THAT OVERLAP WITH THE PROPOSED DEVELOPMENT (NORTH CHANNEL WIND 1)	0 5 10 20 nm; 0 10 20 40 km		North Channel Wind in partnership with rps

Figure 8.5: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 1) - spurdog and whiting

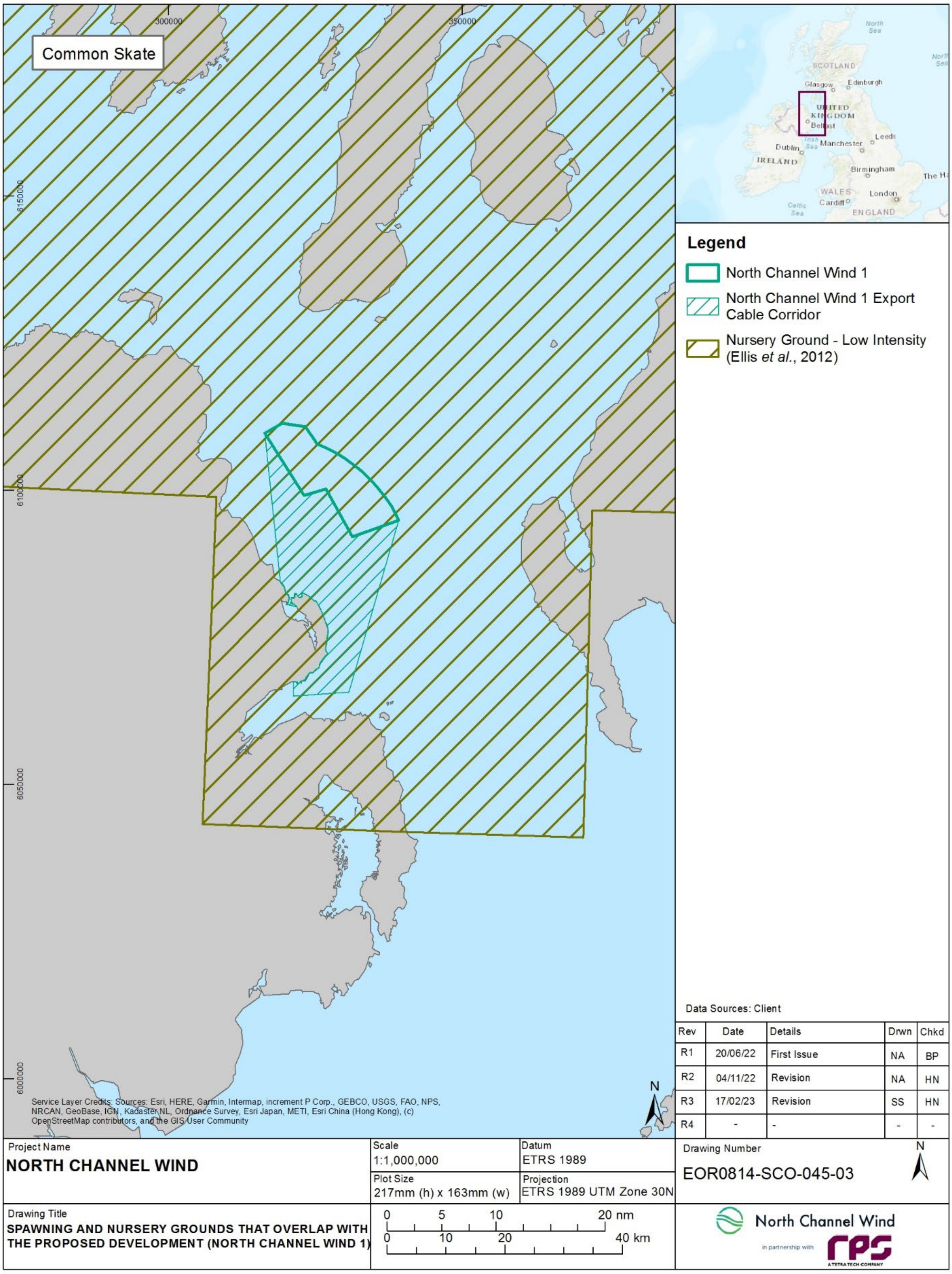


Figure 8.6: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 1) – common skate

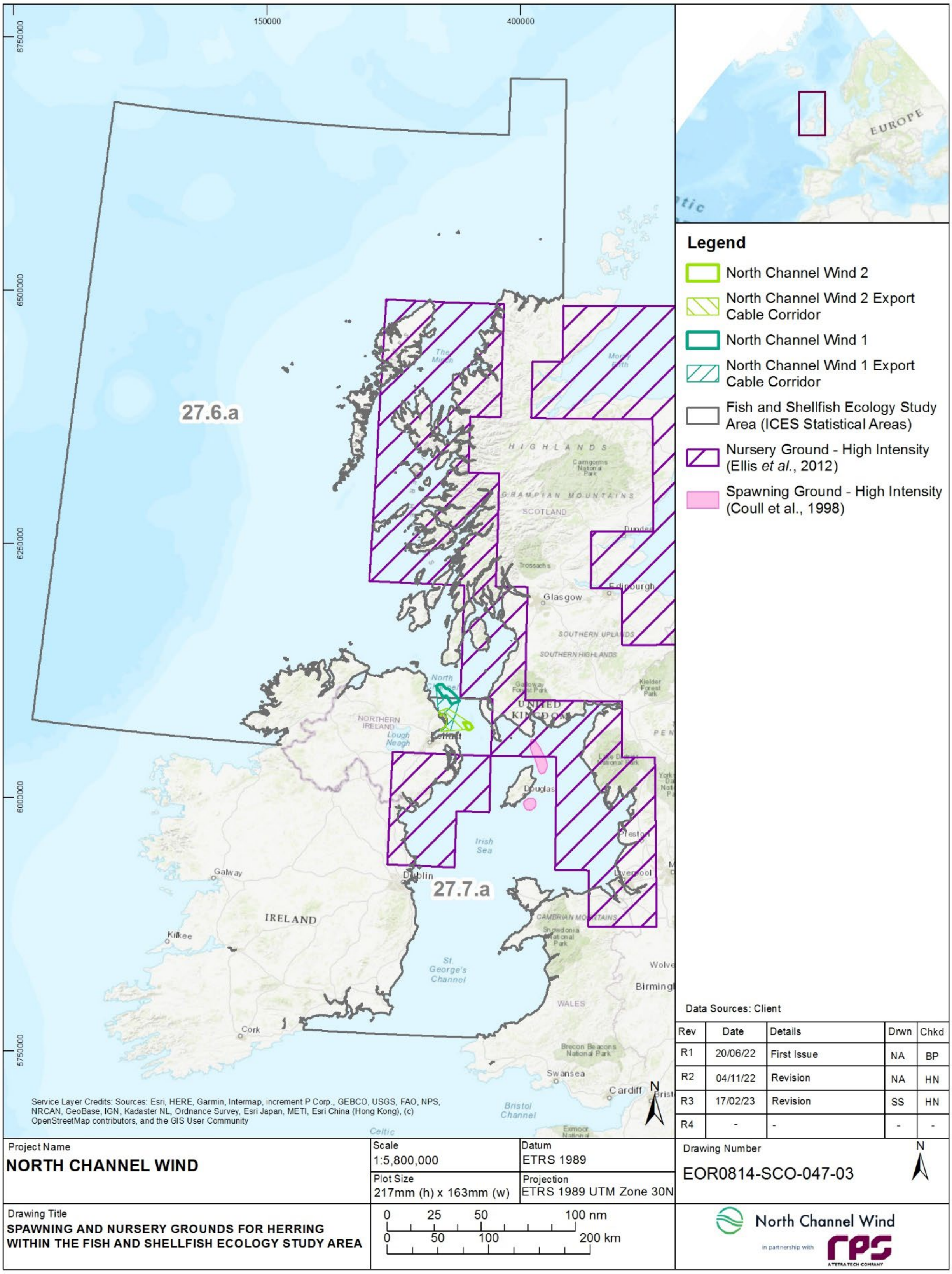


Figure 8.7: Spawning and nursery grounds for herring within the fish and shellfish ecology study area (Coull et al, 1998)

Shellfish assemblage

Shellfish are found locally throughout the intertidal and subtidal regions of the Fish and Shellfish Ecology study area. Key shellfish species in the area include common whelk (Buccinum undatum), European lobster (Homarus gammarus), Edible crab (Cancer pagurus), velvet crab (Necora puber), scallop Pectinidae and Nephrops. Important shellfish landed in the Fish and Shellfish Ecology Study Area in ICES landings from 2016 to 2019 includes Nephrops, Great Atlantic scallop (Pecten maximus), whelk, Queen scallop, razor clams (Ensis. species) and velvet crabs.

Nephrops spawning and nursery areas also overlap the Proposed Development (Coull et al., 1998) (Figure 8.4) and is the most important shellfish species exploited in the area. In addition to these there is a fishery for scallop northwest of the Isle of Man, which is located in the Fish and Shellfish Ecology Study Area. Nephrops distribution is limited by the extent of suitable, relatively soft, sediment in which they construct burrows where they spend most of their time, only coming out to feed and mate. Female Nephrops usually mature at three years of age and reproduce each year thereafter. They mate in early summer and spawn in September, carrying eggs under their tails until they hatch in April or May.

Edible crab is found in rocky areas, but also on sand, gravel and mud. After spawning (in late summer or autumn), eggs are carried by the female under the abdomen until they are ready to hatch. Hatching normally takes place in early summer, and the larvae are distributed by water movements before settling to the seabed as miniature adults. Tagging studies have shown that edible crabs may move up to a few kilometres a day, and hundreds of kilometres in the long term. Lobster has a preference for rocky reef habitats. Spawning and hatching generally follows the same pattern as that described for brown crabs but they are rarely thought to undertake any significant migrations.

8.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.6 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to fish and shellfish ecology that have are proposed to be scoped out of the assessment are described in Table 8.7.

Table 8.6: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Fish and Shellfish Ecology. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary habitat loss and disturbance	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), operations and seabed preparation works for anchoring and mooring systems. Temporary habitat loss/disturbance may occur during the operation and maintenance phase as a result of operations. The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude. There is potential for temporary, direct habitat loss and disturbance due to decommissioning activities to remove array cables, anchors and moorings resulting in potential effects on fish and shellfish ecology.	Given the wide-ranging and comprehensive desktop information and data sources available to characterise the fish and shellfish baseline, no site-specific fish ecology surveys to inform the Proposed Development ES are proposed. However, it is intended that the results of the benthic surveys, which is proposed to characterise the benthic subtidal baseline can be used to enhance the existing data for fish and shellfish.	No specific modelling is required to inform this impact assessment although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the Project Design Envelope (PDE). The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for habitat loss/disturbance will be quantified and the assessment will present the areas of habitat potentially affected in the context of the size of the fish and shellfish ecology study area.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Underwater noise	✓		✓	There is potential for mortality, injury and/or distance to sensitive fish and shellfish species as a result of construction activities such as pile-driving and vessel noise. Embedded mitigation could include piling ramp-up and soft-start measures.	As above.	Modelling undertaken for Subsea Noise section will be used to inform the assessment of underwater noise impacts to fish and shellfish. This will use the most up to date best practice guidelines (i.e., Popper et al., 2014) and other scientific literature to give consideration to the potential for injury and disturbance to fish and shellfish species, including disruption to spawning activity for marine fish species, disruption to migration of diadromous fish species, with a particular focus on potential barriers to migration. In particular, the hearing ability of fish species will be considered, and both sound pressure and particle motion will be considered. Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary increased suspended sediment concentrations and associated sediment deposition	✓	✓	✓	There is potential for an increase in suspended sediments and associated deposition during construction activities such as cable installation and seabed preparation.	As above.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. This will include consideration of the potential for effects on spawning habitats (i.e., changes to sediment composition, smothering of eggs etc) and disturbance to migration of diadromous fish species. This will consider differing sensitivities of the identified receptors and life history stages to this impact. Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.
Long-term habitat loss	✓	✓	✓	There is the potential for long-term habitat loss to occur directly under all foundation, anchoring and mooring structures and chains, and associated scour protection, and under any cable protection required along the inter-array and offshore export cables. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase	As above.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE. The significance of effects upon fish and shellfish receptors will be determined by

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				although this impact will largely occur throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the project lifetime.		correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the MDS.
Electromagnetic Fields (EMF) from subsea and midwater electrical cabling		✓		EMF generated through the subsea electrical cabling may affect fish and shellfish prey/predator relationship by inhibiting/interfering with the detection of EMF behaviours.	As above.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES, based on a thorough review of the available scientific information on EMFs in the marine environment and effects on fish and shellfish ecology receptors. This assessment will be based on information derived from the PDE.
Entanglement or collision risk		✓		Offshore infrastructure may act as a fish aggregation device (FAD), providing refuge for some species and also habitat for some shellfish and benthic species, whilst also potentially attracting larger predators which could indirectly increase entanglement or	As above.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				collision risk for fish (including basking shark). There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat, and further exacerbate this impact.		from the PDE. The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the MDS.
Ghost fishing due to lost fishing gear becoming entangled in installed infrastructure		✓		There is the potential for lost gear to become entangled within mooring lines and suspended cables associated with floating substructures, if this technology is utilised, leading to ghost fishing which may negatively impact fish and shellfish.	As above.	No modelling is required for this impact.

Table 8.7: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Fish and Shellfish Ecology

Impact	Justification
Construction	
Accidental release of pollutants	There is a risk of pollution being accidentally released during the construction phase from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans, e.g., Environmental Management Plans, including Marine Pollution Contingency Plans. These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR, International Maritime Organisation (IMO), MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Operation and Maintenance	
Accidental release of pollutants	As above for construction phase.
Underwater noise from wind turbine operation	Noise generated by operational wind turbines is of a very low frequency and low sound pressure level (Andersson et al., 2011). Studies have found that sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine (Sigray and Andersson 2011, and therefore such levels are not considered to have potential effects on fish and shellfish receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.

Impact	Justification
Underwater noise from vessels	Operational underwater noise generated from vessels is likely to be low and effects would only occur if fish species remained within immediate vicinity of the vessel (i.e., within metres) for a number of hours which is highly unlikely. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Colonisation of hard structures	There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat. However, the increase in surface area suitable for colonisation would be extremely small in the context of hard and soft sediment habitats in the Fish and Shellfish Ecology Study Area and therefore this would not have a potentially significant effect on the diversity or population levels. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Decommissioning	
Accidental release of pollutants	As above for construction phase.

8.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The fish and shellfish ecology EIA will follow the methodology set out in Chapter 3. Specific to the fish and shellfish ecology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Consenting, EIA and HRA Guidance for Marine Renewable Energy Developments in Scotland (European Marine Energy Centre (EMEC) and Xodus, 2010);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008) and
- Sound exposure guidelines for Fishes and Sea Turtles (Popper et al., 2014).

In addition, and specific to marine ecology topics, IEFs will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

8.2.6 POTENTIAL CUMULATIVE EFFECTS

The majority of predicted effects of construction, operation and maintenance, and decommissioning from the Proposed Development on fish and shellfish ecology are considered to be localised to within the footprint of the project. However, there is potential for some predicted impacts from the Proposed Development on fish and shellfish ecology (e.g., underwater noise) to interact with impacts from other projects and activities and lead to a cumulative effect on receptors. The key cumulative effect is likely to result from increased underwater noise during pile driving.

The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development. The following projects or activities will be considered for cumulative effects:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e., telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

8.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

8.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Fish and Shellfish Ecology?
- Do you agree that all receptors and impacts have been identified for Fish and Shellfish Ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

8.3 NCW 2 PROJECT

8.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of fish and shellfish ecology of relevance to the Proposed Development (North Channel Wind 2 or NCW 2) and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on fish and shellfish ecology. Basking sharks (Cetorhinus maximus) are included within this fish and shellfish ecology section, but turtles are included in the marine mammal section.

8.3.2 STUDY AREA

The Proposed Development includes areas within territorial waters of Ireland and Scotland and supports a range of fish and shellfish species. Fish and shellfish are known to be highly variable, both spatially and temporally, and so a broad and inclusive study area has been defined. The fish and shellfish ecology study area is therefore defined as the area encompassing the International Council for the Exploration of the Sea (ICES) Statistical Rectangles (39E4, 38E4, 38E5, 39E5, 39E3 which covers the Proposed NCW 2 Development, offshore cable (up to the mean high water springs (MHWS)), and associated cables (Figure 8.8). This study area will allow for the characterisation of all fish and shellfish receptors within the area, accounting for the spatial and temporal variability of fish and shellfish populations, including fish migration. This study area was considered appropriate as it is sufficiently large to consider all direct (e.g., habitat loss/disturbance within project boundaries) and indirect impacts (e.g., underwater noise over a much wider area) of the Proposed Development on the identified fish and shellfish receptors.

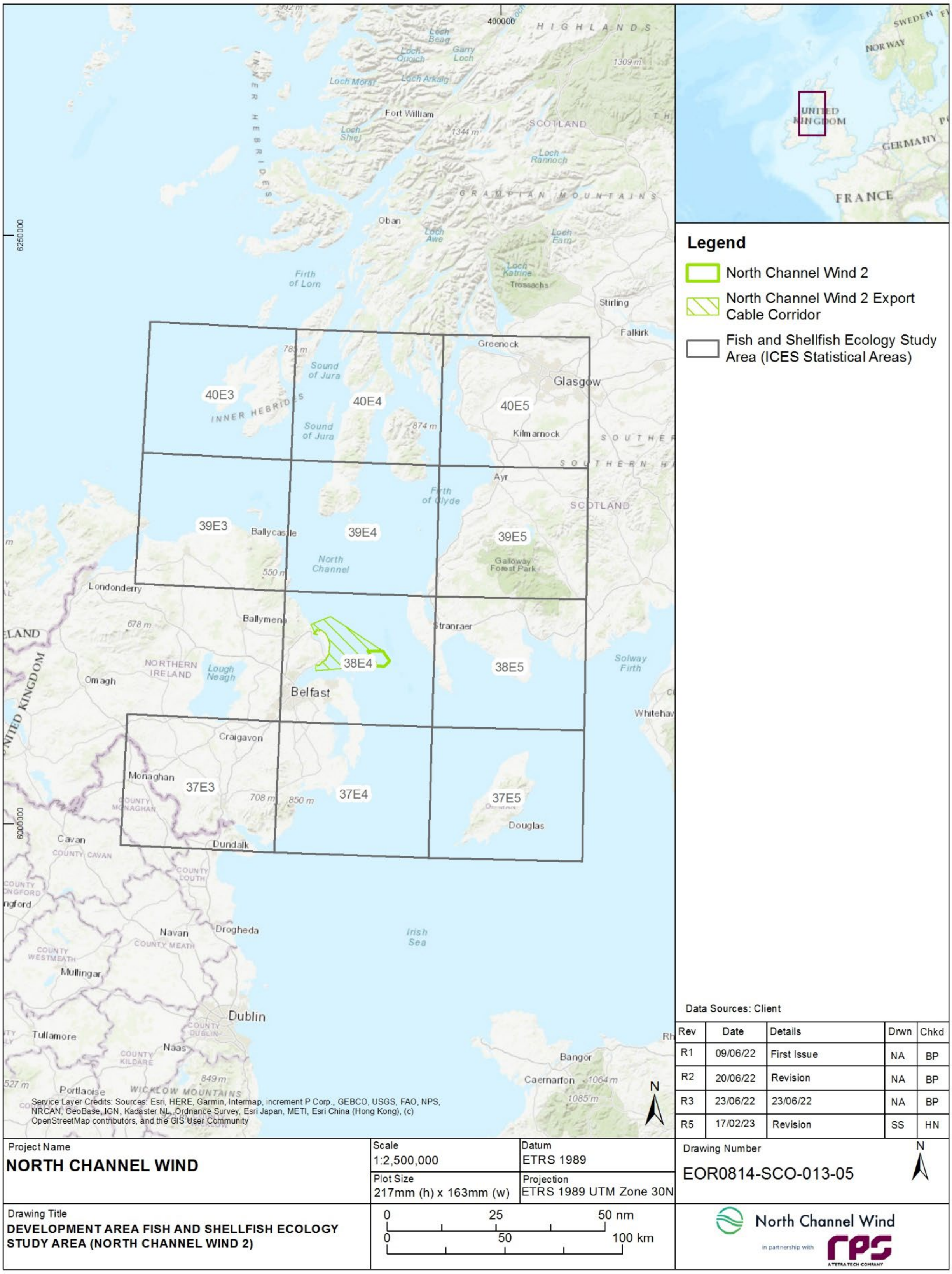


Figure 8.8: Fish and Shellfish Ecology Study Area and North Channel Wind 2

8.3.3 BASELINE ENVIRONMENT

Fish and Shellfish Designated Sites

The Proposed Development does not overlap with any European sites or Natura 2000 sites but there are several protected areas for fish and shellfish within the vicinity. Table 8.9 provides an early indication of the designated sites (international and national) that may be considered within the EIA and HRA. This list will be refined in the EIA to also include sites that fall within the potential zone of influence of the Proposed Development, which will be determined as part of the EIA process to include consideration of migratory fish species.

It is important to highlight that the North Channel area remains an Area of Search (AoS) due to the presence of the common skate (Dipturus batis) (DAERA, 2022), a priority marine feature (PMF), and evidence is currently being gathered to investigate the potential for parts of this site to be considered as a MCZ to complete the MPA network.

Table 8.8 Summary of designated sites for fish and shellfish in proximity to the Proposed Development

Designated Site	Distance to Proposed Development area (km) (North Channel Wind 2)	Qualifying Features and Site Description
Ramsey Bay MNR (Isle of Man)	67.18	Area of 97km2
		Designation features: Intertidal blue mussel, iceland clam (Arctica islandica), European eel, common skate, cod (Gadus morhua) (spawning / nursery), sand eel, seabass nursery (Dicentrarchus labrax)
Port Erin Bay MNR (Isle of Man)	78.51	Area of 4km2.
		Designation features: flame shell (Limaria hians), iceland clam, basking shark, plaice (spawning / nursery)
Calf and Wart Bank MNR (Isle of Man)	80.05	Area of 20km2.
		Designation features: spiny lobster (Palinuridae), flame shell, basking shark, sand eel
Loch Sween (MPA)	123.79	Loch Sween, a fjordic sea loch situated on the west coast of Scotland near Lochgilphead, covers 41km2.
		Native oysters occur patchily throughout Loch Sween, as evidenced by the shells on the beach discarded by feasting otters. Once common in Scotland and supporting a grand shellfish export industry, beds of native oysters now only

Designated Site	Distance to Proposed Development area (km) (North Channel Wind 2)	Qualifying Features and Site Description
		exist in a few scattered locations. The population within Loch Sween is considered to be of national importance.
		Qualifying Features: Native oysters (Ostrea edulis)
		Designation features: intertidal blue mussel (Mytilus edulis), European eel (Anguilla anguilla), basking shark, plaice (spawning / nursery) (Pleuronectes platessa), sand eel (Ammodytes marinus)
Loch Sunart to the Sound of Jura (Scottish) MPA	134.64	The Marine Protected Area (MPA) covers from Loch Sunart to the Sound of Jura, covering 741km2.
		Common skate remain in a relatively small geographical area year-round. Loch Sunart to the Sound of Jura Marine Protected Area has been shown to support a good number of resident mature common skate that may also be breeding in the area
		Qualifying Features: Flapper skate (Dipturus intermedius)

Fish assemblage

Distribution of fish is determined by a range of factors including abiotic parameters (e.g., water temperature, salinity, depth, local scale habitat features and substrate type), biotic parameters (e.g., predator prey interactions, competition), and anthropogenic factors (e.g., infrastructure and commercial fishing intensity). Fish present within the study area include pelagic, demersal, cartilaginous, and migratory species.

In the southern part of the Fish and Shellfish Ecology Study Area, to the south of the Proposed Development, the Irish Sea supports a variety of commercial fisheries for cod, plaice and sole (Solea solea), as well as significant fisheries for Nephrops, crabs, lobster, scallops, razor shells and whelks. Species identified in the Stock Book 2022 (Marine Institute, 2022) as being of commercial importance in the Irish Sea include cod, haddock (Melanogrammus aeglefinus), whiting (Merlangius merlangus), plaice, sole, Nephrops (Nephrops norvegicus), ray species (e.g., thornback ray (Raja clavate), spotted ray (Raja montagui), blonde ray (Raja brachyiura) and herring (Clupea harengus). In the wider Irish Sea region, demersal trawling for Nephrops dominates the fishing effort, whilst vessels operating inshore typically target shellfish with pots, or dredge for scallop. During CEFAS beam trawl surveys of the Irish Sea between 1993 and 2001, more than 100 species of marine fish were recorded (Parker-Humphreys, 2004). Within the Irish sea, deep-water fishing grounds west of the Isle of Man includes Norway pout (Trisopterus esmarkii), witch (Glyptocephalus cynoglossus) and long-rough dab (Hippoglossoides platessoides) (Ellis et al., 2002) whilst inshore waters of Dundrum Bay and Belfast have high abundance of clupeids. Sandy inshore areas of the Irish Sea support large numbers of juvenile flatfish and sand eels, with seasonal populations of sprat (Sprattus sprattus), herring and juvenile gadoids. Rockier areas have fish assemblages dominated by small species such as wrasse, gobies and blennies, as well as juvenile pollack (Pollachius pollachius) and saithe (Pollachius virens) (Pawson et al., 2002).

North of the Proposed Development, in the Fish and Shellfish Ecology Study Area, the tagging has revealed that cod migrate in late summer and early autumn from the west coast of Scotland to the north coast and return in the late winter and early spring (Scottish Executive, 2007). Spawning can occur from January to April, usually peaking in February. Herring is widely distributed off the west coast of Scotland, with the main spawning area lying to the west of the Outer Hebrides and extends north along the North Coast of Scotland and an autumn spawning area around the Inner Hebrides. Although a pelagic species, they are demersal spawners, depositing sticky eggs on stone and gravel in waters down to 200 m and as such herring are considered particularly sensitive to seabed developments. Sprat is another short-lived pelagic species that is widely distributed off western Scotland, with nursery areas along the inshore west coast areas of Scotland. Mature fish often migrate inshore during the winter (September to March).

A number of fish surveys have been undertaken across the fish and shellfish ecology study area for the surrounding offshore wind farm developments. Dover sole and cod were identified as species of key commercial importance in the area (Brown and May Marine Ltd, 2013). The Environmental Assessment (EA) for the Argyll Tidal Development, to the North of the Proposed Development, stated low intensity nursery grounds are recorded across the Argyll Tidal Development Site as part of a wider nursery area and higher intensity nursery grounds are located to the east of the Kintyre peninsula and in the Clyde (Naturicity, 2013). The Argyll Tidal Development site overlaps with low intensity nursery grounds for the following species: anglerfish (Lophius piscatorius), cod, common skate, European hake, mackerel and whiting; and high intensity nursery grounds for spurdog Squalus acanthias. It also overlaps with nursery grounds for Nephrops and saithe (noting that intensity of this was unknown). Herring nursery grounds occur to the east and west of the Kintyre peninsula, but do not overlap the Argyll Development Site. Spawning grounds for Nephrops and saithe are also recorded to overlap the Argyll Development Site.

Commercial landing data provides an overview of species present within the Fish and Shellfish Ecology Study Area (ICES, 2021). Within the Fish and Shellfish Ecology Study Area, Nephrops, whelks, scallops, queen scallops (Aequipecten opercularis) and herring were the highest species in terms landed weight (tonnes) in all years from 2016 to 2020.

Elasmobranchs are also recorded in the waters around the Proposed Development. Basking sharks are commonly seen at the surface in the summer months, particularly around the western coasts of the UK and have been evidenced migrating through the Irish Sea, predominantly near the Isle of Man (Dolton et al., 2020, Doherty et al., 2017a; 2017b). Summer deployment of seventy satellite tags on basking sharks over four years (2012–2015) off the west coast of Scotland and the Isle of Man (Doherty et al., 2017a) showed high usage of the areas around the Proposed Development. Basking shark have been sighted in a density of 11-50 individuals sighted per 0.5 by 0.5° (degrees) (50 by 50km) to the north of the Isle of Man (Southall et al., 2005). Satellite tracking of individuals has shown that basking sharks typically have a north-south migration through the Irish Sea and therefore have the potential to be found within the fish and shellfish ecology study area. Northerly movements have been exhibited by the species in early summer months while southerly movements have been found to take place during late summer and autumn (Sims et al., 2008; Wilson et al., 2020). Studies within the Fish and Shellfish ecology study area have reported other elasmobranch species including cuckoo ray (Raja naevus) and spotted ray (CMACS, 2010; Celtic Array Ltd, 2014). Additionally, two elasmobranch species were also recorded within the Gwynt y Mor offshore wind farm: thornback ray and blonde ray (CMACS, 2011).

Migratory species

Diadromous fish are species which migrate between freshwater and the sea during key life history stages (i.e., spawning). These may be anadromous (when fish spend most of their lives at sea but return to freshwater to spawn (e.g. Atlantic salmon Salmo salar) or catadromous (when fish spend most of their lives in freshwater but return to the sea to breed (e.g. European eel).There is the potential for migratory fish species to migrate to and from rivers in the vicinity of the Proposed Development and, therefore, they may migrate through the Proposed Development Fish and Shellfish Ecology Study Area to rivers during certain periods of the year (Malcolm et al., 2010).

Migratory species present in the area include salmon, European eel, sea trout (Salmo trutta), river lamprey (Lampetra fluviatilis), and sea lamprey (Petromyzon marinus) (Lockwood, 2005). Several rivers in the region are designated for their salmon populations, including River Bladnoch and the Firth of Clyde is also known to support salmonid populations. Important numbers of sea lamprey are present in the wider area, with several rivers designated for their sea lamprey populations. Sea lamprey have been recorded in the estuaries of the River Dee and the River Mersey, therefore may be present migrating in the Fish and Shellfish Ecology Study Area, however these records are from the 1960s and 1970s (NBN Atlas, 2019).

For the purposes of the fish and shellfish assessment, it will be assumed that the aforementioned diadromous species have the potential to occur primarily during key migration periods (e.g., adult migration to spawning rivers and smolt/juvenile migration from natal rivers) in the vicinity of the Proposed Development (North Channel 1). The timing of fish migration will therefore be an important element of the baseline characterisation, and this will be collected through a review of desktop data sources e.g., recent papers (e.g. Gardiner et al., 2018), local rod catches and fish stock reports (Cefas and Environment Agency, 2017).

Spawning and/or Nursery Grounds

Potential nursery and spawning areas in UK waters for a range of species were identified by Coull et al. (1998), based on larvae, egg and benthic habitat survey data. Ellis et al. (2012) reviewed this data for several finfish species, including herring, providing an updated understanding of areas of low and high intensity nursery and spawning grounds. Based on this data, spawning areas for several species overlap the fish and shellfish Proposed Development array area directly, and Fish and Shellfish Ecology Study Area (Figure 8.9 to Figure 8.14). Those species with known spawning periods are given in Table 8.11.

The Proposed Development directly overlaps low intensity spawning grounds for cod, ling, mackerel, whiting and common skate (Figure 8.9 to Figure 8.14, Table 8.10). Spawning grounds for Nephrops, that were not specified in intensity, also overlapped the Proposed Development. Within the Fish and Shellfish Ecology Study Area, high intensity areas are present for cod and plaice and high intensity grounds for herring in 1998 (Coull et al., 1998). Low intensity areas are present for ling (Molva molva), mackerel, whiting, hake, sandeel, skate and sole.

The Proposed Development directly overlaps high intensity nursery grounds for cod, spurdog, whiting (Figure 8.9 to Figure 8.14, Table 8.12) and overlaps low intensity nursery grounds for anglerfish, hake, whiting, skate and mackerel. Nursery grounds for Nephrops, that were not specified in intensity, also overlapped the Proposed Development. Within the Fish and Shellfish Ecology Study Area, high intensity areas are present for cod, spurdog, whiting, and herring, and low intensity areas for hake, anglerfish, mackerel, skate, tope (Galeorhinus galeus), thornback ray, spotted ray, ling, sandeels, plaice, and sole. Nursery grounds for Nephrops also exist in the Fish and Shellfish Ecology Study Area.

Table 8.9: Key species with geographic spawning grounds located within and in proximity to the Proposed Development North Channel Wind 2 (Coull et al., 1998, Ellis et al. 2012)

Common name	Species name	Overlap with proposed Development area (North Channel Wind 2)	Fish and Shellfish Ecology Study Area
Cod	Gadus morhua	Low intensity areas present	High and low intensity areas present
Common skate	Dipturus batis-complex	Low intensity	Low intensity areas present
European hake	Merluccius merluccius	None	Low intensity areas present
Herring	Clupea harengus	None	High intensity grounds in 1998

Common name	Species name	Overlap with proposed Development area (North Channel Wind 2)	Fish and Shellfish Ecology Study Area
Ling	Molva molva	Low intensity areas present	Low intensity areas present
Mackerel	Scomber scombrus	Low intensity areas present	Low intensity areas present
Nephrops	Nephrops norvegicus	Unspecified intensity areas	Unspecified intensity areas present
Plaice	Pleuronectes platessa	None	High and low intensity areas present
Sandeel	Ammodytidae	None	Low intensity areas present
Sole	Solea solea	None	Low intensity areas present
Whiting	Merlangius merlangus	Low intensity areas present	Low intensity areas present

Table 8.10: Spawning times of key species, from Ellis et al. (2012)

Species	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Spurdog	Viviparous species (gravid females can be found all year)											
Tope	Viviparous species (gravid females can be found all year)											
Common skate	Unknown											
Thornback ray												
Spotted ray												
Undulate ray	Unknown											
Herring (~NW Scotland)												
Cod												
Whiting												
Blue whiting												
Ling												

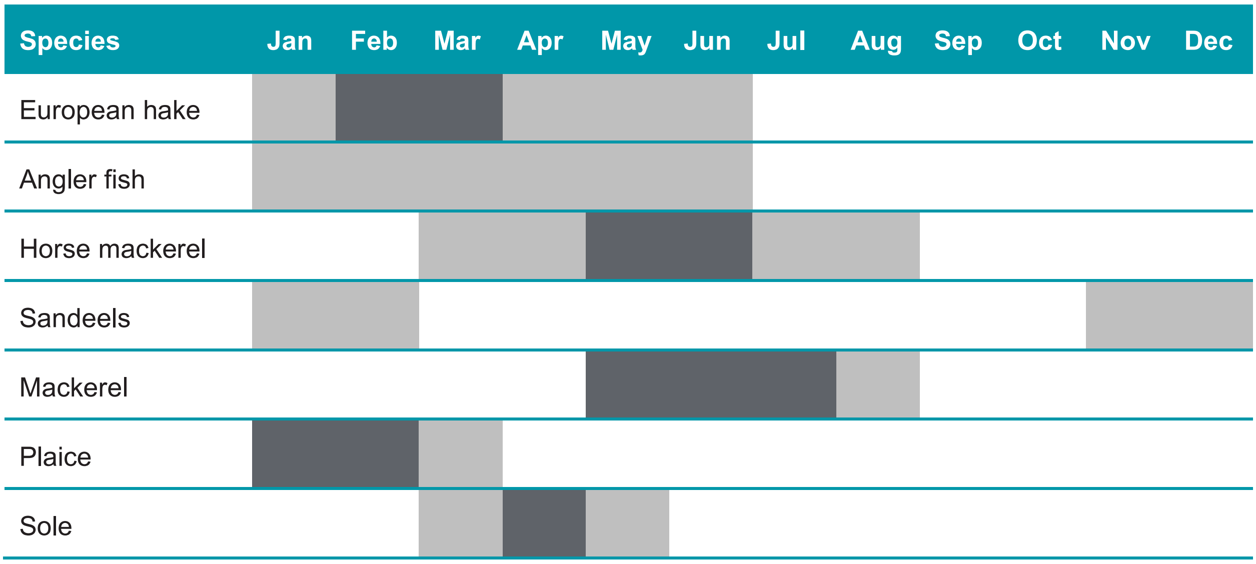


Table 8.11: Key species with geographic nursery grounds located within and in proximity to the Proposed Development North Channel Wind 2 (Coull et al., 1998, Ellis et al. 2012)

Common name	Species name	Proposed Development area (North Channel Wind 2)	Fish and Shellfish Ecology Study Area
Angler fish	Lophius piscatorius	Low intensity	Low intensity areas present
Cod	Gadus morhua	High and low intensity areas	High and low intensity areas present
Common skate	Dipturus batis-complex	Low intensity	Low intensity areas present
European hake	Merluccius merluccius	Low intensity	Low intensity areas present
Herring	Clupea harengus	None	High intensity areas present
Ling	Molva molva	None	Low intensity areas present
Mackerel	Scomber scombrus	Low intensity	Low intensity areas present
Nephrops	Nephrops norvegicus	Unspecified intensity areas present	Unspecified intensity areas present
Plaice	Pleuronectes platessa	None	Low intensity areas present
Sandeels	Ammodytidae	None	Low intensity areas present

Common name	Species name	Proposed Development area (North Channel Wind 2)	Fish and Shellfish Ecology Study Area
Sole	Solea solea	None	Low intensity areas present
Spotted ray	Raja montagui	None	Low intensity areas present
Spurdog	Squalus acanthias	High intensity areas	High intensity areas present
Thornback ray	Raja clavata	None	Low intensity areas present
Tope	Galeorhinus galeus	None	Low intensity areas present
Whiting	Merlangius merlangus	High and low intensity areas	High and low intensity areas present

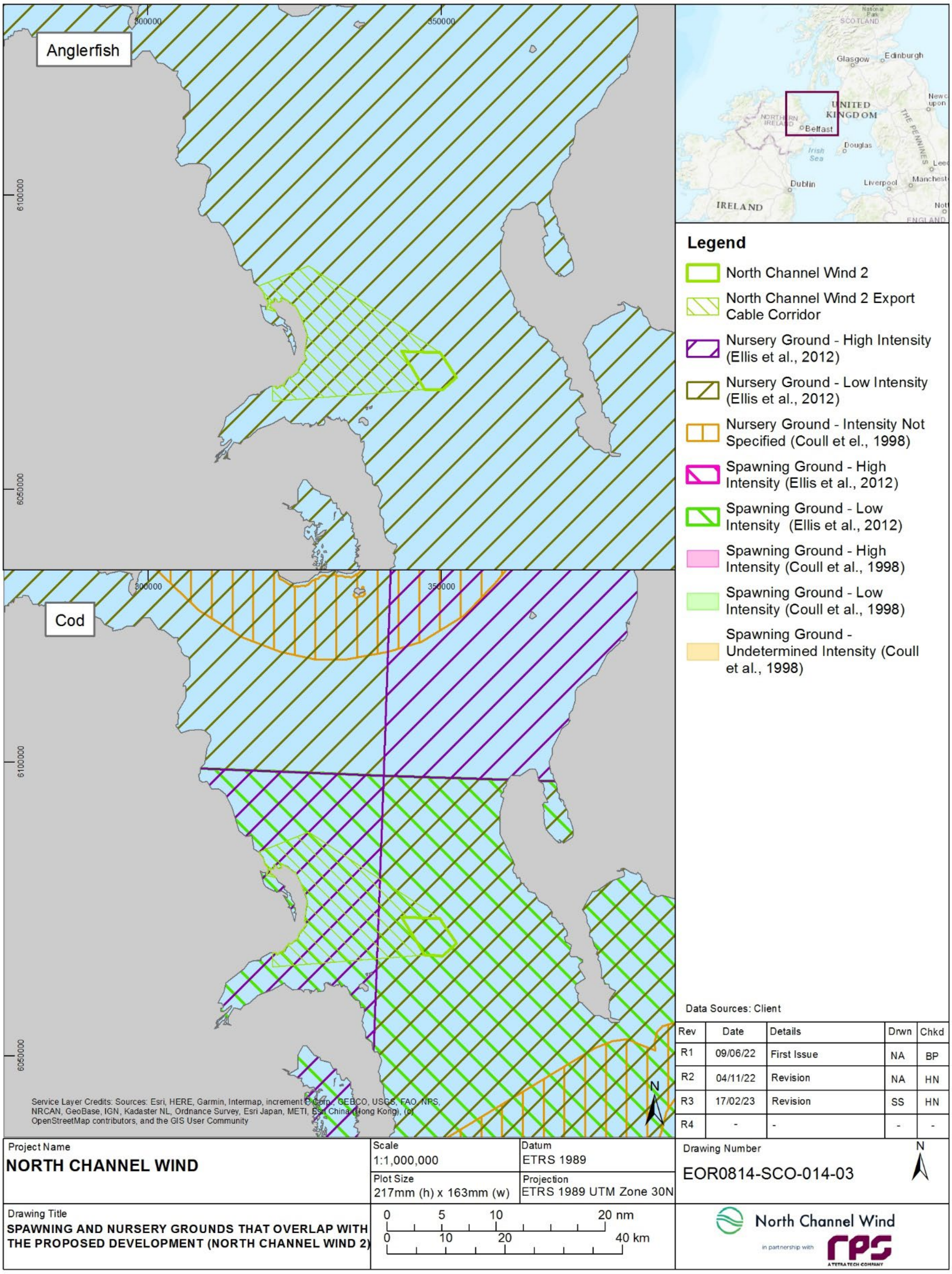


Figure 8.9: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 2) – Anglerfish and Cod

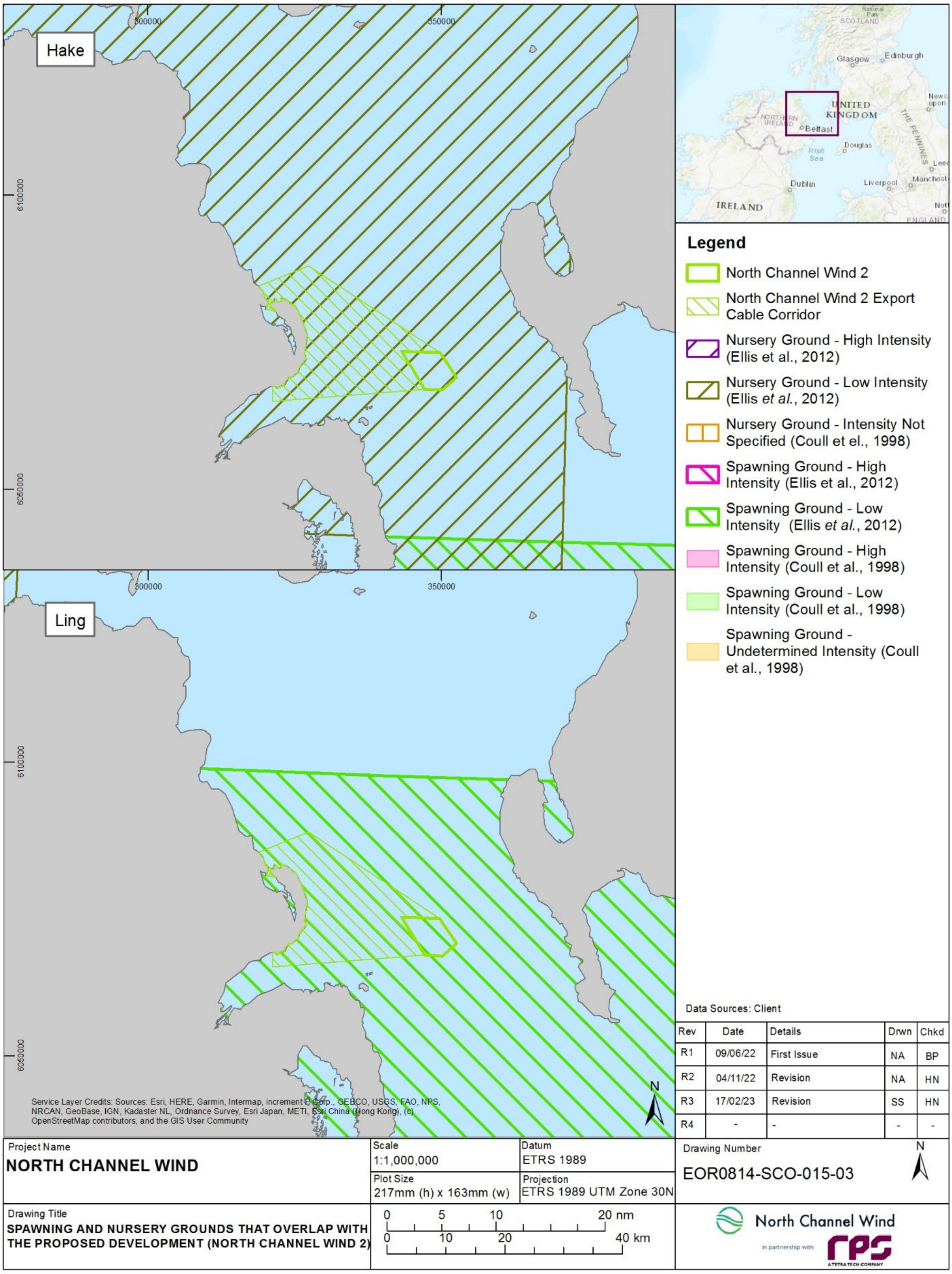


Figure 8.10: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 2) – Hake and ling

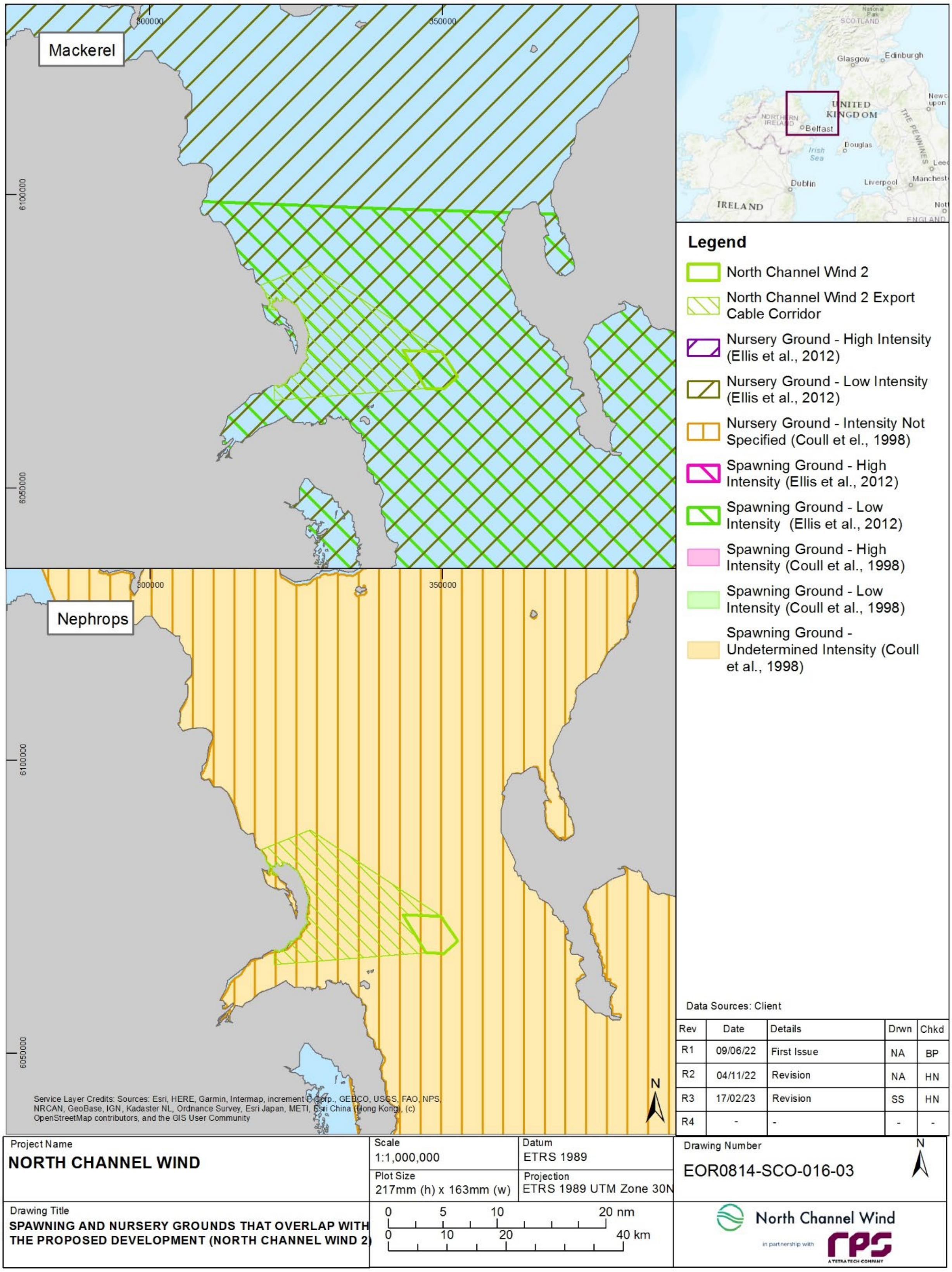


Figure 8.11: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 2) – Mackerel and Nephrops

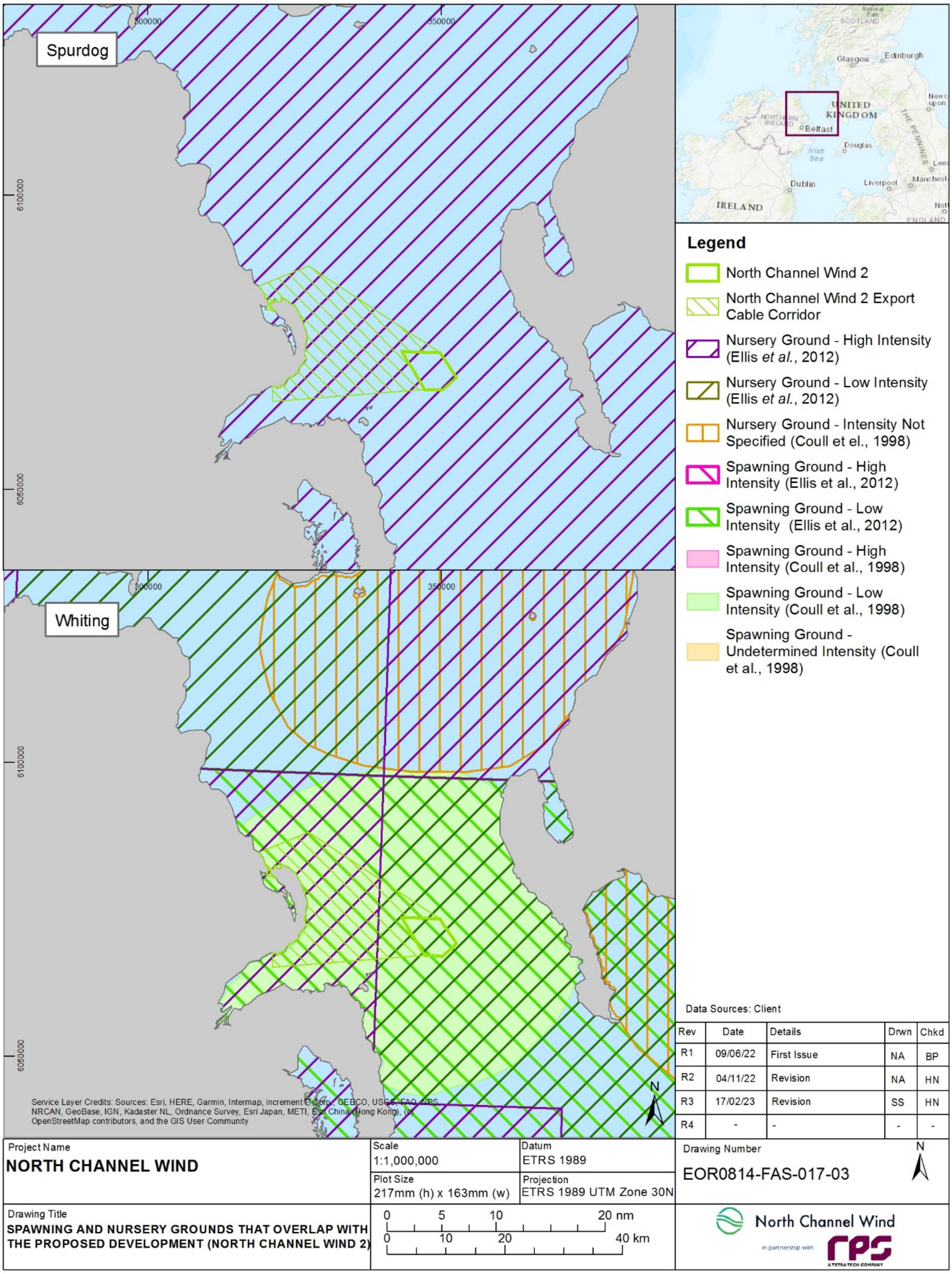


Figure 8.12: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 2) - spurdog and whiting

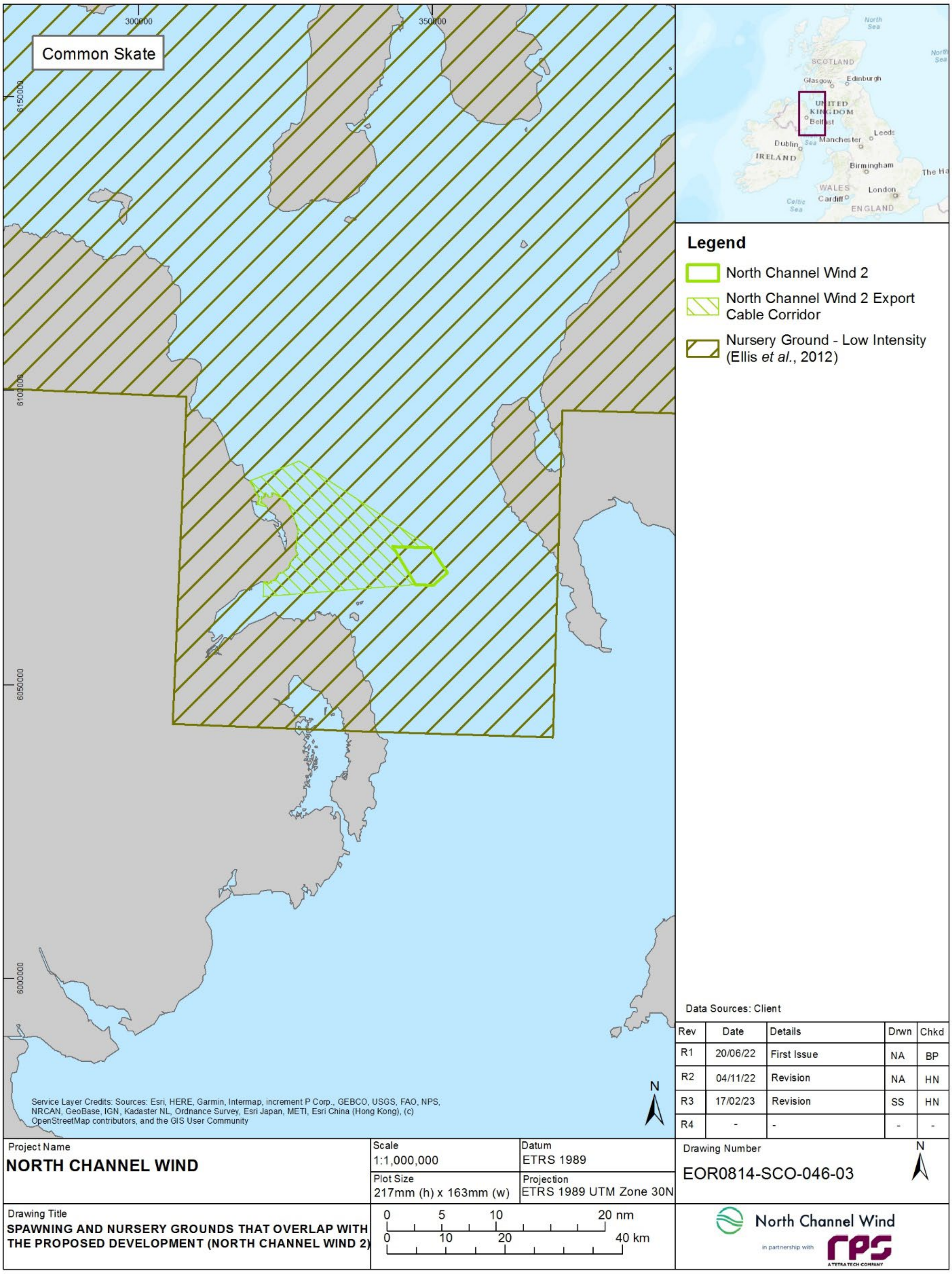


Figure 8.13: Spawning and Nursery Grounds and Overlaps with the Proposed Development (North Channel Wind 2) – common skate

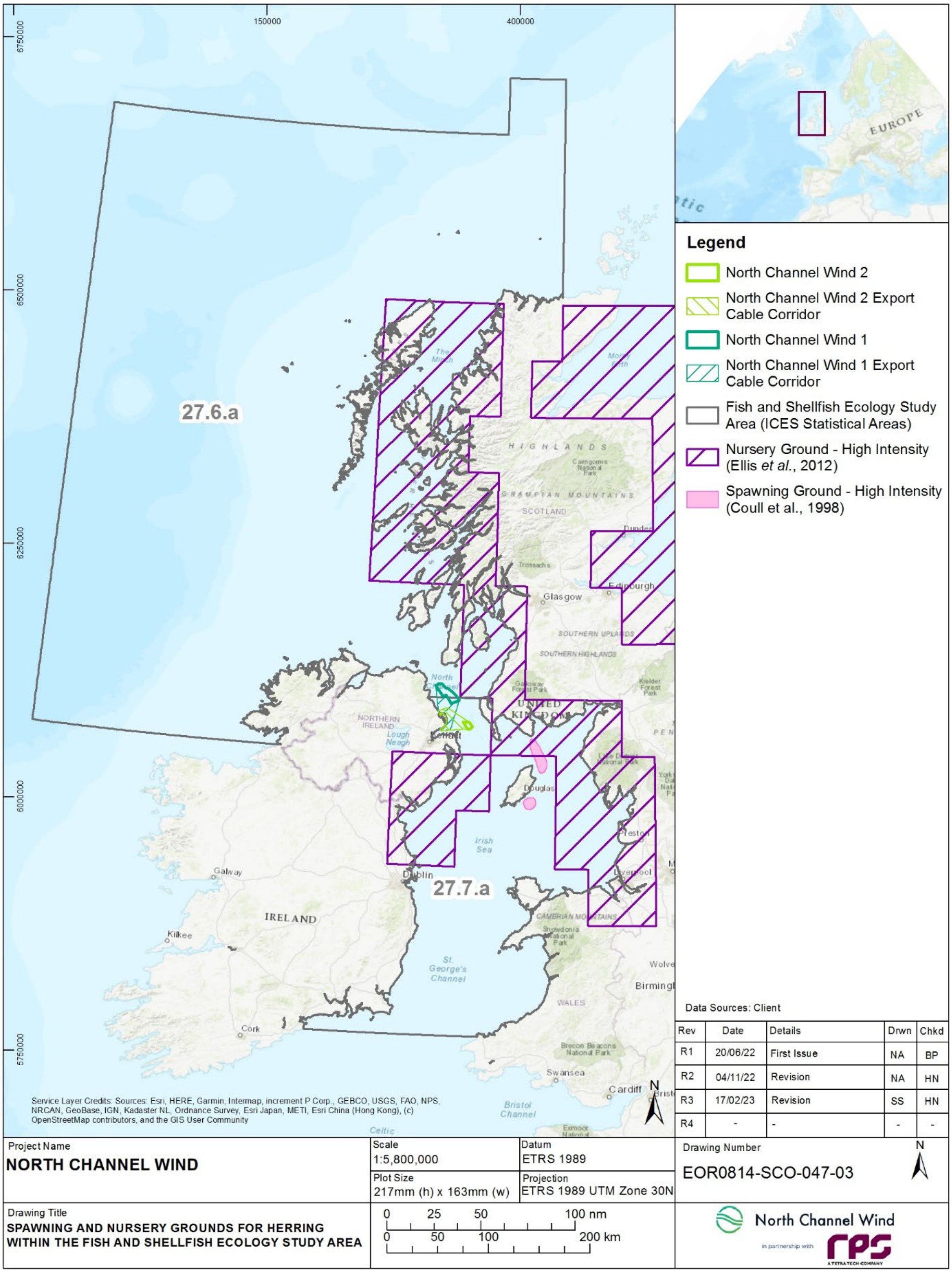


Figure 8.14: Spawning and nursery grounds for herring within the fish and shellfish ecology study area (Coull et al, 1998).

Shellfish assemblage

Shellfish are found locally throughout the intertidal and subtidal regions of the Fish and Shellfish Ecology study area. Key shellfish species in the area include common whelk (Buccinum undatum), European lobster (Homarus gammarus), Edible crab (Cancer pagurus), velvet crab (Necora puber), scallop Pectinidae and Nephrops. Important shellfish landed in the Fish and Shellfish Ecology Study Area in ICES landings from 2016 to 2019 includes Nephrops, Great Atlantic scallop (Pecten maximus), whelk, Queen scallop, razor clams (Ensis. species) and velvet crabs.

Nephrops spawning and nursery areas also overlap the Proposed Development (Coull et al., 1998) (Figure 8.11) and is the most important shellfish species exploited in the area. In addition to these there is a fishery for scallop northwest of the Isle of Man, which is located in the Fish and Shellfish Ecology Study Area. Nephrops distribution is limited by the extent of suitable, relatively soft, sediment in which they construct burrows where they spend most of their time, only coming out to feed and mate. Female Nephrops usually mature at three years of age and reproduce each year thereafter. They mate in early summer and spawn in September, carrying eggs under their tails until they hatch in April or May.

Edible crab is found in rocky areas, but also on sand, gravel and mud. After spawning (in late summer or autumn), eggs are carried by the female under the abdomen until they are ready to hatch. Hatching normally takes place in early summer, and the larvae are distributed by water movements before settling to the seabed as miniature adults. Tagging studies have shown that edible crabs may move up to a few kilometres a day, and hundreds of kilometres in the long term. Lobster has a preference for rocky reef habitats. Spawning and hatching generally follows the same pattern as that described for brown crabs but they are rarely thought to undertake any significant migrations.

8.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 8.13 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to fish and shellfish ecology that have are proposed to be scoped out of the assessment are described in Table 8.13.

Table 8.12: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Fish and Shellfish Ecology. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary habitat loss and disturbance	✓	✓	✓	There is potential for temporary, direct habitat loss and disturbance due to cable laying operations (including anchor placements), operations and seabed preparation works for anchoring and mooring systems. Temporary habitat loss/disturbance may occur during the operation and maintenance phase as a result of operations. The impacts associated with these operations are likely to be similar in nature to those associated with the construction phase although of reduced magnitude. There is potential for temporary, direct habitat loss and disturbance due to decommissioning activities to remove array cables, anchors and moorings resulting in potential effects on fish and shellfish ecology.	Given the wide-ranging and comprehensive desktop information and data sources available to characterise the fish and shellfish baseline, no site-specific fish ecology surveys to inform the Proposed Development ES are proposed. However, it is intended that the results of the benthic surveys, which is proposed to characterise the benthic subtidal baseline can be used to enhance the existing data for fish and shellfish.	No specific modelling is required to inform this impact assessment although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the Project Design Envelope (PDE). The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the maximum design scenario (MDS). For example, the MDS for habitat loss/disturbance will be quantified and the assessment will present the areas of habitat potentially affected in the context of the size of the fish and shellfish ecology study area.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Underwater noise	✓		✓	There is potential for mortality, injury and/or distance to sensitive fish and shellfish species as a result of construction activities such as pile-driving and vessel noise. Embedded mitigation could include piling ramp-up and soft-start measures.	As above.	Modelling undertaken for Subsea Noise section will be used to inform the assessment of underwater noise impacts to fish and shellfish. This will use the most up to date best practice guidelines (i.e., Popper et al., 2014) and other scientific literature to give consideration to the potential for injury and disturbance to fish and shellfish species, including disruption to spawning activity for marine fish species, disruption to migration of diadromous fish species, with a particular focus on potential barriers to migration. In particular, the hearing ability of fish species will be considered, and both sound pressure and particle motion will be considered. Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary increased suspended sediment concentrations and associated sediment deposition	✓	✓	✓	There is potential for an increase in suspended sediments and associated deposition during construction activities such as cable installation and seabed preparation.	As above.	The outputs of numerical modelling undertaken for the physical processes assessment will inform this impact assessment. This will include consideration of the potential for effects on spawning habitats (i.e., changes to sediment composition, smothering of eggs etc) and disturbance to migration of diadromous fish species. This will consider differing sensitivities of the identified receptors and life history stages to this impact. Impacts during the decommissioning phase are anticipated to be less than or equal to the construction phase.
Long-term habitat loss	✓	✓	✓	There is the potential for long-term habitat loss to occur directly under all foundation, anchoring and mooring structures and chains, and associated scour protection, and under any cable protection required along the inter-array and offshore export cables. As foundations are installed throughout the construction phase this impact is also relevant to the construction phase	As above.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived from the PDE. The significance of effects upon fish and shellfish receptors will be determined by

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				although this impact will largely occur throughout the operation and maintenance phase. Permanent habitat loss may occur under any infrastructure that is not decommissioned at the end of the project lifetime.		correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the MDS.
Electromagnetic Fields (EMF) from subsea and midwater electrical cabling		✓		EMF generated through the subsea electrical cabling may affect fish and shellfish prey/predator relationship by inhibiting/interfering with the detection of EMF behaviours.	As above.	No specific modelling is required to inform this impact assessment. A qualitative assessment will be undertaken and presented in the ES, based on a thorough review of the available scientific information on EMFs in the marine environment and effects on fish and shellfish ecology receptors. This assessment will be based on information derived from the PDE.
Entanglement or collision risk		✓		Offshore infrastructure may act as a fish aggregation device (FAD), providing refuge for some species and also habitat for some shellfish and benthic species, whilst also potentially attracting larger predators which could indirectly increase entanglement or	As above.	No specific modelling is required to inform this impact assessment, although the assessment will be quantitative in nature (i.e., clearly presenting the maximum spatial scale of impacts). This assessment will be based on information derived

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				collision risk for fish (including basking shark). There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat, and further exacerbate this impact.		from the PDE. The significance of effects upon fish and shellfish receptors will be determined by correlating the magnitude of the impact and the sensitivity of the receptor. Where possible, the magnitude of the impact will be quantified for the MDS.
Ghost fishing due to lost fishing gear becoming entangled in installed infrastructure		✓		There is the potential for lost gear to become entangled within mooring lines and suspended cables associated with floating substructures, if this technology is utilised, leading to ghost fishing which may negatively impact fish and shellfish.	As above.	No modelling is required for this impact.

Table 8.13: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Fish and Shellfish Ecology

Impact	Justification
Construction	
Accidental release of pollutants	There is a risk of pollution being accidentally released during the construction phase from sources including vessels/vehicles and equipment/machinery. However, the risk of such events is managed by the implementation of measures set out in standard post consent plans, e.g., Environmental Management Plans, including Marine Pollution Contingency Plans. These plans include planning for accidental spills, address all potential contaminant releases and include key emergency contact details. It will also set out industry good practice and OSPAR, International Maritime Organisation (IMO), MARPOL (International Convention for the Prevention of Pollution from Ships) guidelines for preventing pollution at sea. Therefore, the likelihood of an accidental spill occurring is very low and in the unlikely event that such events occur, the magnitude of these will be minimised through measures such as marine pollution contingency planning. On this basis, and subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Operation and Maintenance	
Accidental release of pollutants	As above for construction phase.
Underwater noise from wind turbine operation	Noise generated by operational wind turbines is of a very low frequency and low sound pressure level (Andersson et al., 2011). Studies have found that sound levels are only high enough to possibly cause a behavioural reaction within metres from a wind turbine (Sigray and Andersson 2011, and therefore such levels are not considered to have potentially effects on fish and shellfish receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.

Impact	Justification
Underwater noise from vessels	Operational underwater noise generated from vessels is likely to be low and effects would only occur if fish species remained within immediate vicinity of the vessel (i.e., within metres) for a number of hours which is highly unlikely. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Colonisation of hard structures	There is the potential for the introduction of subsurface structures to provide suitable substrate for colonisation by marine species which may lead to effects on fish and shellfish receptors by creating reef habitat. However, the increase in surface area suitable for colonisation would be extremely small in the context of hard and soft sediment habitats in the Fish and Shellfish Ecology Study Area and therefore this would not have a potentially significant effect on the diversity or population levels. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for fish and shellfish.
Decommissioning	
Accidental release of pollutants	As above for construction phase.

8.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The fish and shellfish ecology EIA will follow the methodology set out in Chapter 3. Specific to the fish and shellfish ecology EIA, the following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Consenting, EIA and HRA Guidance for Marine Renewable Energy Developments in Scotland (European Marine Energy Centre (EMEC) and Xodus, 2010);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008) and
- Sound exposure guidelines for Fishes and Sea Turtles (Popper et al., 2014).

In addition, and specific to marine ecology topics, IEFs will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

8.3.6 POTENTIAL CUMULATIVE EFFECTS

The majority of predicted effects of construction, operation and maintenance, and decommissioning from the Proposed Development on fish and shellfish ecology are considered to be localised to within the footprint of the project. However, there is potential for some predicted impacts from the Proposed Development on fish and shellfish ecology (e.g., underwater noise) to interact with impacts from other projects and activities and lead to a cumulative effect on receptors. The key cumulative effect is likely to result from increased underwater noise during pile driving.

The cumulative assessment will consider the maximum adverse scenarios for each of the projects or activities across all phases of the Proposed Development. The following projects or activities will be considered for cumulative effects:

- other offshore wind farms and associated cabling and infrastructure;
- oil and gas infrastructure/development (cables and pipelines);
- other forms of cabling (i.e., telecommunications and interlinks);
- commercial fishing activity;
- beach replenishment schemes;
- navigation and shipping; and
- aggregate extraction and disposal of dredging spoil.

8.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

8.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Fish and Shellfish Ecology?
- Do you agree that all receptors and impacts have been identified for Fish and Shellfish Ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

9. MARINE MAMMALS AND SEA TURTLES

9.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified several baseline datasets. These are summarised in Table 9.1.

Table 9.1: Summary of Key Desktop Reports for Marine Mammals.

Title	Survey / Data years	Author
Atlas of the Distribution and Relative Abundance of Marine Mammals in Irish Offshore Waters	2005 to 2011	Wall *et al*. (2013)
Distribution and abundance of harbour porpoise, white-beaked dolphins, minke whales	1979 to 1991	Northridge *et al*. (1995)
JNCC Atlas of Cetacean Distribution	2003	Reid *et al*. (2003)
JNCC MPA and SACs	2022	JNCC Mapper
JNCC Report 544: Harbour Porpoise Density	1994 to 2011	Heinänen and Skov (2015)
JNCC Report 565: The use of harbour porpoise sightings data to inform the development of Special Areas of Conservation in UK waters.	1994-2011	IAMMWG (2015)
Joint Cetacean Data Portal (JDCP)	2005 to 2019	JDCP (2022)
Joint Cetacean Protocol Phase III (now called JDCP)	1994 to 2010	Paxton *et al*. (2016)
Marine Ecosystems Research Program cetacean density surfaces	1980 to 2018	Waggitt *et al*. (2020)
ObSERVE studies	2015 to 2017	Rogan *et al.* (2018)
Relative abundance, density and distribution of the harbour porpoise (Phocoena phocoena) along the west coast of the of the UK	2002 to 2004	Goodwin and Speedie (2008)
Seal at-sea usage	Telemetry: 2005 to 2019 Count: 2001 to 2018	Carter *et al*., (2020)

Title	Survey / Data years	Author
Seal haul-out counts	2016 to 2019	Data provided by SMRU
Seal telemetry	1990 to 2018	Data provided by SMRU
Small Cetaceans in European Atlantic Waters (SCANS I)	Jul-94	Hammond *et al*. (2002)
SCANS II	Jul-05	Hammond *et al*. (2006)
SCANS III	2021	Hammond *et al*. (2021)
Special Committee on Seals (SCOS) reports from 1990-2020	2019	SCOS (2020)
Updated abundance estimates for cetacean Management Units in UK waters	2021	Inter-Agency Marine Mammal Working Group (IAMMWG)
Welsh Marine Atlas	1990 to 2009	Baines and Evans (2012)
ISCOPE – Irish Scheme for Cetacean	2003 to 2005	Berrow *et al* (2005)
Observation and Public Education		
DAERA Survey Data 2021 – not published yet		
Coastal based watches		
Manx Marine Environmental Assessment. Isle of Man Marine Plan. Isle of Man Government, pp. 14	2013	Hanley *et al.* (2013)

9.2 NCW 1 PROJECT

9.2.1 INTRODUCTION

This section of the Scoping Report identifies the marine mammals of relevance to the proposed North Channel Wind 1 (NCW 1) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on marine mammals. Other marine megafauna such as turtles, may occasionally use the area, and are included in the baseline environment. Basking sharks are covered in Fish and Shellfish Ecology (Chapter 8).

9.2.2 STUDY AREA

The marine mammal study area has been defined at two spatial scales:

- Proposed Development marine mammal study area: this is defined as the area encompassing the development area (North Channel Wind 1), offshore pipeline, and associated cables plus a buffer of 10 km which includes the survey area and
- Regional marine mammal study area: this is defined as the North Channel and Northern Irish Sea to provide a wider geographic context (see note below) (Figure 9.1). This study area is also used in the initial screening to identify potential cumulative projects (e.g., other offshore wind farms in planning) and for consideration of European designated sites for marine mammals.

Note: marine mammals are known for being highly mobile and covering vast distances within their range of distribution. A comprehensive desktop review will be undertaken to detail the ecology, distribution, and abundance of marine mammals within a wider geographic area - the Regional marine mammal study area - extending beyond the boundaries of the Proposed development (North Channel Wind 1). This regional marine mammal study area will inform the assessment where the Zone of Influence (ZoI) for given impacts, such as subsea noise, may potentially extend beyond the Proposed Development marine mammal study area. The Regional marine mammal study area is defined as the North Channel and Northern Irish Sea region to enable a proportionate approach to the cumulative assessment, however, for the purposes of EIAR the quantification of effects (i.e. number of animals potentially affected) will be compared against the marine mammal management units (MMMUs) defined in Inter-Agency Marine Mammal Working Group (IAMMWG (2015)) for cetaceans and the Seal Management Areas (SMAs) for pinnipeds as reference populations.

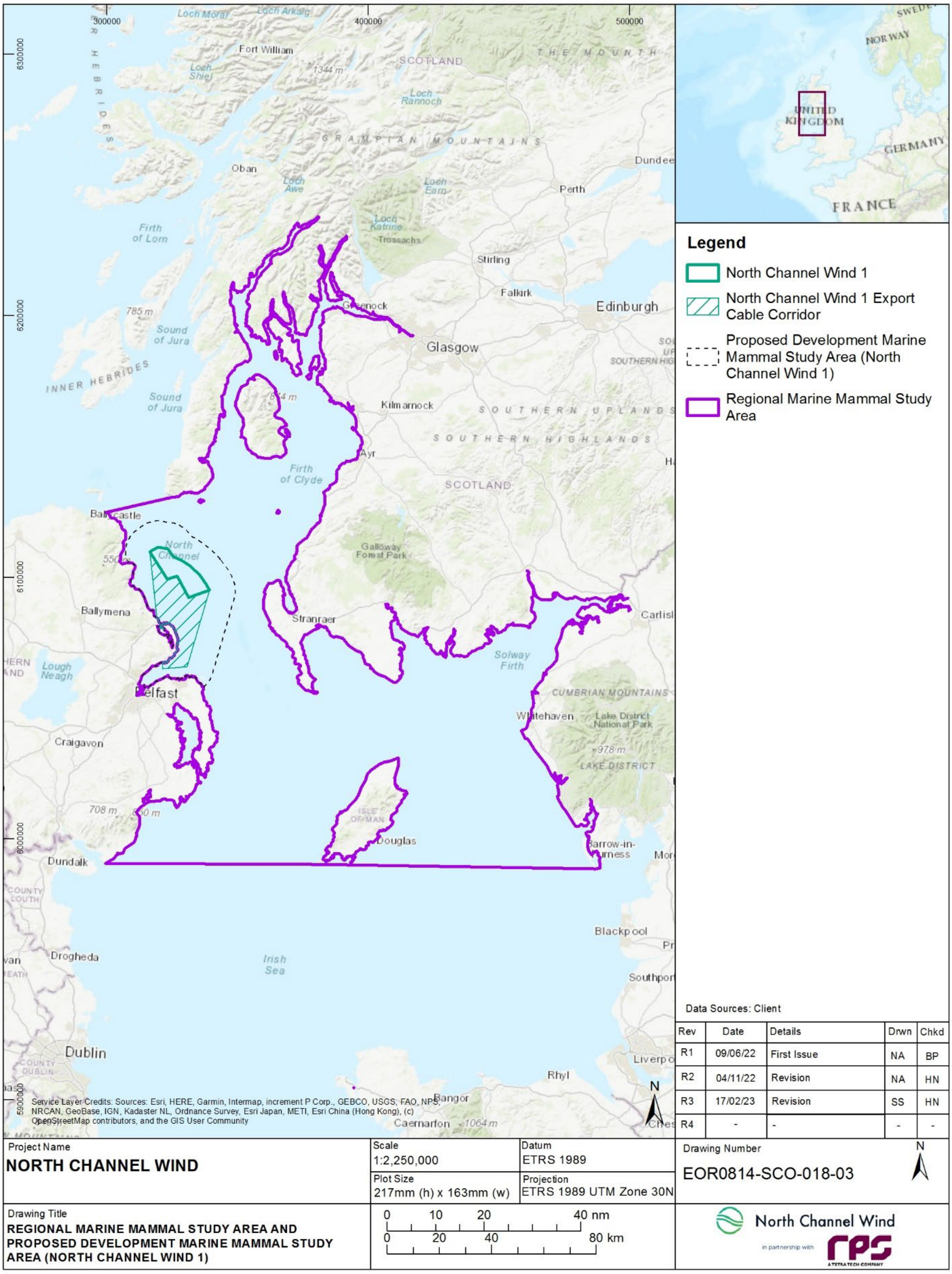


Figure 9.1: Illustrates the Regional marine mammal study area and Proposed Development marine mammal study area (North Channel Wind 1).

9.2.3 BASELINE ENVIRONMENT

Protected areas

There are several protected areas for marine mammals off the coast of Ireland and Scotland, and marine nature reserves in the Isle of Man to the South of the Proposed Development (North Channel Wind 1). Table 9.2 provides an early indication of key designated sites that may occur in the Regional marine mammal study area, and which may require consideration within the EIA and HRA. The EIA will consider notified marine mammal interest features of protected sites for which a receptor-impact pathway has been identified. A full screening of Natura 2000 sites with qualifying marine mammal interest features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant marine mammal notified interest features of European protected sites screened into the marine mammal assessment will be fully considered and assessed in the marine mammal ES chapter, with the assessment on the European protected site itself deferred to report to inform HRA.

The screening to be undertaken in the marine mammal ES chapter will also include national designations, including designated seal haul out sites, Special Areas of Conservation (SACs) and Marine Nature Reserves (MNRs).

Table 9.2: Summary of Marine Mammal Protected Areas in the regional marine mammal study area with distances (km) to Proposed Development (North Channel Wind 1).

Site	Type	Species	Distance to NCW 1 (km)
Special Areas of Conservation			
The Maidens	SAC	Grey seal	0
North Channel	SAC	Harbour porpoise	12.38
Strangford Lough	SAC	Common seal	40.6
Murlough	SAC	Common seal	74.43
Inner Hebrides and the Minches	SAC	Harbour porpoise	66.84
South-East Islay Skerries	SAC	Common seal	58.29
Skerries and Causeway	SAC	Harbour porpoise	39.53
Isle of Man Marine Nature Reserves			
West Coast	MNR	Harbour porpoise Grey seal Common seal	86.85
Calf and Wart Bank	MNR	Harbour porpoise Common seal Grey seal Risso’s dolphin	110.17
Port Erin Bay	MNR	Harbour porpoise	108.5

Site	Type	Species	Distance to NCW 1 (km)
Baie ny Carrickey	MNR	Harbour porpoise Bottlenose dolphin Risso's dolphin	111.52
Douglas Bay	MNR	Risso's dolphin Bottlenose dolphin	112.78
Langness	MNR	Risso's dolphin Common seal Grey seal Harbour porpoise	114.46
Laxey Bay	MNR	Minke whale Harbour porpoise Bottlenose dolphin	110.45
Niarbyl Bay	MNR	Harbour porpoise Grey seal	103.29
Ramsey	MNR	Grey and common seal	92.95

Marine mammal and turtle species

Marine mammals in UK waters comprise cetaceans (dolphins and whales), pinnipeds and the European otter *Lutra* (however, if present, otter is considered in terrestrial). Twenty-eight cetacean species have been recorded in UK waters from sightings and strandings. Table 9.3 summarises abundant, common, occasional and rare cetacean species within the regional marine mammal area.

Only certain species of cetaceans and pinnipeds are likely observed in proximity to the development area based on their habitat preferences and fine-scale distribution. The five cetacean species, two pinniped species and one marine turtle species that are likely to be observed within the development area and have therefore been identified as key marine mammal receptors and are described in further detail in Table 9.4.

Of the world's seven marine turtle species, five have been recorded in British, Irish and Manx waters (DECC, 2016). Botterell *et al.,* (2020) used data from 1910 to 2018 to show sightings and strandings of loggerheads in the North Channel, some strandings of Kemp's Ridley turtle in the Irish Sea, and numerous sightings of leatherback turtles *Dermochelys coriacea* within the North Channel and surrounding areas (sightings were numerous on the west of the UK coastline and around Ireland). The leatherback sea turtle is the most likely species to be present in the marine mammal ecology study area, as their unique physiology offers protection from the colder sea temperatures. Hanley *et al*., (2013) described sightings of 16 leatherback turtles recorded in Manx waters between 2001 and 2011, and additional 4 unidentified turtles, but assumes that a lack of records does not reflect a lack of occurrences but rather a lack of sampling and reporting.

Table 9.3: Summary of the abundant, common, occasional, and rare cetacean species within the regional marine mammal area (Reid *et al.,* 2003; Baines and Evans, 2012; Wall *et al.,* 2013).

Species	Occurrence in the region	Description
Toothed whales, dolphins and porpoises		
Harbour porpoise Phocoena phocoena	Abundant	Abundant and widespread throughout Irish Sea and West Coast of Scotland, with locally high densities of porpoises in areas including the west coast of Scotland. Sightings tend to be higher in coastal areas than offshore.
Short-beaked common dolphin Delphinus delphis	Common	Found off the western coasts of Britain and Ireland in continental shelf waters, notably in the Celtic Sea at the Southern end of the Irish Sea. The species occurs at low densities mainly offshore in the Irish Sea, in a central band that extends northwards towards the Isle of Man.
Bottlenose dolphin Tursiops truncatus	Common	Occurs in both eastern and western Irish Sea near the coast, and there is a semi-resident population at Cardigan Bay.
Atlantic white-sided dolphin Lagenorhynchus acutus	Occasional	Largely restricted to cool waters of the North Atlantic; rarely recorded in the Irish Sea.
Striped dolphin Stenella coeruleoalba	Occasional	Small number of records from the Irish Sea and rarely sighted in inshore waters; largely distributed along south and west Ireland.
Risso's dolphin Grampeus griseus	Common	Frequently recorded species in Irish Sea and western Scotland. Coastal areas of the Isle of Man and north Anglesey have a recorded Risso's.
White-beaked dolphin Lagenorhychus albirostris	Rare	Sightings rare in all Irish waters; no sightings records for Irish Sea and only one stranding record.
Killer whale Orcinus orca	Occasional	Occasionally sighted in Irish Sea but most sightings to southwest, west and north of Ireland, over the Irish Shelf.
Sperm whale Physeter macrocephalus	Rare	Largely distributed off the west of Scotland and Ireland. All sightings of sperm whales in Wall *et al.* (2013) were recorded in deep waters (>500 m) beyond the edge of the Irish shelf, with the majority of sightings occurring in waters deeper than 1000 m.
Beaked whales (Ziphidae)		

Species	Occurrence in the region	Description
Northern bottlenose whale Hyperoodon ampullatus	Rare	Records of strandings on east coast of Ireland although none since 1954; sightings in inshore waters very rare.
Sowerby's beaked whale Mesoplodon bidens	Rare	Rarely recorded in Irish Sea; records of strandings on the southeast coast of Ireland; one in 2004.
Baleen whales		
Humpback whale Megaptera novaeangliae	Occasional	More commonly seen in the south and southwest of Ireland but occasional sightings on the east coast of Ireland.
Minke whale Balaenoptera acutorostrata	Common	Most frequently sighted baleen whale in Irish waters; occurs seasonally (spring/summer) in the Irish Sea. In Manx waters, they are typically seen off the west and south between May and August, moving round to the east between September and November.
Fin whale Balaenoptera physalus	Rare	Occurs primarily in the south of Ireland but also along the west coast; rarely recorded in the Irish Sea.
Blue whale Balaenoptera musculus	Rare	Migrates along the western seaboard of Ireland; single stranding record (early 1900) on the southeast coast of Ireland.

Table 9.4: Summary of marine mammal species and turtle species commonly found within the Regional Marine Mammal Study Area.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
Cetaceans					
Harbour Porpoise	Phocena phocena	The harbour porpoise is the most commonly observed cetacean species in UK waters,with high densities in the Irish Sea and its northern and Southern Channels (Wall *et al*., 2013). Sightings occur year-round throughout the Irish Sea (Baines and Evans, 2009).	Harbour porpoise has been found to prefer habitats where depths range from –5 - 150 m in highly sloped regions (Booth *et al*., 2013; Buttifant, 2021).	Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Harbour porpoise has been identified as a citation species for SAC designation in the Irish Sea due to areas of consistently high densities (Heinanen and Skov, 2015). It is also a desginated feature for the North Channel SAC, Inner Hebrides and the Minches SAC and Skerries and Causeway SAC. Harbour porpoise is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay. Water depth and hydrodynamic variables have been found to have the greatest influence on distribution of the species within the Irish Sea (Heinänen and Skov, 2015).
Bottlenose Dolphin	Tursiops truncatus	The bottlenose dolphin is relatively common in the Irish Sea. High concentration of sightings occur Cardigan Bay to the south of the development area (CMACS, 2005; Baines and Evans, 2009), due to semi-resident populations here. Seasonally, higher sightings occur in coastal regions during	Bottlenose dolphin is predominanlty found in coastal regions, with low densities often recorded offshore (Baines and Evans, 2012). Studies conducted within the UK have found that bottlenose dolphin prefer estuarine areas	Range and Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	Most sightings that occur in UK waters take place between July and September, with a secondary peak in April (Reid *et al*., 2003). The species often occur in small groups in coastal areas, moving offshore during winter months to feed on benthic and pelagic fish species (CMACS, 2005). In coastal waters, bottlenose dolphins have been found to prefer headlands, river estuaries, or sandbanks, where there is typically uneven bottom relief and/or stong tidal currents

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		summer and autumn (Baines and Evans, 2009).	with the steepest slope and greatest depth (Ingram and Rogan, 2002).		(Reid *et al*., 2003). High sighting rates are observed in Cardigan Bay and off the North Wales Coast, and regular sightings are seen in the Coastal West of Scotland and Hebrides Management Unit (MU).
Short-beaked common Dolphin	Delphinus delphis	Short-beaked common dolphin has a large offshore distribution, predominantly occurring at the southern-end of the Irish Sea (Baines and Evans, 2012). They have been recorded in Irish waters all year round, but strong seasonal shifts in their distribution have been noted, with winter inshore movements onto the Celtic Shelf and into the western English Channel and St. George's Channel resulting in pronounced concentrations (Northridge *et al*. 2004).	Short-beaked common dolphin typically prefer coastal, shelf, slope, and deepwater habitats (Mackey and Gimenez, 2006). Short-beaked common dolphins have additionally been found more frequently along shelf edges and in areas comprised of sharp bottom relief, such as seamounts and escarpments (NOAA, 2022).	Range: Favourable, Future Prospects, Population and Habitat: Unknown; Overall FCS: Unknown.	Sightings in the Irish Sea predominantly occur along the west coast of Scotland, Ireland and to the southwest of England (Reid *et al*., 2003). Infrequent sightings in the Irish Sea typically occur between June and September (CMACS, 2005). Prey species tend to be pelagic fish such as mackeral, sardine and sprat. Research undertaken to analyse short-beaked common dolphin foraging habits illustrated that the species is abundant in both neritic and oceanic habitats, suggesting a highly variable habitat preferency and associated foraging strategies (Pusineri *et al*., 2007).
Risso's Dolphin	Grampus griseus	The species is uncommon, but is frequently sighted in nearshore waters in the northern Irish Sea around Shetland and Orkney, in the southern Irish Sea, particularly off the north-west	Risso's dolphin tend to prefer shelf-edge offshore waters and are typically found at depths ranging from 400 – 1,000 m (NOAA, 2022).	Range: Favourable, Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	This species has been found to predominantly be a nocturnal forager, targeting deep dwelling benthic organisms (Visser *et al.,* 2021). However, Risso's dolphin is known to perform 'prey switching' between deeper diving for squid and shallow water foraging. As stated, the species will often feed at night to benefit from vertical migrations of squid as they can then stay

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		coast of Wales, and off south-west Ireland.			nearer surface to breathe and conserve energy (Benoit-Bird *et al*., 2019). Risso's are designated features in the Isle of Man MNR Calf and Wart Bank.
Minke Whale	Balaenoptera acutorostrata	Minke whale has a largely offshore distribution, with the highest density of sighting occurring in the area of the Celtic Deep (Baines and Evans, 2012). The species predominanly visits the Irish Sea during summer months, with few sightings occurring in the winter. This seasonal variation in observance within the Irish Sea has been linked to changes in oceanographic conditions and prey availability (NatureScot, 2019).	The minke whale is known to have a largely offshore distribution, typically found in deep water areas over 50 m in depth (Baines and Evans, 2012). Their low energetic cost of swimming allows the species to switch between prey species according to seasonal availabiltiy, ultimately affecting their habitat preferences throughout the year (Anderwald *et al*., 2012).	Range: Favourable, Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	Minke whales can be observed in the western Irish Sea and Celtic sea in summer months and most often alone or in small groups (Reeves *et al*., 2002). The lesser sandeel (Ammodytes marinus) is known to have both spawning and nursery grounds which are to the south of the development area, and are a key food source for minke whale (RSPB, 2014).
Pinnipeds					
Harbour seal	Phoca vitulina	Harbour seal is the most widely distributed pinniped species in the world and is known to inhabit North	Modelled data from GPS tracked harbour seals, supplemented by aerial surveys,	Range: Favourable, Future Prospects, Population and Habitat: Unfavourable - Inadequate;	Harbour seals are known to be opportunistic feeders, hunting crustaceans, molluscs, and fish species in coastal and offshore waters, typically within 50 km of haul-out sites

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		Atlantic and North Pacific seas (CMACS, 2005; Thompson *et al.*, 2019). Results indicate that the current UK harbour seal population is similar to the estimate made in 1990, with significant regional declines or increases depending on the location populations worldwide (Thompson *et al.*, 2019). In Northern Ireland, the population appears to have declined slowly after 2002 but has been apparently stable since 2011 (SCOS, 2021).	showed that harbour seal densities were found to be substantially high near haul-out areas and sites of ~30m water depth and low mud content (Aarts, *et al.*, 2016). Harbour seals come ashore in sheltered waters, often on sanbanks and within estuaries and rocky areas utilised for protection (SCOS, 2021).	Overall FCS: Unfavourable - Inadequate.	(CMACS, 2005; Vance *et al.*, 2021; SCOS, 2021). Their diets in the UK have been evidenced to predominantly be comprised of sandeel, cod, and saithe in spring and summer months, and herring and gadids during winter months (Jones *et al.*, 2017). The largest concentrations of haul-out sites are found in Scotland, primarily on the West coast, Inner and Outer Hebrides, Orkney and Shetland, but other important haul out sites are found on the east coast of Northern Ireland. Harbour seal is a designated feature for the Strangford Lough, Murlough, South-East Islay Skerries. It is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay.
Grey seal	Halichoerus grypus	Grey seals are the most commonly observed pinniped species in UK waters, accounting for approximatley 40% of the world population and 95% of the European population (JNCC, 2004; CMACS, 2005). The main grey seal breeding colonies are close to the Proposed Development are those in the Inner Hebrides, though smaller breeding colonies exist off the coast of Northern	Grey seals regularly forage in the open sea at depths of up to 100 m and return to haul-out sites where they rest, moult and breed (SCOS, 2021). The species generally prefers isolated habitats, away fom the presence of humans and other terrestrial predators (Kierly *et al.*, 200). These	Range and Future Prospects: Favourable; Population and Habitat: Favourable; Overall FCS: Favourable Improving.	Prey species include flatfish and gadoids as well as invertebrates and squid (SMRU, 2002; CMACS, 2005). Grey seal is a designated feature for the Maidens SAC. It is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		Ireland, the Isle of Man, and North Wales. The latest UK grey seal population estimate is 149,700 individuals (approximate 95% CI 120,000-174,900) (SCOS, 2020).	environments are typically more exposed to the elements and grey seals tend to favour haul-out sites in remote mainland areas (SCOS, 2021).		
Turtles					
Leatherback turtles	Dermochelys coriacea	There are numerous sightings of leatherback turtle within the North Channel and surrounding areas (sightings were numerous on the west of the UK coastline and around Ireland) (Botterell *et al*, 2020). Hanley *et al*., (2013) recorded 16 leatherback turtles in Manx waters between 2001 and 2011. This species is present mostly in August and September off the south and west coasts of Britain and Ireland (MARLIN, 2022).	This species generally inhabits open seas and is capable of diving to 1200 m (MARLIN, 2022).	Overall assessment of Conservation Status is Unknown because all of the conclusions are Unknown.	It is clear that the leatherback turtle's extensive migrations to British waters are to follow swarms of jellyfish which are the leatherback turtle's main prey item (MarLIN, 2022)

[1]UK Conservation status assessment under Article 17 of the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) from January 2013 to December 2018.

Management Units (Mus) for cetaceans

The Inter-Agency Marine Mammal Working Group (IAMMWG) defined Management Units (MUs) for the for the seven most common cetacean species found in UK waters (IAMMWG 2015): harbour porpoise, bottlenose dolphin, short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale. The latest 2020 abundance estimates for each species within their respective MUs using the most recent data available are presented in IAMMWG (2021). Estimates are derived from projects including SCANS-II and SCANS-III (Hammond et al. 2013; 2017) and ObSERVE (Rogan *et al.*, 2018). Population estimates for each MU and for the UK portion of each MU, for each species likely to be found in the Regional marine mammal area, is given in Table 9.5.

Table 9.5: Abundance estimates of cetacean species for relevant management units from IAMMWG (2021)

Species	MU	Abundance of animals in MU (CV)	95% confidence interval	Abundance of animals in the UK portion of MU (CV)	95% Confidence interval for UK portion of MU
Harbour porpoise	West Scotland (WS)	28,936 (0.16)	21,140 – 39,608	24,305 (0.18)	17,121 –34,505
	Celtic and Irish Sea (CIS)	62,517 (0.13)	48,324 – 80,877	16,777 (0.2)	11,216 – 25,096
Bottlenose dolphin	Coastal West Scotland and the Hebrides (CWSH)	-	-	45*	33-66
	Irish Sea (IS)	293 (0.54)	108 - 793	186 (0.52)	70 - 492
Short-beaked common dolphin	Celtic and Greater North Seas (CGNS)	102,656 (0.29)	58,932 – 178,822	57,417 (0.32)	30,850 – 106,863
Risso's dolphin		12,262 (0.46)	5,227 – 28,764	8,687 (0.63)	2,810 – 26,852
Minke whale		20,118 (0.18)	14,061 – 28,786	10,288 (0.26)	6,210 – 17,042

* No CV was given for this value for bottlenose dolphin in IAMMWG (2021)

Harbour porpoise

The Proposed Development (North Channel Wind 1) is located across both the West Scotland (WS) and the Celtic and Irish Seas MUs (CIS) for Harbour porpoise (Table 9.4), and population estimates are given in Table 9.5 (from IAMMWG, 2021).The SCANS III density estimate for the relevant survey blocks that cover the Proposed Development area (Block E, F, G) are given in Table 9.6. (from Hammond *et al.*, 2021).

The most recent assessment of harbour porpoise in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019a). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013).

Seasonally, data gathered from this initial desktop study suggests that harbour porpoise is likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Table 9.6: SCANS-III survey block densities with CVs for each species (Hammond *et al.,* 2021). Short-beaked common dolphin was not recorded in Blocks E/F/G therefore not included.

Species	Harbour porpoise		Bottlenose dolphin		Risso's dolphin		Minke whale	
SCANS Block	Density	CV	Density	CV	Density	CV	Density	CV
Block E	0.239	0.282	0.0082	0.573	0.0313	0.686	0.0173	0.618
Block F	0.086	0.383	-	-	-	-	-	-
Block G	0.336	0.438	0.1206	0.682	-	-	0.0271	0.7

Bottlenose dolphin

The Proposed Development (North Channel Wind 1) is located across the Coastal West Scotland and the Hebrides (CWSH) and Irish Sea (IS) MU for bottlenose dolphin (Table 9.4), and population estimates are given in Table 9.5.The SCANS III density estimate for the relevant survey blocks that cover the Proposed Development area (Block E, F, G) are given in Table 9.6.

The most recent assessment of bottlenose dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that although the range is favourable, there were too few datapoints to confidently conclude on the current and future population trends (JNCC, 2019b). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013b).

Given the evidence gathered from the initial desktop study in preparing this baseline, bottlenose dolphins are considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Short-beaked common dolphin

A single MU the Celtic and Greater North Seas (CGNS), has been defined for short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale (IAMMWG 2015) (Table 9.4 and Figure 9.4). Population estimates for this MU for short-beaked common dolphin are given in Table 9.5. The relevant survey blocks that cover the Proposed Development area (Block E, F, G) had no short-beaked common dolphin sightings within them and were not reported in the SCANS-III report (Hammond *et al.,* 2021).

The most recent assessment of short-beaked common dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019c). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013c).

Given the evidence gathered from the initial desktop study in preparing this baseline, short-beaked common dolphin is considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Risso's dolphin

Population estimates for the CGNS MU for Risso's dolphin are given in **Table 9.5**. Only block E, of the relevant survey blocks that cover the Proposed Development area (Block E, F, G), had Risso's dolphin sightings within them (**Table 9.6**) (Hammond *et al.,* 2021).

The most recent assessment of Risso's dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019d). This concurrent with the Unknown trend in the previous 2007 to 2012 assessment (JNCC, 2013c).

Given the evidence gathered from the initial desktop study in preparing this baseline, Risso's dolphin is considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al*., 2013; Waggitt *et al.,* 2020).

Minke whale

Population estimates for the CGNS MU for minke whale are given in Table 9.5. Block E and G, of the relevant survey blocks that cover the Proposed Development area (Block E, F, G), had minke whale sightings within them and are given in Table 9.6 (Hammond *et al.,* 2021).

The most recent assessment of minke whale in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019e). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013e).

Given densities are comparatively high in the North Channel area, minke whale is considered likely to occur in the summer months within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al*., 2013; Waggitt *et al.,* 2020).

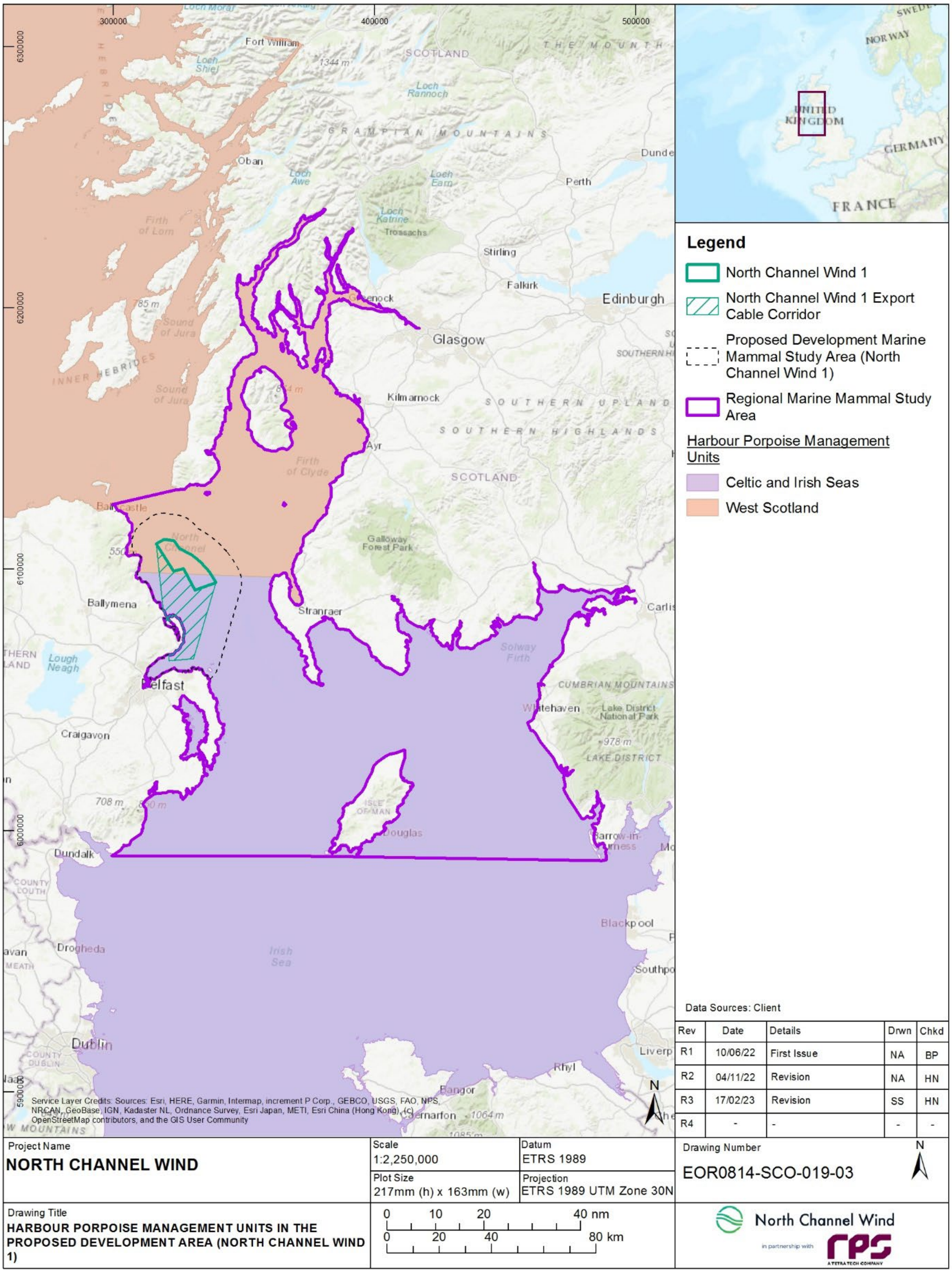


Figure 9.2: Harbour porpoise Management Units (MUs), noting that this species is largely confined to the continental shelf (i.e., waters <200m depth). The UK portion of the MUs is delimited by the UK EEZ.

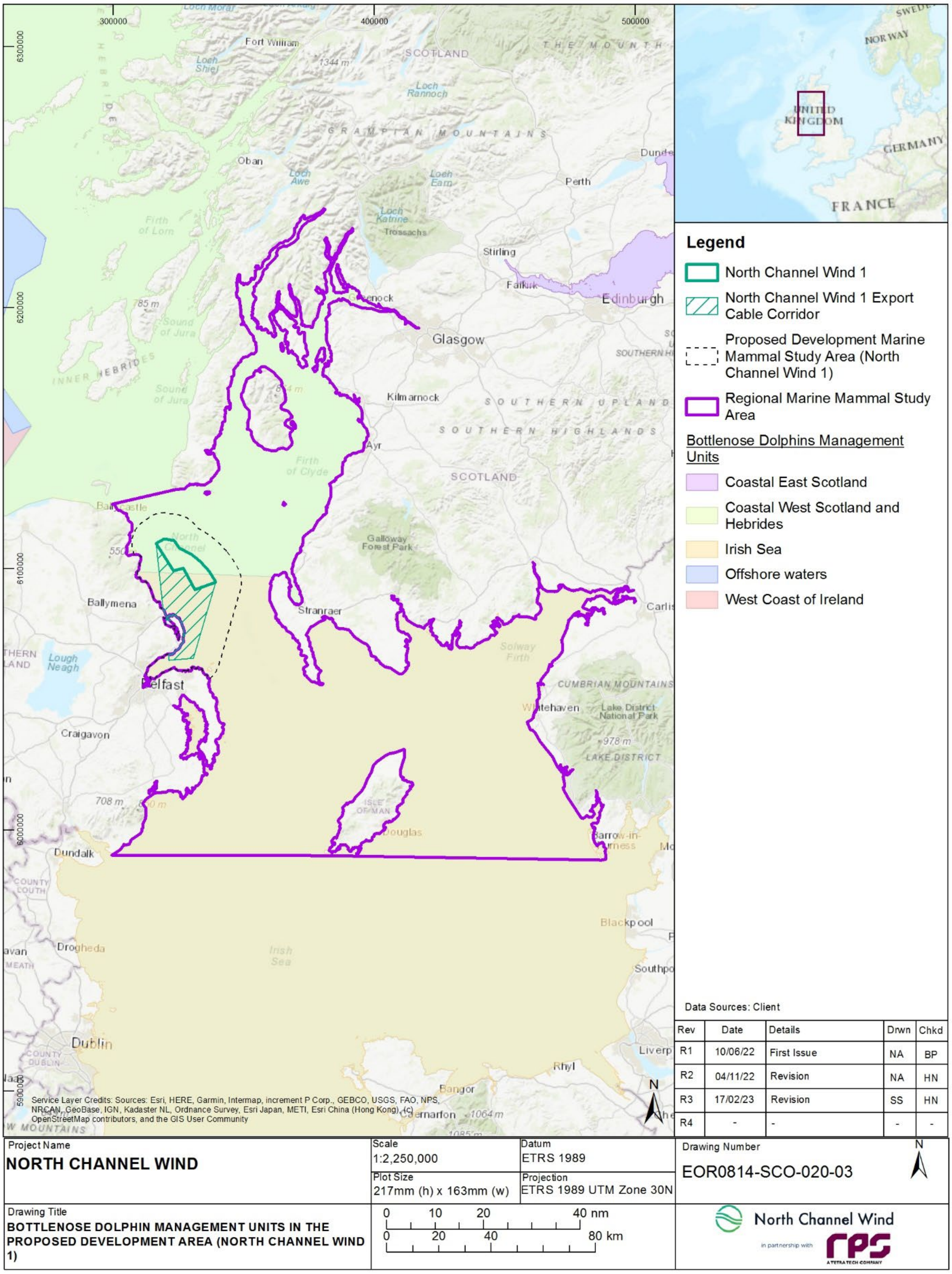


Figure 9.3: Bottlenose dolphin Management Units (MU). The UK portion of the MUs is delimited by the UK EEZ

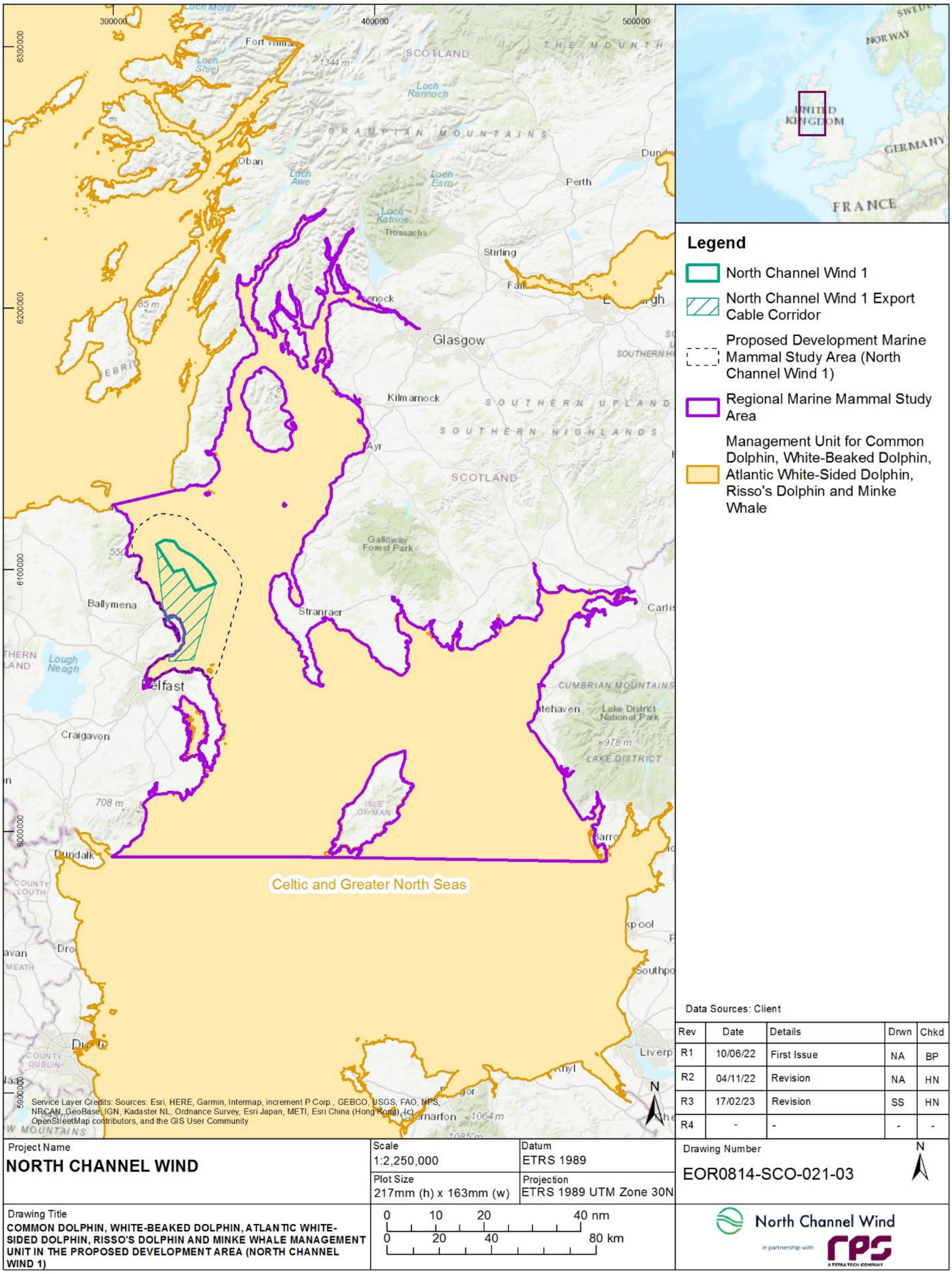


Figure 9.4: MU for short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin, and minke whale

Seal Management Units (SMUs) for pinnipeds

Seal management units are given for grey seals and harbour seals (Figure 9.5) (SCOS, 2021). The Proposed Development (North Channel Wind 1) is located across Seal Management Unit's (SMU) 1 (Southwest Scotland) and 14 (Northern Ireland). The Regional marine mammal study area also crosses SMUs 13 (NW England) and 2 (West Scotland).

Grey seal

Grey seals are found across the north Atlantic, with approximately 36% of the world population of grey seals occurs in the UK (SCOS 2019), and about 84% of the UK population breeds in Scotland, largely in the Hebrides and Orkney. Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. The latest UK grey seal population estimate is 149,700 individuals (approximate 95% CI 120,000-174,900) (SCOS, 2020).

The most recent August moult count (2016 to 2019 period) for SMU 1 is 517 animals, 505 animals for SMU 14 and 517 for SMU 1 (SCOS, 2020). Rough estimates are given SMU 13, with 250 animals, but should be interpreted with caution. Seal at-sea usage maps from Carter *et al*. (2020). Figure 9.6 show higher relative areas of predicted seal distribution around the Proposed Development zone.

The most recent assessment of grey seal in UK waters concluded that the overall trend in Conservation Status was Favourable Improving, with range population, habitat and future all favourable (JNCC, 2019f). This an improvement on the Favourable overall trend in the previous 2007-2012 assessment (JNCC, 2013f).

Given the evidence gathered during the initial desktop study, including the grey seal haul out distribution maps and at-sea usage maps, grey seal is considered likely to occur year-round within the Proposed Development marine mammal study area.

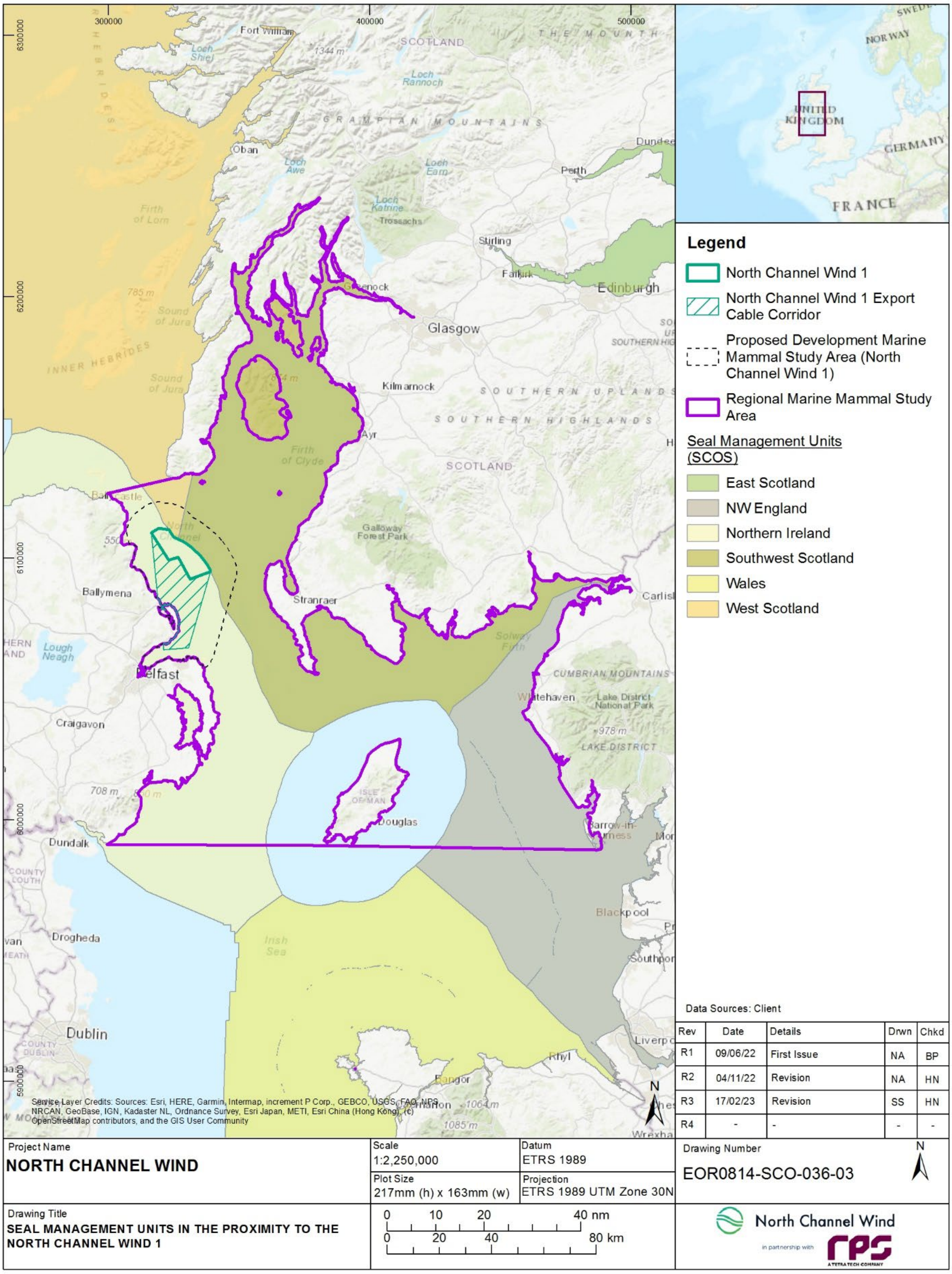


Figure 9.5: Seal management units (SMUs) for grey seal and harbour seal (SCOS, 2020).

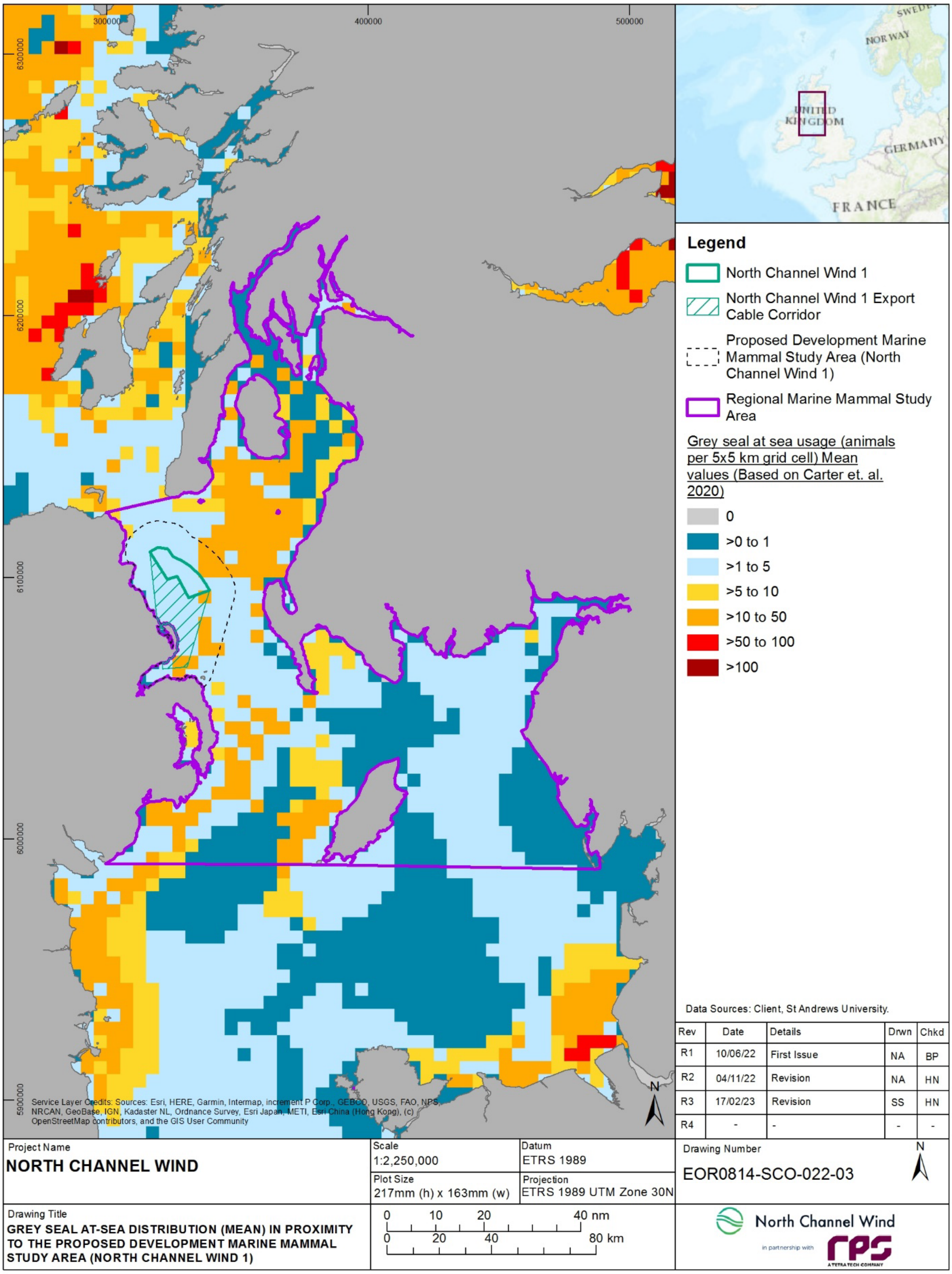


Figure 9.6: Grey seal at-sea distribution map (Mean). From Carter *et al.* (2020)

Harbour seal

The UK harbour seal population estimate based on most recent moult counts is 44,000 (95% CI 36,000 to 58,700) (SCOS, 2021). The largest concentrations of haul out sites are found in Scotland, primarily on the

West coast, Inner and Outer Hebrides, Orkney and Shetland, but other important haul out sites are found on the East coast of Northern Ireland.

The most recent harbour seal August moult count presented for SMU 1 (Southwest Scotland) is 1,709 (2016-2019 count period) (SCOS, 2020), 1,012 for 14 (given as Northern Ireland total in SCOS 2020 Report), 15,600 for SMU 2 (West Scotland) and a rough estimate of 5 for SMU 13 (Northwest England). Harbour seal at-sea usage maps from Carter *et al*. (2020) Figure 9.7 shows higher relative areas of predicted seal distribution around the Proposed Development zone towards the coast of Northern Ireland, with lower density areas over the array.

In the UK, harbour seals have been assessed as having an Unfavourable – Inadequate unknown conservation status (JNCC, 2019g). This an improvement on the Bad declining overall trend in the previous 2007 – 2012 assessment (JNCC, 2013g).

Given the evidence gathered during the initial desktop study, including the harbour seal haul-out distribution maps and at-sea usage maps, harbour seal is considered likely to occur year-round within the Proposed Development marine mammal study area.

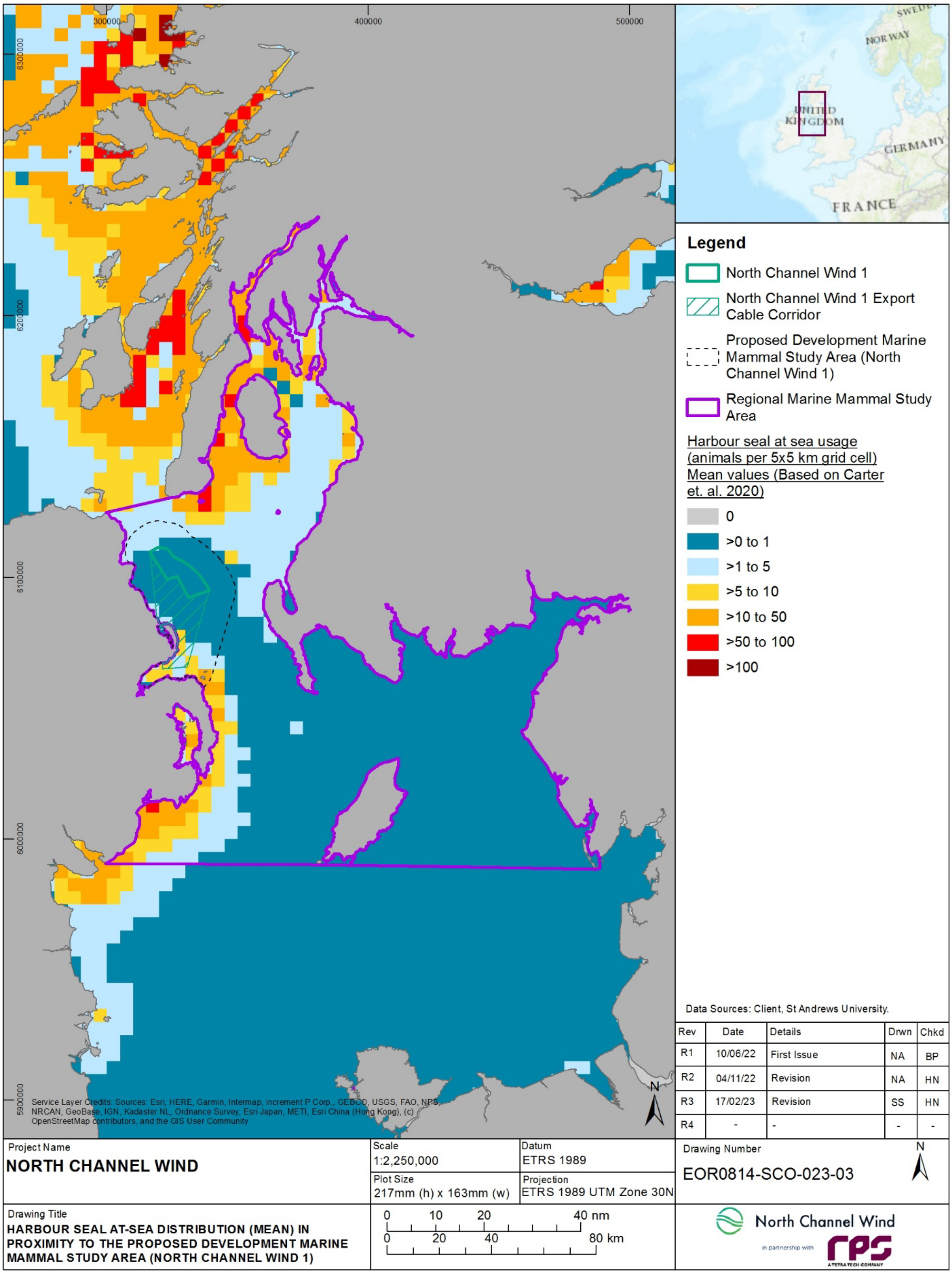


Figure 9.7: Harbour seal at-sea distribution map (Mean). From Carter *et al.* (2020).

9.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 9.7.

together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to marine mammals that have been scoped out of the assessment are described in Table 9.8.

Table 9.7: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Marine Mammals. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Injury and disturbance from pile-driving during construction	✓			Impact piling of driven or drilled anchoring legs during construction may result in hearing damage/auditory injury to marine mammals and sea turtles in the form of a Permanent Threshold Shift (PTS) or behavioural disturbance/displacement of marine mammals. Designed in measures will typically include soft start measures and the implementation of a marine mammal mitigation plan (MMMP) which would involve monitoring of a mitigation zone prior to the start of piling.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Noise modelling will be required to quantitatively assess the risk of PTS based on published and accepted guidance and thresholds. The assessment of disturbance will be based on the best available scientific evidence (e.g., species-specific dose-response). Number of animals potentially affected will be predicted within the modelled ranges using density estimates for key species.
Injury or disturbance associated with activities during construction and decommissioning (e.g., drilling, trenching, dredging, cutting etc)	✓		✓	Underwater noise from other construction or decommissioning activities may affect sensitive marine species, including the potential for landfall activities to result in disturbance to seals at nearby haul-out sites (discussed below). Most noise sources in this category will be low-level continuous noises and likely to result in localised, short-term and temporary effects.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Disturbance associated with airborne noise from activities during construction and decommissioning of cable route	✓		✓	Airborne noise from construction or decommissioning activities may affect sensitive marine species, particularly those that haul out near to the landfall cable routes (grey seal and harbour seal).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	The assessment of disturbance will be based on the best available scientific evidence, and number of animals potentially affected based on densities of key species.
Injury or disturbance due to vessel noise	✓	✓	✓	The impact of vessel use during all phases of the Proposed Development may result in behavioural disturbance/ displacement of marine mammals and sea turtles. Project designed in measure is likely to include a code of conduct for vessel operators and will be detailed as part of a Vessel Management Plan (VMP).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species
Injury or disturbance due to UXO clearance	✓			Underwater noise from clearance of UXOs may affect sensitive species, particularly in relation to physical or auditory injury, with very short-term behavioural effects also possible. Additional mitigation will be applied to reduce these risks (e.g., ADDs and soft start charges).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Entanglement with moorings (floating WTG)		✓		Derelict/lost fishing gear has the opportunity to entangle in moorings, which could increase the chance of marine mammal and sea turtle entanglement. The likelihood of this is not well understood. Risk posed by the project array will vary depending on device spacing, mooring design and array layout.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Literature review to determine the potential risk of entanglement and assessment of risk for each species based on density and distribution within the ZoI.
Increased vessel activity may result in collision risk	✓	✓	✓	Increased vessel traffic during all phases of the Proposed Development may result in collisions with marine mammals and sea turtles. Project designed in measure is likely to include a code of conduct for vessel operators and will be detailed as part of a Vessel Management Plan (VMP).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	A qualitative assessment will be undertaken based on best available literature at the time of writing.
Changes in prey availability	✓	✓	✓	Changes in prey abundance and distribution resulting all phases of the Proposed Development may impact on the ability of marine mammals and sea turtles to forage in the area. Several fish species that are sensitive to noise disturbance are prey for marine mammals (leatherbacks are largely gelatinivores), and include sprat, herring, cod and whiting; these prey species all potentially spawn or have nursery areas in the offshore study area. There are also potential benefits to marine mammals as some evidence supports higher use of areas with infrastructure due to “reef effects”.	Review of Fish and Shellfish Ecology EIAR	No specific modelling required for this impact although the assessment will be based on the results of the underwater noise modelling assessment. and physical processes assessment. and the resulting impact assessment carried out fish and shellfish receptors.

Table 9.8: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Marine Mammals

Impact	Justification
Construction	
Accidental pollution	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates. With implementation of an appropriate pollution prevention plan and based on evidence from other consented offshore wind farms and consent applications, a significant impact within the equivalent extent of a wind farm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is also considered very unlikely. It is predicted that any impact would be of local spatial extent, short-term duration, intermittent and medium reversibility within the context of the regional populations and therefore not significant in EIA terms. This is considered to be equally applicable to the Proposed Development for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate pollution prevention plan. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, the Proposed Development intends to scope this impact out of further consideration within the EIA.
Changes in water clarity	Disturbance to water quality as a result of construction operations can have both direct and indirect impacts on marine mammals. Indirect impacts would include effects on prey species whilst direct impacts could include impairment of visibility and therefore affect foraging success. Marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. For example, harbour porpoise and harbour seals in the UK have been documented foraging in areas with high tidal flows (e.g., Pierpoint 2008, Marubini *et al*. 2009, Hastie *et al*. 2016); therefore, low light levels, turbid waters and suspended sediments are unlikely to negatively impact marine mammal foraging success. When the visual sensory systems of marine mammals are compromised, they are able to sense the environment in other ways, for example, seals can detect water movements and hydrodynamic trails with their mystacial vibrissae; while odontocetes primarily use echolocation to navigate and find food in darkness. Whilst elevated levels of SSC arising during construction of the offshore wind farm may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion. In addition, there is likely to be large natural variability in the SSC within the Proposed Development Marine Mammal Study Area due to increased shipping traffic in the area, so marine mammals living here will be tolerant of any small-scale increases, such as those associated with the construction activities. In summary, the ZoI of increased SSC will be small, particularly in the context of the wider available habitat, and the duration of effects will be short (one tidal excursion). Marine mammal receptors in the Marine Mammal Study Area are not considered to be sensitive to increases in SSC as they are likely to be adapted to high natural variation in sediment levels. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed that this impact is scoped out of the EIA.
Operation and Maintenance	

Impact	Justification
Operational noise	The MMO (2014) review of post-consent monitoring at Offshore Wind Farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to wind turbines. This is supported by several published studies which provide evidence that marine mammals are not displaced from operational wind farms. At the Horns Rev and Nysted offshore wind farms in Denmark, long-term monitoring showed that both harbour porpoise and harbour seals were sighted regularly within the operational Offshore Wind Farms, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al*. 2008). Similarly, a monitoring programme at the Egmond aan Zee Offshore Wind Farm in the Netherlands reported that significantly more porpoise activity was recorded within the Offshore Wind Farm compared to the reference area during the operational phase (Scheidat *et al*. 2011). Other studies at Dutch and Danish offshore wind farms (Lindeboom *et al*. 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating offshore wind farms. In addition, recent tagging work by Russell *et al*. (2014) found that some tagged harbour and grey seals demonstrated grid-like movement patterns as these animals moved between individual wind turbines, strongly suggestive of these structures being used for foraging. Other reviews have also concluded that operational wind farm noise will have negligible effects (Madsen *et al*. 2006, Teilmann *et al*. 2006a, Teilmann *et al*. 2006b, Cefas, 2010, Brasseur *et al*., 2012). In addition, previous modelling by Subacoustech (e.g., Hornsea Project Three EIA) concluded that underwater noise during the operational phase is expected to have a negligible range of influence on any marine receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Risk associated with electromagnetic fields (EMFs) associated with subsea and midwater cabling	Based on the data available to date, there is no evidence of EMF related to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping, 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al*. 2011). To date, the only marine mammal known to show any response to EMF is the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al*. 2013). However, this has not been shown in any other species of marine mammal and this species does not occur within the Proposed Development marine mammal study area or Regional marine mammal study area. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Decommissioning	

Impact	Justification
Accidental pollution	As for construction phase. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Changes in water clarity	As for construction phase. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.

9.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The marine mammals EIA will follow the methodology set out in Chapter 3. Specific to the marine mammals EIA, the following guidance documents will also be considered:

- Guidelines for Marine and Coastal EcIA in Britain and Ireland (IEEM, 2010; CIEEM, 2019);
- Guidance on Wind Energy Developments and Natura 2000 legislation (EC, 2011);
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- 2018 Revision to: Technical guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. (NMFS, 2018); and
- Marine mammal injury noise exposure-onset noise exposure criteria recommended in (Southall *et al*., 2019)

This is not considered to be an exhaustive list and the Proposed Development marine mammal ES chapter will detail all guidance considered in the preparation of the marine mammal assessment. In addition, and specific to marine ecology topics, IEFs will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

9.2.6 POTENTIAL CUMULATIVE EFFECTS

The marine mammal cumulative effect assessment will follow the approach set out in Chapter 3. The identification of cumulative effects on marine mammals will follow receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix.

There is potential for the impacts from the Project to interact with those from other projects, plans and activities, resulting in a cumulative effect on marine mammal and sea turtle receptors. The key cumulative effect is likely to result from increased underwater noise from pile driving. Other activities may contribute to the cumulative assessment of noise including vessel traffic from surrounding projects and other marine users such as seismic surveys, commercial shipping and passenger vessels.

The phasing of the Proposed Development will need to be considered in the context of any other developments occurring within the region and for marine mammals, the relevant management units. The CEA will primarily adopt a qualitative approach due to limitations on the availability of data from other projects although a semi-quantitative assessment may be possible where information supports this approach. The approach to CEA will be agreed as part of the roadmap process via consultation with key stakeholders.

9.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

9.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Marine Mammal and Sea Turtle Ecology?
- Do you agree that all receptors and impacts have been identified for Marine Mammal and Sea Turtle Ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

9.3 NCW 2 PROJECT

9.3.1 INTRODUCTION

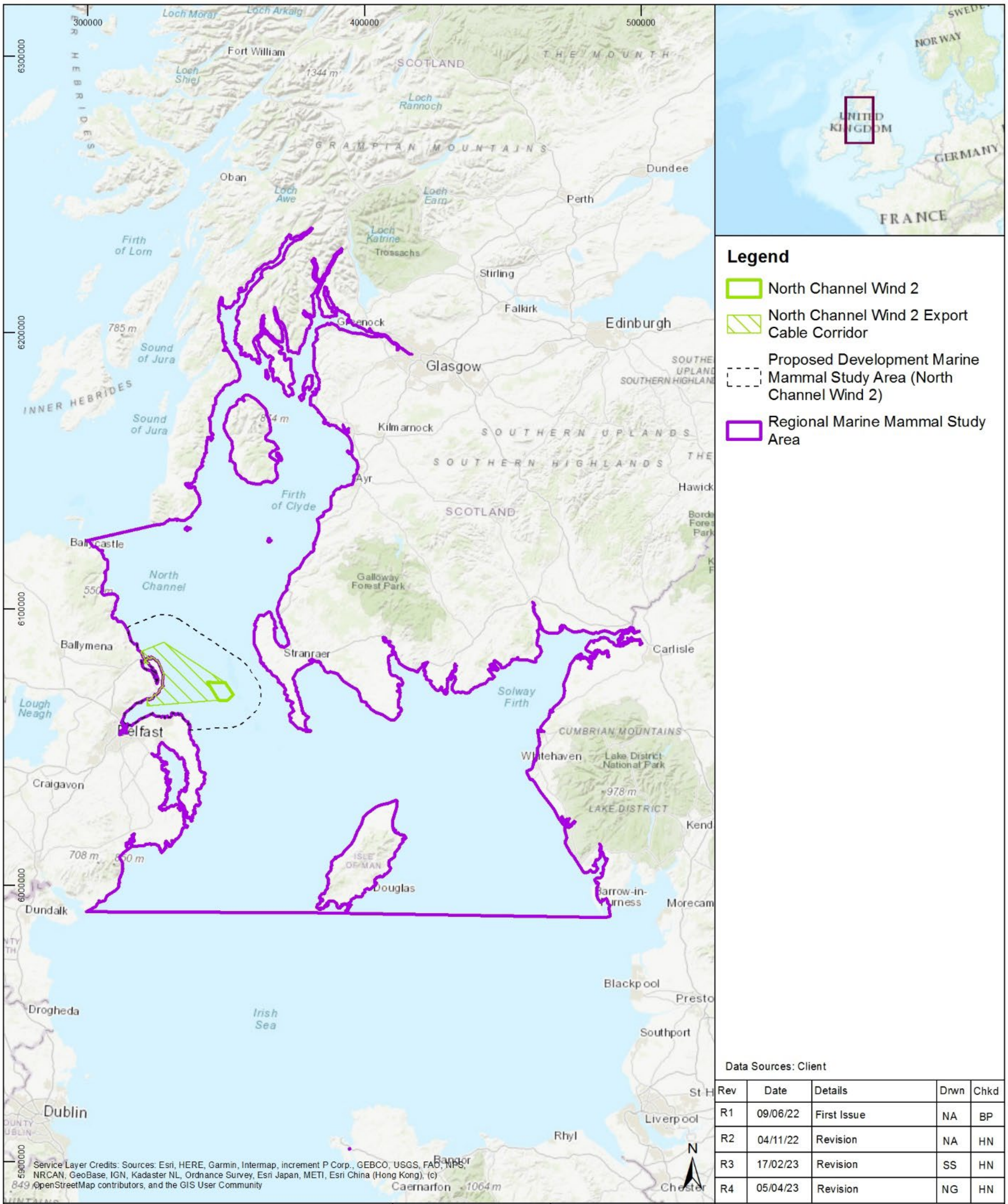
This section of the Scoping Report identifies the marine mammals of relevance to the proposed North Channel Wind 2 (NCW 2) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on marine mammals. Other marine megafauna such as turtles, may occasionally use the area, and are included in the baseline environment. Basking sharks are covered in Fish and Shellfish Ecology (Chapter 8).

9.3.2 STUDY AREA

The marine mammal study area has been defined at two spatial scales:

- Proposed Development marine mammal study area: this is defined as the area encompassing the development area (North Channel Wind 2), offshore pipeline, and associated cables plus a buffer of 10 km which includes the survey area; and
- Regional marine mammal study area: this is defined as the North Channel and Northern Irish Sea to provide a wider geographic context (see note below) (**Figure 9.8**). This study area is also used in the initial screening to identify potential cumulative projects (e.g., other offshore wind farms in planning) and for consideration of European designated sites for marine mammals.

Note: marine mammals are known for being highly mobile and covering vast distances within their range of distribution. A comprehensive desktop review will be undertaken to detail the ecology, distribution, and abundance of marine mammals within a wider geographic area – the Regional marine mammal study area - extending beyond the boundaries of the Proposed development (North Channel Wind 2). This regional marine mammal study area will inform the assessment where the Zone of Influence (ZoI) for given impacts, such as subsea noise, may potentially extend beyond the Proposed Development marine mammal study area. The Regional marine mammal study area is defined as the North Channel and Northern Irish Sea region to enable a proportionate approach to the cumulative assessment, however, for the purposes of EIAR the quantification of effects (i.e. number of animals potentially affected) will be compared against the marine mammal management units (MMMUs) defined in Inter-Agency Marine Mammal Working Group (IAMMWG (2015)) for cetaceans and the Seal Management Areas (SMAs) for pinnipeds as reference populations.



Rev	Date	Details	Drwn	Chkd
R1	09/06/22	First Issue	NA	BP
R2	04/11/22	Revision	NA	HN
R3	17/02/23	Revision	SS	HN
R4	05/04/23	Revision	NG	HN

Project Name	Scale	Datum	Drawing Number
NORTH CHANNEL WIND	1:2,250,000	ETRS 1989	EOR0814-SCO-024-04
	Plot Size: 217mm (h) x 163mm (w)	Projection: ETRS 1989 UTM Zone 30N	

Drawing Title
REGIONAL MARINE MAMMAL STUDY AREA AND PROPOSED DEVELOPMENT MARINE MAMMAL STUDY AREA (NORTH CHANNEL WIND 2)

0 10 20 40 nm
0 20 40 80 km

North Channel Wind in partnership with rps

Figure 9.8: Illustrates the Regional marine mammal study area and Proposed Development marine mammal study area (North Channel Wind 2).

9.3.3 BASELINE ENVIRONMENT

Protected areas

There are several protected areas for marine mammals off the coast of Ireland and Scotland, and marine nature reserves in the Isle of Man to the South of the Proposed Development (North Channel Wind 2). provides an early indication of key designated sites that may occur in the Regional marine mammal study area, and which may require consideration within the EIA and HRA. The EIA will consider notified marine mammal interest features of protected sites for which a receptor-impact pathway has been identified. A full screening of Natura 2000 sites with qualifying marine mammal interest features will be undertaken in the LSE Screening Report for the Proposed Development. Relevant marine mammal notified interest features of European protected sites screened into the marine mammal assessment will be fully considered and assessed in the marine mammal ES chapter, with the assessment on the European protected site itself deferred to the RIAA.

The screening to be undertaken in the marine mammal ES chapter will also include national designations, including designated seal haul out sites, Special Areas of Conservation (SACs) and Marine Nature Reserves (MNRs).

Marine mammal and turtle species

Marine mammals in UK waters comprise cetaceans (dolphins and whales), pinnipeds and the European otter *Lutra lutra* (however, if present, otter is considered in terrestrial). Twenty-eight cetacean species have been recorded in UK waters from sightings and strandings. **Table 9.11** summarises abundant, common, occasional and rare cetacean species within the regional marine mammal area.

Only certain species of cetaceans and pinnipeds are likely observed in proximity to the development area based on their habitat preferences and fine-scale distribution. The five cetacean species, two pinniped species and one marine turtle species that are likely to be observed within the development area and have therefore been identified as key marine mammal receptors and are described in further detail in **Table 9.12**.

Of the world's seven marine turtle species, five have been recorded in British, Irish and Manx waters (DECC, 2016). Botterell *et al.,* (2020) used data from 1910 to 2018 to show sightings and strandings of loggerheads in the North Channel, some strandings of Kemp's Ridley turtle in the Irish Sea, and numerous sightings of leatherback turtles *Dermochelys coriacea* within the North Channel and surrounding areas (sightings were numerous on the west of the UK coastline and around Ireland). The leatherback sea turtle is the most likely species to be present in the marine mammal ecology study area, as their unique physiology offers protection from the colder sea temperatures. Hanley *et al*., (2013) described sightings of 16 leatherback turtles recorded in Manx waters between 2001 and 2011, and additional 4 unidentified turtles, but assumes that a lack of records does not reflect a lack of occurrences but rather a lack of sampling and reporting.

Table 9.9: Summary of Marine Mammal Protected Areas in the regional marine mammal study area with distances (km) to Proposed Development (North Channel Wind 2).

Site	Type	Species	Distance to NCW2 (km)
Special Areas of Conservation			
The Maidens	SAC	Grey seal	21.19
North Channel	SAC	Harbour porpoise	0
Strangford Lough	SAC	Common seal	24.3
Murlough	SAC	Common seal	56.71
Inner Hebrides and the Minches	SAC	Harbour porpoise	103.4
South-East Islay Skerries	SAC	Common seal	101.88

Site	Type	Species	Distance to NCW2 (km)
Skerries and Causeway	SAC	Harbour porpoise	82.2
Isle of Man Marine Nature Reserves			
West Coast	MNR	Harbour porpoise Grey seal Common seal	58.9
Calf and Wart Bank	MNR	Harbour porpoise Common seal Grey seal Risso's dolphin	80.05
Port Erin Bay	MNR	Harbour porpoise	78.51
Baie nyCarrickey	MNR	Harbour porpoise Bottlenose dolphin Risso's dolphin	81.63
Douglas Bay	MNR	Risso's dolphin Bottlenose dolphin	84.02
Langness	MNR	Risso's dolphin Common seal Grey seal Harbour porpoise	84.86
Laxey Bay	MNR	Minke whale Harbour porpoise Bottlenose dolphin	82.35
Niarbyl Bay	MNR	Harbour porpoise Grey seal	73.38
Ramsey	MNR	Grey and common seal	67.18

Table 9.10: Summary of the abundant, common, occasional, and rare cetacean species within the regional marine mammal area (Reid *et al.,* 2003; Baines and Evans, 2012; Wall *et al.,* 2013).

Species	Occurrence in the region	Description
Toothed whales, dolphins and porpoises		
Harbour porpoise Phocoena phocoena	Abundant	Abundant and widespread throughout Irish Sea and West Coast of Scotland, with locally high densities of porpoises in areas including the west coast of Scotland. Sightings tend to be higher in coastal areas than offshore.
Short-beaked common dolphin Delphinus delphis	Common	Found off the western coasts of Britain and Ireland in continental shelf waters, notably in the Celtic Sea at the Southern end of the Irish Sea. The species occurs at low densities mainly offshore in the Irish Sea, in a central band that extends northwards towards the Isle of Man.
Bottlenose dolphin Tursiops truncatus	Common	Occurs in both eastern and western Irish Sea near the coast, and there is a semi-resident population at Cardigan Bay.
Atlantic white-sided dolphin Lagenorhynchus acutus	Occasional	Largely restricted to cool waters of the North Atlantic; rarely recorded in the Irish Sea.
Striped dolphin Stenella coeruleoalba	Occasional	Small number of records from the Irish Sea and rarely sighted in inshore waters; largely distributed along south and west Ireland.
Risso's dolphin Grampeus griseus	Common	Frequently recorded species in Irish Sea and western Scotland. Coastal areas of the Isle of Man and north Anglesey have a recorded Risso's.
White-beaked dolphin Lagenorhychus albirostris	Rare	Sightings rare in all Irish waters; no sightings records for Irish Sea and only one stranding record.
Killer whale Orcinus orca	Occasional	Occasionally sighted in Irish Sea but most sightings to southwest, west and north of Ireland, over the Irish Shelf.
Sperm whale	Rare	Largely distributed off the west of Scotland and Ireland. All sightings of sperm whales in Wall *et al.* (2013) were recorded in deep waters

Species	Occurrence in the region	Description
Physeter macrocephalus		(>500 m) beyond the edge of the Irish shelf, with the majority of sightings occurring in waters deeper than 1000 m.
Beaked whales (Ziphidae)		
Northern bottlenose whale Hyperoodon ampullatus	Rare	Records of strandings on east coast of Ireland although none since 1954; sightings in inshore waters very rare.
Sowerby's beaked whale Mesoplodon bidens	Rare	Rarely recorded in Irish Sea; records of strandings on the southeast coast of Ireland; one in 2004.
Baleen whales		
Humpback whale Megaptera novaeangliae	Occasional	More commonly seen in the south and southwest of Ireland but occasional sightings on the east coast of Ireland.
Minke whale Balaenoptera acutorostrata	Common	Most frequently sighted baleen whale in Irish waters; occurs seasonally (spring/summer) in the Irish Sea. In Manx waters, they are typically seen off the west and south between May and August, moving round to the east between September and November.
Fin whale Balaenoptera physalus	Rare	Occurs primarily in the south of Ireland but also along the west coast; rarely recorded in the Irish Sea.
Blue whale Balaenoptera musculus	Rare	Migrates along the western seaboard of Ireland; single stranding record (early 1900) on the southeast coast of Ireland.

Table 9.11: Summary of marine mammal species and turtle species commonly found within the Regional Marine Mammal Study Area.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
Cetaceans					
Harbour Porpoise	Phocena phocena	The harbour porpoise is the most commonly observed cetacean species in UK waters,with high densities in the Irish Sea and its northern and Southern Channels (Wall *et al*., 2013). Sightings occur year-round throughout the Irish Sea (Baines and Evans, 2009).	Harbour porpoise has been found to prefer habitats where depths range from –5 - 150 m in highly sloped regions (Booth *et al*., 2013; Buttifant, 2021).	Range and Future Prospects: Favourable; Population and Habitat: Unknown; Overall FCS: Unknown.	Harbour porpoise has been identified as a citation species for SAC designation in the Irish Sea due to areas of consistently high densities (Heinanen and Skov, 2015). It is also a desginated feature for the North Channel SAC, Inner Hebrides and the Minches SAC and Skerries and Causeway SAC. Harbour porpoise is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay. Water depth and hydrodynamic variables have been found to have the greatest influence on distribution of the species within the Irish Sea (Heinänen and Skov, 2015).
Bottlenose Dolphin	Tursiops truncatus	The bottlenose dolphin is relatively common in the Irish Sea. High concentration of sightings occur Cardigan Bay to the south of the development area (CMACS, 2005; Baines and Evans, 2009), due to semi-resident populations here. Seasonally, higher sightings occur in coastal regions during	Bottlenose dolphin is predominanlty found in coastal regions, with low densities often recorded offshore (Baines and Evans, 2012). Studies conducted within the UK have found that bottlenose dolphin prefer estuarine areas	Range and Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	Most sightings that occur in UK waters take place between July and September, with a secondary peak in April (Reid *et al*., 2003). The species often occur in small groups in coastal areas, moving offshore during winter months to feed on benthic and pelagic fish species (CMACS, 2005). In coastal waters, bottlenose dolphins have been found to prefer headlands, river estuaries, or sandbanks, where there is typically uneven bottom relief and/or stong tidal currents

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		summer and autumn (Baines and Evans, 2009).	with the steepest slope and greatest depth (Ingram and Rogan, 2002).		(Reid *et al*., 2003). High sighting rates are observed in Cardigan Bay and off the North Wales Coast, and regular sightings are seen in the Coastal West of Scotland and Hebrides Management Unit (MU).
Short-beaked common Dolphin	Delphinus delphis	Short-beaked common dolphin has a large offshore distribution, predominantly occurring at the southern-end of the Irish Sea (Baines and Evans, 2012). They have been recorded in Irish waters all year round, but strong seasonal shifts in their distribution have been noted, with winter inshore movements onto the Celtic Shelf and into the western English Channel and St. George's Channel resulting in pronounced concentrations (Northridge *et al*. 2004).	Short-beaked common dolphin typically prefer coastal, shelf, slope, and deepwater habitats (Mackey and Gimenez, 2006). Short-beaked common dolphins have additionally been found more frequently along shelf edges and in areas comprised of sharp bottom relief, such as seamounts and escarpments (NOAA, 2022).	Range: Favourable, Future Prospects, Population and Habitat: Unknown; Overall FCS: Unknown.	Sightings in the Irish Sea predominantly occur along the west coast of Scotland, Ireland and to the southwest of England (Reid *et al*., 2003). Infrequent sightings in the Irish Sea typically occur between June and September (CMACS, 2005). Prey species tend to be pelagic fish such as mackeral, sardine and sprat. Research undertaken to analyse short-beaked common dolphin foraging habits illustrated that the species is abundant in both neritic and oceanic habitats, suggesting a highly variable habitat preferency and associated foraging strategies (Pusineri *et al*., 2007).
Risso's Dolphin	Grampus griseus	The species is uncommon, but is frequently sighted in nearshore waters in the northern Irish Sea around Shetland and Orkney, in the southern Irish Sea, particularly off the north-west	Risso's dolphin tend to prefer shelf-edge offshore waters and are typically found at depths ranging from 400 – 1,000 m (NOAA, 2022).	Range: Favourable, Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	This species has been found to predominantly be a nocturnal forager, targeting deep dwelling benthic organisms (Visser *et al.,* 2021). However, Risso's dolphin is known to perform 'prey switching' between deeper diving for squid and shallow water foraging. As stated, the species will often feed at night to benefit from vertical migrations of squid as they can then stay

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		coast of Wales, and off south-west Ireland.			nearer surface to breathe and conserve energy (Benoit-Bird *et al*., 2019). Risso's are designated features in the Isle of Man MNR Calf and Wart Bank.
Minke Whale	Balaenoptera acutorostrata	Minke whale has a largely offshore distribution, with the highest density of sighting occurring in the area of the Celtic Deep (Baines and Evans, 2012). The species predominanly visits the Irish Sea during summer months, with few sightings occurring in the winter. This seasonal variation in observance within the Irish Sea has been linked to changes in oceanographic conditions and prey availability (NatureScot, 2019).	The minke whale is known to have a largely offshore distribution, typically found in deep water areas over 50 m in depth (Baines and Evans, 2012). Their low energetic cost of swimming allows the species to switch between prey species according to seasonal availabiltiy, ultimately affecting their habitat preferences throughout the year (Anderwald *et al*., 2012).	Range: Favourable, Future Prospects: Unknown; Population and Habitat: Unknown; Overall FCS: Unknown.	Minke whales can be observed in the western Irish Sea and Celtic sea in summer months and most often alone or in small groups (Reeves *et al*., 2002). The lesser sandeel (Ammodytes marinus) is known to have both spawning and nursery grounds which are to the south of the development area, and are a key food source for minke whale (RSPB, 2014).
Pinnipeds					
Harbour seal	Phoca vitulina	Harbour seal is the most widely distributed pinniped species in the world and is known to inhabit North	Modelled data from GPS tracked harbour seals, supplemented by aerial surveys,	Range: Favourable, Future Prospects, Population and Habitat: Unfavourable - Inadequate;	Harbour seals are known to be opportunistic feeders, hunting crustaceans, molluscs, and fish species in coastal and offshore waters, typically within 50 km of haul-out sites

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		Atlantic and North Pacific seas (CMACS, 2005; Thompson *et al.*, 2019). Results indicate that the current UK harbour seal population is similar to the estimate made in 1990, with significant regional declines or increases depending on the location populations worldwide (Thompson *et al.*, 2019). In Northern Ireland, the population appears to have declined slowly after 2002 but has been apparently stable since 2011 (SCOS, 2021).	showed that harbour seal densities were found to be substantially high near haul-out areas and sites of ~30m water depth and low mud content (Aarts, *et al.*, 2016). Harbour seals come ashore in sheltered waters, often on sanbanks and within estuaries and rocky areas utilised for protection (SCOS, 2021).	Overall FCS: Unfavourable - Inadequate.	(CMACS, 2005; Vance *et al.*, 2021; SCOS, 2021). Their diets in the UK have been evidenced to predominantly be comprised of sandeel, cod, and saithe in spring and summer months, and herring and gadids during winter months (Jones *et al.*, 2017). The largest concentrations of haul-out sites are found in Scotland, primarily on the West coast, Inner and Outer Hebrides, Orkney and Shetland, but other important haul out sites are found on the east coast of Northern Ireland. Harbour seal is a designated feature for the Strangford Lough, Murlough, South-East Islay Skerries. It is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay.
Grey seal	Halichoerus grypus	Grey seals are the most commonly observed pinniped species in UK waters, accounting for approximatley 40% of the world population and 95% of the European population (JNCC, 2004; CMACS, 2005). The main grey seal breeding colonies are close to the Proposed Development are those in the Inner Hebrides, though smaller breeding colonies exist off the coast of Northern	Grey seals regularly forage in the open sea at depths of up to 100 m and return to haul-out sites where they rest, moult and breed (SCOS, 2021). The species generally prefers isolated habitats, away fom the presence of humans and other terrestrial predators (Kierly *et al.*, 200). These	Range and Future Prospects: Favourable; Population and Habitat: Favourable; Overall FCS: Favourable Improving.	Prey species include flatfish and gadoids as well as invertebrates and squid (SMRU, 2002; CMACS, 2005). Grey seal is a designated feature for the Maidens SAC. It is also designated in several Isle of Man Marine Nature Reserves on the northern coast of the Isle of Man: West Coast, Calf and Wart Bank, Port Erin Bay.

Species	Taxonomic Name	Distribution	Habitat Preference	Favourable Conservation Status (FCS): UK assessment[1]	Additional Information
		Ireland, the Isle of Man, and North Wales. The latest UK grey seal population estimate is 149,700 individuals (approximate 95% CI 120,000-174,900) (SCOS, 2020).	environments are typically more exposed to the elements and grey seals tend to favour haul-out sites in remote mainland areas (SCOS, 2021).		
Turtles					
Leatherback turtles	Dermochelys coriacea	There are numerous sightings of leatherback turtle within the North Channel and surrounding areas (sightings were numerous on the west of the UK coastline and around Ireland) (Botterell *et al*, 2020). Hanley *et al*., (2013) recorded 16 leatherback turtles in Manx waters between 2001 and 2011. This species is present mostly in August and September off the south and west coasts of Britain and Ireland (MARLIN, 2022).	This species generally inhabits open seas and is capable of diving to 1200 m (MARLIN, 2022).	Overall assessment of Conservation Status is Unknown because all of the conclusions are Unknown.	It is clear that the leatherback turtle's extensive migrations to British waters are to follow swarms of jellyfish which are the leatherback turtle's main prey item (MarLIN, 2022)

[1]UK Conservation status assessment under Article 17 of the Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) from January 2013 to December 2018.

Management Units MUs for cetaceans

The Inter-Agency Marine Mammal Working Group (IAMMWG) defined Management Units (MUs) for the for the seven most common cetacean species found in UK waters (IAMMWG 2015): harbour porpoise, bottlenose dolphin, short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale. The latest 2020 abundance estimates for each species within their respective MUs using the most recent data available are presented in IAMMWG (2021). Estimates are derived from projects including SCANS-II and SCANS-III (Hammond et al. 2013; 2017) and ObSERVE (Rogan *et al.*, 2018). Population estimates for each MU and for the UK portion of each MU, for each species likely to be found in the Regional marine mammal area, is given in **Table 9.13**.

Table 9.12: Abundance estimates of cetacean species for relevant management units from IAMMWG (2021)

Species	MU	Abundance of animals in MU (CV)	95% confidence interval	Abundance of animals in the UK portion of MU (Coefficient Variable CV)	95% Confidence interval for UK portion of MU
Harbour porpoise	West Scotland (WS)	28,936 (0.16)	21,140 – 39,608	24,305 (0.18)	17,121 –34,505
	Celtic and Irish Sea (CIS)	62,517 (0.13)	48,324 – 80,877	16,777 (0.2)	11,216 – 25,096
Bottlenose	Coastal West Scotland and the Hebrides (CWSH)	-	-	45*	33-66
	Irish Sea (IS)	293 (0.54)	108 - 793	186 (0.52)	70 - 492
Short-beaked common dolphin	Celtic and Greater North Seas (CGNS)	102,656 (0.29)	58,932 – 178,822	57,417 (0.32)	30,850 – 106,863
Risso's dolphin		12,262 (0.46)	5,227 – 28,764	8,687 (0.63)	2,810 – 26,852
Minke whale		20,118 (0.18)	14,061 – 28,786	10,288 (0.26)	6,210 – 17,042

* No CV was given for this value for bottlenose dolphin in IAMMWG (2021)

Harbour porpoise

The Proposed Development (North Channel Wind 2) is located across both the West Scotland (WS) and the Celtic and Irish Seas MUs (CIS) for Harbour porpoise (from IAMMWG, 2021) (**Figure 9.9**). The SCANS III density estimate for the relevant survey blocks that cover the Proposed Development area (Block E, F, G) are given in **Table 9.14** (from Hammond *et al.*, 2021).

The most recent assessment of harbour porpoise in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019a). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013).

Seasonally, data gathered from this initial desktop study suggests that harbour porpoise is likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Table 9.13: SCANS-III survey block densities with CVs for each species. Short-beaked common dolphin was not recorded in Blocks E/F/G therefore not included.

Species	Harbour porpoise		Bottlenose dolphin		Risso's dolphin		Minke whale	
SCANS Block	Density	CV	Density	CV	Density	CV	Density	CV
Block E	0.239	0.282	0.0082	0.573	0.0313	0.686	0.0173	0.618
Block F	0.086	0.383	-	-	-	-	-	-
Block G	0.336	0.438	0.1206	0.682	-	-	0.0271	0.7

Bottlenose dolphin

The Proposed Development (North Channel Wind 2) is located across the Coastal West Scotland and the Hebrides (CWSH) and Irish Sea (IS) MU for bottlenose dolphin (**Figure 9.10**, **Table 9.13**), and population estimates are given in **Table 9.14**. The SCANS III density estimate for the relevant survey blocks that cover the Proposed Development area (Block E, F, G) are given in **Table 9.14**.

The most recent assessment of bottlenose dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that although the range is favourable, there were too few datapoints to confidently conclude on the current and future population trends (JNCC, 2019b). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013b).

Given the evidence gathered from the initial desktop study for this baseline, bottlenose dolphins are considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Short-beaked common dolphin

A single MU the Celtic and Greater North Seas (CGNS), has been defined for short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin and minke whale (IAMMWG 2015) (**Figure 9.11**). Population estimates for this MU for short-beaked common dolphin are given **Table 9.13**. The relevant survey blocks that cover the Proposed Development area (Block E, F, G) had no short-beaked common dolphin sightings within them and were not reported in the SCANS-III report (Hammond *et al.,* 2021).

The most recent assessment of short-beaked common dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019c). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013c).

Given the evidence gathered from the initial desktop study for this baseline, short-beaked common dolphin is considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al.*, 2013; Waggitt *et al.,* 2020).

Risso's dolphin

Population estimates for the CGNS MU for Risso's dolphin are given in **Table 9.13**. Only block E, of the relevant survey blocks that cover the Proposed Development area (Block E, F, G), had Risso's dolphin sightings within them (**Table 9.14**) (Hammond *et al.,* 2021).

The most recent assessment of Risso's dolphin in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019d). This concurrent with the Unknown trend in the previous 2007 to 2012 assessment (JNCC, 2013c).

Given the evidence gathered from the initial desktop study for this baseline, Risso's dolphin is considered likely to occur year-round within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al*., 2013; Waggitt *et al.,* 2020).

Minke whale

Population estimates for the CGNS MU for minke whale are given in **Table 9.13**. Block E and G, of the relevant survey blocks that cover the Proposed Development area (Block E, F, G), had minke whale sightings within them and are given in **Table 9.14** (Hammond *et al.,* 2021).

The most recent assessment of minke whale in UK waters (2013 to 2018) concluded that the overall trend in Conservation Status was Unknown, highlighting that there was insufficient data to establish a trend for the population size nor potential future prospects for the population (JNCC, 2019e). This is a change from Favourable in the previous 2007 to 2012 assessment (JNCC, 2013e).

Given densities are comparatively high in the North Channel area, minke whale is considered likely to occur in the summer months within the Proposed Development marine mammal study area (Reid *et al.*, 2003; Baines and Evans, 2012; Wall *et al*., 2013; Waggitt *et al.,* 2020).

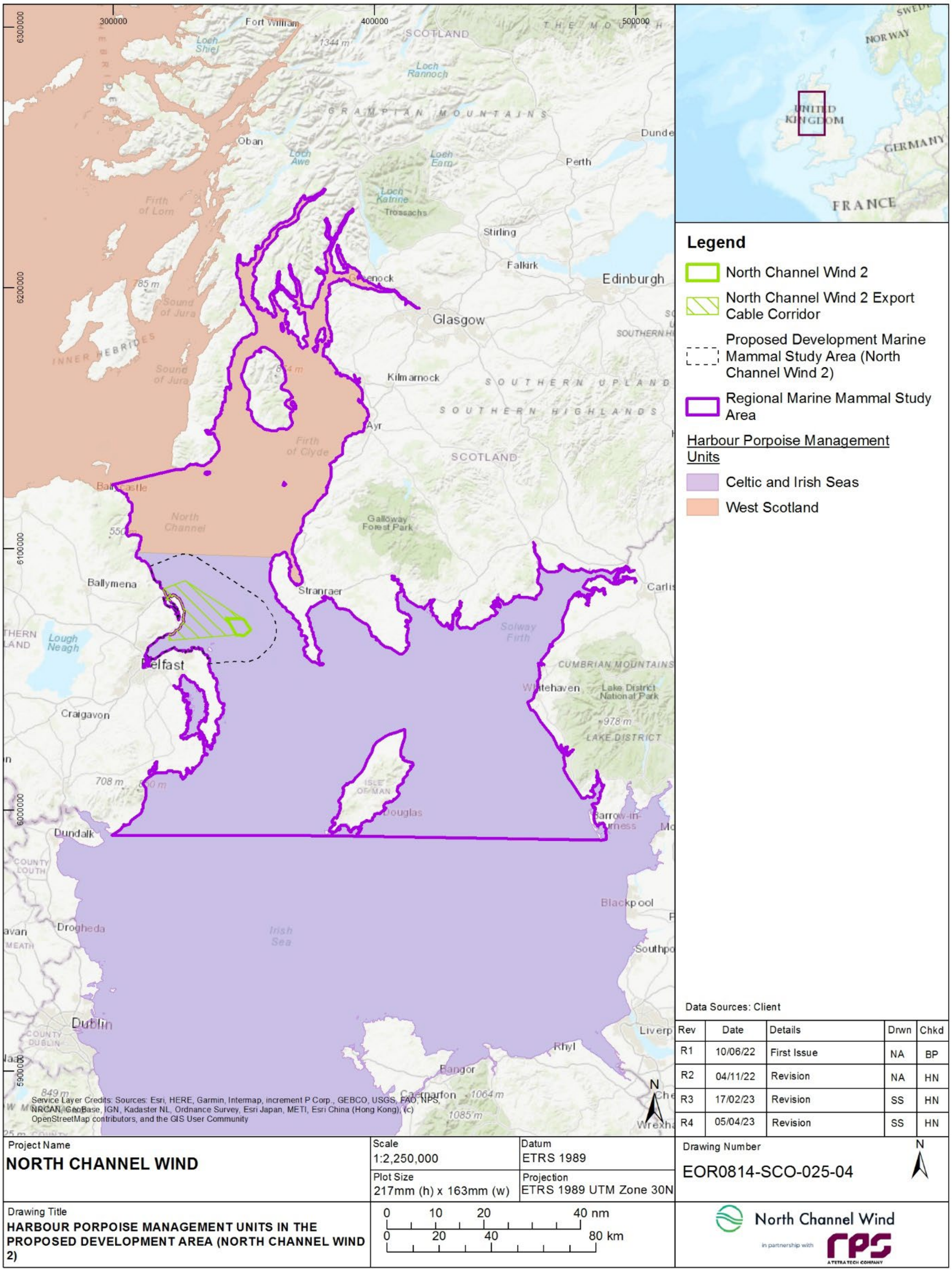


Figure 9.9: Harbour porpoise Management Units (MUs), noting that this species is largely confined to the continental shelf (i.e., waters <200m depth). The UK portion of the MUs is delimited by the UK EEZ.

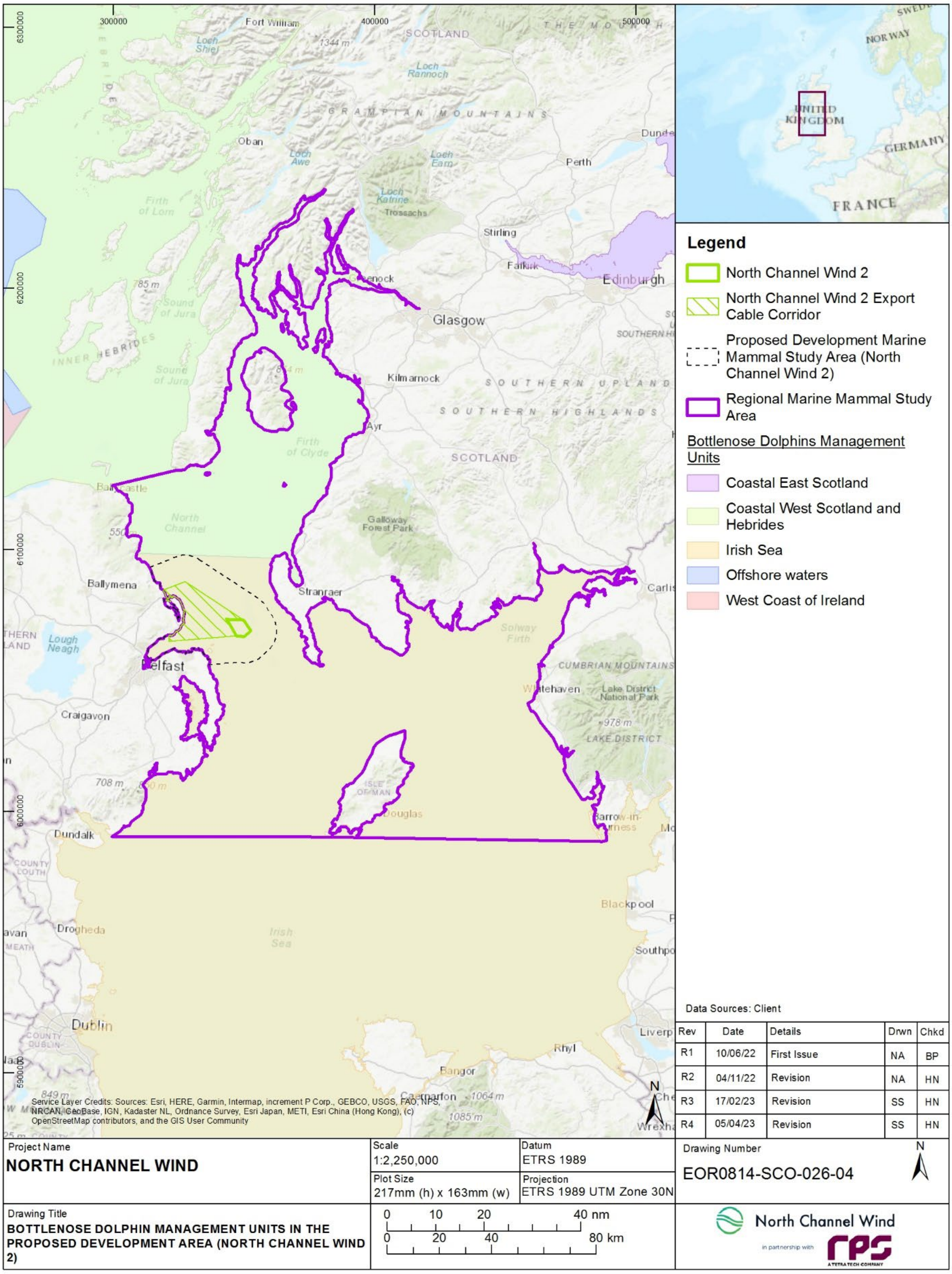


Figure 9.10: Bottlenose dolphin Management Units (MU). The UK portion of the MUs is delimited by the UK EEZ

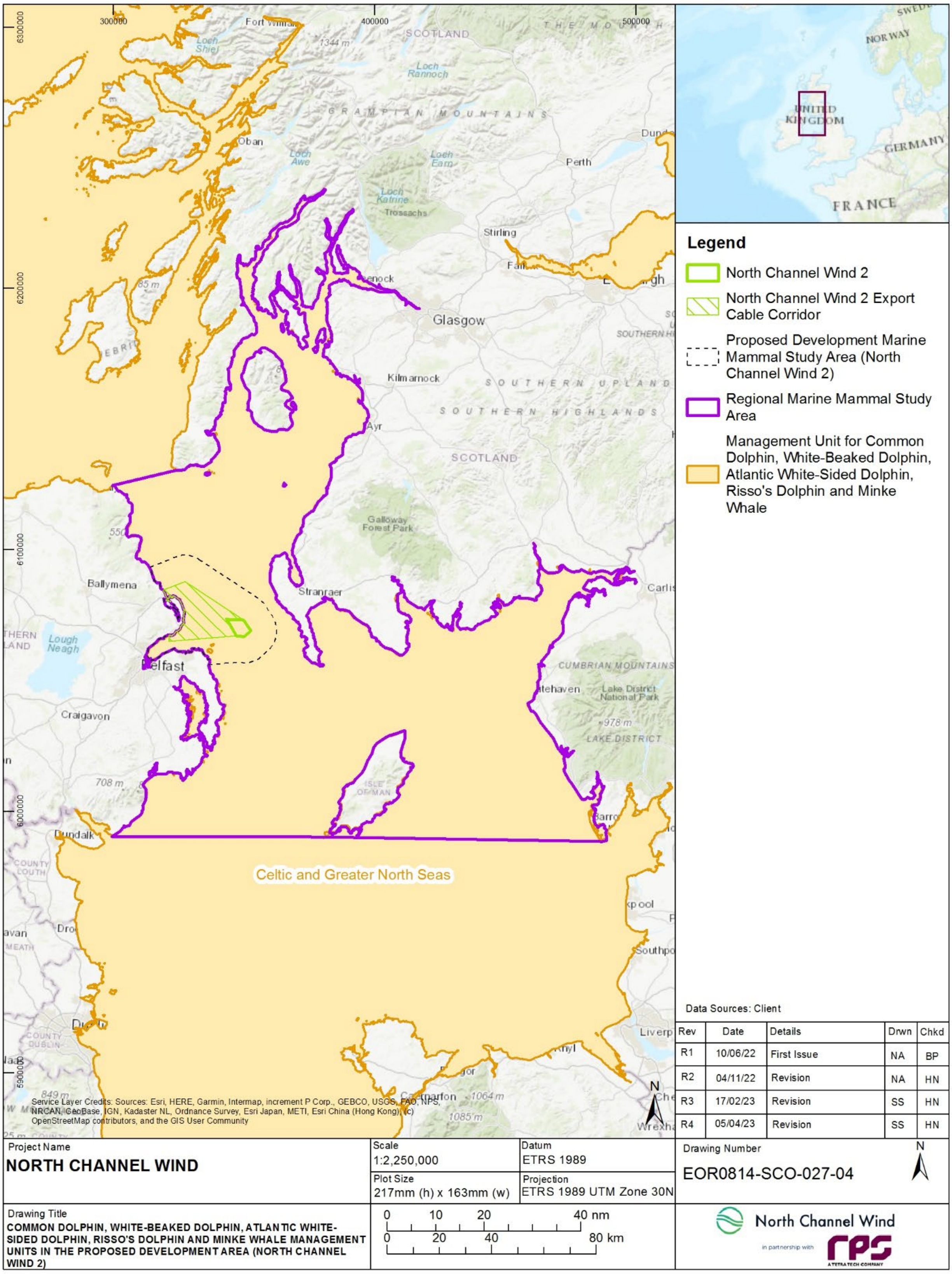


Figure 9.11: MU for short-beaked common dolphin, white-beaked dolphin, Atlantic white-sided dolphin, Risso's dolphin, and minke whale

Seal Management Units (SMUs) for pinnipeds

Seal management units are given for grey seals and harbour seals (SCOS, 2021). The Proposed Development (North Channel Wind 2) is located across Seal Management Unit's (SMU) 1 (South West Scotland) and 14 (Northern Ireland). The Regional marine mammal study area also crosses SMUs 13 (NW England) and 2 (West Scotland).

Grey seal

Grey seals are found across the north Atlantic, with approximately 36% of the world population of grey seals occurs in the UK (SCOS 2019), and about 84% of the UK population breeds in Scotland, largely in the Hebrides and Orkney. Grey seals forage in the open sea and return regularly to haul out on land where they rest, moult and breed. The latest UK grey seal population estimate is 149,700 individuals (approximate 95% CI 120,000-174,900) (SCOS, 2020).

The most recent August moult count (2016 to 2019 period) for SMU 1 is 517 animals, 505 animals for SMU 14 and 517 for SMU 1 (SCOS, 2020). Rough estimates are given SMU 13, with 250 animals, but should be interpreted with caution. Seal at-sea usage maps from Carter *et al*. (2020) show higher relative areas of predicted seal distribution around the Proposed Development zone.

The most recent assessment of grey seal in UK waters concluded that the overall trend in Conservation Status was Favourable Improving, with range population, habitat and future all favourable (JNCC, 2019f). This an improvement on the Favourable overall trend in the previous 2007-2012 assessment (JNCC, 2013f).

Given the evidence gathered during the initial desktop study, including the grey seal haul out distribution maps and at-sea usage maps (**Figure 9.12**), grey seal is considered likely to occur year-round within the Proposed Development marine mammal study area (**Figure 9.13**).

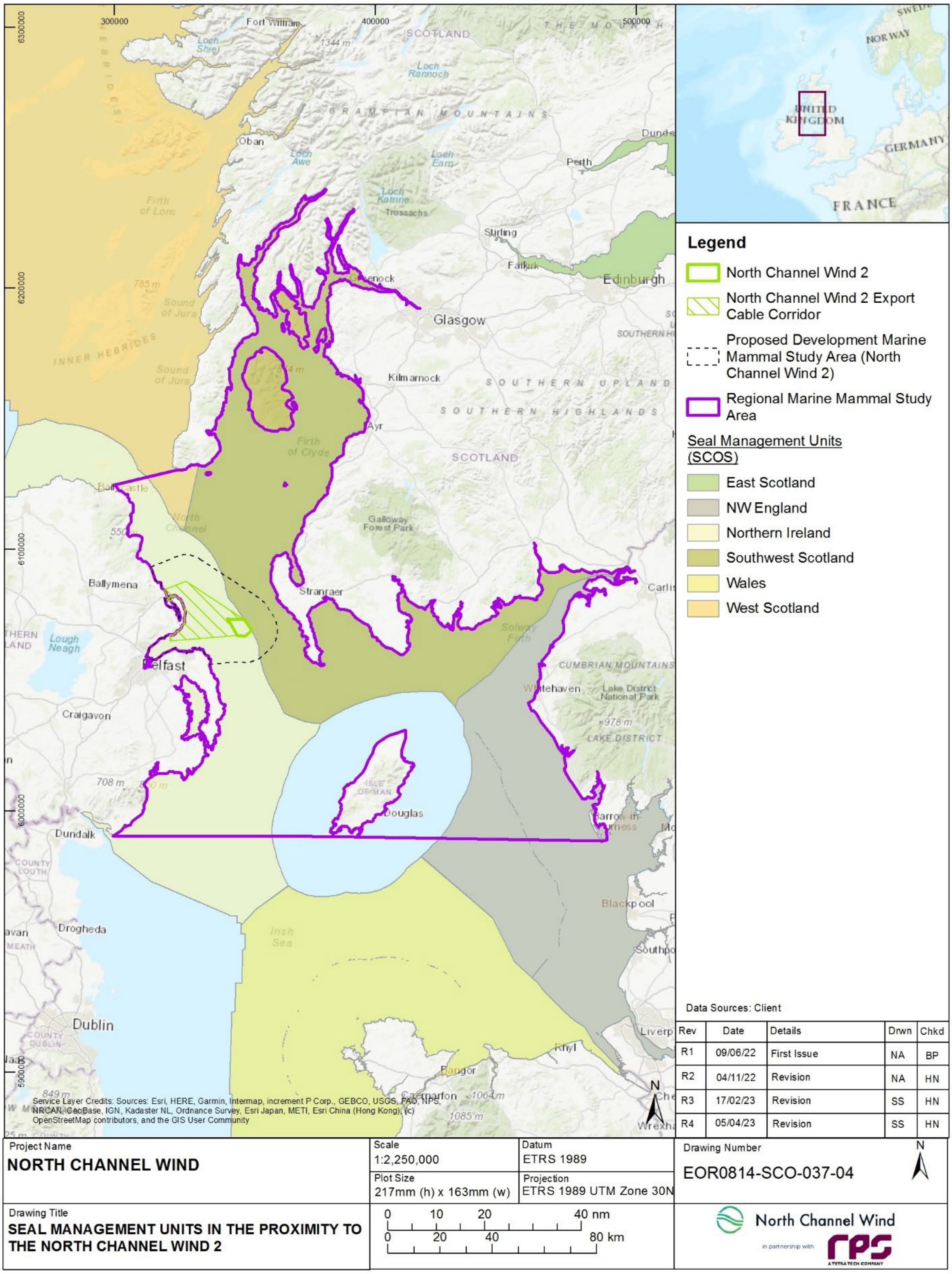
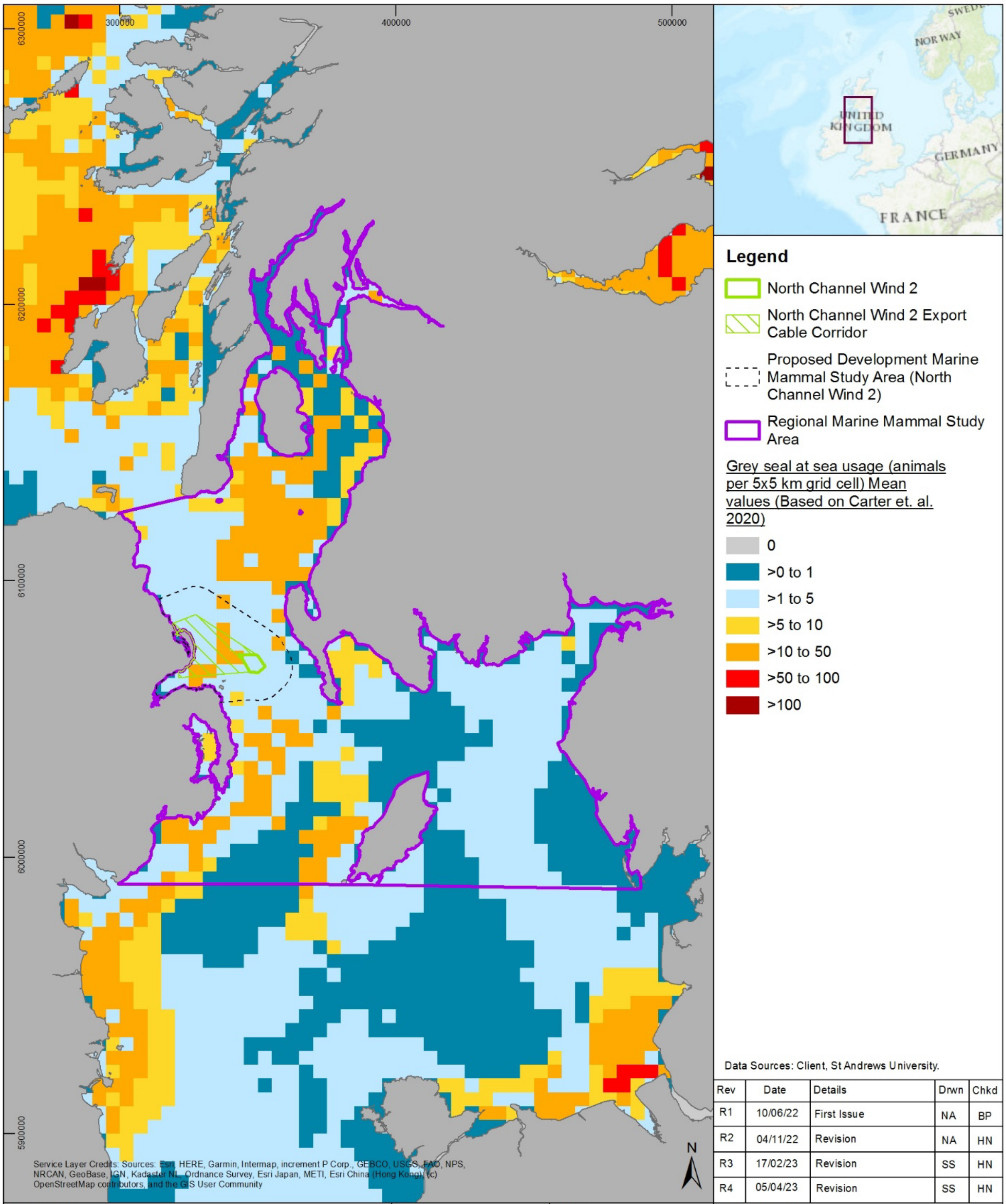


Figure 9.12: Seal management units (SMUs) for grey seal and harbour seal (SCOS, 2020).



Rev	Date	Details	Drwn	Chkd
R1	10/06/22	First Issue	NA	BP
R2	04/11/22	Revision	NA	HN
R3	17/02/23	Revision	SS	HN
R4	05/04/23	Revision	SS	HN

Project Name NORTH CHANNEL WIND	Scale 1:2,250,000	Datum ETRS 1989	Drawing Number EOR0814-SCO-028-04
	Plot Size 217mm (h) x 163mm (w)	Projection ETRS 1989 UTM Zone 30N	
Drawing Title GREY SEAL AT-SEA DISTRIBUTION (MEAN) IN PROXIMITY TO THE PROPOSED DEVELOPMENT MARINE MAMMAL STUDY AREA (NORTH CHANNEL WIND 2)	0 10 20 40 nm 0 20 40 80 km		North Channel Wind in partnership with rps A TETRA TECH COMPANY

Figure 9.13: Grey seal at-sea distribution map (Mean). From Carter *et al.* (2020)

Harbour seal

The UK harbour seal population estimate based on most recent moult counts is 44,000 (95% CI 36,000 to 58,700) (SCOS, 2021). The largest concentrations of haul out sites are found in Scotland, primarily on the West coast, Inner and Outer Hebrides, Orkney and Shetland, but other important haul out sites are found on the East coast of Northern Ireland.

The most recent harbour seal August moult count presented for SMU 1 (Southwest Scotland) is 1,709 (2016-2019 count period) (SCOS, 2020), 1,012 for 14 (given as Northern Ireland total in SCOS 2020 Report), 15,600 for SMU 2 (West Scotland) and a rough estimate of 5 for SMU 13 (Northwest England). Harbour seal at-sea usage maps from Carter *et al*. (2020) shows higher relative areas of predicted seal distribution around the Proposed Development zone towards the coast of Northern Ireland, with lower density areas over the array (**Table 9.13**).

In the UK, harbour seals have been assessed as having an Unfavourable – Inadequate unknown conservation status (JNCC, 2019g). This an improvement on the Bad declining overall trend in the previous 2007 – 2012 assessment (JNCC, 2013g).

Given the evidence gathered during the initial desktop study, including the harbour seal haul-out distribution maps and at-sea usage maps (**Figure 9.14**), harbour seal is considered likely to occur year-round within the Proposed Development marine mammal study area.

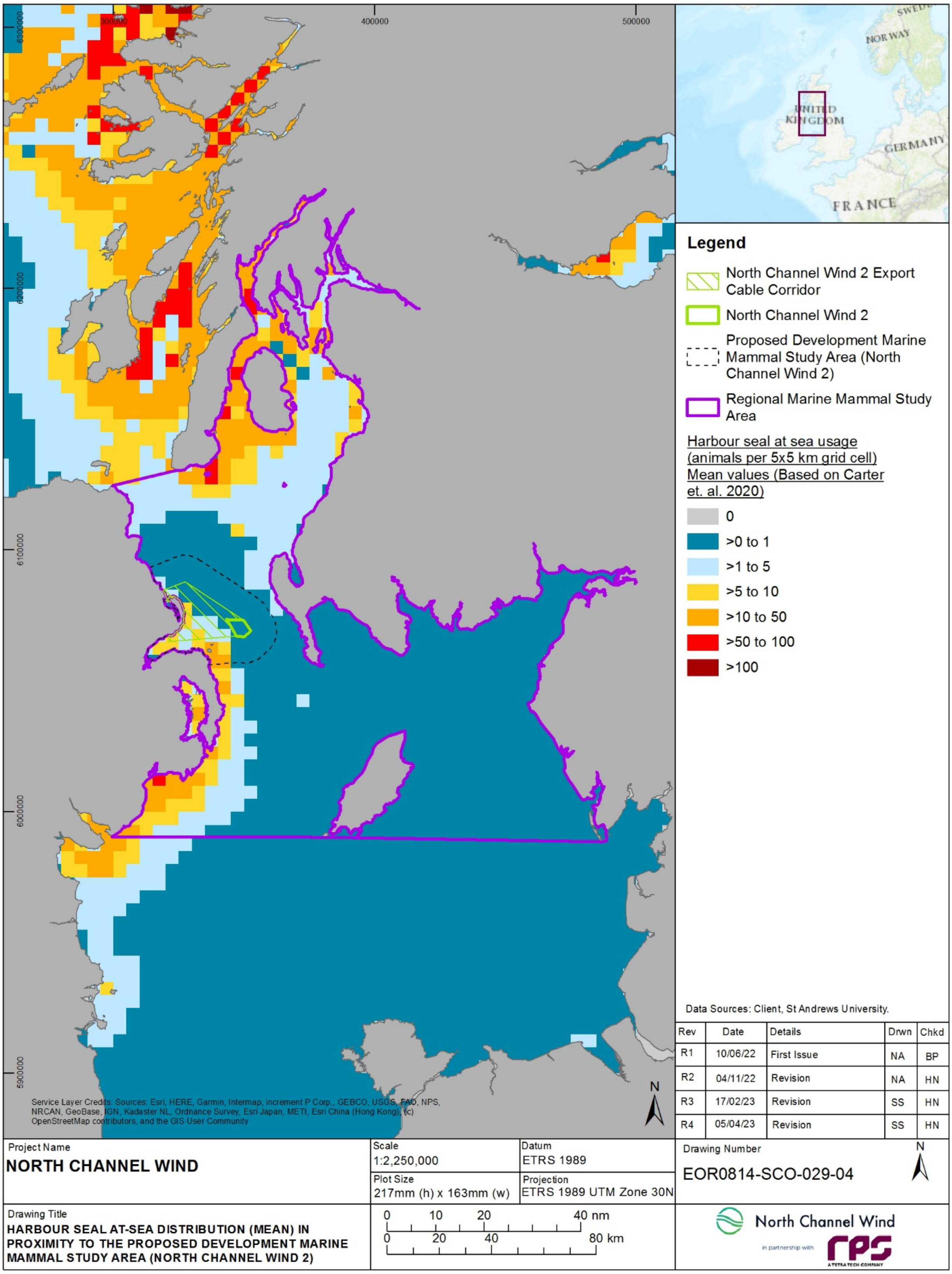


Figure 9.14: Harbour seal at-sea distribution map (Mean). From Carter *et al*. (2020).

9.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in **Table 9.15** together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to marine mammals that have been scoped out of the assessment are described in **Table 9.16**.

Table 9.14: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Marine Mammals. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Injury and disturbance from pile-driving during construction	✓			Impact piling of driven or drilled anchoring legs during construction may result in hearing damage/auditory injury to marine mammals and sea turtles in the form of a Permanent Threshold Shift (PTS) or behavioural disturbance/displacement of marine mammals. Designed in measures will typically include soft start measures and the implementation of a marine mammal mitigation plan (MMMP) which would involve monitoring of a mitigation zone prior to the start of piling.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Noise modelling will be required to quantitatively assess the risk of PTS based on published and accepted guidance and thresholds. The assessment of disturbance will be based on the best available scientific evidence (e.g., species-specific dose-response). Number of animals potentially affected will be predicted within the modelled ranges using density estimates for key species.
Injury or disturbance associated with activities during construction and decommissioning (e.g., drilling, trenching, dredging, cutting etc)	✓		✓	Underwater noise from other construction or decommissioning activities may affect sensitive marine species, including the potential for landfall activities to result in disturbance to seals at nearby haul-out sites (discussed below). Most noise sources in this category will be low-level continuous noises and likely to result in localised, short-term and temporary effects.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Disturbance associated with airborne noise from activities during construction and decommissioning of cable route	✓		✓	Airborne noise from construction or decommissioning activities may affect sensitive marine species, particularly those that haul out near to the landfall cable routes (grey seal and harbour seal).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	The assessment of disturbance will be based on the best available scientific evidence, and number of animals potentially affected based on densities of key species.
Injury or disturbance due to vessel noise	✓	✓	✓	The impact of vessel use during all phases of the Proposed Development may result in behavioural disturbance/ displacement of marine mammals and sea turtles. Project designed in measure is likely to include a code of conduct for vessel operators and will be detailed as part of a Vessel Management Plan (VMP).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species
Injury or disturbance due to UXO clearance	✓			Underwater noise from clearance of UXOs may affect sensitive species, particularly in relation to physical or auditory injury, with very short-term behavioural effects also possible. Additional mitigation will be applied to reduce these risks (e.g., ADDs and soft start charges).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Subsea noise modelling will predict the ranges of effect based on published and agreed thresholds and number of animals potentially affected based on densities of key species

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Entanglement with moorings (floating WTG)		✓		Derelict/lost fishing gear has the opportunity to entangle in moorings, which could increase the chance of marine mammal and sea turtle entanglement. The likelihood of this is not well understood. Risk posed by the project array will vary depending on device spacing, mooring design and array layout.	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	Literature review to determine the potential risk of entanglement and assessment of risk for each species based on density and distribution within the ZoI.
Increased vessel activity may result in collision risk	✓	✓	✓	Increased vessel traffic during all phases of the Proposed Development may result in collisions with marine mammals and sea turtles. Project designed in measure is likely to include a code of conduct for vessel operators and will be detailed as part of a Vessel Management Plan (VMP).	Surveys to obtain density estimates, where data allows, or densities derived from published source for each species within the relevant impact footprint.	A qualitative assessment will be undertaken based on best available literature at the time of writing.
Changes in prey availability	✓	✓	✓	Changes in prey abundance and distribution resulting all phases of the Proposed Development may impact on the ability of marine mammals and sea turtles to forage in the area. Several fish species that are sensitive to noise disturbance are prey for marine mammals (leatherbacks are largely gelatinivores), and include sprat, herring, cod and whiting; these prey species all potentially spawn or have nursery areas in the offshore study area. There are also potential benefits to marine mammals as some evidence supports higher use of areas with infrastructure due to “reef effects”.	Review of Fish and Shellfish Ecology EIAR	No specific modelling required for this impact although the assessment will be based on the results of the underwater noise modelling assessment. and physical processes assessment. and the resulting impact assessment carried out fish and shellfish receptors.

Table 9.15: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Marine Mammals

Impact	Justification
Construction	
Accidental pollution	The impact of pollution including accidental spills and contaminant releases associated with the construction of infrastructure and use of supply/service vessels may lead to direct mortality of marine mammals or a reduction in prey availability, either of which may affect species' survival rates. With implementation of an appropriate pollution prevention plan and based on evidence from other consented offshore wind farms and consent applications, a significant impact within the equivalent extent of a wind farm's array plus buffer area is considered very unlikely to occur, and a major incident that may impact any species at a population level is also considered very unlikely. It is predicted that any impact would be of local spatial extent, short-term duration, intermittent and medium reversibility within the context of the regional populations and therefore not significant in EIA terms. This is considered to be equally applicable to the Proposed Development for which construction will be comparable in scale and operation within the same environment, whilst implementing an appropriate pollution prevention plan. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, the Proposed Development intends to scope this impact out of further consideration within the EIA.
Changes in water clarity	Disturbance to water quality as a result of construction operations can have both direct and indirect impacts on marine mammals. Indirect impacts would include effects on prey species (which is scoped in) whilst direct impacts could include impairment of visibility and therefore affect foraging success. Marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. For example, harbour porpoise and harbour seals in the UK have been documented foraging in areas with high tidal flows (e.g., Pierpoint 2008, Marubini *et al*. 2009, Hastie *et al*. 2016); therefore, low light levels, turbid waters and suspended sediments are unlikely to negatively impact marine mammal foraging success. When the visual sensory systems of marine mammals are compromised, they are able to sense the environment in other ways, for example, seals can detect water movements and hydrodynamic trails with their mystacial vibrissae; while odontocetes primarily use echolocation to navigate and find food in darkness. Whilst elevated levels of SSC arising during construction of the offshore wind farm may decrease light availability in the water column and produce turbid conditions, the maximum impact range is expected to be localised with sediments rapidly dissipating over one tidal excursion. In addition, there is likely to be large natural variability in the SSC within the Proposed Development Marine Mammal Study Area due to increased shipping traffic in the area, so marine mammals living here will be tolerant of any small-scale increases, such as those associated with the construction activities. In summary, the ZoI of increased SSC will be small, particularly in the context of the wider available habitat, and the duration of effects will be short (one tidal excursion). Marine mammal receptors in the Marine Mammal Study Area are not considered to be sensitive to increases in SSC as they are likely to be adapted to high natural variation in sediment levels. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed that this impact is scoped out of the EIA.
Operation and Maintenance	

Impact	Justification
Operational noise	The MMO (2014) review of post-consent monitoring at Offshore Wind Farms found that available data on the operational wind turbine noise, from the UK and abroad, in general showed that noise levels from operational wind turbines are low and the spatial extent of the potential impact of the operational wind turbine noise on marine receptors is generally estimated to be small, with behavioural response only likely at ranges close to wind turbines. This is supported by several published studies which provide evidence that marine mammals are not displaced from operational wind farms. At the Horns Rev and Nysted offshore wind farms in Denmark, long-term monitoring showed that both harbour porpoise and harbour seals were sighted regularly within the operational Offshore Wind Farms, and within two years of operation, the populations had returned to levels that were comparable with the wider area (Diederichs *et al*. 2008). Similarly, a monitoring programme at the Egmond aan Zee Offshore Wind Farm in the Netherlands reported that significantly more porpoise activity was recorded within the Offshore Wind Farm compared to the reference area during the operational phase (Scheidat *et al*. 2011). Other studies at Dutch and Danish offshore wind farms (Lindeboom *et al*. 2011) also suggest that harbour porpoise may be attracted to increased foraging opportunities within operating offshore wind farms. In addition, recent tagging work by Russell *et al*. (2014) found that some tagged harbour and grey seals demonstrated grid-like movement patterns as these animals moved between individual wind turbines, strongly suggestive of these structures being used for foraging. Other reviews have also concluded that operational wind farm noise will have negligible effects (Madsen *et al*. 2006, Teilmann *et al*. 2006a, Teilmann *et al*. 2006b, Cefas, 2010, Brasseur *et al*., 2012). In addition, previous modelling by Subacoustech (e.g., Hornsea Project Three EIA) concluded that underwater noise during the operational phase is expected to have a negligible range of influence on any marine receptors. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Risk associated with electromagnetic fields (EMFs) associated with subsea and midwater cabling	Based on the data available to date, there is no evidence of EMF related to marine renewable devices having any impact (either positive or negative) on marine mammals (Copping, 2018). There is no evidence that seals can detect or respond to EMF, however, some species of cetaceans may be able to detect variations in magnetic fields (Normandeau *et al*. 2011). To date, the only marine mammal known to show any response to EMF is the Guiana dolphin (*Sotalia guianensis*) which has been shown to possess an electroreceptive system, which uses the vibrissal crypts on their rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al*. 2013). However, this has not been shown in any other species of marine mammal and this species does not occur within the Proposed Development marine mammal study area or Regional marine mammal study area. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.
Decommissioning	
Accidental pollution	As for construction phase. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.

Impact	Justification
Changes in water clarity	As for construction phase. Therefore, subject to consultation with the SNCBs and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA.

9.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The marine mammals EIA will follow the methodology set out in Chapter 3. Specific to the marine mammals EIA, the following guidance documents will also be considered:

- Guidelines for Marine and Coastal EcIA in Britain and Ireland (IEEM, 2010; CIEEM, 2019);
- Guidance on Wind Energy Developments and Natura 2000 legislation (EC, 2011);
- Oslo Paris Convention (OSPAR) Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- 2018 Revision to: Technical guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (Version 2.0): Underwater Thresholds for Onset of Permanent and Temporary Threshold Shifts. (NMFS, 2018); and
- Marine mammal injury noise exposure-onset noise exposure criteria recommended in (Southall *et al*., 2019).

This is not considered to be an exhaustive list and the Proposed Development marine mammal ES chapter will detail all guidance considered in the preparation of the marine mammal assessment. In addition, and specific to marine ecology topics, IEFs will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each IEF will be defined to reflect topic-specific interests.

9.3.6 POTENTIAL CUMULATIVE EFFECTS

The marine mammal cumulative effect assessment will follow the approach set out in Chapter 3. The identification of cumulative effects on marine mammals will follow receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix.

There is potential for the impacts from the Project to interact with those from other projects, plans and activities, resulting in a cumulative effect on marine mammal and sea turtle receptors. The key cumulative effect is likely to result from increased underwater noise from pile driving. Other activities may contribute to the cumulative assessment of noise including vessel traffic from surrounding projects and other marine users such as seismic surveys, commercial shipping and passenger vessels.

The phasing of the Proposed Development will need to be considered in the context of any other developments occurring within the region and for marine mammals, the relevant management units. The CEA will primarily adopt a qualitative approach due to limitations on the availability of data from other projects although a semi-quantitative assessment may be possible where information supports this approach. The approach to CEA will be agreed as part of the roadmap process via consultation with key stakeholders.

9.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

9.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Marine Mammal and Sea Turtle Ecology?
- Do you agree that all receptors and impacts have been identified for Marine Mammal and Sea Turtle Ecology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

10. OFFSHORE AND INTERTIDAL ORNITHOLOGY

10.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified baseline datasets in the form of pre-existing and non-Proposed Development specific datasets. These are summarised at Table 10.1 below. Other sources of data will be sought as the assessment progresses and all such sources of information will be referenced appropriately in the ES.

Further detail on the nature of the data sources utilised is set out within Annex B.

Table 10.1: Summary of Key Desktop Study Inputs

Title	Source	Year	Author
Special Protection Areas, proposed marine Special Protection Areas, and Areas of Special Scientific Interest (NI)	*DAERA*	*Accessed 2022*	*DAERA*: Protected areas | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Special Protection Areas proposed marine Special Protection Areas and Natural Heritage Areas. (RoI)	*NPWS*	*Accessed 2022*	*NPWS:* Protected Sites in Ireland | National Parks & Wildlife Service (npws.ie)
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (Scotland)	*SNH SiteLink*	*Accessed 2022*	*SNH:* https://sitelink.nature.scot
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (Wales)	*NRW*	*Accessed 2022*	*NRW:* Natural Resources Wales / Protected areas of land and seas
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (England)	*Natural England*	*Accessed 2022*	*NE:* Planning and development: Protected sites and species - detailed information - GOV.UK (www.gov.uk)
Special Protection Areas and proposed marine Special Protection Areas	*JNCC*	*Accessed 2022*	JNCC - Adviser to Government on Nature Conservation
Seabird colony data	*Seabirds Count and the Seabird Monitoring Programme*	*2020*	*JNCC:* https://jncc.gov.uk/our-work/seabird-monitoring-programme/#smp-results-data
Migration Zones	*British trust for Ornithology (BTO)*	*Accessed 2022*	*BTO:* Migration Zone Shapefiles | BTO - British Trust for Ornithology
Non-estuarine Coastal Waterbird Survey	*British trust for Ornithology (BTO)*	*2015/16*	*BTO:* https://app.bto.org/webs-reporting/?tab=news
Seabird records submitted by the public	*National Biodiversity Data Centre*	*Accessed 2022*	Home - Biodiversity Maps (biodiversityireland.ie)

Title	Source	Year	Author
Northern Ireland Seabird Reports 2013-2021	*BTO*	*Accessed 2022*	Northern Ireland Seabird Report | BTO - British Trust for Ornithology
SEA678 Data Report for Offshore Seabird Populations	*Coastal and Marine Resources Centre*	*Accessed 2022*	Mackey, M. & Gimenez, D.P. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197026/SEA678_Seabirds.pdf
Distribution maps of cetacean and seabird populations in the North-East Atlantic	*Journal of Applied Ecology*	*2019*	Waggitt et al. Distribution maps of cetacean and seabird populations in the North-East Atlantic - Waggitt - 2020 - Journal of Applied Ecology - Wiley Online Library

10.2 NCW 1 PROJECT

10.2.1 INTRODUCTION

This section of the Scoping Report considers the potential impacts on birds from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components of the proposed North Channel Wind 1 (NCW 1) project (seaward of the MHWS mark).

10.2.2 STUDY AREA

Three proposed ornithology study areas inform this section of the scoping report. These are listed below with further detail provided in each of the individual sections below:

- Offshore Ornithology Regional Study Area;
- Offshore Ornithology Study Area; and
- Intertidal Ornithology Study Area.

Offshore Ornithology Regional Study Area

The proposed offshore ornithological regional study area was determined by the area within which potential impacts to breeding seabirds could occur and was based on the foraging ranges of breeding seabirds. Many seabirds have large foraging ranges which extend several hundred kilometres from their breeding colonies. Birds may therefore overlap (i.e., have connectivity with) the Proposed Development, even when the colonies they originate from are a significant distance away. The proposed offshore ornithology regional study area therefore identifies the SPA breeding colonies with potential connectivity to the Proposed Development.

Published mean-maximum foraging ranges (plus one standard deviation (+1 S.D.)) in Woodward et al. (2019) were used to define the offshore ornithology regional study area. The largest foraging range considered that of northern gannet *Morus bassanus* (Mean Max. of 315.2 km ± 194.2 km) extends 509.4 km from the Proposed Development. Several species are known to utilise foraging ranges larger than gannet including fulmar *Fulmarus glacialis,* great skua *Stercorarius skua* and manx shearwater *Puffinus puffinus*. However, it is considered that the assessment of likely significant effects upon SPAs designated on account of the supported populations of such species within a 509.4km radius will adequately reflect the colonies which could be potentially significantly affected by the proposed development, given the significantly smaller mean foraging range of these species, which is well within this chosen buffer distance. The proposed offshore ornithology regional study area therefore extends 509.4 km from the Proposed Development (Figure 10.1). Search areas for breeding colonies and regional search areas for other key species in the assessment will fall well within the mean-maximum foraging range of gannet. Therefore, this approach is appropriate to define the maximum extent of the offshore ornithology regional study area.

A seabird breeding colony that is affected by the potential impacts of the Proposed Development could also be affected by the potential impacts of other developments within the foraging range of seabirds from that colony. The offshore ornithology cumulative study area for each species will therefore be defined by implementing a search area equivalent to the species-specific mean-maximum foraging range (+ 1 S.D.) along a marine pathway, from those potentially affected breeding colonies of that species.

In the non-breeding season, seabirds are not constrained by colony location and can, depending on individual species, range widely within UK seas and beyond. The Zone of Influence (ZoI) for seabird species in the non-breeding season (where an assessment is deemed to be required) is based on Furness (2015) which presents Biologically Defined Minimum Population Scales (BDMPS). It is not possible to represent these scales on a figure.

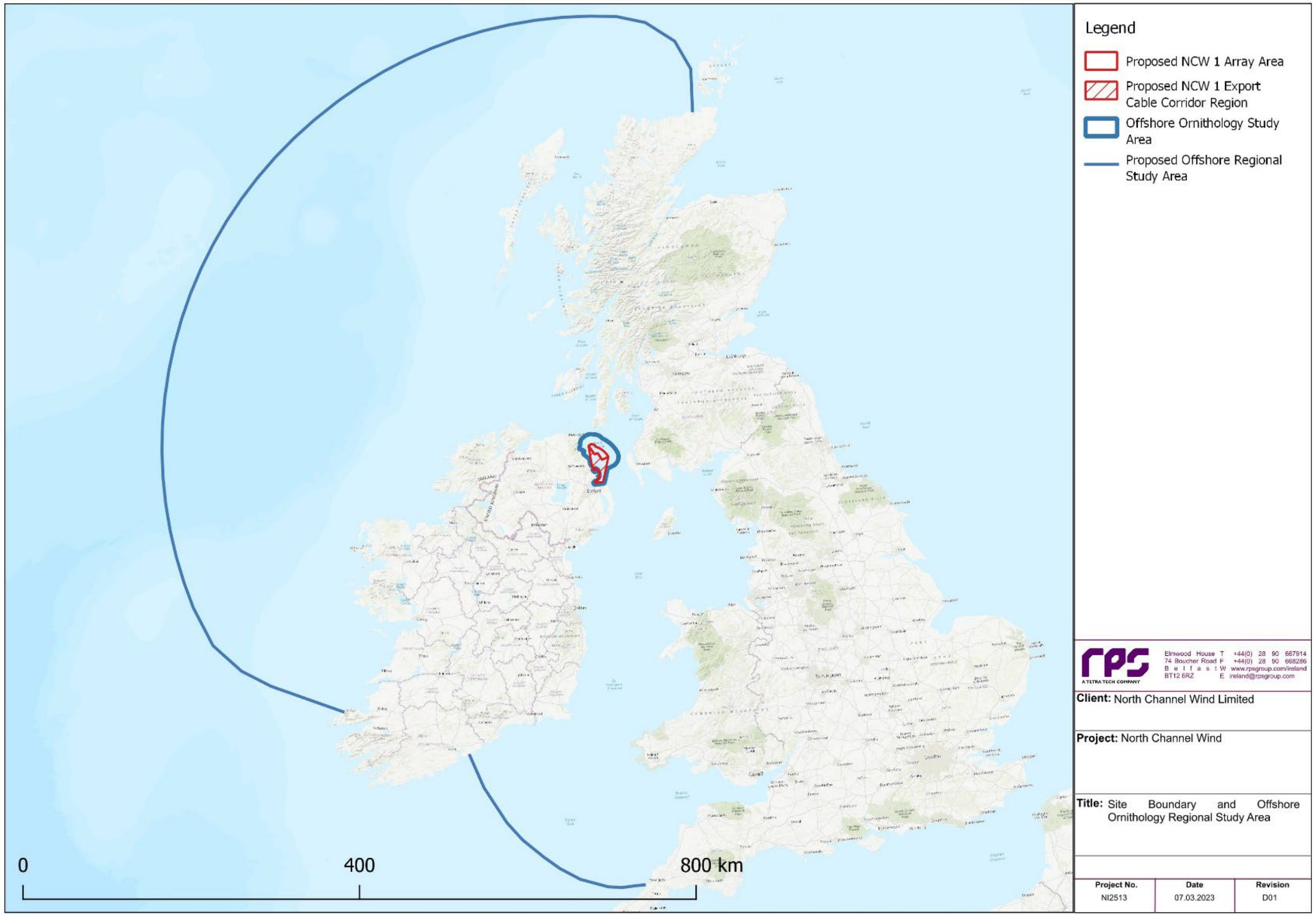


Figure 10.1: Offshore Ornithology Regional Study Area for North Channel Wind 1 Project

Offshore Ornithology Study Area

It is proposed that the baseline survey should extend a minimum buffer of 4 km, extending out to 10 km for development areas in proximity to the East Coast (NI) Marine pSPA. This survey area and a 2 km buffer of the proposed export cable corridor area of search forms the proposed offshore ornithology study area (Figure 10.2).

This study area encompasses the Proposed Development's 2 km direct ZOI on birds and provides the wider ornithological context within 10km in proximity to sites classified under the Birds Directive for the Proposed Development. It is also of sufficient size to provide a potential control area for monitoring change in seabird abundance and distribution pre and post construction of the project.

The offshore ornithology assessment will include consideration of the potential impacts on migratory species such as Greenland white-fronted geese, whooper and Bewick's swan among a range of species, which may be associated with a number of SPAs located within Northern Ireland and further afield.

Intertidal Ornithology Study Area

The proposed study area for the assessment of effects on birds in the intertidal zone covers the coastal area between MHWS and MLWS at the landfall locations within which wintering intertidal bird surveys will be conducted. This study area will extend 250 m either side of the landfall locations and up to 300 m seaward from MHWS. It is noted that at this stage the exact location of the proposed landfall is not known, and a preliminary study area has been illustrated (Figure 10.3). The exact study area will be established when more information on the exact location/s of the proposed export cable landfall are known.

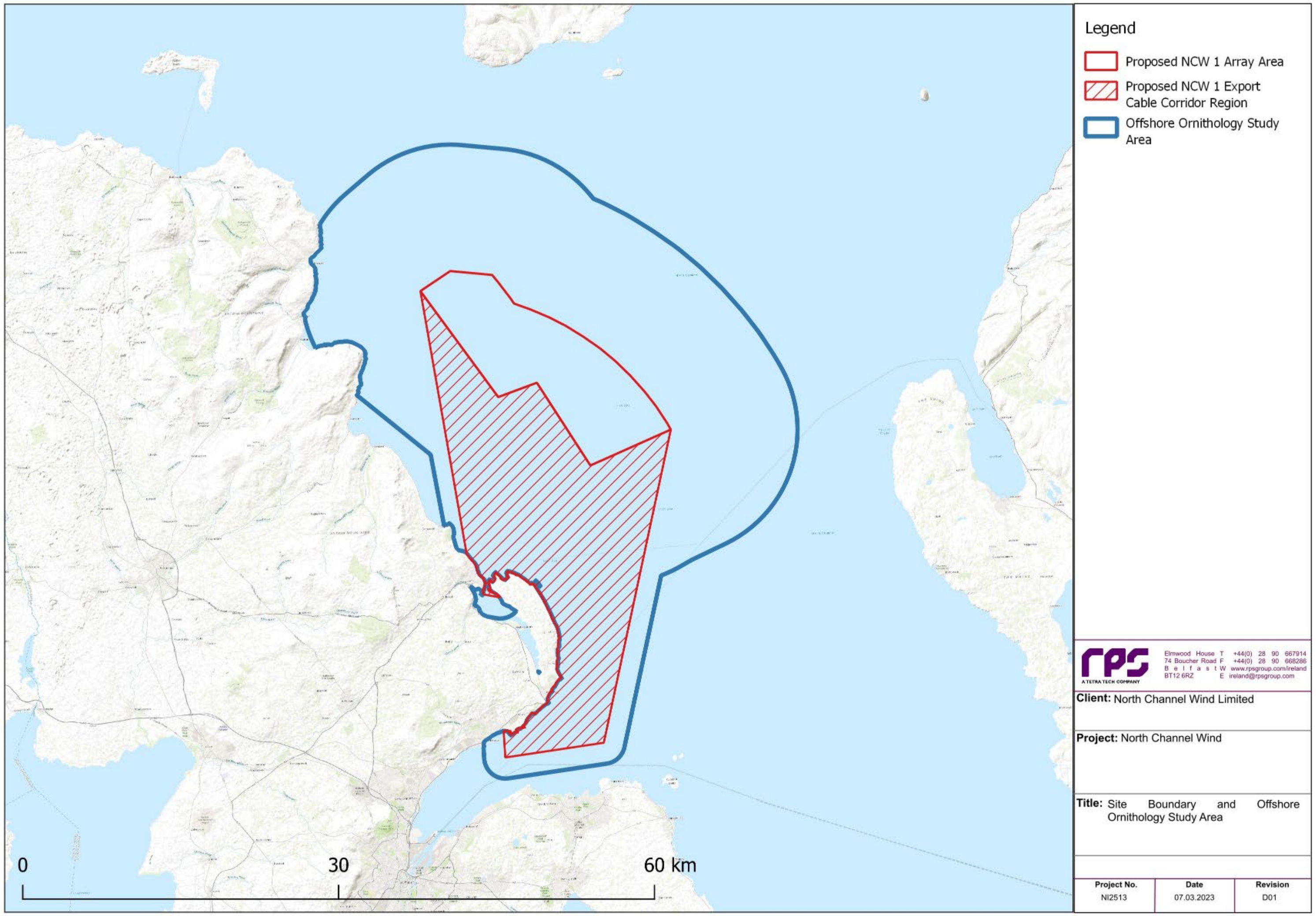


Figure 10.2: Offshore Ornithology Study Area for NCW 1 Project

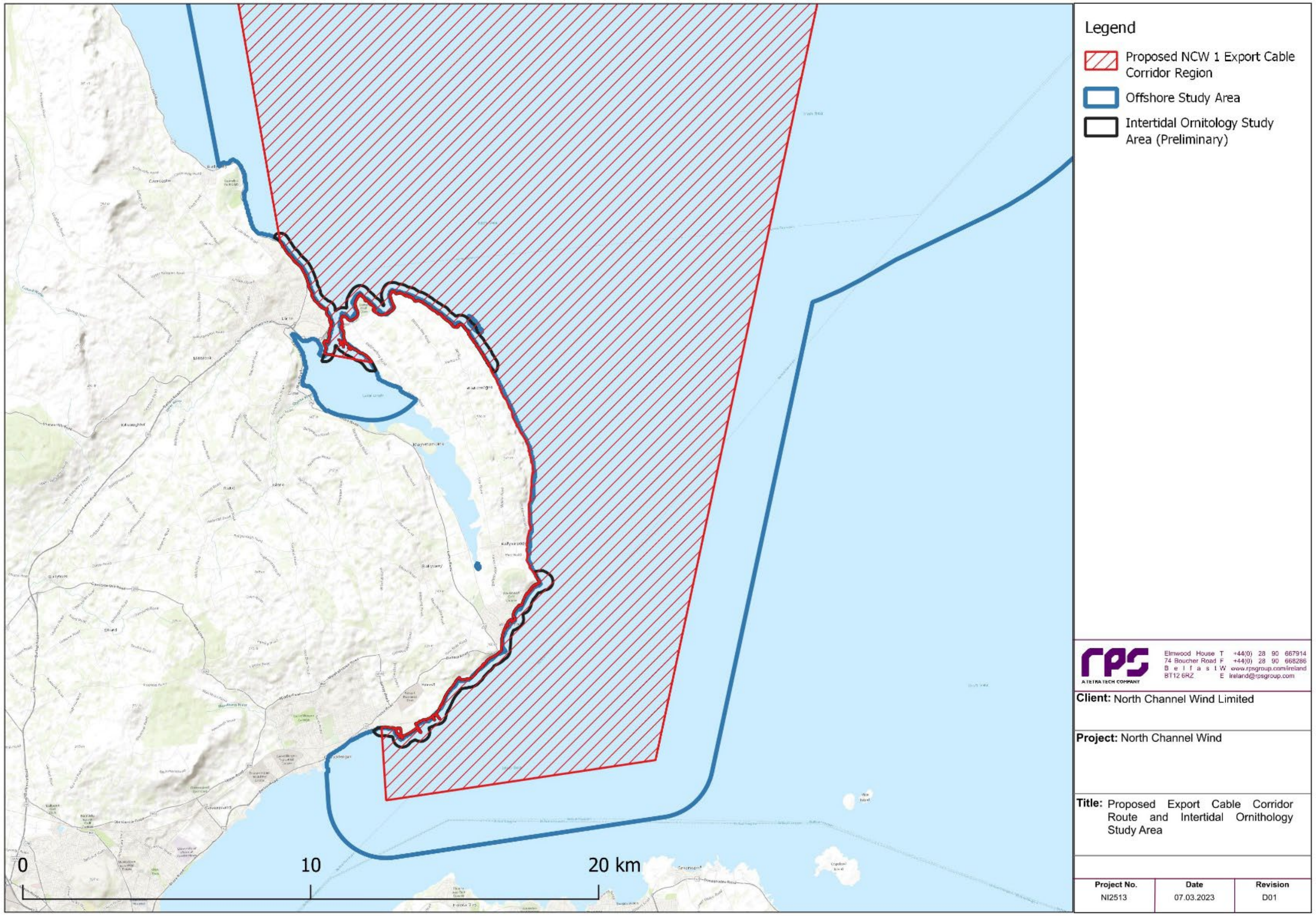


Figure 10.3: Intertidal Ornithology Study Area for NCW 1 Project

10.2.3 BASELINE ENVIRONMENT

This section provides a concise summary of the baseline environment in respect of offshore and intertidal ornithology with a more detailed description provided in Annex B.

Breeding Species

Available data indicate that the most numerous species in the Proposed Development Site area are northern fulmar *Fulmarus glacialis,* manx shearwater *Puffinus,* herring gull *Larus argentatus,* common guillemot *Uria aalge*, black legged kittiwake *Rissa tridactyla*, gannet *Morus bassanus*, and razorbill *Alca torda*. For these species, numbers are typically highest during the pre-breeding period when birds forage further from their breeding colonies and during post-breeding dispersal. High numbers of shag *Phalacrocorax aristotelis* and cormorant *Phalacrocorax carbo* may also be present in winter.

The proposed development lies in close proximity to a number of breeding seabird colonies including the gannet colony at Ailsa Craig (around 35,825 pairs), manx shearwater colonies at the Copeland Islands and further notable colonies at The Gobbins, Muck Island and The Maidens.

It is considered that the abundances of the key species within the available data for the proposed development site, including gannet, kittiwake, auks, terns and manx shearwater is consistent with the presence of internationally important breeding seabird colonies around the nearby coast, including the Larne Lough SPA, Outer Ards SPA, Copeland Islands SPA, Belfast Lough SPA and the Ailsa Craig SPA in addition to more distant SPAs in Scotland.

Wintering Species

Available data indicate that in winter, fulmar, gannet, cormorant, shag, gull species including kittiwake and auks are the most common species within the offshore ornithology study area with numbers of cormorant, kittiwake, black-headed gull and herring gull likely to be peaking at this time of year.

Seaducks, divers, grebes and waders which winter within Belfast, Strangford and Larne Loughs and along the west coast of Scotland in nationally important numbers are also likely to be present within the offshore ornithology study area, with particular attention drawn to the population of red-throated diver which forms a qualifying interest of the East Coast (NI) Marine proposed SPA.

Passage Species

As set out above the use of a site by migrating birds can present difficulties due to the potential for these movements to occur at night or at high altitude, thus preventing the collection of reliable records through boat-based or aerial surveys. As discussed above limitations of the available data include for the lack of data on the use of the site by migrant waterfowl and waders.

The SPAs of Belfast Lough, Strangford Lough, Larne Lough and Outer Ards, in addition to sites along the west coast of Wales, England and Scotland support large populations of wintering migrants including, sea ducks, divers, grebes and waders. Passerine species are known to cross the Irish Sea in large numbers moving to and from Britain, continental Europe and Scandinavia. However, they also are unrepresented in the available data.

Between MLWS and MHWS

The intertidal and near shore bird populations supported within the intertidal ornithology study area will be subject to significant seasonal variation, across the breeding, wintering and passage periods. In the absence of any concentrations of breeding seabirds, as discussed above, or other species of conservation concern however, the key feature of these habitats occur during winter and passage. The Belfast Lough and its shoreline is internationally and nationally important for its wader and wildfowl assemblages over these periods, reflected in the designation of the Belfast Lough SPA and Belfast Lough Open Water SPA. Furthermore, the East Coast (NI) Marine SPA within which the proposed Export Cable Corridor (ECC) Area of Search (AoS) connection will traverse is designated on account of the supported wintering populations of great crested grebe *Podiceps cristatus* and red-throated diver both of which are likely to utilise the intertidal area for the purposes of foraging.

While the preferred landfall location is yet to be finalised, options are largely outside of sites designated primarily for ornithology features, with the exception of the East Coast (NI) Marine pSPA. It is anticipated that the specific intertidal locations in the immediate vicinity of the landfall potentially comprise over-wintering and passage assemblages of national to international importance. Further consideration will be required to establish the extent of the use of the proposed finalised landfall locations by birds.

Conservation Sites

There are many protected areas for ornithology receptors in the east of Northern Ireland and the Republic of Ireland, in addition to along the west coasts of Scotland, England and Wales which lie within the offshore ornithology regional study area. A screening of European sites with qualifying ornithology interest features will be undertaken in the Habitats Regulations Appraisal (HRA) Screening Report for the Proposed Development. Relevant ornithology interest features of European sites screened into the ornithology assessment will be fully considered and assessed in the ES chapter with the assessment on the European site(s) within the Natura 2000 network and UK national site network deferred to the HRA report. Designated sites for ornithological interest, including SPAs and proposed SPAs (pSPA), will be identified through the process described for identification of the offshore ornithology study area and offshore ornithology cumulative study areas.

This will generate a ‘long-list’ of designated sites with potential connectivity derived from seabirds’ large foraging ranges (mean-maximum + 1 S.D.). Due to their proximity to the site and based on the site location and the location and qualifying features of nearby SPAs, the assessment is likely to focus on the potential effects on:

- East Coast (NI) Marine pSPA;
- Belfast Lough SPA;
- Belfast Lough Open Water SPA;
- Larne Lough SPA;
- Copeland Islands SPA;
- Outer Ards SPA;
- Ailsa Craig SPA;
- Sound of Gigha SPA; and
- Loch of Inch and Torrs Warren SPA;

The screening to be undertaken in the ornithology ES chapter will also include national designations, including ASSIs, SSSIs and MPAs.

10.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine and coastal birds have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 10.2 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to offshore and intertidal ornithology that have been scoped out of the assessment are described in Table 10.3.

Preliminary analysis of the available data suggests that seabird species on which assessment should focus on for the Proposed Development are:

- gannet;
- shag;
- fulmar;

- kittiwake;
- Manx shearwater;
- guillemot;
- razorbill; and
- puffin.

It is also considered that the site and its surrounds is likely to be of importance for a range of further species for which data was unavailable within the assessed datasets, including red-throated diver as noted by NIEA in early engagement, and great crested grebe.

Other species are likely to occur very infrequently or at low density within the survey area and are not likely to feature in detail in the assessment, although the inclusion of other species will be considered and discussed in the ES Chapter.

It is envisaged that collision risk will be considered for gannet and kittiwake, whilst displacement impacts would be considered for kittiwake, guillemot, razorbill, puffin and red-throated diver. This will be subject to review and agreement with NIEA however, as further evidence emerges on the potential effects of the proposed offshore wind farm development on these and other species.

The EIA approach will also consider the wider ecosystem characteristics of the Proposed Development area by drawing together information on environmental and biological drivers of seabird abundance and distribution. This will include particular consideration of the relationships between seabird distribution and prey availability and distribution, as well as the physical influences of bathymetry, tidal conditions and distance from colonies. Integrated into this analysis will be consideration of the effects of climate change on the food chains on which the key seabird species depend, and the potential implications of climate change for their populations within the study area.

Table 10.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Offshore and Intertidal Ornithology Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	Project Phase O	Project Phase D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary habitat loss/ disturbance	✓		✓	Presence of vessels and construction works may disturb birds from foraging areas in the short-term. Cable landfall design will seek to avoid conservation sites.	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	No specific modelling is required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors.
Impacts to prey availability through construction phase effects including noise and vibration.	✓		✓	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	See Chapter 8 for assessment of effects on fish and shellfish ecology.	No specific modelling required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.
Collision		✓		Additional mortality may cause a decrease in seabird populations. Final design may avoid areas of consistently and significantly high seabird sensitivity.	Baseline surveys and data analysis described below including intertidal and marine bird surveys. Collision Risk Modelling (CRM) and population viability analysis described below is likely to be required for a number of species.	Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects and the outputs of the associated CRM model and analysis.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Disturbance/displacement		✓		Presence of operational wind turbines and associated maintenance activities may disturb birds and displace them from foraging/ resting areas over the long-term. Final design may avoid areas of consistently and significantly high seabird sensitivity	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	Displacement matrices and population viability analysis may be required for some species. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.
Barrier to movement		✓		Presence of operational wind turbines may result in additional energy expenditure as migrating or commuting birds are forced to fly longer distances around the wind farm over the long-term.	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	No specific modelling required for this impact, although quantification of impact may be integrated with disturbance/displacement.
Impacts to prey availability through operational phase effects including noise, vibration and displacement.		✓		Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	See Chapter 8 for assessment of effects on fish and shellfish ecology.	No specific modelling required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.

Table 10.3: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Offshore and Intertidal Ornithology

Impact	Justification
Construction	
Pollution impacts	Embedded and applied mitigation implemented during construction (e.g., implementation of an agreed construction pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Disturbance from offshore export cable construction	It is extremely unlikely that there would be any significant disturbance to seabirds as a result of the construction process for the offshore proposed export cable corridor. Installation is likely to be of short duration, temporary in any location at a time and therefore disturbance will be localised around the source. A Vessel Management Plan may be implemented to avoid disturbance to rafting auks or other groups of seabirds, such as red-throated diver. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Operation and Maintenance	
Pollution impacts	Embedded and applied mitigation implemented during operation (e.g., implementation of an agreed operational pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Decommissioning	
Pollution impacts	Embedded and applied mitigation implemented during decommissioning (e.g., Development of, and adherence to, a Decommissioning Plan and a Pollution Prevention Plan) will avoid the risk of significant pollution incidence and as a result

Impact	Justification
	seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.

10.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The offshore and intertidal ornithology EIA will follow the methodology set out in Chapter 3. Specific to the offshore and intertidal ornithology EIA, the following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine. CIEEM (2019).
- Mapping Seabird Sensitivity to Offshore Wind Farm, Bradbury et al. (2014).
- SeaBORD (Searle et al., 2018).
- SNH-led Marine Impact Assessment Guidance Workshop (20 February 2020).
- Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas. BTO (Wright et al. 2012).
- Joint SNCB Interim Displacement Advice Note. JNCC and Natural England (2017).
- Vulnerability of Seabirds to Offshore Wind Farms (Furness et al., 2013; Wade et al., 2016);
- Guidance on Ornithological CEA (King et al., 2009);

Additional sources of guidance and information to inform the ornithological assessment will be identified, and the offshore and intertidal ornithology ES chapter will detail all guidance considered in the preparation of the assessment. Emerging guidance will be monitored and applied as appropriate to the assessment, in discussion with consultees.

In addition, and specific to marine ecology topics, important ecological features will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each important ecological feature will be defined to reflect topic-specific interests.

Proposed Surveys

Early engagement with DAERA and its expert ornithological advisor in NIEA Natural Environment Division has confirmed the broad parameters of survey requirements to support the applications for development consent for North Channel Wind.

Offshore ornithology aerial surveys started in September 2022 across the Development Array Area (DAA) and Export Cable Corridor (ECC) Area of Search (AoS) in accordance with NatureScot guidance (2 year of monthly aerial surveys over the project area plus an appropriate buffer is standard for the ORE industry).

The survey area includes a to 10 km for development areas in proximity to the East Coast (NI) Marine pSPA.

Aerial surveys shall include shallow areas of upwelling north and east of The Maidens for NCW 1 Project, and the area of the North Channel outside of outer Belfast Lough for NCW 2 Project.

The Scope of onshore bird surveys will be determined once a selection of landfall location has been determined.

Data Analysis

Breeding and Non-Breeding Seasons

Different seabird species have different phenologies relating to the breeding and non-breeding seasons. The analyses described below will identify the seasons for each species according to SNH guidance (Tyler, 2017). Table 10.4 shows the seasonal definitions for eight key species in the assessment.

Displacement

Displacement will be assessed using the matrix methods recommended by the statutory authority and other relevant bodies (JNCC; Natural England, 2017), based on estimated seabird densities derived from the survey data resultant from the proposed survey campaign within the offshore ornithology study area.

The use of SeaBORD (Searle et al., 2018) as a tool for assessing displacement during the breeding season will also be investigated and new techniques emerging from the SNH-led Marine Impact Assessment Guidance Workshop (20 February 2020) will be considered and discussed with consultees during the development of the assessment.

Barrier Effects

Barrier effects will be considered in a qualitative way with reference to published literature. Emerging guidance and techniques may consider the integration of displacement and barrier effects together.

Collision Risk

The predicted collision risk to birds will be analysed using two CRM techniques. The monthly densities of flying birds derived from both boat-based surveys and digital aerial surveys will be used to populate the offshore Band model (2012) presented alongside outputs using the stochastic collision risk model (sCRM) developed by Masden (2015) to incorporate variation and uncertainty in input parameters.

CRM modelling will be based on the spreadsheets accompanying Band (2012), using the appropriate Options (1 to 4) for the data and species-specific parameters available. Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from the Johnston et al. (2014) Corrigendum. The proposed survey campaign will be used to provide site-specific flight height distributions applicable to the Band model Option 4.

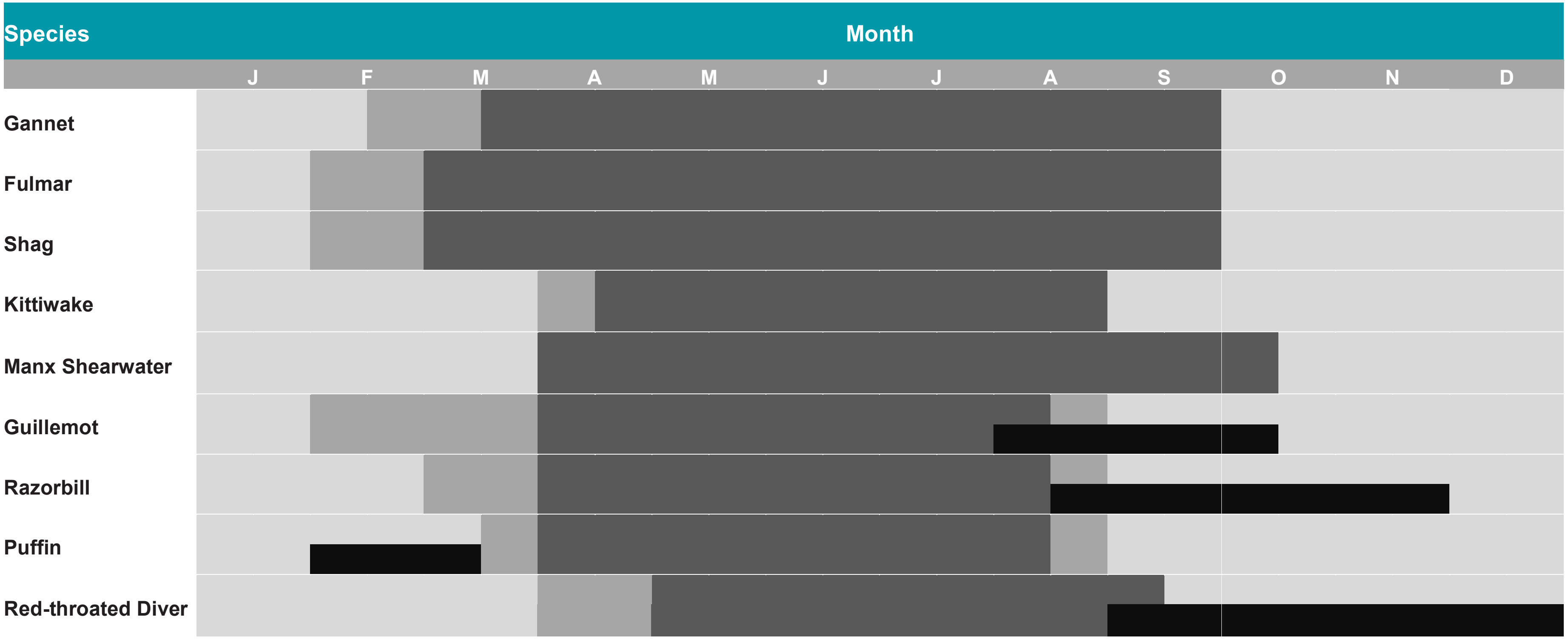
Biological parameters of birds used in the CRM will be discussed in consultation with stakeholders and will apply the best available evidence: bird size, flight speed, nocturnal activity factor, seasonality, age class and avoidance rates. CRM will be completed in accordance with published guidance. It may also take a modified approach, or use different parameters, where evidence justifies (in which case the evidence and reasoning will be provided).

Potential collision risk to migratory species will be assessed qualitatively with reference to the survey results and the Marine Scotland commissioned strategic level report (Marine Scotland, 2014) in addition to available data for Northern Ireland where possible.

Apportioning

For the assessment of impacts on different breeding colonies, particularly in relation to the HRA for SPA breeding colonies, it is necessary to apportion the entire potential impact described for the development (e.g., the additional mortality as a result of collision risk, or number of birds displaced) between breeding colonies. Apportioning of effects will be based on guidance published by Marine Scotland (Butler et al. 2020) for guillemot, razorbill, gulls, kittiwake and shag and on SNH (2018) interim guidance for all other species considered in detail in the assessment.

Table 10.4: Seasonal periods for key seabird species



Colour Code	
Winter (non-breeding) period	
Breeding site attendance (not closely associated with nest site)	
Breeding period (strongly associated with nest site)	
Flightless moult period	

Colony data will be accessed through the Seabird Monitoring Plan (SMP) portal, as discussed above, including recent data collected for Seabirds Count.

The approach to apportioning impacts during the non-breeding season will be the subject of further discussion with consultees. Effects will be assessed against wider regional populations as defined in Furness (2015) for biologically defined minimum population scales.

Population Assessment

Where thresholds for significant effects may be approached for any particular species, population models will be developed to examine the potential change in populations over time.

10.2.6 POTENTIAL CUMULATIVE EFFECTS

The ornithology cumulative effect assessment will follow the approach set out in Chapter 3 of this report.

The identification of cumulative effects on birds will follow a receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix. The offshore and intertidal ornithology cumulative assessment will also take into account the principles set out in COWRIE guidance (King et al., 2009). Where necessary, effects related to operational collision and displacement will be summed across cumulative developments and subject to population assessment at relevant breeding colonies. When considering the predicted collision rates from other developments, the most recent CRM results will be used.

10.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

The potential for transboundary impacts upon bird populations which are present outside of Northern Ireland, including those within the Republic of Ireland, Scotland, Wales and England certainly arises in the case of North Channel Wind, given the large foraging and migration ranges of the bird species concerned.

Considering both the location of the Proposed Development and the identified key ornithology receptors, the potential for transboundary impacts is considered to be likely due to the presence of non-UK seabird breeding colonies within mean-maximum (+ 1 S.D.) foraging range of the Proposed Development along a marine pathway, within the Republic of Ireland. This conclusion is reached in respect of a number of bird species including fulmar, gannet, great skua, lesser black-backed gull, kittiwake, guillemot, razorbill and puffin.

During the non-breeding season, it is considered that there is a high likelihood of non-breeding seabirds, waterfowl and waders from the Republic of Ireland, to move through the Proposed Development array area. The potential for impact from collision, displacement or barrier effects is therefore considered possible.

The potential for the Proposed Development to impact ornithology features of nature conservation designations outside of the UK will also be considered within the HRA process.

10.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Offshore and Intertidal Ornithology?
- Do you agree that all receptors and impacts have been identified for Offshore and Intertidal Ornithology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

10.3 NCW 2 PROJECT

10.3.1 INTRODUCTION

This section of the Scoping Report considers the potential impacts on birds from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components of the proposed North Channel Wind 2 (NCW 2) project (seaward of the MHWS mark).

10.3.2 STUDY AREA

Three proposed ornithology study areas inform this section of the scoping report. These are listed below with further detail provided in each of the individual sections below:

- Offshore Ornithology Regional Study Area;
- Offshore Ornithology Study Area; and
- Intertidal Ornithology Study Area.

Offshore Ornithology Regional Study Area

The proposed offshore ornithological regional study area was determined by the area within which potential impacts to breeding seabirds could occur and was based on the foraging ranges of breeding seabirds. Many seabirds have large foraging ranges which extend several hundred kilometres from their breeding colonies. Birds may therefore overlap (i.e., have connectivity with) the Proposed Development, even when the colonies they originate from are a significant distance away. The proposed offshore ornithology regional study area therefore identifies the SPA breeding colonies with potential connectivity to the Proposed Development.

Published mean-maximum foraging ranges (plus one standard deviation (+1 S.D.)) in Woodward et al. (2019) were used to define the offshore ornithology regional study area. The largest foraging range considered that of northern gannet *Morus bassanus* (Mean Max. of 315.2 km ± 194.2 km) extends 509.4 km from the Proposed Development. Several species are known to utilise foraging ranges larger than gannet including fulmar *Fulmarus glacialis,* great skua *Stercorarius skua* and manx shearwater *Puffinus puffinus*. However, it is considered that the assessment of likely significant effects upon SPAs designated on account of the supported populations of such species within a 509.4km radius will adequately reflect the colonies which could be potentially significantly affected by the proposed development, given the significantly smaller mean foraging range of these species, which is well within this chosen buffer distance. The proposed offshore ornithology regional study area therefore extends 509.4 km from the Proposed Development (Figure 10.4). Search areas for breeding colonies and regional search areas for other key species in the assessment will fall well within the mean-maximum foraging range of gannet. Therefore, this approach is appropriate to define the maximum extent of the offshore ornithology regional study area.

A seabird breeding colony that is affected by the potential impacts of the Proposed Development could also be affected by the potential impacts of other developments within the foraging range of seabirds from that colony. The offshore ornithology cumulative study area for each species will therefore be defined by implementing a search area equivalent to the species-specific mean-maximum foraging range (+ 1 S.D.) along a marine pathway, from those potentially affected breeding colonies of that species.

In the non-breeding season, seabirds are not constrained by colony location and can, depending on individual species, range widely within UK seas and beyond. The Zone of Influence (ZoI) for seabird species in the non-breeding season (where an assessment is deemed to be required) is based on Furness (2015) which presents Biologically Defined Minimum Population Scales (BDMPS). It is not possible to represent these scales on a figure.

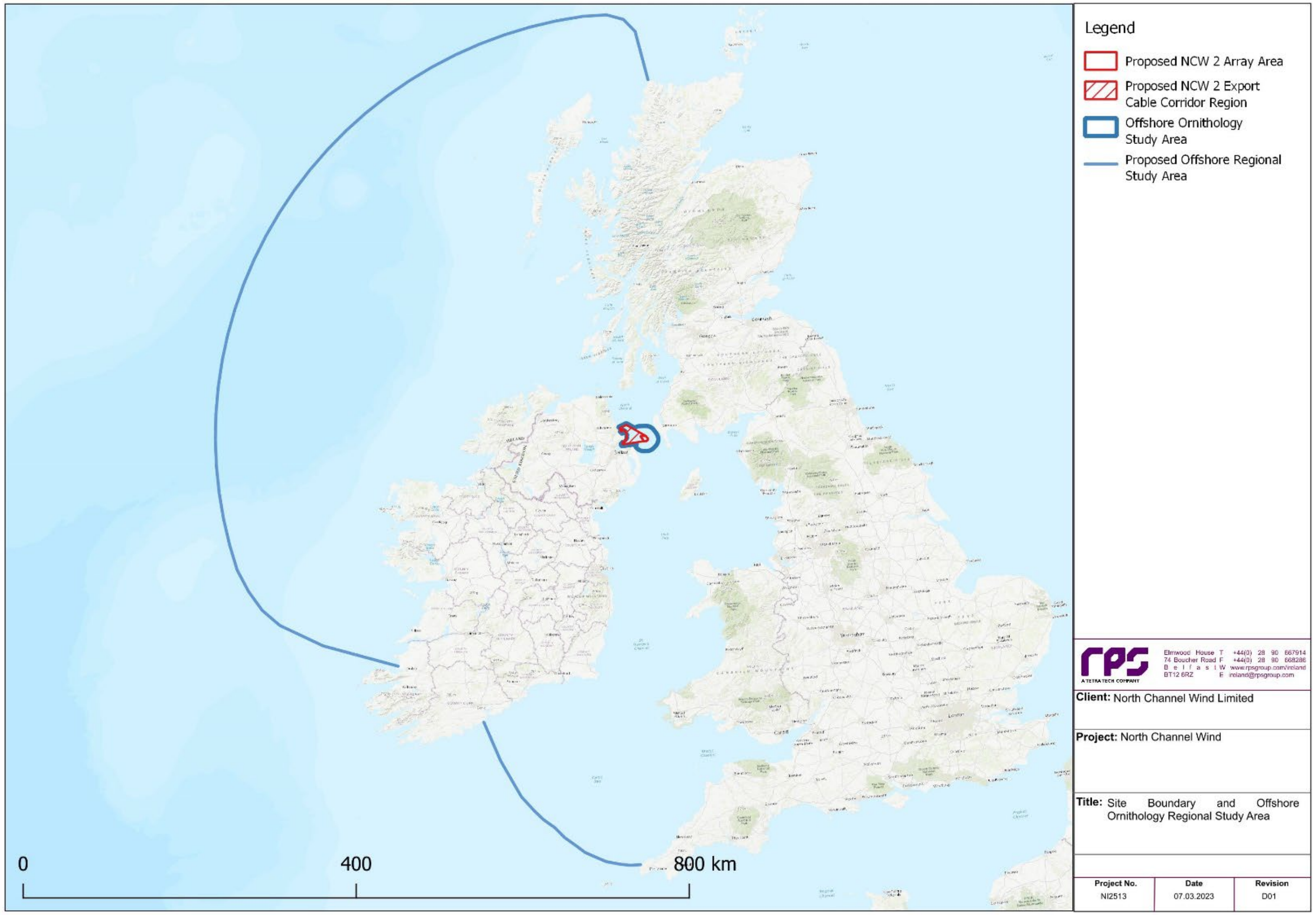


Figure 10.4: Offshore Ornithology Regional Study Area for North Channel Wind 2 Project

Offshore Ornithology Study Area

It is proposed that the baseline survey should extend a minimum buffer of 4 km, extending out to 10 km for development areas in proximity to the East Coast (NI) Marine pSPA. This survey area and a 2 km buffer of the proposed export cable corridor area of search forms the proposed offshore ornithology study area (Figure 10.5).

This study area encompasses the Proposed Development's 2 km direct ZOI on birds and provides the wider ornithological context within 10km in proximity to sites classified under the Birds Directive for the Proposed Development. It is also of sufficient size to provide a potential control area for monitoring change in seabird abundance and distribution pre and post construction of the project.

The offshore ornithology assessment will include consideration of the potential impacts on migratory species such as Greenland white-fronted geese, whooper and Bewick's swan among a range of species, which may be associated with a number of SPAs located within Northern Ireland and further afield.

Intertidal Ornithology Study Area

The proposed study area for the assessment of effects on birds in the intertidal zone covers the coastal area between MHWS and MLWS at the landfall locations within which wintering intertidal bird surveys will be conducted. This study area will extend 250 m either side of the landfall locations and up to 300 m seaward from MHWS. It is noted that at this stage the exact location of the proposed landfall is not known, and a preliminary study area has been illustrated (Figure 10.6). Note that this area is identical to that for NCW 1. The exact study area will be established when more information on the exact location/s of the proposed export cable landfall are known.

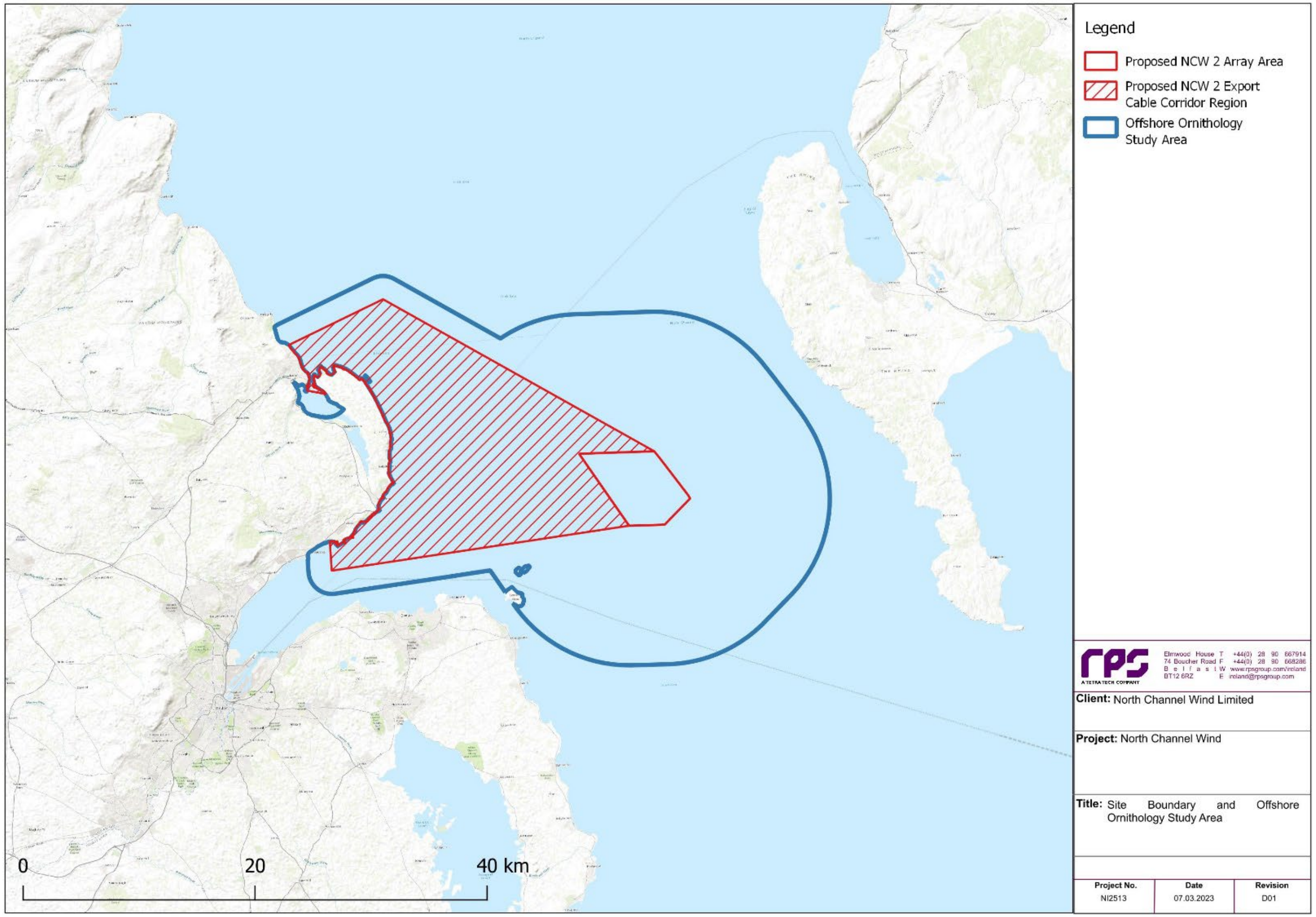


Figure 10.5: Offshore Ornithology Study Area for NCW 2 Project

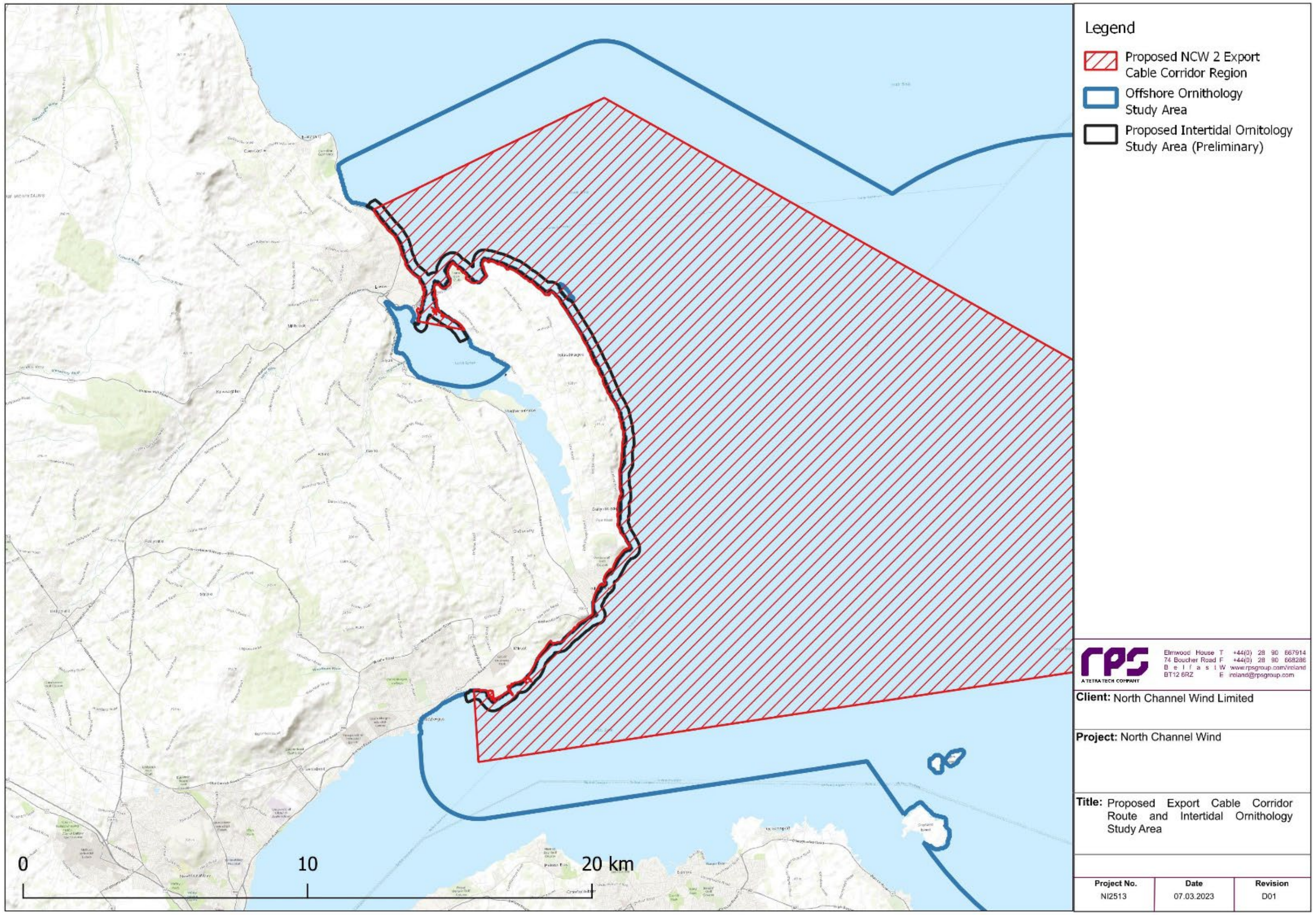


Figure 10.6: Intertidal Ornithology Study Area for NCW 2 Project

10.3.3 BASELINE ENVIRONMENT

This section provides a concise summary of the baseline environment in respect of offshore and intertidal ornithology with a more detailed description provided in Annex B.

Breeding Species

Available data indicate that the most numerous species in the Proposed Development Site area are northern fulmar *Fulmarus glacialis,* manx shearwater *Puffinus puffinus,* herring gull *Larus argentatus,* common guillemot *Uria aalge*, black legged kittiwake *Rissa tridactyla*, gannet *Morus bassanus*, and razorbill *Alca torda*. For these species, numbers are typically highest during the pre-breeding period when birds forage further from their breeding colonies and during post-breeding dispersal. High numbers of shag *Phalacrocorax aristotelis* and cormorant *Phalacrocorax carbo* may also be present in winter.

The proposed development lies in close proximity to a number of breeding seabird colonies including the gannet colony at Ailsa Craig (around 35,825 pairs), manx shearwater colonies at the Copeland Islands and further notable colonies at The Gobbins, Muck Island and The Maidens.

It is considered that the abundances of the key species within the available data for the proposed development site, including gannet, kittiwake, auks, terns and manx shearwater is consistent with the presence of internationally important breeding seabird colonies around the nearby coast, including the Larne Lough SPA, Outer Ards SPA, Copeland Islands SPA, Belfast Lough SPA and the Ailsa Craig SPA in addition to more distant SPAs in Scotland.

Wintering Species

Available data indicate that in winter, fulmar, gannet, cormorant, shag, gull species including kittiwake and auks are the most common species within the offshore ornithology study area with numbers of cormorant, kittiwake, black-headed gull and herring gull likely to be peaking at this time of year.

Seaducks, divers, grebes and waders which winter within Belfast, Strangford and Larne Loughs and along the west coast of Scotland in nationally important numbers are also likely to be present within the offshore ornithology study area, with particular attention drawn to the population of red-throated diver which forms a qualifying interest of the East Coast (NI) Marine proposed SPA.

Passage Species

As set out above the use of a site by migrating birds can present difficulties due to the potential for these movements to occur at night or at high altitude, thus preventing the collection of reliable records through boat-based or aerial surveys. As discussed above limitations of the available data include for the lack of data on the use of the site by migrant waterfowl and waders.

The SPAs of Belfast Lough, Strangford Lough, Larne Lough and Outer Ards, in addition to sites along the west coast of Wales, England and Scotland support large populations of wintering migrants including, sea ducks, divers, grebes and waders. Passerine species are known to cross the Irish Sea in large numbers moving to and from Britain, continental Europe and Scandinavia. However, they also are unrepresented in the available data.

Between MLWS and MHWS

The intertidal and near shore bird populations supported within the intertidal ornithology study area will be subject to significant seasonal variation, across the breeding, wintering and passage periods. In the absence of any concentrations of breeding seabirds, as discussed above, or other species of conservation concern however, the key feature of these habitats occur during winter and passage. The Belfast Lough and its shoreline is internationally and nationally important for its wader and wildfowl assemblages over these periods, reflected in the designation of the Belfast Lough SPA and Belfast Lough Open Water SPA. Furthermore, the East Coast (NI) Marine SPA within which the proposed Export Cable Corridor (ECC) Area of Search (AoS) connection will traverse is designated on account of the supported wintering populations of great crested grebe *Podiceps cristatus* and red-throated diver both of which are likely to utilise the intertidal area for the purposes of foraging.

While the preferred landfall location is yet to be finalised, options are largely outside of sites designated primarily for ornithology features, with the exception of the East Coast (NI) Marine pSPA. It is anticipated that the specific intertidal locations in the immediate vicinity of the landfall potentially comprise over-wintering and passage assemblages of national to international importance. Further consideration will be required to establish the extent of the use of the proposed finalised landfall locations by birds.

Designated Sites

There are many protected areas for ornithology receptors in the east of Northern Ireland and the Republic of Ireland, in addition to along the west coasts of Scotland, England and Wales which lie within the offshore ornithology regional study area. A screening of European sites with qualifying ornithology interest features will be undertaken in the Habitats Regulations Appraisal (HRA) Screening Report for the Proposed Development. Relevant ornithology interest features of European sites screened into the ornithology assessment will be fully considered and assessed in the Offshore ES chapter with the assessment on the European site(s) within the Natura 2000 network and UK national site network deferred to the HRA report. Designated sites for ornithological interest, including SPAs and proposed SPAs (pSPA), will be identified through the process described for identification of the offshore ornithology study area and offshore ornithology cumulative study areas.

This will generate a 'long-list' of designated sites with potential connectivity derived from seabirds' large foraging ranges (mean-maximum + 1 S.D.). Due to their proximity to the site and based on the site location and the location and qualifying features of nearby SPAs, the assessment is likely to focus on the potential effects on:

- East Coast (NI) Marine pSPA;
- Belfast Lough SPA;
- Belfast Lough Open Water SPA;
- Larne Lough SPA;
- Copeland Islands SPA;
- Outer Ards SPA;
- Ailsa Craig SPA;
- Sound of Gigha SPA; and
- Loch of Inch and Torrs Warren SPA;

The screening to be undertaken in the ornithology Offshore ES chapter will also include national designations, including ASSIs, SSSIs and MPAs.

10.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on marine and coastal birds have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development.

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 10.6 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, the potential impacts to offshore and intertidal ornithology that have been scoped out of the assessment are described in Table 10.7.

Preliminary analysis of the available data suggests that seabird species on which assessment should focus on for the Proposed Development are:

- gannet;
- shag;
- fulmar;
- kittiwake;
- Manx shearwater;

- guillemot;
- razorbill; and
- puffin.

It is also considered that the site and its surrounds is likely to be of importance for a range of further species for which data was unavailable within the assessed datasets, including red-throated diver as noted by NIEA in early engagement, and great crested grebe.

Other species are likely to occur very infrequently or at low density within the survey area and are not likely to feature in detail in the assessment, although the inclusion of other species will be considered and discussed in the ES Chapter.

It is envisaged that collision risk will be considered for gannet and kittiwake, whilst displacement impacts would be considered for kittiwake, guillemot, razorbill, puffin and red-throated diver. This will be subject to review and agreement with NIEA NED however, as further evidence emerges on the potential effects of the proposed offshore wind farm development on these and other species.

The EIA approach will also consider the wider ecosystem characteristics of the Proposed Development area by drawing together information on environmental and biological drivers of seabird abundance and distribution. This will include particular consideration of the relationships between seabird distribution and prey availability and distribution, as well as the physical influences of bathymetry, tidal conditions and distance from colonies. Integrated into this analysis will be consideration of the effects of climate change on the food chains on which the key seabird species depend, and the potential implications of climate change for their populations within the study area.

Table 10.5: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Offshore and Intertidal Ornithology Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary habitat loss/ disturbance	✓		✓	Presence of vessels and construction works may disturb birds from foraging areas in the short-term. Cable landfall design will seek to avoid designated sites.	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	No specific modelling is required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors.
Impacts to prey availability through construction phase effects including noise and vibration.	✓		✓	Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	See Section 6.2 for assessment of effects on fish and shellfish ecology.	No specific modelling required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.
Collision		✓		Additional mortality may cause a decrease in seabird populations. Final design may avoid areas of consistently and significantly high seabird sensitivity.	Baseline surveys and data analysis described below including intertidal and marine bird surveys. CRM and population viability analysis described below is likely to be required for a number of species.	Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects and the outputs of the associated CRM model and analysis.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Disturbance/displacement		✓		Presence of operational wind turbines and associated maintenance activities may disturb birds and displace them from foraging/ resting areas over the long-term. Final design may avoid areas of consistently and significantly high seabird sensitivity	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	Displacement matrices and population viability analysis may be required for some species. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.
Barrier to movement		✓		Presence of operational wind turbines may result in additional energy expenditure as migrating or commuting birds are forced to fly longer distances around the wind farm over the long-term.	Baseline surveys and data analysis described below including intertidal and marine bird surveys.	No specific modelling required for this impact, although quantification of impact may be integrated with disturbance/displacement.
Impacts to prey availability through operational phase effects including noise, vibration and displacement.		✓		Reduction or disruption to prey availability may cause displacement from the area or reduced energy intake, affecting productivity or survival in the short-term.	See Section 6.2 for assessment of effects on fish and shellfish ecology.	No specific modelling required for this impact. Assessment will be based on the recorded use of the affected areas by sensitive receptors and predicted effects.

Table 10.6: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Offshore and Intertidal Ornithology

Impact	Justification
Construction	
Pollution impacts	Embedded and applied mitigation implemented during construction (e.g., implementation of an agreed construction pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Disturbance from offshore export cable construction	It is extremely unlikely that there would be any significant disturbance to seabirds as a result of the construction process for the offshore proposed export cable corridor. Installation is likely to be of short duration, temporary in any location at a time and therefore disturbance will be localised around the source. A Vessel Management Plan may be implemented to avoid disturbance to rafting auks or other groups of seabirds, such as red-throated diver. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Operation and Maintenance	
Pollution impacts	Embedded and applied mitigation implemented during operation (e.g., implementation of an agreed operational pollution prevention plan) will avoid the risk of significant pollution incidence and as a result seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.
Decommissioning	
Pollution impacts	Embedded and applied mitigation implemented during decommissioning (e.g., Development of, and adherence to, a Decommissioning Plan and a Pollution Prevention Plan) will avoid the risk of significant pollution incidence and as a result

Impact	Justification
	seabirds and shorebirds are extremely unlikely to be adversely affected by any such incident. On this basis, and subject to consultation with the statutory authority and other relevant bodies and feedback received on this Offshore Scoping Report, it is proposed to scope this impact out of further consideration within the EIA for offshore and intertidal ornithology.

10.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The offshore and intertidal ornithology EIA will follow the methodology set out in Chapter 3. Specific to the offshore and intertidal ornithology EIA, the following guidance documents will also be considered:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine. CIEEM (2019).
- Mapping Seabird Sensitivity to Offshore Wind Farm, Bradbury et al. (2014).
- SeaBORD (Searle et al., 2018).
- SNH-led Marine Impact Assessment Guidance Workshop (20 February 2020).
- Assessing the risk of offshore wind farm development to migratory birds designated as features of UK Special Protection Areas. BTO (Wright et al. 2012).
- Joint SNCB Interim Displacement Advice Note. JNCC and Natural England (2017).
- Vulnerability of Seabirds to Offshore Wind Farms (Furness et al., 2013; Wade et al., 2016);
- Guidance on Ornithological CEA (King et al., 2009);

Additional sources of guidance and information to inform the ornithological assessment will be identified, and the offshore and intertidal ornithology Offshore EIA Report chapter will detail all guidance considered in the preparation of the assessment. Emerging guidance will be monitored and applied as appropriate to the assessment, in discussion with consultees.

In addition, and specific to marine ecology topics, important ecological features will be identified, and assessments will be presented for appropriate ecological receptor groups in the baseline characterisation of each relevant technical chapter. Criteria defining the value of each important ecological feature will be defined to reflect topic-specific interests.

Proposed Surveys

Early engagement with DAERA and its expert ornithological advisor in NIEA Natural Environment Division has confirmed the broad parameters of survey requirements to support the applications for development consent for North Channel Wind.

Offshore ornithology aerial surveys shall be conducted across the Development Array Area (DAA) and Export Cable Corridor (ECC) Area of Search (AoS) in accordance with NatureScot guidance (2 year of monthly aerial surveys over the project area plus an appropriate buffer is standard for the ORE industry)

The survey area shall include a minimum buffer of 4 km, extending out to 10 km for development areas in proximity to the East Coast (NI) Marine pSPA.

Aerial surveys shall include shallow areas of upwelling north and east of The Maidens for NCW 1 Project, and the area of the North Channel outside of outer Belfast Lough for NCW 2 Project.

A coastal vantage point survey and Wetland Bird Survey (WeBS) campaign shall also be undertaken to supplement the aerial survey campaign, covering the intertidal and nearshore areas at the proposed landfall area as illustrated in Table 10.7.

Data Analysis

<u>Breeding and Non-Breeding Seasons</u>

Different seabird species have different phenologies relating to the breeding and non-breeding seasons. The analyses described below will identify the seasons for each species according to SNH guidance (Tyler, 2017). Table 10.8 shows the seasonal definitions for eight key species in the assessment.

Displacement

Displacement will be assessed using the matrix methods recommended by the statutory authority and other relevant bodies (JNCC; Natural England, 2017), based on estimated seabird densities derived from the survey data resultant from the proposed survey campaign within the offshore ornithology study area.

The use of SeaBORD (Searle et al., 2018) as a tool for assessing displacement during the breeding season will also be investigated and new techniques emerging from the SNH-led Marine Impact Assessment Guidance Workshop (20 February 2020) will be considered and discussed with consultees during the development of the assessment.

Barrier Effects

Barrier effects will be considered in a qualitative way with reference to published literature. Emerging guidance and techniques may consider the integration of displacement and barrier effects together.

Collision Risk

The predicted collision risk to birds will be analysed using two CRM techniques. The monthly densities of flying birds derived from both boat-based surveys and digital aerial surveys will be used to populate the offshore Band model (2012) presented alongside outputs using the stochastic collision risk model (sCRM) developed by Masden (2015) to incorporate variation and uncertainty in input parameters.

CRM modelling will be based on the spreadsheets accompanying Band (2012), using the appropriate Options (1 to 4) for the data and species-specific parameters available. Where Band CRM Options 2 and 3 are applied, the proportion of birds at risk height will be derived from the Johnston et al. (2014) Corrigendum. The proposed survey campaign will be used to provide site-specific flight height distributions applicable to the Band model Option 4.

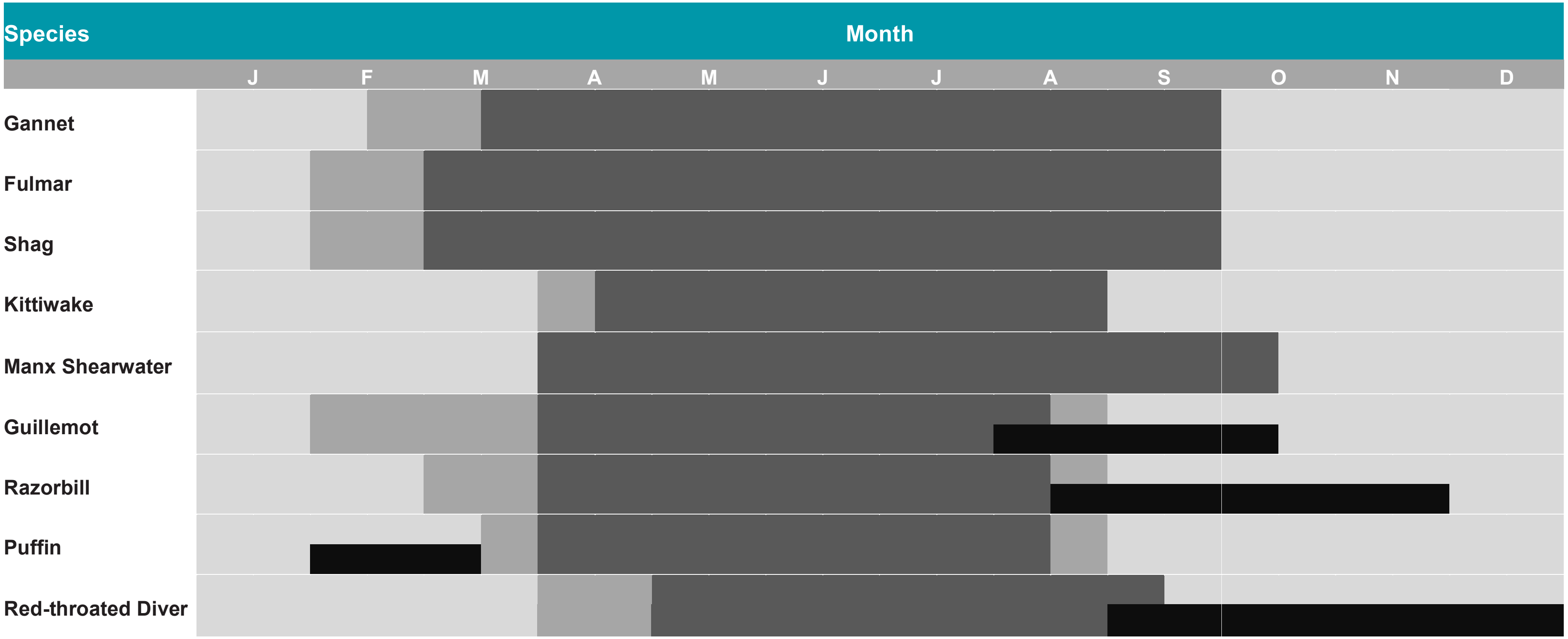
Biological parameters of birds used in the CRM will be discussed in consultation with stakeholders and will apply the best available evidence: bird size, flight speed, nocturnal activity factor, seasonality, age class and avoidance rates. CRM will be completed in accordance with published guidance. It may also take a modified approach, or use different parameters, where evidence justifies (in which case the evidence and reasoning will be provided).

Potential collision risk to migratory species will be assessed qualitatively with reference to the survey results and the Marine Scotland commissioned strategic level report (Marine Scotland, 2014) in addition to available data for Northern Ireland where possible.

Apportioning

For the assessment of impacts on different breeding colonies, particularly in relation to the HRA for SPA breeding colonies, it is necessary to apportion the entire potential impact described for the development (e.g., the additional mortality as a result of collision risk, or number of birds displaced) between breeding colonies. Apportioning of effects will be based on guidance published by Marine Scotland (Butler et al. 2020) for guillemot, razorbill, gulls, kittiwake and shag and on SNH (2018) interim guidance for all other species considered in detail in the assessment.

Table 10.7: Seasonal periods for key seabird species



Colour Code	
Winter (non-breeding) period	
Breeding site attendance (not closely associated with nest site)	
Breeding period (strongly associated with nest site)	
Flightless moult period	

Colony data will be accessed through the Seabird Monitoring Plan (SMP) portal, as discussed above, including recent data collected for Seabirds Count.

The approach to apportioning impacts during the non-breeding season will be the subject of further discussion with consultees. Effects will be assessed against wider regional populations as defined in Furness (2015) for biologically defined minimum population scales.

Population Assessment

Where thresholds for significant effects may be approached for any particular species, population models will be developed to examine the potential change in populations over time.

10.3.6 POTENTIAL CUMULATIVE EFFECTS

The ornithology cumulative effect assessment will follow the approach set out in Chapter 3 of this report.

The identification of cumulative effects on birds will follow a receptor-specific approach to determine receptor-impact pathways from the cumulative screening matrix. The offshore and intertidal ornithology cumulative assessment will also take into account the principles set out in COWRIE guidance (King et al., 2009). Where necessary, effects related to operational collision and displacement will be summed across cumulative developments and subject to population assessment at relevant breeding colonies. When considering the predicted collision rates from other developments, the most recent CRM results will be used.

10.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

The potential for transboundary impacts upon bird populations which are present outside of Northern Ireland, including those within the Republic of Ireland, Scotland, Wales and England certainly arises in the case of North Channel Wind, given the large foraging and migration ranges of the bird species concerned.

Considering both the location of the Proposed Development and the identified key ornithology receptors, the potential for transboundary impacts is considered to be likely due to the presence of non-UK seabird breeding colonies within mean-maximum (+ 1 S.D.) foraging range of the Proposed Development along a marine pathway, within the Republic of Ireland. This conclusion is reached in respect of a number of bird species including fulmar, gannet, great skua, lesser black-backed gull, kittiwake, guillemot, razorbill and puffin.

During the non-breeding season, it is considered that there is a high likelihood of non-breeding seabirds, waterfowl and waders from the Republic of Ireland, to move through the Proposed Development array area. The potential for impact from collision, displacement or barrier effects is therefore considered possible.

The potential for the Proposed Development to impact ornithology features of nature conservation designations outside of the UK will also be considered within the HRA process.

10.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Offshore and Intertidal Ornithology?
- Do you agree that all receptors and impacts have been identified for Offshore and Intertidal Ornithology?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

11. COMMERCIAL FISHERIES

11.1 DATA SOURCES

An initial desk-based review of literature and data sources to support this commercial fisheries section of the Offshore Scoping Report has identified a number of baseline datasets. These are summarised in **Table 11.1**.

These datasets provide a wide coverage of the information available on commercial fisheries activities within the study area surrounding the Proposed Development. Specifically, the Marine Management Organisation (MMO) provides landings and effort statistics for UK and Isle of Man vessels, while European vessel fishing activity will be obtained from the European Commission's Scientific, Technical and Economic Committee for Fisheries (STECF) database to best inform the EIA process.

Commercial fisheries catch and effort, plus landings and sales notes data is collated by ICES statistical rectangle; compiled annually and made publicly available.

Fishing activity within the ICES rectangles 38E4 and 39E4 will also analysed using Vessel Monitoring Systems (VMS) data. Since 2012 it has been a statutory requirement for all European fishing vessels over 12m in length to have a functioning Vessel Monitoring System (VMS) on board (Council Regulation (EC) No 1224/2009) which pole position data every 2 hours to their respective national authority.

Data representing each position are aggregated by general gear type in a grid of sub-rectangles approximately 5.3nm^2 (i.e., at a resolution of 200th of an ICES rectangle) and provide a more precise picture of fishing activity by using vessel speed as a proxy: vessel speeds above 1 knot but below 4 knots are distilled form the data to provide an indication of fishing density per spatial unit.

These data can be analysed with landings values, thereby providing both effort and value of each sub-rectangle for mobile and static gears. Spatially disaggregated effort and landings data for UK and EU fishing fleets can be obtained from UK Sea Fisheries Statistics Reports, and the STECF data; and flag-specific effort data can be obtained from transversal data available in STECF Annual Economic Reports.

Note that care is therefore required when interpreting these data and qualitative inputs from experts with local knowledge, such as enforcement and fisheries management officers plus with Fisheries Representatives to further refine and accurately interpret data and will be considered as part of the consultation.

Historically commercial fisheries statistics on catch and effort for smaller vessels has been reliant on logbooks and sales notes that differentiate catches and effort by ICES rectangle. It is generally accepted that fleets operating within the 12nm inshore territorial boundary are more likely to be under 15m vessel length category; and under 10m in length if fishing within 6nm of shore. Although a statutory requirement exists for vessels over 12m to be equipped with VMS, actual uptake has been hindered by a number of technical and broader issues.

However, recent technical innovations have seen the introduction of inshore VMS or I-VMS to smaller vessels and which may provide a rich data set of fishing activity with the Development area: I-VMS provides positional information such as latitude and longitude, course, speed and date and time of each positional report e.g., every 10 minutes but can be set to report more frequently if required, such as when fishing within an MPA.

Going forward, UK autonomous Fisheries Management authorities in Isle of Man, England, Wales, Scotland and Northern Ireland are introducing legal requirements for all vessels under 12m in length to have an I-VMS installed and transmitting data within the 12nm boundary. The respective timeline of introduction may vary between Fisheries Management authorities, but progress will be monitored and included within the scope of consultation.

Further technical developments which may illuminate commercial fishing catch and effort activity within the Development area also includes reporting Apps used by smaller scale vessels noted above, such as the MMO Catch App.

The scope of these Apps is intended to create a record for everything caught within a fishing trip: effort details, live weight, conversion factors, quota species, sizes of fish species subject to controls.

The key improvement on existing logbooks and sales notes is the resolution of data: the reporting spatial unit is significantly smaller and will create a more precise understanding of catch and effort within the study area by dividing an ICES statistical rectangle into a further nine equal sub-areas.

The progress of the uptake and associated data availability will be included in the consultation.

Table 11.1: Summary of Key Data Sources

Title	Source	Year
VMS Data for EU mobile bottom contacting gear vessels (>12m)	ICES	2018
Fisheries landings and effort data by ICES rectangle	Marine Management Organisation (MMO)	2014 - 2018
Fisheries datasets available from the Marine Scotland MAPS NMPi (including ScotMap data)	Marine Scotland	Various
ScotMap – Inshore Fisheries Mapping Project in Scotland	Marine Scotland (Kafas et al., 2014)	2007 - 2011
Landings data (value) by fishing method, vessel length and species	MMO	2015-2019
Vessel Monitoring System (VMS) data	MMO	2010 - 2020
Landings data (value) by port	MMO	2021
Automatic Information System (AIS) data of fishing vessel tracks	MMO	2017
Spatial data on fisheries (e.g., areas where fishing is restricted or prohibited)	NMPi and Kingfisher Information Service	2021
Quarterly statistics	Sea Fisheries Protection Authority	2021 - 2022
Annual landing statistics for Irish ports and Irish vessels	Sea Fisheries Protection Authority	2002 - 2020
SBM Offshore NI Projects Commercial Fisheries Baseline Report	Poseidon Aquatic Resource Management	2022

No site-specific surveys have been undertaken to inform the EIA Scoping Report for commercial fisheries, however, preliminary meetings were held with the Northern Ireland Fish Producers Organisation (NIFPO) and the Anglo North Irish Fish Producers Organisation (ANIFO) as well as with owners of potting vessels operating off the Co. Antrim coast. Consultation with fisheries stakeholders started in Dec 2022 and will be ongoing until EIAR submission to help inform the commercial fisheries baseline as indicated above; plus, benthic subtidal and shipping and navigation survey data will be reviewed as part of the EIA and integrated into the characterisation of the commercial fisheries baseline, as appropriate.

The main thrust of the consultation with commercial fisheries stakeholders is on additional qualitative information on fishing practices and behaviours that may illuminate any trends that may be apparent from quantitative sets and may aid the identification of key biological / ecological events and pathways significant for commercial fisheries e.g., spawning times and grounds, nursery grounds and migratory routes, which can be cross checked with literature and national scientific bodies.

The key regional and national fishing organisations that will be consulted for all relevant data and views during this assessment are listed below:

- Anglo Northern Irish Fish Producers Organisation (ANIFPO);
- Northern Irish Fish Producers Organisation (NIFPO);
- Scottish Fishermen's Federation (SFF);
- Scottish Creel Fishermen's Federation (SCFF);
- National Federation of Fishermen's Organisations (NFFO);
- Federation of Irish Fishermen (FIF);
- Manx Fish Producers Organisation (Manx FPO);
- Clyde Fisherman's Association (CFA)
-

In addition, the following key national and regional commercial fisheries management authorities and science institutions will also be included in the consultation strategy:

- Northern Ireland: Department of Agriculture, Environment & Rural Affairs (DAERA), Department of Agriculture, Food and the Marine (AFBI);
- UK : Marine Management Organisation (MMO) ;
- Scotland: Marine Scotland, Marine Science Scotland, Marine Alliance for Science and Technology for Scotland (MASTS);
- Isle of Man Government; and
- Republic of Ireland: Bord Iascaigh Mhara, Department of Agriculture, Food and the Marine, Marine Institute, Sea-Fisheries Protection Authority (SFPA).

11.2 NCW 1 PROJECT

11.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of commercial fishing of relevance to the proposed North Channel Wind 1 (NCW 1) project, including intertidal habitats up to the MHWS) and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on commercial fisheries receptors. Commercial fisheries are defined for the purpose of this report as activity by licensed fishing vessels undertaken for legitimate capture and sale of finfish and shellfish in the marine environment. Aquaculture, recreational fishing, and fishing activities in rivers are not considered within this section.

11.2.2 STUDY AREA

The Proposed Development is located primarily in International Council for the Exploration of the Sea (ICES) Division VIIa (Irish Sea), with the north-east of the Proposed Development traversing into VIa (West of Scotland) (Kafas *et al.*, 2017; NMPi, 2022). Fisheries data are recorded and collated by statistical rectangles within each ICES Division. The commercial fisheries study area has therefore been defined with reference to the ICES rectangle 38E4 and 39E4 within which the Proposed Development is located as shown in Figure 11.1.

The commercial fisheries study area defined above will be used to identify fisheries active in areas relevant to the Proposed Development. Where relevant, however, data and information will be analysed for wider areas to provide context and describe the full extent of activity of the fisheries included in the assessment.

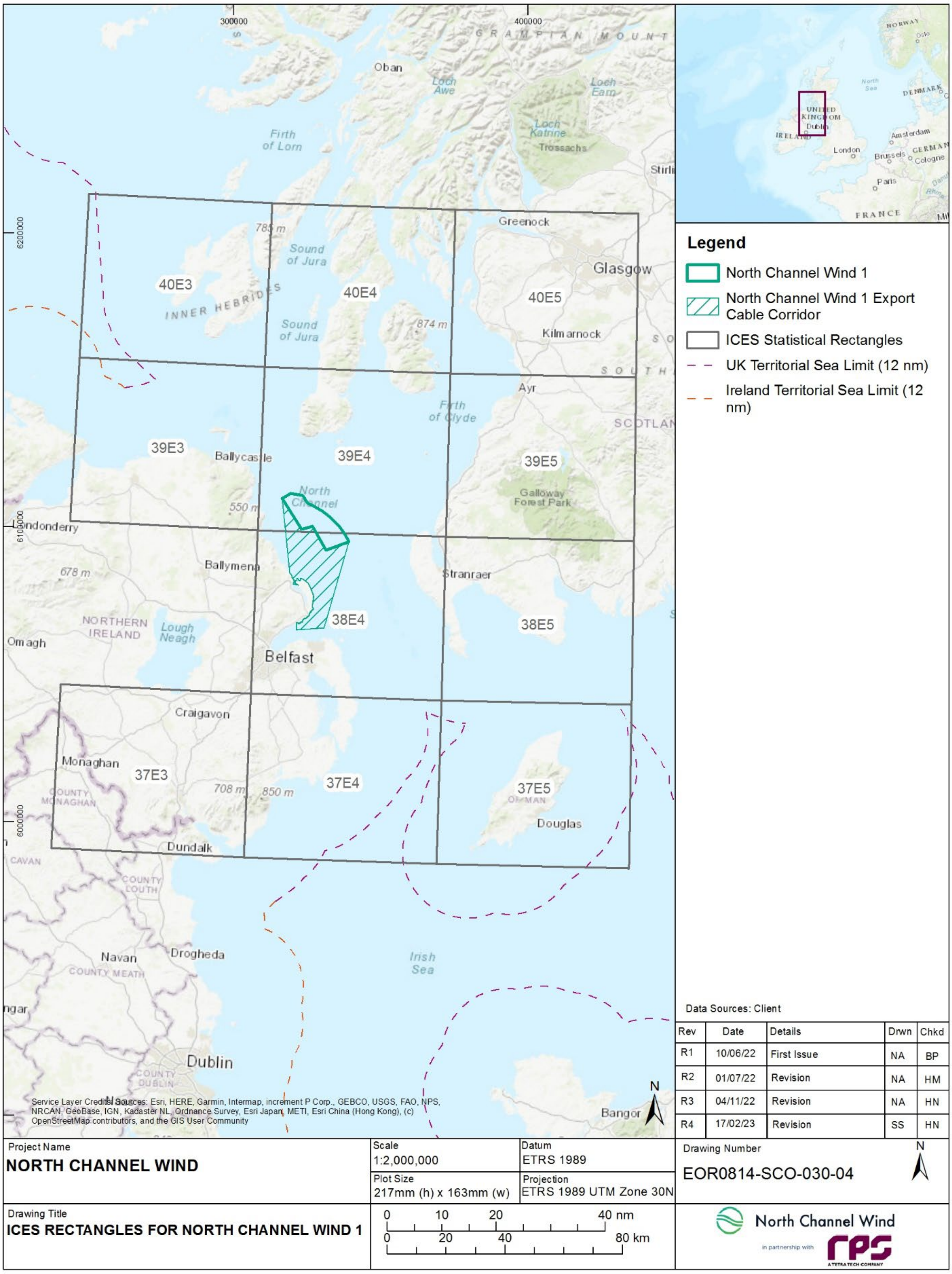


Figure 11.1: Commercial Fisheries Study Area for North Channel Wind 1.

11.2.3 BASELINE ENVIRONMENT

The baseline environment for commercial fisheries is constantly evolving, as the fishing industry is dynamic with frequent and sometimes unpredictable changes in fish abundance and distribution, climatic conditions, management regulations and fuel costs, all of which affect activity (DECC, 2016). Anticipated trends to the baseline environment will be considered within the EIA, including changes as a result of the new EUUK Trade and Cooperation Agreement; and the availability and significance of data on fishing activity as introduced above.

Based on the initial desk study review, an indication of the principal fishing activities undertaken within the commercial fisheries study areas is provided below, based on analysis of landings values (£) by species and fishing method for UK vessels (MMO, 2020).

Landings by value

The annual average value of landings for ICES statistical rectangle 38E4 is £1,670,865 and £6,736,403 for 39E4 for all UK and Isle of Man vessels for the years 2010 to 2020 (MMO, 2021). The total annual value across the commercial studies fisheries study area is presented in Figure 11.2.

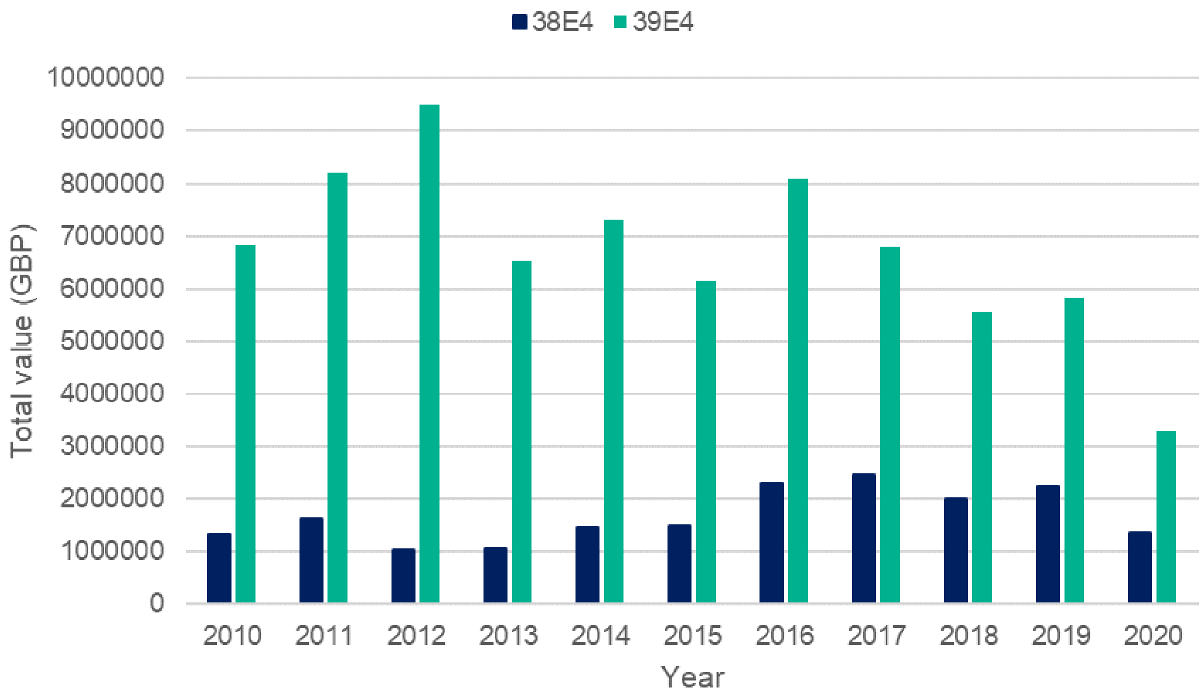


Figure 11.2: Total annual value (GBP) of landings from 2010 to 2020 from the from the Proposed Development (North Channel 1) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

Landings by volume

Landings in UK ports near the Proposed Development are shown in Figure 11.3. The largest landings in 2019 were found at Belfast, with an average of 200 to 2000 tonnes caught.

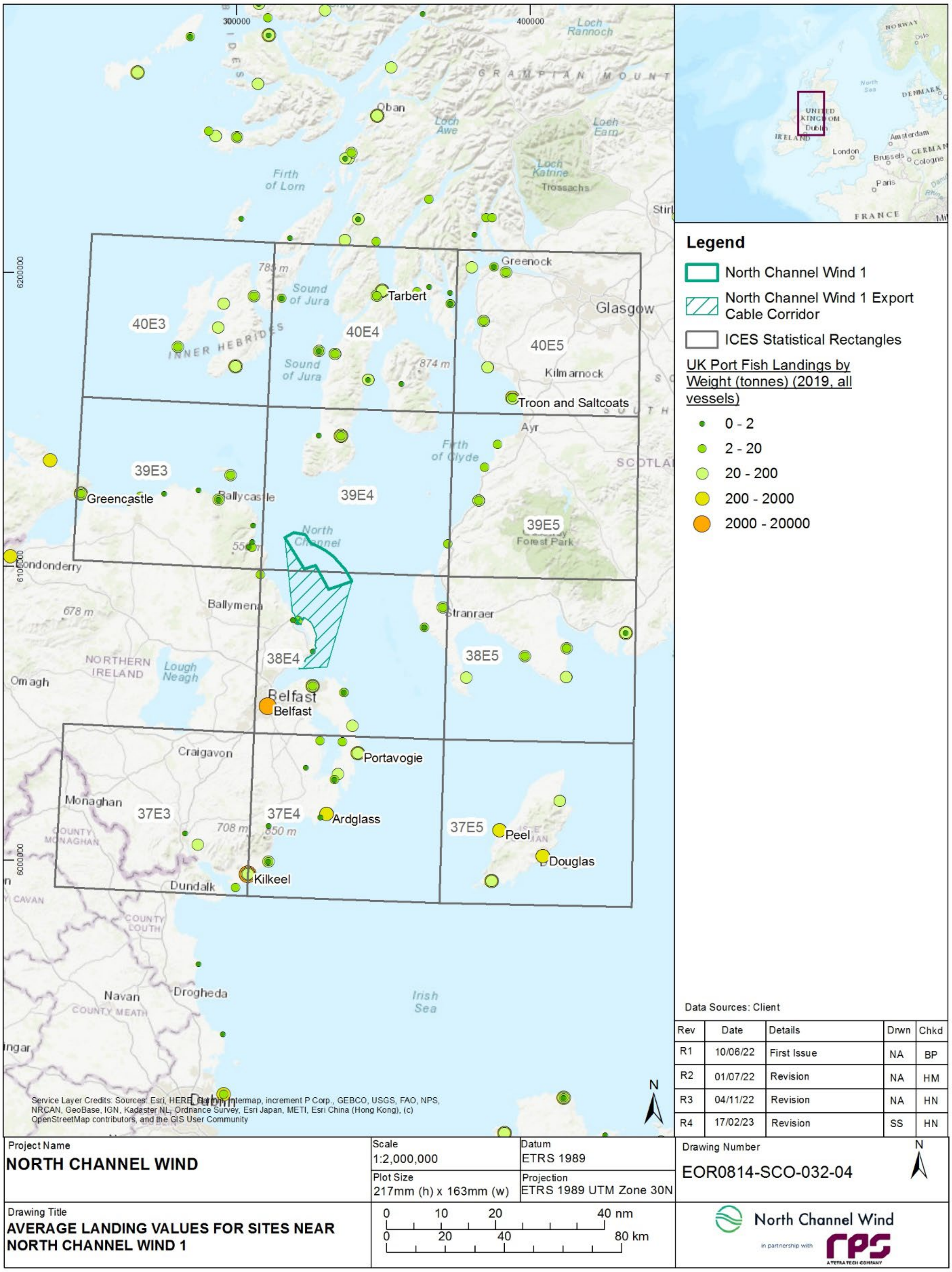


Figure 11.3 UK port fish landings by weight (tonnes), 2019, all vessels.

The total volume (tonnage) of historical landings is presented in Figure 11.4.

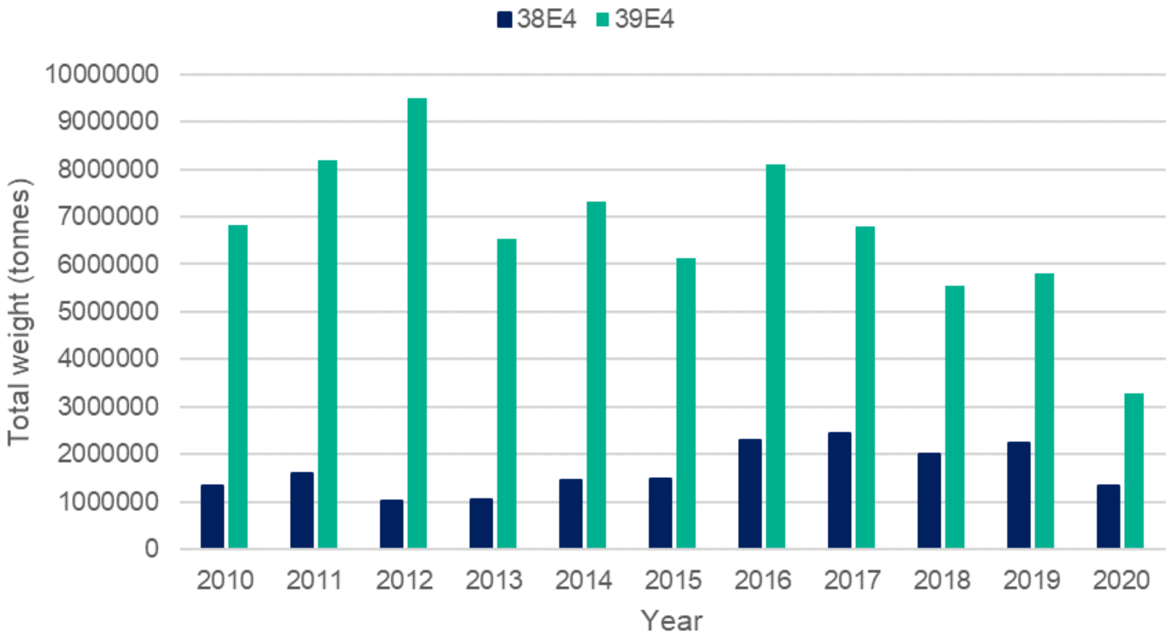
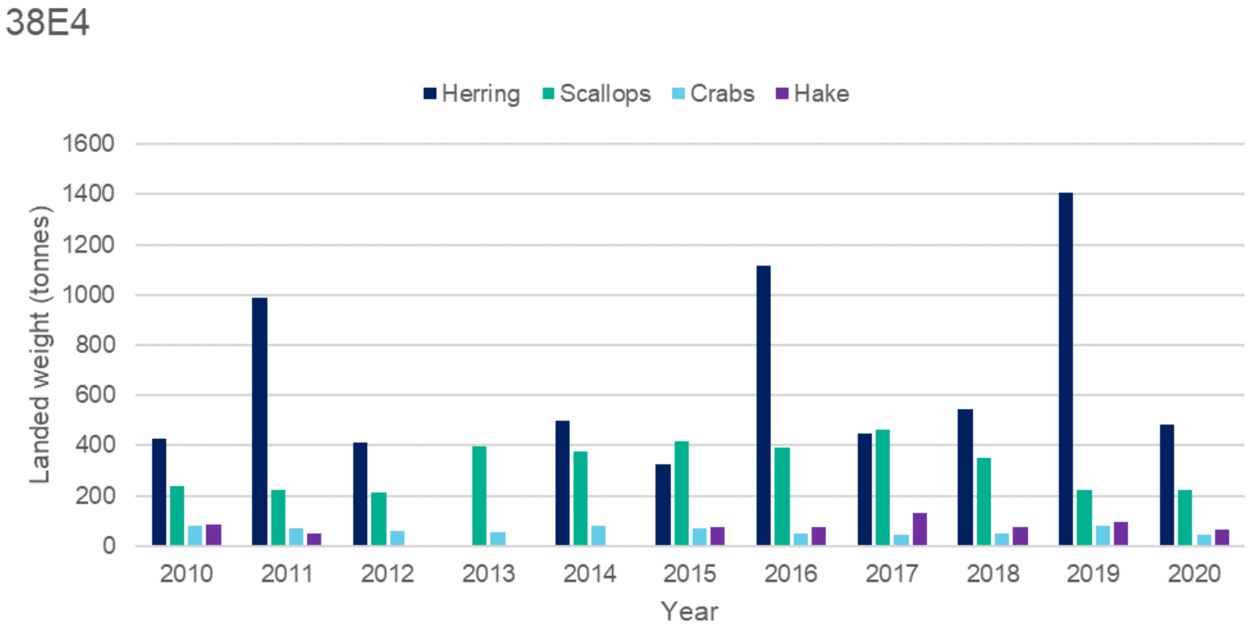


Figure 11.4 Total volume (tonnes) of landings from 2010 to 2020 from the Proposed Development (North Channel 1) fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

Key commercial species by value and volume

The top four species landed by weight (tonnes) from the commercial fisheries study area is presented in Figure 11.5, whilst Figure 11.6 shows the top four species by commercial value from the same area over the same period. They key species in terms of weight are herring, scallops, crab, and hake for 38E4; and *Nephrops*, crab, herring, and crab for 39E4.

An annual average value of almost £2.1 million was landed by all UK vessels for the years 2016 to 2020 from the ICES rectangle 38E4 (based on data from MMO, 2021). 27 May 2022 Page 10 Site 2 occupies a small portion (6%) of this ICES rectangle (the array area occupies 1.5% and the offshore Export Cable Corridor occupies 4.4%). It is also important to note that fishing activity, catches and therefore value is not evenly distributed across the ICES rectangles, and the North Channel Wind 1 development area takes up a relatively small proportion of each ICES rectangle it overlaps.



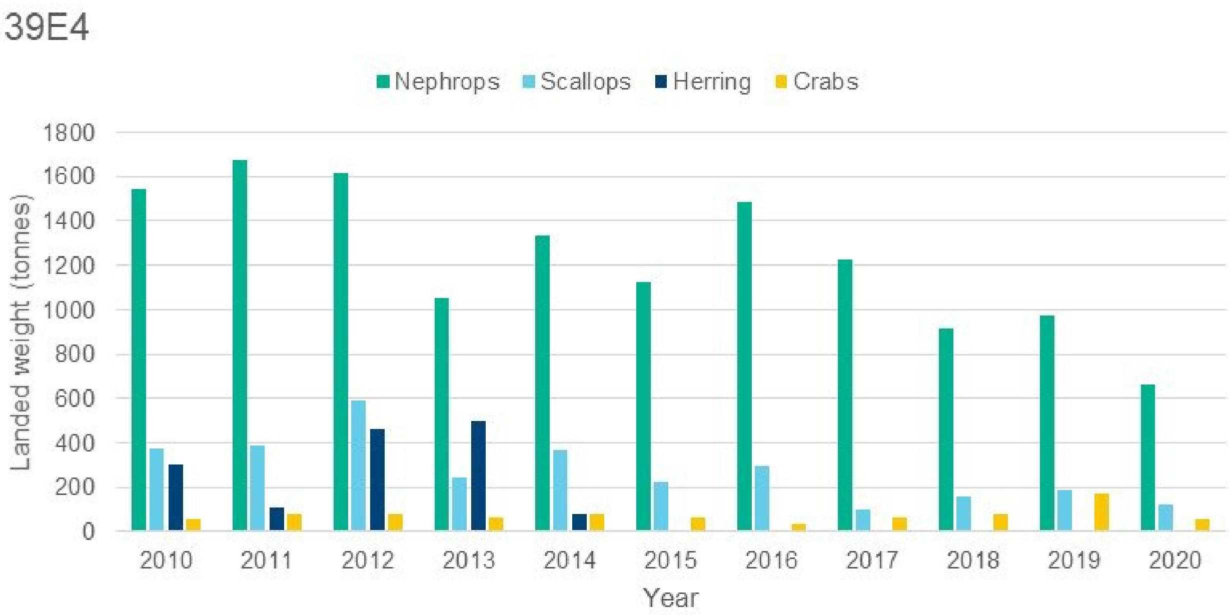
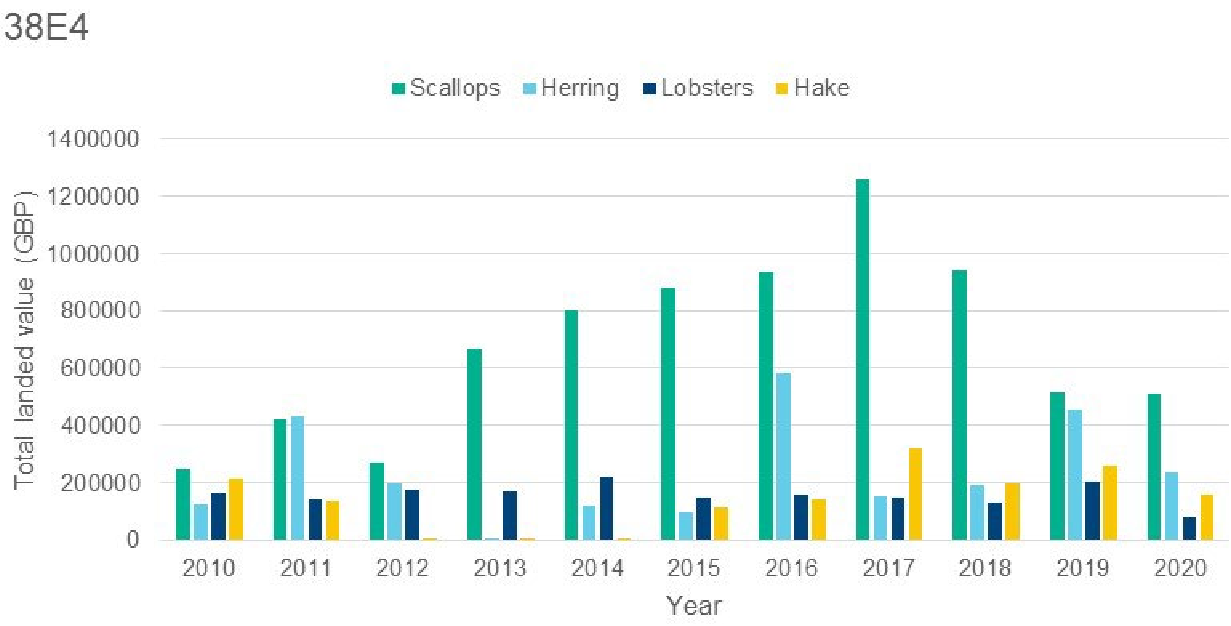


Figure 11.5: Top four species by weight (tonnes) from 2010 to 2020 landed from the Proposed Development (North Channel 1) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

In terms of value, key species are scallops, herring, lobsters, and hake for 38E4; and *Nephrops*, scallops, lobsters, and crabs for 39E4.



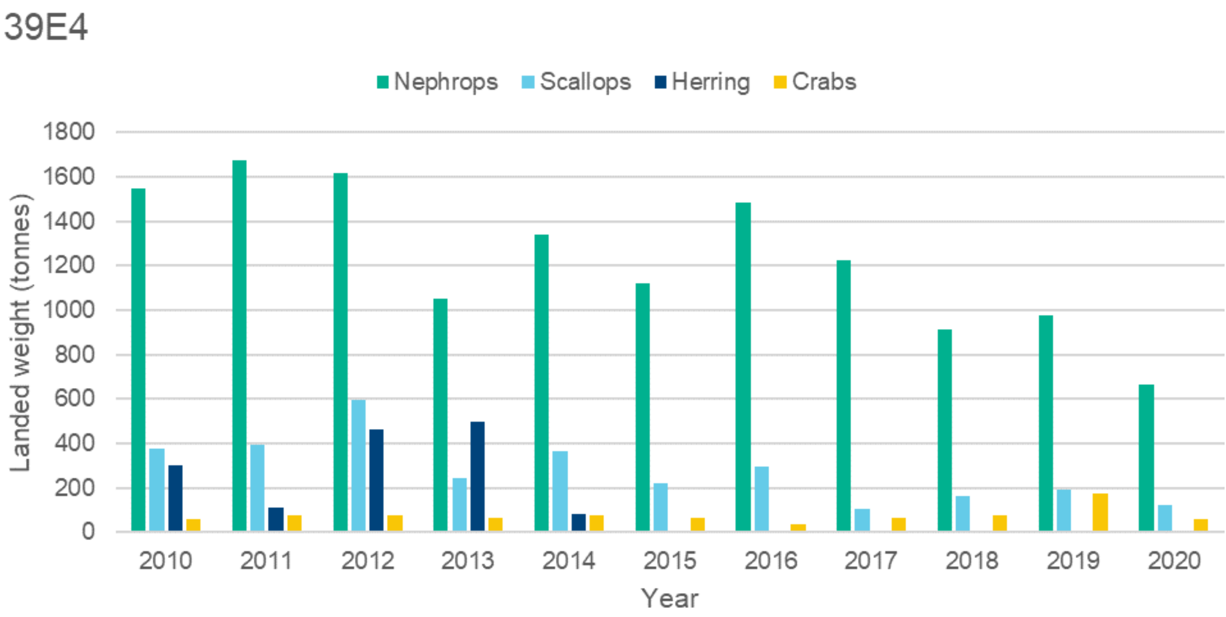


Figure 11.6: Top four species by total value (GBP) from 2010 to 2020 landed from the Proposed Development (North Channel 1) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

The fishing gear types for each of the commercially important species in the study area surrounding the Proposed Development are listed below:

- Herring – Demersal trawls, Otter trawls, and Gears with hooks;
- Crab – Pots and traps, Dredges, Demersal trawls, and Gears with hooks;
- Hake – Demersal trawl, Otter trawls;
- Scallop – Dredge, Otter trawls, Demersal trawls, Pots and traps, and other passive gear;
- Queen Scallop – Dredge, and Otter trawls; and
- Lobster – Pots and traps, Demersal trawls, Dredges, Gears with hooks, and other passive gear.

It should be noted that the scope of these initial findings is limited to UK-registered vessels landing in the UK and abroad (MMO, 2017; MMO, 2020), and third country vessels landings into the UK (NMPi, 2021). There may also be landings associated with third country vessels landing in non-UK ports (SFPA, 2020; SFPA, 2022). The latter will be identified by analysis of STECF Annual Economic Reports for EU Member State flagged vessels e.g., Republic of Ireland vessels landing in Irish ports.

11.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development in the absence of designed in measures. This initial list of impacts that have been scoped into the Proposed Development assessment are set out below and in relation to development project:

- Construction
  - Temporary loss or restricted access to fishing grounds.
  - Displacement of fishing activity into other areas.
  - Interference with fishing activity.
  - Increased steaming times.
  - Snagging risk - loss or damage to fishing gear.
  - Potential impacts on commercially exploited species.
-
- Operation and Maintenance
  - Loss or restricted access to fishing grounds.
  - Displacement of fishing activity into other areas.
  - Interference with fishing activity.
  - Increased steaming times.
  - Snagging risk – loss or damage to fishing gear.
  - Potential impacts on commercially exploited species.
-
- Decommissioning
  - As per Construction.

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 11.2 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, no potential impacts to commercial fisheries have been scoped out of the assessment.

Table 11.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Commercial Fisheries Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Loss or restricted access to fishing grounds.	✓	✓	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary loss or restricted access to fishing grounds within the Proposed Development Area. The presence of wind farm infrastructure may result in long-term loss or restricted access to parts of the existing fishing grounds within the Proposed Development Area.	Datasets are listed in Table 11.1 and include VMS data (indicating hours fished and value of catch by area) and landing statistics by ICES rectangle. Additional datasets including maps of key fishing grounds may also be collated where available. These datasets will be requested from the relevant fishing industry representatives and stakeholders in order to inform the commercial fisheries EIA. This information will also be supplemented by results of site-specific marine vessel traffic survey data.	Detailed analysis of existing datasets will be carried out to characterise the status of historic commercial fisheries patterns within the commercial fisheries study area and predict the potential impacts upon future commercial fishing activities (for UK and non-UK vessels). Datasets will be analysed over 5-to-10-year time periods to account for fluctuations in the commercial fisheries activities. Qualitative assessment informed by data analysis and consultation.
Displacement of fishing activity into other areas	✓	✓	✓	Fishing activity may be temporarily displaced to other areas due to loss or restricted access to fishing ground	As above.	As above.
Interference with fishing activity	✓		✓	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and project vessel traffic in the vicinity of the Proposed	As above.	As above.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				Development may result in increased interaction with fishing vessels.		
Increase in steaming distances.	✓	✓	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary increases in steaming distances to and from fishing grounds. The physical presence of offshore infrastructure during operational phase may result in long term increases in steaming distances to and from fishing grounds.	As above.	As above.
Loss or damage to fishing gear due to snagging.		✓		Potential for snagging fishing gear on interarray cables and export cable, and for floating offshore wind anchoring and mooring systems this risk is increased for loss or damage due to snagging. Safety risks for fishing vessels associated with potential gear snagging will be assessed in the shipping and navigation chapter of the EIA	As above.	As above.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Potential impacts on commercially important fish and shellfish resources.	✓	✓	✓	Informed by Fish and Shellfish ecology section of the scoping report.	As above.	Qualitative assessment informed by data analysis in addition to consideration of results of the fish and shellfish ecology assessment of the EIA.
Supply chain opportunities for local fishing vessels	✓	✓	✓	Requirement for vessels (such as guard vessels) during all phases of the Offshore Wind Project may provide supply chain opportunities for local fishing vessels leading to a beneficial impact.	Engagement with local fisheries stakeholders.	Qualitative assessment informed by consultation.

11.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The commercial fisheries EIA will follow the methodology set out in Chapter 3. Specific to the commercial fisheries EIA, the following guidance documents will also be considered:

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2015);
- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (United Kingdom Fisheries Economics Network (UKFEN), 2012);
- Options and opportunities for marine fisheries mitigation associated with windfarms (Blyth-Skyrme, 2010); and
- Fishing and Submarine Cables – Working Together (International Cable Protection Committee (ICPC), 2009).

In order to characterise the importance of fisheries in this region, consideration will be given to the value of fisheries within the commercial fisheries study area for the generation assets. Any valuation will not be used as the basis of the impact assessment process.

11.2.6 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to arise from other projects or activities within North Channel area where projects or activities could act collectively with the North Channel Wind project to affect commercial fisheries receptors. The cumulative effect assessment will consider the maximum design scenarios for each of the identified projects or activities. The following projects or activities will be considered within the commercial fisheries study area for the generation assets:

- other offshore wind farms, and other existing and proposed projects;
- other energy infrastructure projects, including oil and gas activities (including decommissioning) and carbon capture and storage (CCS) projects;
- other infrastructure projects (e.g., cables and pipelines); and
- other aquaculture projects as applicable.

The cumulative effect assessment will follow the approach outlined in Chapter 3.

11.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

11.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Commercial Fisheries?
- Do you agree that all receptors and impacts have been identified for Commercial Fisheries?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

11.3 NCW 2 PROJECT

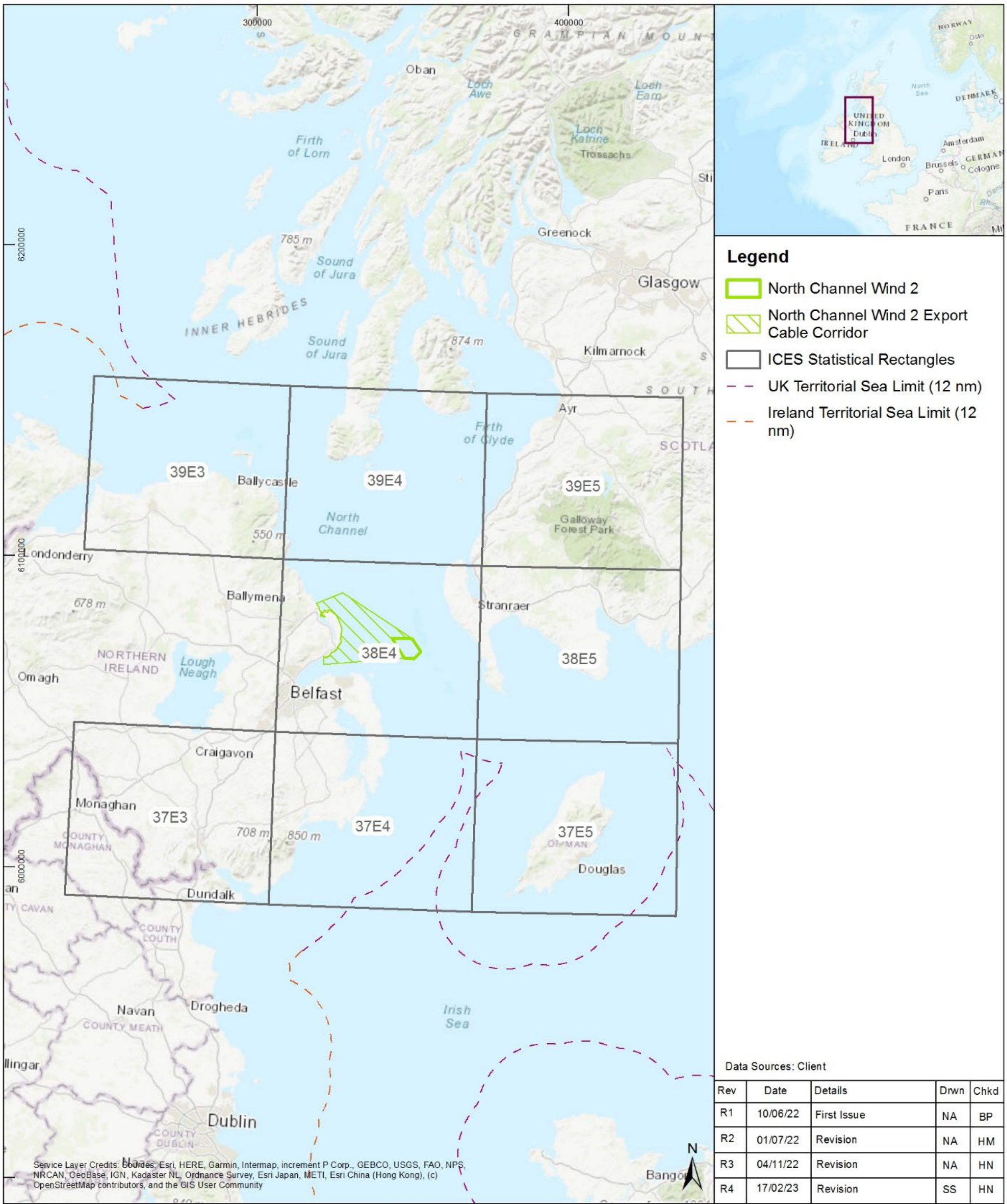
11.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of commercial fishing of relevance to the Proposed Development (the North Channel Wind 2 development area, and Export Cable Corridor, including intertidal habitats up to the MHWS) and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on commercial fisheries receptors. Commercial fisheries are defined for the purpose of this report as activity by licensed fishing vessels undertaken for legitimate capture and sale of finfish and shellfish in the marine environment. Aquaculture, recreational fishing and fishing activities in rivers are not considered within this section.

11.3.2 STUDY AREA

The Proposed Development is located primarily in International Council for the Exploration of the Sea (ICES) Division VIIa (Irish Sea), with the east of the Proposed Development traversing into VIa (West of Scotland) (Kafas *et al*., 2017; NMPi, 2022). Fisheries data are recorded and collated by statistical rectangles within each ICES Division. The commercial fisheries study area has therefore been defined with reference to the ICES rectangle 38E4 within which the Proposed Development is located as shown in Figure 11.7.

The commercial fisheries study area defined above will be used to identify fisheries active in areas relevant to the Proposed Development. Where relevant, however, data and information will be analysed for wider areas to provide context and describe the full extent of activity of the fisheries included in the assessment.



Rev	Date	Details	Drwn	Chkd
R1	10/06/22	First Issue	NA	BP
R2	01/07/22	Revision	NA	HM
R3	04/11/22	Revision	NA	HN
R4	17/02/23	Revision	SS	HN

Project Name: NORTH CHANNEL WIND	Scale: 1:2,000,000	Datum: ETRS 1989	Drawing Number: EOR0814-SCO-031-04
	Plot Size: 217mm (h) x 163mm (w)	Projection: ETRS 1989 UTM Zone 30N	
Drawing Title: ICES RECTANGLES FOR NORTH CHANNEL WIND 2	0 10 20 40 nm / 0 20 40 80 km		North Channel Wind in partnership with rps

Figure 11.7: Commercial Fisheries Study Area for North Channel Wind 2.

Landings by value

The annual average value of landings for ICES statistical rectangle 38E4 is £1,670,865 for all UK and Isle of Man vessels for the years 2010 to 2020 (MMO, 2021). The total annual value across the commercial studies fisheries study area is presented in Figure 11.8.

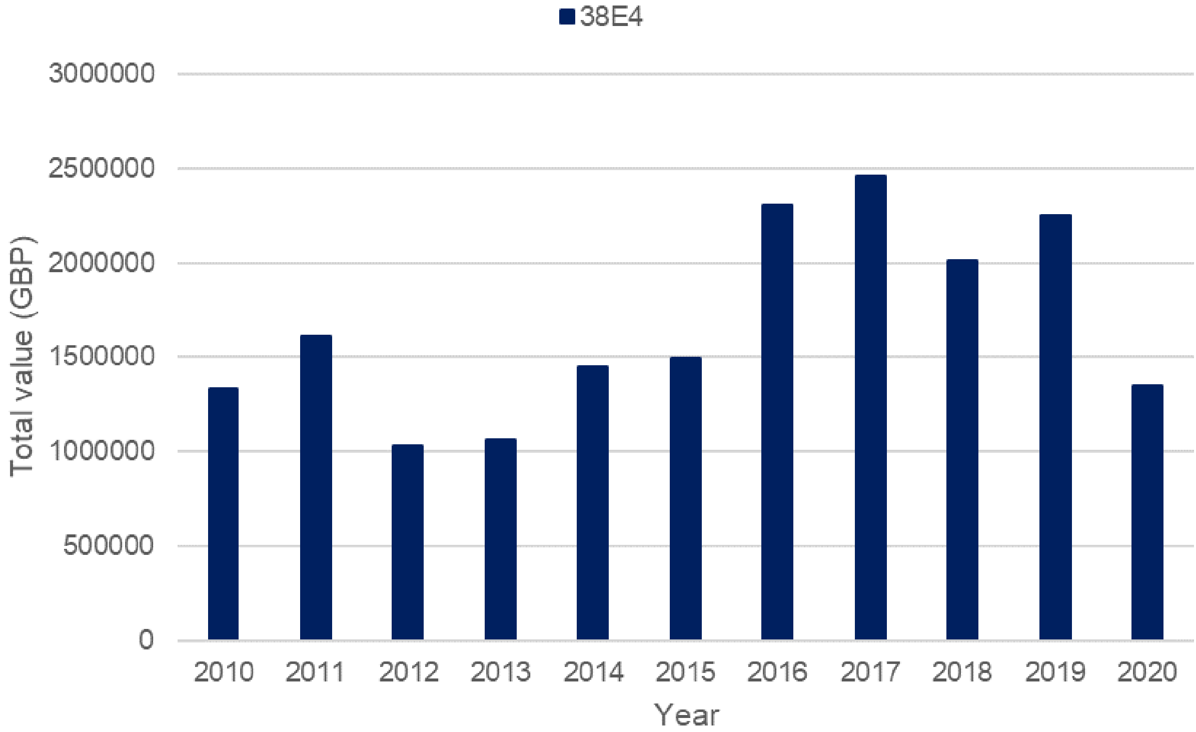


Figure 11.8: Total annual value (GBP) of landings from 2010 to 2020 from the from the Proposed Development (North Channel 2) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

Landings by volume

Landings in UK ports near the proposed Development are shown in Figure 11.9. The largest landings in 2019 were found at Belfast, with an average of 200 to 2000 tonnes caught (MMO, 2019).

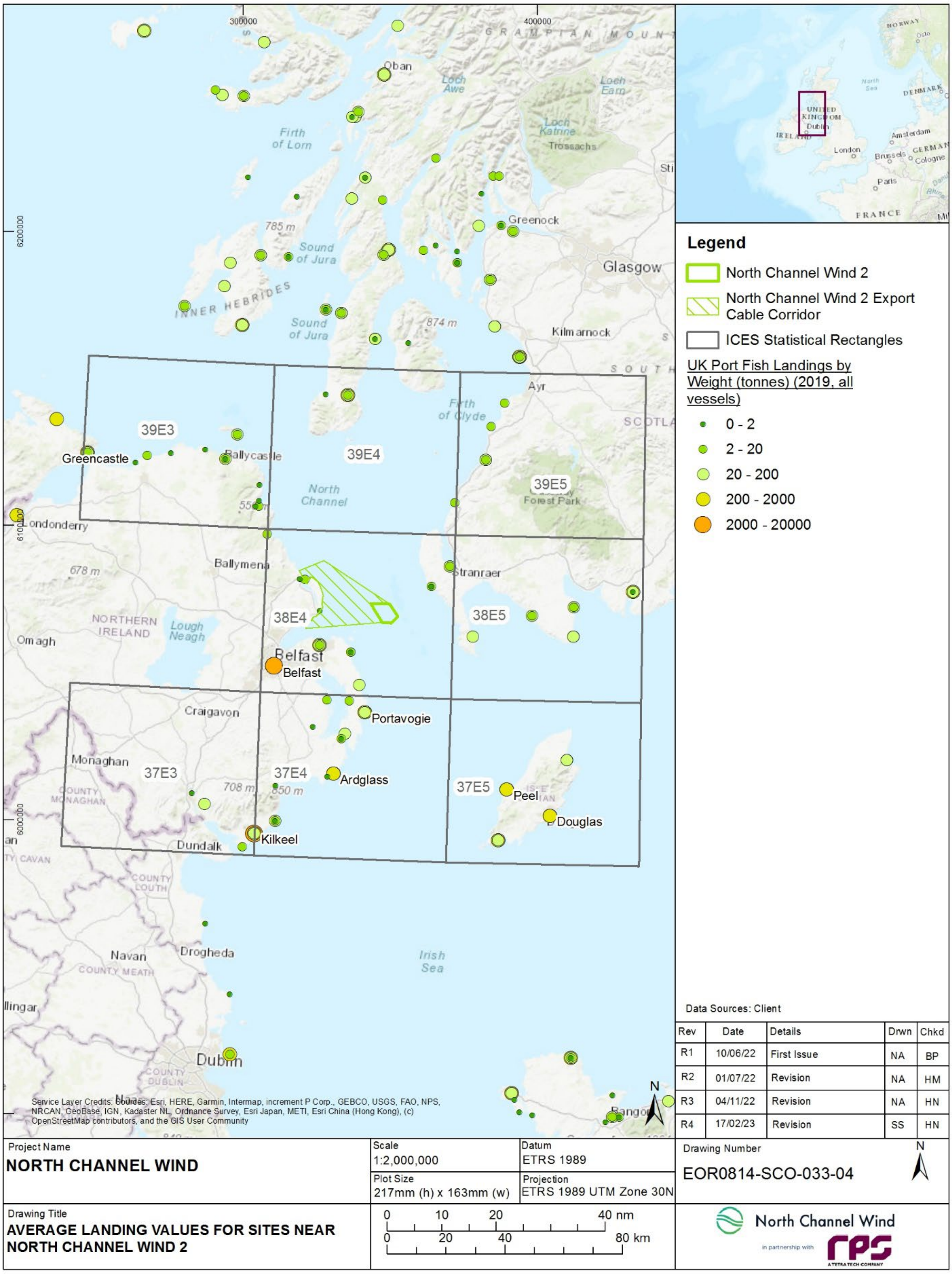


Figure 11.9: UK port fish landings by weight (tonnes), 2019 all vessels.

The total volume (tonnage) of historical landings is presented in Figure 11.10

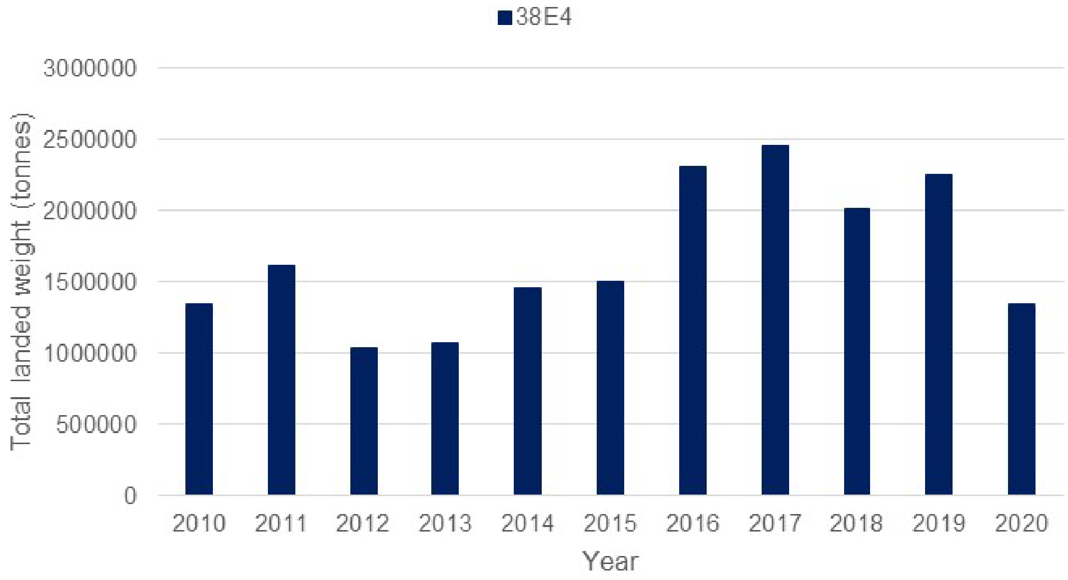


Figure 11.10: Total volume (tonnes) of landings from 2010 to 2020 from the from the Proposed Development (North Channel 2) fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

Key commercial species by value and volume

The top four species landed by weight (tonnes) from the commercial fisheries study area is presented in Figure 11.11, whilst Figure 11.12 shows the top four species by commercial value from the same area over the same period. It should be noted that the North Channel Wind 2 development area only covers a relatively small proportion of the 38E4 ICES rectangle.

The key species for 38E4 in terms of weight are herring, scallops, crab and hake.

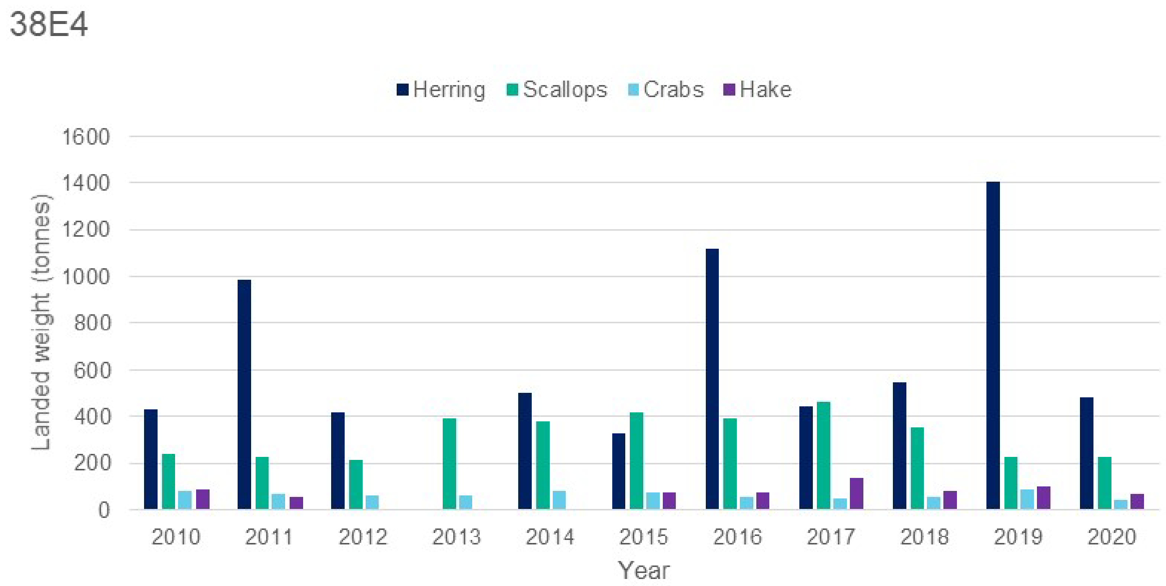


Figure 11.11: Top four species by weight (tonnes) from 2010 to 2020 landed from the Proposed Development (North Channel 2) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

The key species for 38E4 in terms of value are scallops, herring, lobsters and hake.

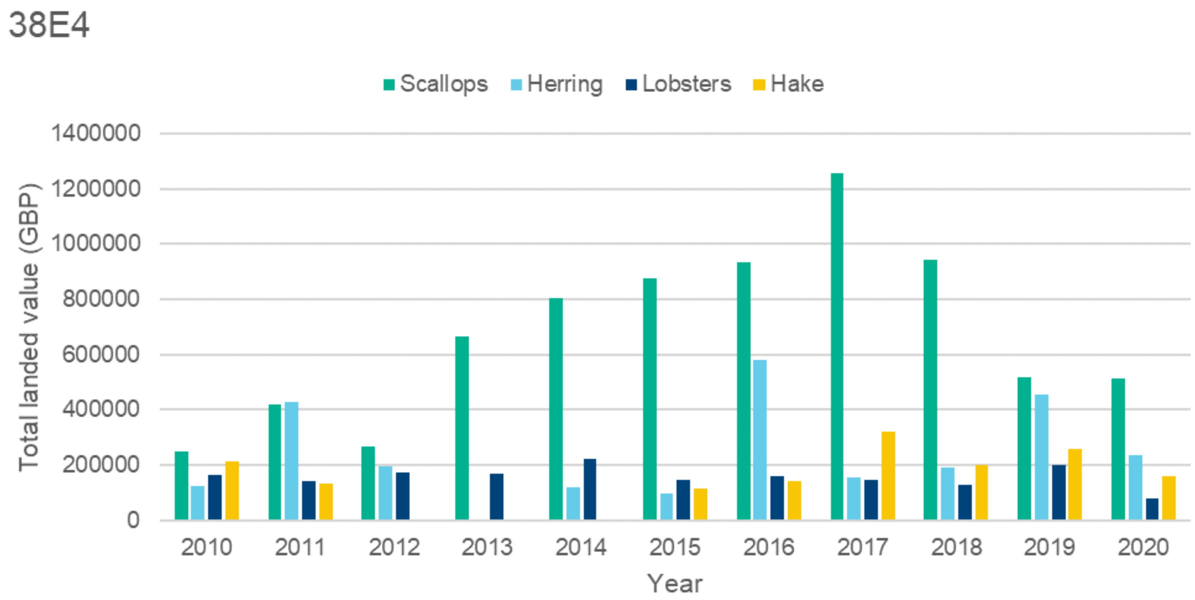


Figure 11.12: Top four species by total value (GBP) from 2010 to 2020 landed from the Proposed Development (North Channel 2) commercial fisheries study area for the generation assets (UK and Isle of Man vessels ≥15m and foreign vessels ≥15m into the UK) (MMO, 2021).

The fishing gear types for each of the commercially important species in the study area surrounding the Proposed Development are listed below:

- Herring – Demersal trawls, Otter trawls, and Gears with hooks;
- Crab – Pots and traps, Dredges, Demersal trawls, and Gears with hooks;
- Hake – Demersal trawl, Otter trawls;
- Scallop – Dredge, Otter trawls, Demersal trawls, Pots and traps, and other passive gear;
- Queen Scallop – Dredge, and Otter trawls; and
- Lobster – Pots and traps, Demersal trawls, Dredges, Gears with hooks, and other passive gear.

It should be noted that the scope of these initial findings is limited to UK-registered vessels landing in the UK and abroad (MMO, 2017; MMO, 2020), and third country vessels landings into the UK (NMPi, 2021). There may also be landings associated with third country vessels landing in non-UK ports (SFPA, 2020; SFPA, 2022). The latter will be identified by analysis of STECF Annual Economic Reports for EU Member State flagged vessels e.g., Republic of Ireland vessels landing in Irish ports.

11.3.3 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on commercial fisheries have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development in the absence of designed in measures. This initial list of impacts that have been scoped into the Proposed Development assessment are set out below and in relation to development project:

- Construction
  - Temporary loss or restricted access to fishing grounds.
  - Displacement of fishing activity into other areas.
  - Interference with fishing activity.
  - Increased steaming times.
  - Snagging risk - loss or damage to fishing gear.

  - Potential impacts on commercially exploited species.
- Operation and Maintenance
  - Loss or restricted access to fishing grounds.
  - Displacement of fishing activity into other areas.
  - Interference with fishing activity.
  - Increased steaming times.
  - Snagging risk – loss or damage to fishing gear.
  - Potential impacts on commercially exploited species.
- Decommissioning
  - As per Construction.

These impacts are further elaborated in Table 11.3 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, no potential impacts to commercial fisheries have been scoped out of the assessment.

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Table 11.3: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Commercial Fisheries Project. Phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Loss or restricted access to fishing grounds.	✓	✓	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary loss or restricted access to fishing grounds within the Proposed Development Area. The presence of wind farm infrastructure may result in long-term loss or restricted access to parts of the existing fishing grounds within the Proposed Development Area.	Datasets are listed in Table 11.1 above and include VMS data (indicating hours fished and value of catch by area) and landing statistics by ICES rectangle. Additional datasets including maps of key fishing grounds may also be collated where available. These datasets will be requested from the relevant fishing industry representatives and stakeholders in order to inform the commercial fisheries EIA. This information will also be supplemented by results of site-specific marine vessel traffic survey data.	Detailed analysis of existing datasets will be carried out to characterise the status of historic commercial fisheries patterns within the commercial fisheries study area and predict the potential impacts upon future commercial fishing activities (for UK and non-UK vessels). Datasets will be analysed over 5-to-10-year time periods to account for fluctuations in the commercial fisheries activities. Qualitative assessment informed by data analysis and consultation.
Displacement of fishing activity into other areas	✓	✓	✓	Fishing activity may be temporarily displaced to other areas due to loss or restricted access to fishing ground	As above.	As above.
Interference with fishing activity	✓		✓	Increased vessel traffic within fishing grounds as a result of changes to shipping routes and project vessel traffic in the vicinity of the Proposed Development may result in increased interaction with fishing vessels.	As above.	As above.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Temporary increase in steaming distances.	✓	✓	✓	The implementation of safety zones around construction, maintenance and decommissioning works may result in temporary increases in steaming distances to and from fishing grounds. The physical presence of offshore infrastructure during operational phase may result in long term increases in steaming distances to and from fishing grounds.	As above.	As above.
Loss or damage to fishing gear due to snagging.		✓		Potential for snagging fishing gear on interarray cables, and for floating offshore wind anchoring and mooring systems this risk is increased for loss or damage due to snagging. Safety risks for fishing vessels associated with potential gear snagging will be assessed in the shipping and navigation chapter of the EIA	As above.	As above.
Potential impacts on commercially important fish and shellfish resources.	✓	✓	✓	Informed by Fish and Shellfish ecology section of the scoping report.	As above.	Qualitative assessment informed by data analysis in addition to consideration of results of the fish and shellfish ecology assessment of the EIA.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Supply chain opportunities for local fishing vessels	✓	✓	✓	Requirement for vessels (such as guard vessels) during all phases of the Offshore Wind Project may provide supply chain opportunities for local fishing vessels leading to a beneficial impact.	Engagement with local fisheries stakeholders.	Qualitative assessment informed by consultation.

11.3.4 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The following designed in measures, and how these can reduce potential for impact have been considered in identification of impacts that have been scoped into the Proposed Development assessment (**Table 11.3**).

Measures adopted as part of the Proposed Development will include consideration of industry good practice as set out in:

- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Liaison: FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2014);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds. FLOWW (Fishing Liaison with Offshore Wind and Wet Renewables Group) (FLOWW, 2015);
- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (United Kingdom Fisheries Economics Network (UKFEN), 2012);
- Options and opportunities for marine fisheries mitigation associated with windfarms (Blyth-Skyrme, 2010); and
- Fishing and Submarine Cables – Working Together (International Cable Protection Committee (ICPC), 2009).

Specific measures will also include, inter alia:

- Establishing and participation in Commercial Fisheries Working Group (CFWG) and liaison with Fisheries Industry Representatives (FIRs), as appropriate;
- Timely and efficient distribution of Notice to Mariners (NtM);
- Kingfisher notifications and other navigational warnings of the position and nature of works associated with the Proposed Development;
- Use of guard vessels and Offshore Fisheries Liaison Officers (OFLOs), as appropriate;
- Implementation of a Vessel Management Plan (VMP) and Navigational Safety Plan (NSP);
- Notification to the UK Hydrographic Office (UKHO) of the proposed works to facilitate the promulgation of maritime safety information and updating of nautical charts and publications;
- Undertaking of post-lay and cable burial inspection surveys and monitoring; and
- Assessment of the as laid data (geophysical) in order to assess the potential for snagging.
- Applied to inform the requirement for an over trawlability study, which would then be planned and undertaken in discussion with fisheries stakeholders.

The requirement and feasibility of additional measures will be dependent on the significance of the effects on commercial fisheries and will be consulted upon with statutory consultees throughout the EIA process.

The impact assessment will follow the methodology set out in Chapter 3. Although the financial importance of fisheries in this region is considered as part of the characterisation of the baseline, any valuation will not be used as the basis of the impact assessment process.

11.3.5 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to arise from other projects or activities within North Channel area where projects or activities could act collectively with the North Channel Wind project to affect commercial fisheries receptors. The cumulative effect assessment will consider the maximum design scenarios for each of the identified projects or activities. The following projects or activities will be considered within the commercial fisheries study area for the generation assets:

- Other offshore wind farms, and other existing and proposed projects;

- Other energy infrastructure projects, including oil and gas activities (including decommissioning) and carbon capture and storage (CCS) projects; and
- Other infrastructure projects (e.g., cables and pipelines).

The cumulative effect assessment will follow the approach outlined in Chapter 3: EIA methodology.

11.3.6 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

11.3.7 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Commercial Fisheries?
- Do you agree that all receptors and impacts have been identified for Commercial Fisheries?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

12. SHIPPING AND NAVIGATION

12.1 DATA SOURCES

Table 12.1 lists the principal datasets that have been used in the desktop review of the baseline environment in this scoping chapter.

It is recognised that COVID-19 had a substantial impact on vessel traffic during 2020 and 2021, particularly related to recreational and ferry movements. Therefore, datasets have been limited to 2019 to show representative pre-COVID vessel numbers. Further data collection, including two 14-day traffic surveys, are required in compliance with MGN654 for submission with the EIA.

Table 12.1: Summary of Key Desktop Data Sources

Type	Description	Date	Source
AIS Data	Anonymised Vessel Track Data for the UK	2019	MMO
AIS Data	High Fidelity AIS data for the study area	August 2019 January 2020	MarineTraffic
Admiralty Charts	Latest nautical charts for the study area.	2022	UKHO
Incident Data	Locations and details of maritime accidents reported to MAIB.	2010-2020	MAIB
Incident Data	Locations and details of maritime incidents responded to by RNLI.	2008-2019	RNLI
Coastal Atlas of Recreational Boating	GIS dataset of recreational boating activity for the UK.	2022	RYA
VMS Data	Fishing intensity data for UK vessels.	2019	MMO
VMS Data	Fishing intensity data for European vessels.	2017	OSPAR

12.2 NCW 1 PROJECT

12.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of shipping and navigation of relevance to the proposed North Channel 1 (NCW 1) project and considers the potential impacts on shipping and navigation receptors from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development.

Shipping and navigation receptors include the impacts of the generation and transmission assets on navigational safety and commercial vessel routeing, and impacts associated with project vessel activities during construction, operation and maintenance, and decommissioning. This scoping chapter includes a review of the baseline environment within the study area, identification of potential impacts of the project and a summary of the proposed approach to assess these impacts for the EIA.

12.2.2 STUDY AREA

The shipping and navigation study area is considered to include waters within 10 nm of the array boundary search area and 3 nm from the export cable corridor, seaward of Mean High-Water Springs (MHWS). This is shown in Figure 12.1. This shipping and navigation study area is considered best practice in previous applications and has been accepted by statutory consultees within those applications.

A wider shipping and navigation study area to consider cumulative impacts is defined as the northern Irish Sea, including waters within 30 nm of the development area.

12.2.3 BASELINE ENVIRONMENT

Navigational features

The main navigational feature for the area is the Traffic Separation Scheme (TSS) in the North Channel located 9 nm north-west of the array study area. The International Regulations for Preventing Collisions at Sea (COLREGs) Rule 10 prescribes actions to be taken by vessels when navigating through or in the vicinity of a TSS. This provides a framework for how vessels will be transiting through the wider area.

Larne Port is located at the south of the array study area. The port is primarily used for the P&O Ferries routes that operate in this area with limited other general cargo use on an ad-hoc basis. Larne Port has a fishing and recreational community with several clubs making use of Larne Lough and the wider area.

One MoD practice area is located in the array study area and intersects with the south-eastern corner of North Channel Wind 1. The D509 firing practice area is operated using a clear range procedure. The whole area is designated as a submarine exercise area which is primarily used for training operations.

No aggregate extraction, oil and gas or offshore wind farm licences or proposals are identified in the study area.

Vessel Traffic Activities

There were 435 commercial vessel transits that intersected the footprint of the array area during the two months of analysis, approximately 2,610 per year Figure 12.2. In the immediate vicinity of North Channel Wind 1, most routes are north-west / south-east as vessels are transiting the TSS in the North Channel on coastal shipping routes. To the south-east of Site 1 there is an increased number of crossing vessels due to the approaches to Larne Port, Belfast and the Firth of Clyde. There is also some evidence of commercial vessel anchoring to the south-east of Kilroot Power Station, within the cable corridor.

Two ferry routes are evident to the south-east of the site. 1.5 nm to the south-east is the Larne to Cairnryan route operated by P&O Ferries with six crossings per day. 6 nm to the south-east is the Belfast to Loch Ryan route operated by Stena conducting five crossings per day. In addition, routes from Heysham, Liverpool and Douglas intersect the cable route on passage to Belfast.

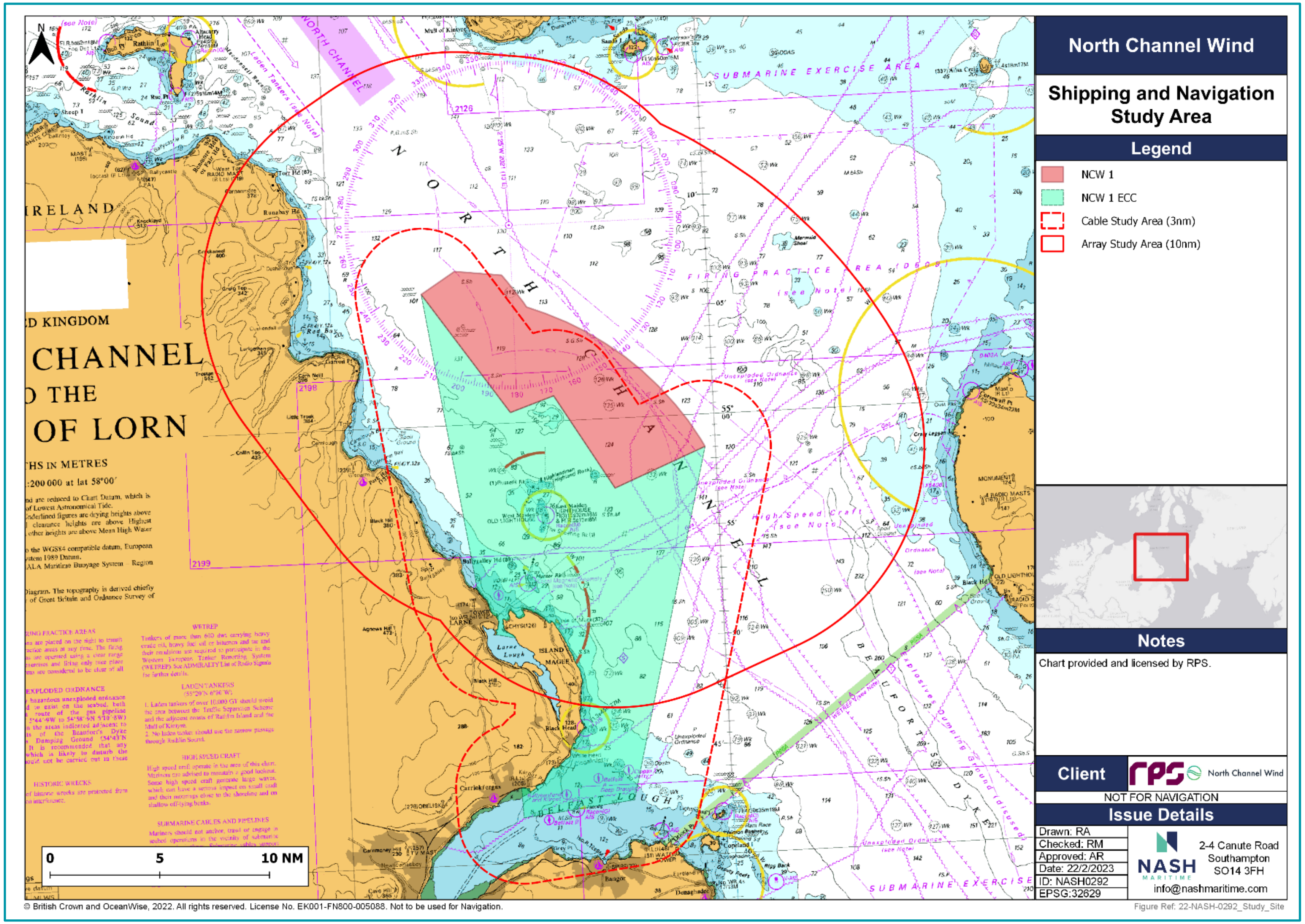

Figure 12.1: Overview of Proposed Development and Shipping and Navigation Study Area

The highest concentration of fishing activity is shown to the east inshore along the Scottish coast between Loch Ryan and the entrance to the Firth of Clyde Figure 12.4. There are several fishing vessel transits passing through the site between Larne or Belfast and the north-eastern traffic lane of the TSS in the North Channel Figure 12.3. There is some evidence of fishing activity along the cable route, particularly near to landfall around Larne and the approaches to Belfast. Further details on commercial fishing are detailed in Chapter 11.

There is relatively little recreational activity through the site Figure 12.5, this is potentially due to recreational vessels tending to transit close to the coast to avoid interaction with larger vessels and the site being located 7.6 km (4.5 nm) from the mainland coast. Offshore cruising routes through the site include routes between Belfast Lough and Campbeltown, Glenarm and the Firth of Clyde, and Belfast Lough and the Sound of Jura. Tug and Service Vessel data is illustrated in Figure 12.6.

Marine Incidents

A total of 80 unique incidents were recorded in the Marine Accident Investigation Branch (MAIB) database within 10 nm of the array area and 3 nm of the export cable corridor. Two collisions were reported within 3 nm of the cable corridor within Carrickfergus Marina (01/08/2014) and the second in the approaches to Belfast, involving a ferry and cargo ship (01/03/2012).

Three MAIB reported incidents occurred within 1nm of the array area:

- A near miss between a tanker and yacht (01/07/2015).
- An injured crewman on a cruise ship (01/07/2013).
- A mechanical failure on a survey vessel in (01/04/2011)

The RNLI database identified 539 records within 10 nm of the array area and 3 nm of the export cable corridor. Of these, 488 (90.5%) involved responses to leisure vessels and 42 (7.8%) involved commercial craft. These incidents were mostly clustered inshore and within Belfast Lough.

Four RNLI reported incidents occurred within 1 nm of the array area, two involved yachts with an engine having a machinery failure (22/08/2010 and 02/07/2012), one involved a crewman injury on a yacht with an engine (20/08/2011), and one involved a crewman injury on a power boat (29/09/2020). Incidents near to the array area are typically responded to by lifeboats from Red Bay and Larne. Incidents near to cable landfall are typically responded to by Donaghadee and Bangor.

12.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 12.2 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, no potential impacts to shipping and navigation have been scoped out of the assessment.

A Navigation Risk Assessment (NRA) will be produced in compliance with MGN654, which will include additional collection, consultation and assessment, and will determine whether any of these impacts will be scoped out of the EIA.

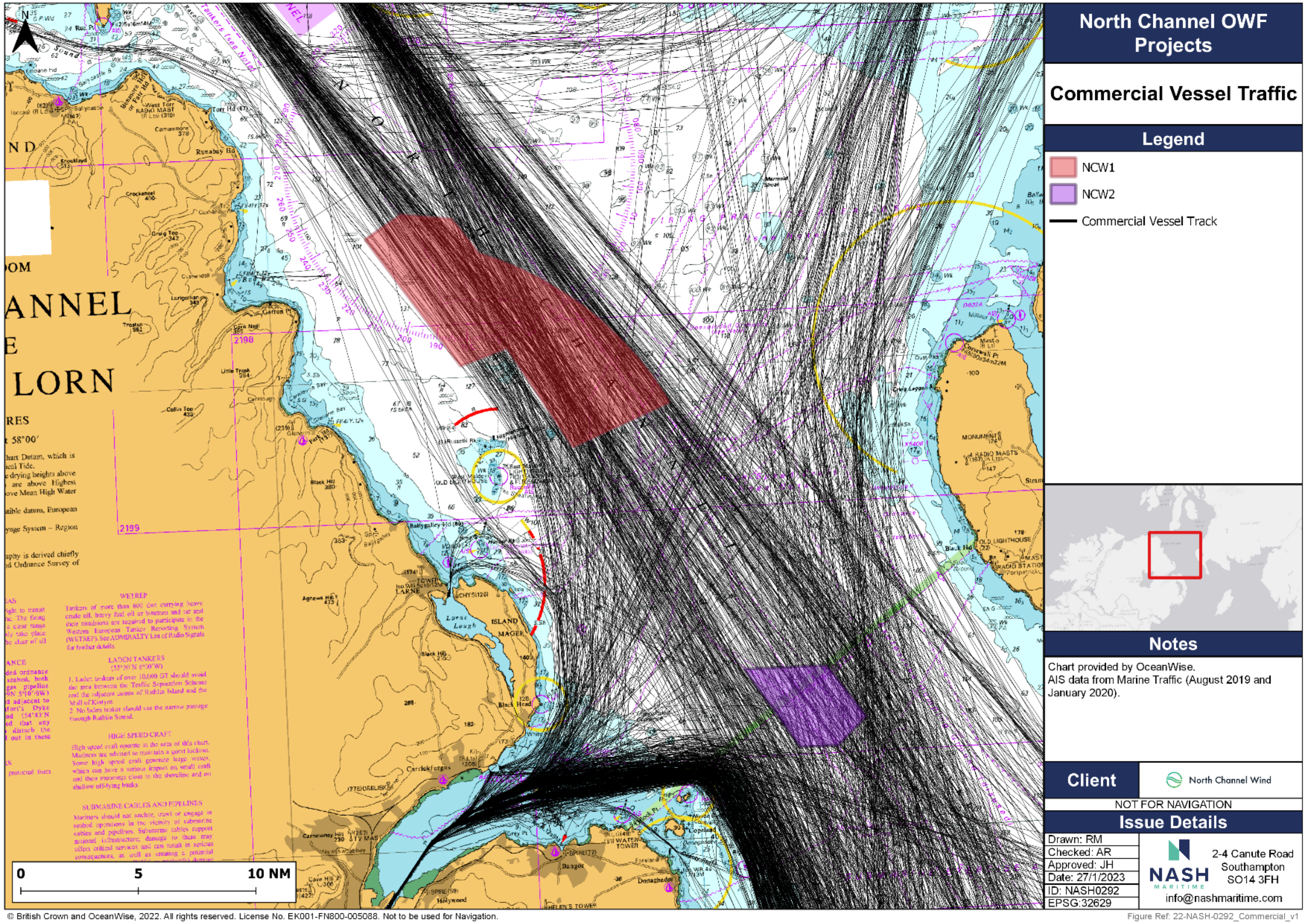

Figure 12.2: Commercial Vessel Traffic in Study Area

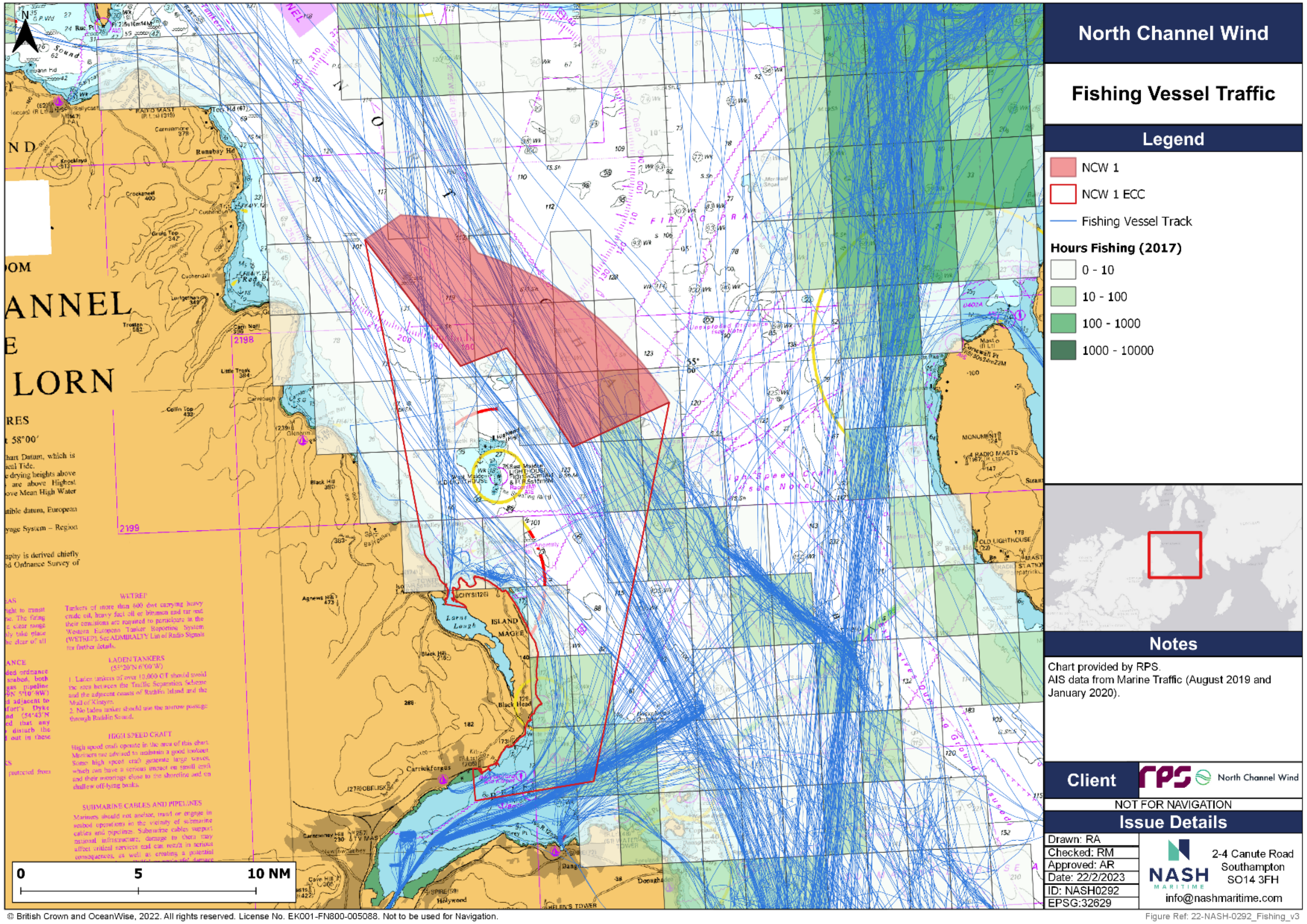

Figure 12.3: Fishing Vessel Traffic in Study Area

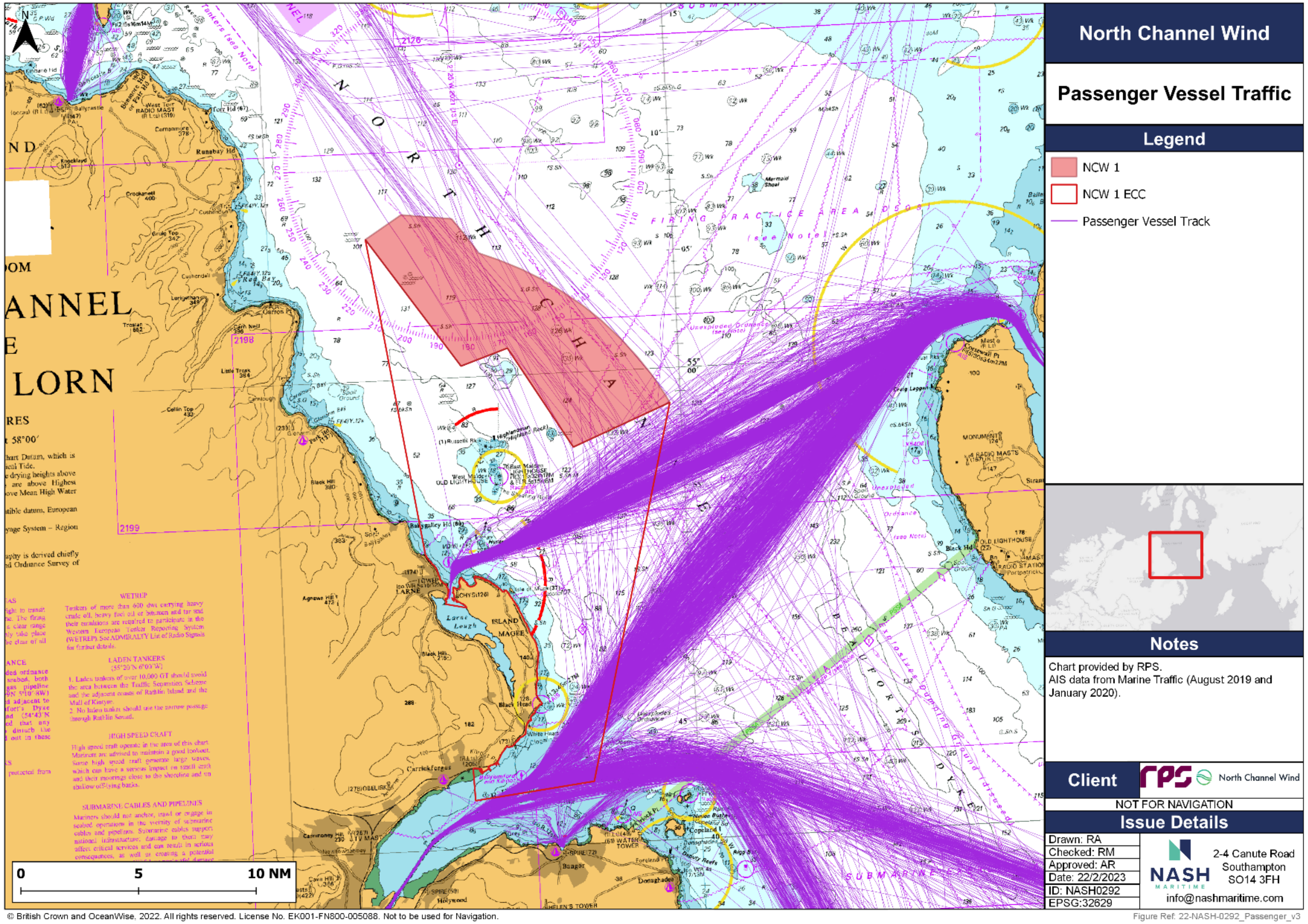

Figure 12.4: Passenger Vessel Traffic in Study Area

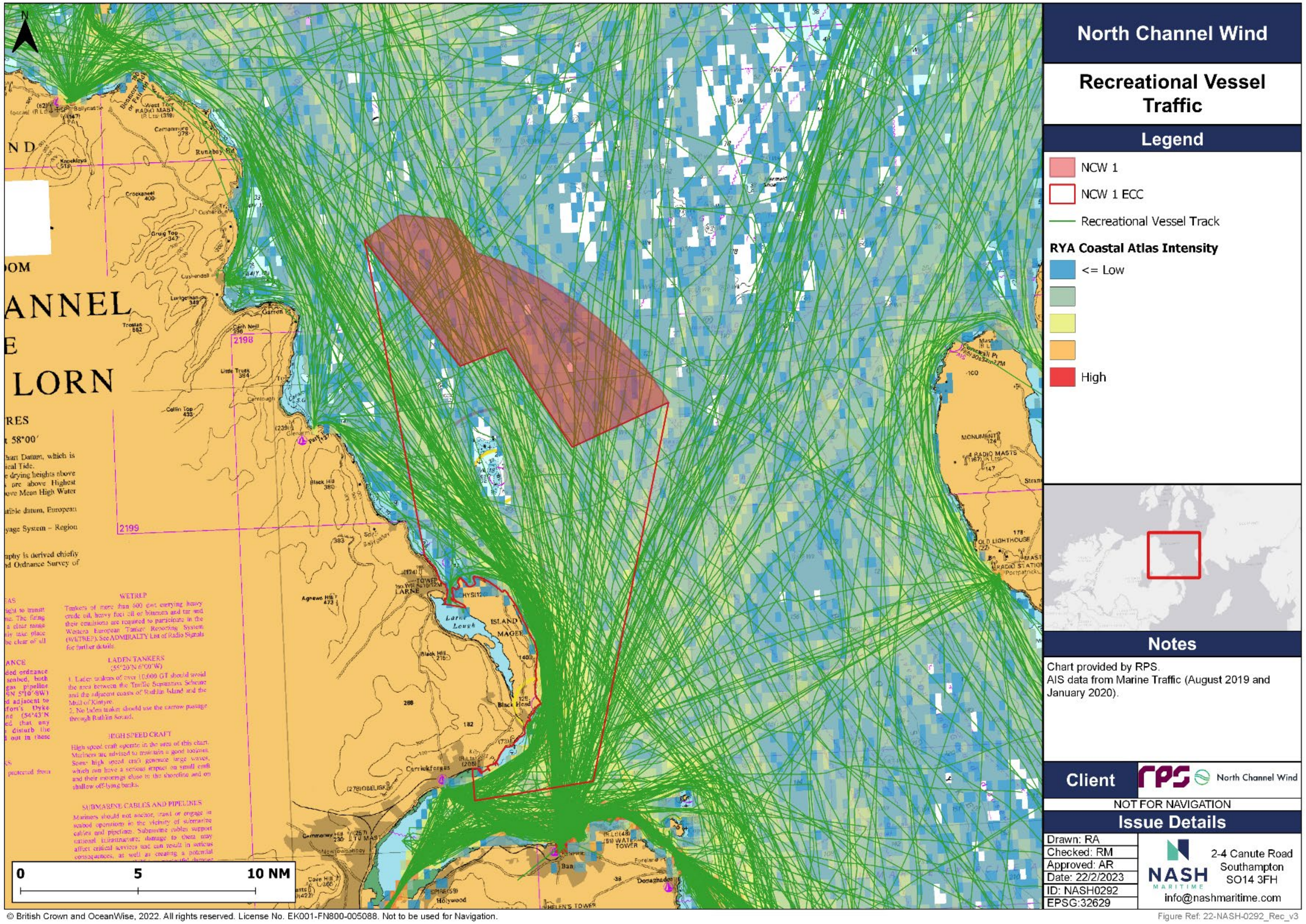

Figure 12.5: Recreational Vessel Traffic in Study Area

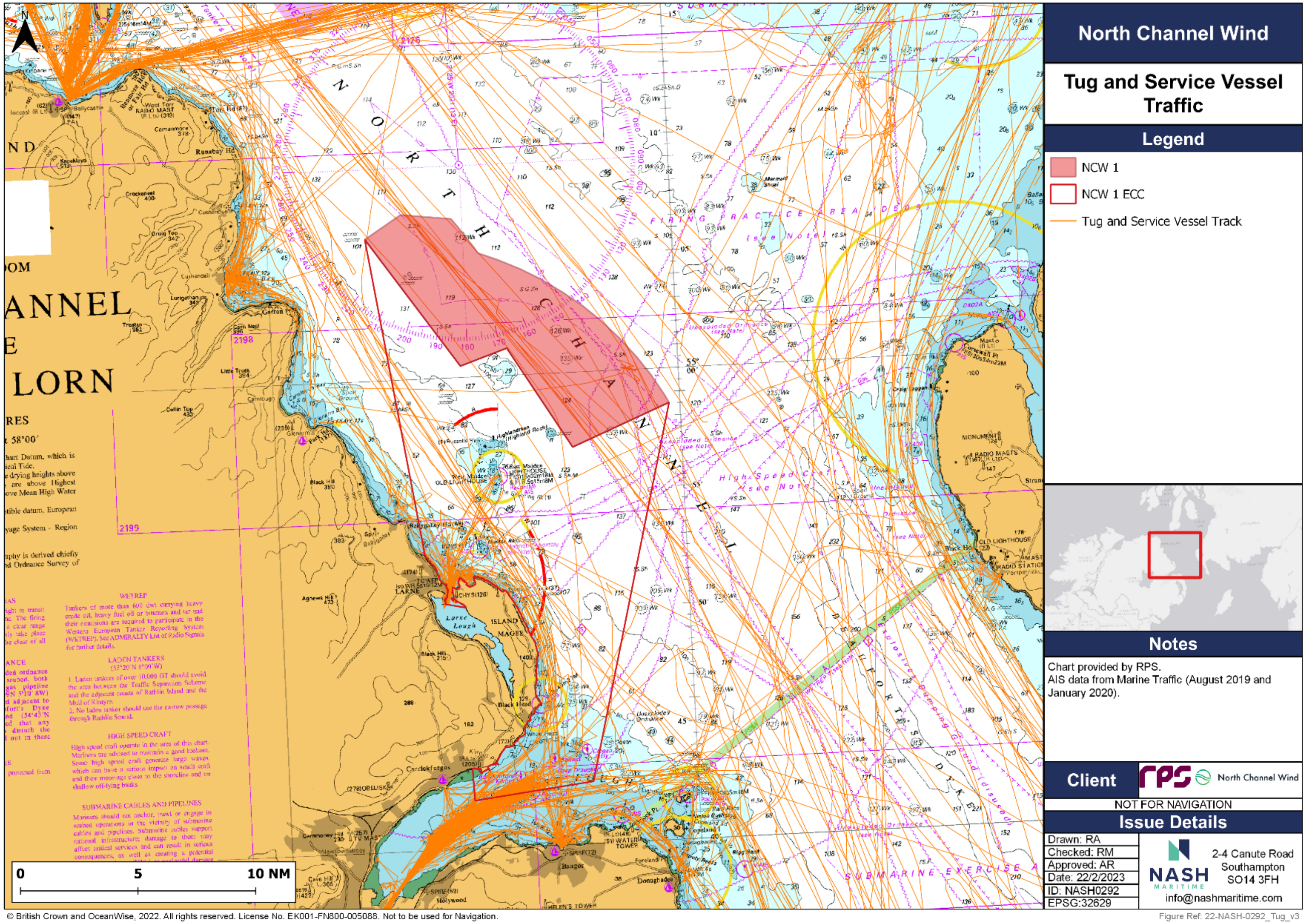

Figure 12.6: Tug and Service Vessel Traffic in Study Area

Table 12.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Shipping and Navigation Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
Increased Collision Risk due to Increased Activity	Y	Y	Y	Marine craft associated with the construction, operation and decommissioning of the project will be transiting to/from the area in all phases. There will be potential interaction with other vessels transiting the area which leads to an increased risk of collision.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Increased Collision Risk Due to Presence of Infrastructure	Y	Y	Y	The presence of the project will limit the available sea room for vessels to use when taking action to avoid collision. This means that there is potential for increased risk of collision between vessels navigating in the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA to assess the change in collision risk for vessels transiting the area.
Increased Contact Risk Due to Presence of Infrastructure	Y	Y	Y	Infrastructure in the area will create a risk of contact for either powered or drifting vessels transiting the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA for both powered and drifting vessels.

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
Increased Grounding Risk Due to Presence of Infrastructure	Y	Y	Y	Changes to vessel routeing as a result of the available infrastructure may lead to a potential increase in the risk of grounding.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Interference with Sea Lanes Essential to International Navigation	Y	Y	Y	The presence of the Project in relation to the existing sea lanes and the TSS in the North Channel will affect the routeing through the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the main routes will also be undertaken in the NRA.
Increased Risk of Collision for Vessels with Crossing Ferries	Y	Y	Y	The presence of infrastructure close to current ferry routes has the potential for loss of situational awareness of vessels, particularly close to the array areas. This may lead to increased risk of collision between coastal traffic and ferries that cross the general flow of vessel traffic.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA to assess the change in collision risk for vessels transiting the area.
Increased Deviation of Commercial Vessels	Y	Y	Y	Commercial vessels will potentially be displaced from existing routes due to the presence of the Project.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
						and vessel safety for the main routes will also be undertaken in the NRA.
Impact on Fishing / Recreational Vessel Activity	Y	Y	Y	Fishing / recreational vessels may be displaced from their current routes due to the presence of infrastructure and activities associated with the Project.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the main routes will also be undertaken in the NRA.
Wet storage of floating wind turbines		Y		Floating wind turbines may need to be stored at port facilities or a nearby anchorage while they await installation, maintenance and/or decommissioning. This will involve the movement of vessels and turbines which may have temporary, short-term impacts on other users including other vessel movements, mainly during construction phases.		
Impact on Adverse Weather Routeing	Y	Y	Y	Ferry routes in the area vary based on the prevailing metocean conditions. The reduction in sea room associated with the Project has	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the adverse

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				the potential to impact the weather routeing.		weather routes will be undertaken in the NRA.
Reduced Access into Ports and Harbours	Y	Y	Y	Access to local ports may be affected by the presence of the project and operations associated with it.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Reduction in Search and Rescue Capability	Y	Y	Y	The increase in vessel activity may result in an increase in incidents. This along with the potential for reduced access for SAR responders due to infrastructure may affect SAR capability.	Available incident data for the area and Department for Transport (DfT) SAR helicopter taskings for the area with used to characterise baseline incident rates.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Interference with Radar, Communications and Positioning Systems	Y	Y	Y	Communication and positioning systems may be affected by the presence of infrastructure.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Reduction in Under Keel Clearance	Y	Y	Y	Use of cable protection associated with the Project has the potential to reduce the available depth of water along the cable route. This would reduce the available under keel clearance for vessels transiting the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Risk of Snagging of Fishing Gear or Anchors	Y	Y	Y	The presence of cable, protection and other infrastructure associated with the project has the potential to increase the risk of snagging fishing gear or anchors.	A dedicated vessel traffic survey will be required to characterise fishing vessel transits and areas used for anchoring.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.

12.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The shipping and navigation EIA will follow the methodology set out in Chapter 3. Specific to the shipping and navigation EIA, the following guidance documents will also be considered:

- MGN654 Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021), including Annexes;
- Revised Guidelines for Formal Safety Assessment (FSA) (IMO, 2018);
- IALA G1162: The Marking of Offshore Man-Made Structures (IALA, 2021);
- The RYA's Position on Offshore Renewable Energy Developments: Wind Energy (RYA, 2019);
- PIANC WG161 Interaction Between Offshore Wind Farms and Maritime Navigation (PIANC, 2018);
- G+ IOER Good Practice Guidelines for Offshore Renewable Energy Developments (G+, 2019);
- The Shipping Industry and Marine Spatial Planning (Nautical Institute, 2013); and
- MGN372: OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008).

The principal guidance for assessing impacts to shipping and navigation are described in MGN654 (MCA, 2021). Annex 1 to that document describes the methodology by which an NRA should be undertaken, including data collection and consultation requirements.

Two 14-day seasonally representative vessel traffic surveys will be undertaken to collect AIS, radar and visual data on all vessel movements. A longer-term AIS dataset for the study area and cable route will also be sought and other datasets where appropriate.

Consultation with key stakeholders will be used to inform the assessment. Meetings will be arranged either through teleconference or in-person to discuss activities in the study area and any potential impacts of the project on those activities. The list of consultees will likely include:

- Maritime and Coastguard Agency (MCA);
- Commissioners of Irish Lights (CIL);
- Northern Lighthouse Board (NLB);
- Chamber of Shipping;
- Ports and harbours (including Belfast Harbour Commissioners and Larne);
- Ferry operators (Stena Line, Isle of Man Steampacket Company, P&O);
- Royal National Lifeboat Institute (RNLI);
- Royal Yachting Association (RYA);
- Local yacht clubs;
- Local fishing organisations; and
- Commercial regular runners.

As per the MGN, the NRA will follow the IMO's FSA methodology, an internationally recognised approach for conducting maritime risk assessments. Hazards will be identified, and their likelihood and consequence scored to produce a risk score. Where necessary, risk controls will be identified in order to mitigate any unacceptable risks and reduce the risks to As Low as Reasonably Practicable (ALARP). This will be presented in the form of a hazard log and used to inform the EIA Impact Assessment.

12.2.6 POTENTIAL CUMULATIVE EFFECTS

There are potential cumulative effects as a result of the development on shipping and navigation receptors. A search area consisting of the northern Irish Sea up to 30nm from the development area will be screened to identify cumulative projects. By following MGN654 guidance, impacts assessed within the NRA will be considered both in isolation and in combination with other cumulative developments.

12.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

This section describes transboundary impacts which may arise from shipping and navigation due to the construction, operation and maintenance, and decommissioning from the Proposed Development.

There is the potential for transboundary impacts upon shipping and navigation due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

These include:

- Increased Collision Risk due to Increased Activity
- Increased Collision Risk Due to Presence of Infrastructure
- Increased Contact Risk Due to Presence of Infrastructure
- Increased Grounding Risk Due to Presence of Infrastructure
- Interference with Sea Lanes Essential to International Navigation
- Increased Risk of Collision for Vessels with Crossing Ferries
- Increased Deviation of Commercial Vessels
- Impact on Fishing / Recreational Vessel Activity
- Impact on Adverse Weather Routeing
- Reduced Access into Ports and Harbours
- Reduction in Search and Rescue Capability
- Interference with Radar, Communications and Positioning Systems
- Reduction in Under Keel Clearance
- Risk of Snagging of Fishing Gear or Anchors

12.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Shipping and Navigation?
- Do you agree that all receptors and impacts have been identified for Shipping and Navigation?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

12.3 NCW 2 PROJECT

12.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of shipping and navigation of relevance to the proposed North Channel 2 (NCW 2) project and considers the potential impacts on shipping and navigation receptors from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development.

Shipping and navigation receptors include the impacts of the generation and transmission assets on navigational safety and commercial vessel routeing, and impacts associated with project vessel activities during construction, operation and maintenance, and decommissioning. This scoping chapter includes a review of the baseline environment within the study area, identification of potential impacts of the project and a summary of the proposed approach to assess these impacts for the EIA.

12.3.2 STUDY AREA

The shipping and navigation study area is considered to include waters within 10 nm of the array boundary search area and 3 nm from the export cable corridor, seaward of Mean High-Water Springs (MHWS). This is shown in Figure 12.7. This shipping and navigation study area is considered best practice in previous applications and has been accepted by statutory consultees within those applications.

A wider shipping and navigation study area to consider cumulative impacts is defined as the northern Irish Sea, including waters within 30 nm of the development area.

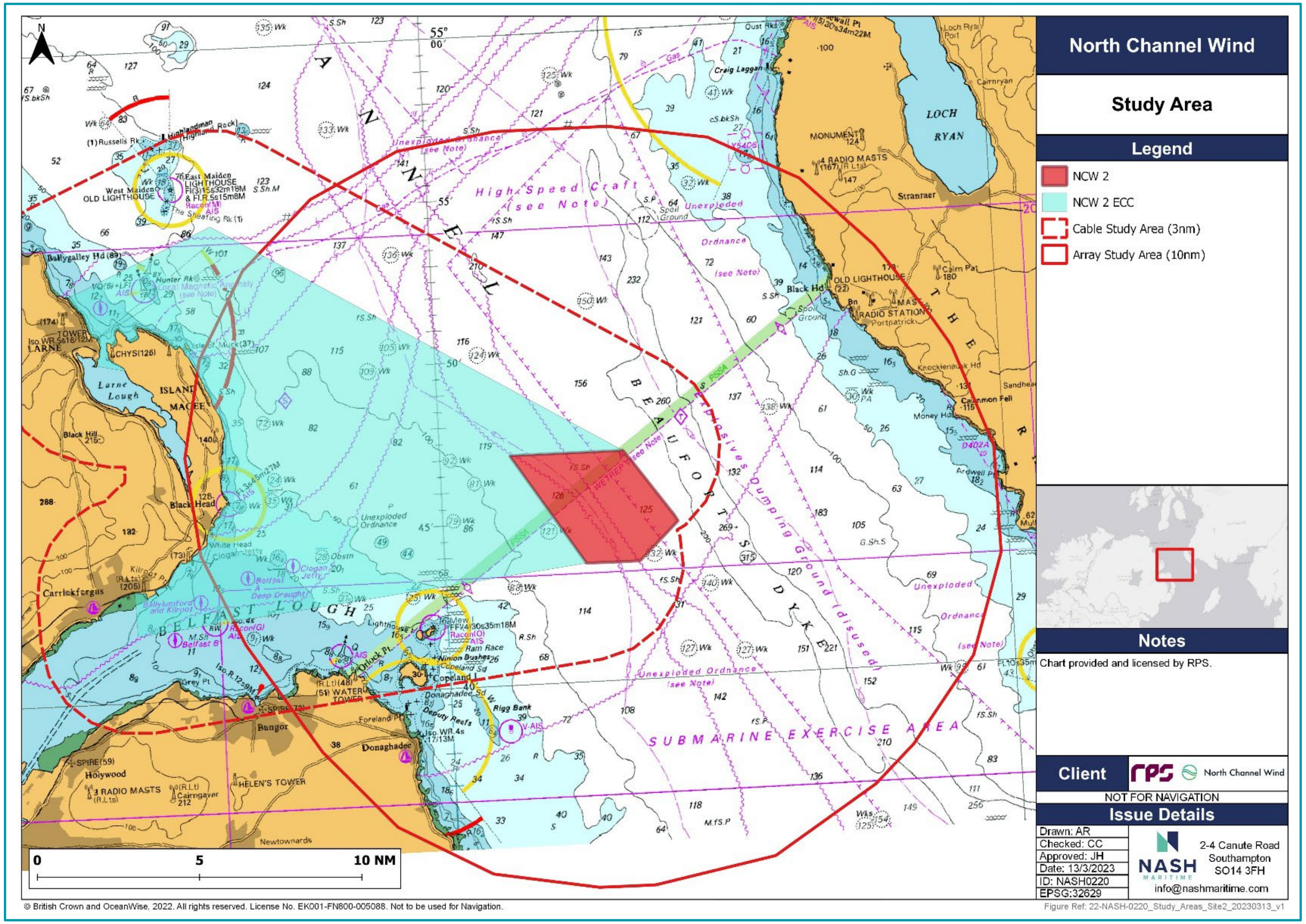

Figure 12.7: Overview of Proposed NCW 2 Development and Shipping and Navigation Study Area

12.3.3 BASELINE ENVIRONMENT

Navigational Features

Mew Island is an important navigational feature in the array study area marking the narrowest point of the North Channel of approximately 16 nm. The island is located 4.5 nm to the south-west of North Channel Wind 2 and is marked with a lighthouse, Racon 'O' and an AIS transponder.

The study area is adjacent to the approaches for Belfast Harbour which is a Statutory Harbour Authority (SHA), Competent Harbour Authority (CHA) in respect to pilotage and Local Lighthouse Authority (LLA) with respect to aids to navigation. There are two pilot boarding stations in the array study area, one for vessels on passage to Cloghan Jetty and the other for deep draught vessels (10.2 m or greater). Belfast Harbour operates a Vessel Traffic Service (VTS) meeting the requirements of MGN401 Amendment 3 with the ability to monitor vessel traffic through radar, AIS and using VHF communications.

Cloghan Jetty is inside the array study area which is used by tankers bringing oil for storage or use by the Kilroot power station.

The whole area is designated as a submarine exercise area which is primarily used for training operations.

No aggregate extraction, oil and gas or offshore wind farm licenses or proposals are identified in the study area.

Vessel Traffic Activities

There were 209 commercial vessel transits that intersected the footprint of the array area during the two months of analysis, approximately 1,254 per year (Figure 12.8). A significant proportion of the traffic within the study area passes to the east or west of the array area with the highest density of traffic associated with the passage into / out of Belfast Harbour, including Tug and Service Vessels (Figure 12.12). Much of this traffic for Belfast is clear to the west and close to the coast, turning after passing Mew Island. There is some evidence of commercial vessel anchoring to the south-east of Kilroot Power Station, within the cable corridor.

Three ferry routes are evident within the study area (Figure 12.10). 3.6 nm to the north-west is the is the Belfast to Loch Ryan route operated by Stena, conducting five crossings per day. 2 nm to the south-east is transits for ferries on routes between Belfast and Heysham/Liverpool and infrequent transits of a high-speed ferry between Douglas and Belfast. The routes are seen to diverge after Mew Island and pass either side of the Isle of Man dependent on the prevailing metocean conditions.

The highest concentrations of fishing activity (Figure 12.9) are shown immediately to the north-east, south and west of the site. There is a significant proportion of transits shown to / from the ports of Bangor, Belfast and Larne. There is some evidence of fishing activity along the cable route, particularly to the west near to landfall within the approaches to Belfast.

There were 23 passenger ships recorded transiting through the array area, approximately 138 per year. These include large cruise ships such as the Celebrity Silhouette at 315 m to smaller boutique cruise ships and tall ships.

The site is located 7 nm from the mainland coast and therefore there is relatively little recreational activity (Figure 12.11) through the site other than an offshore cruising route between Portpatrick (Scotland) and both Bangor and Carrickfergus in Belfast Lough. The highest density of activity is further inshore with a significant amount of activity in Belfast Lough.

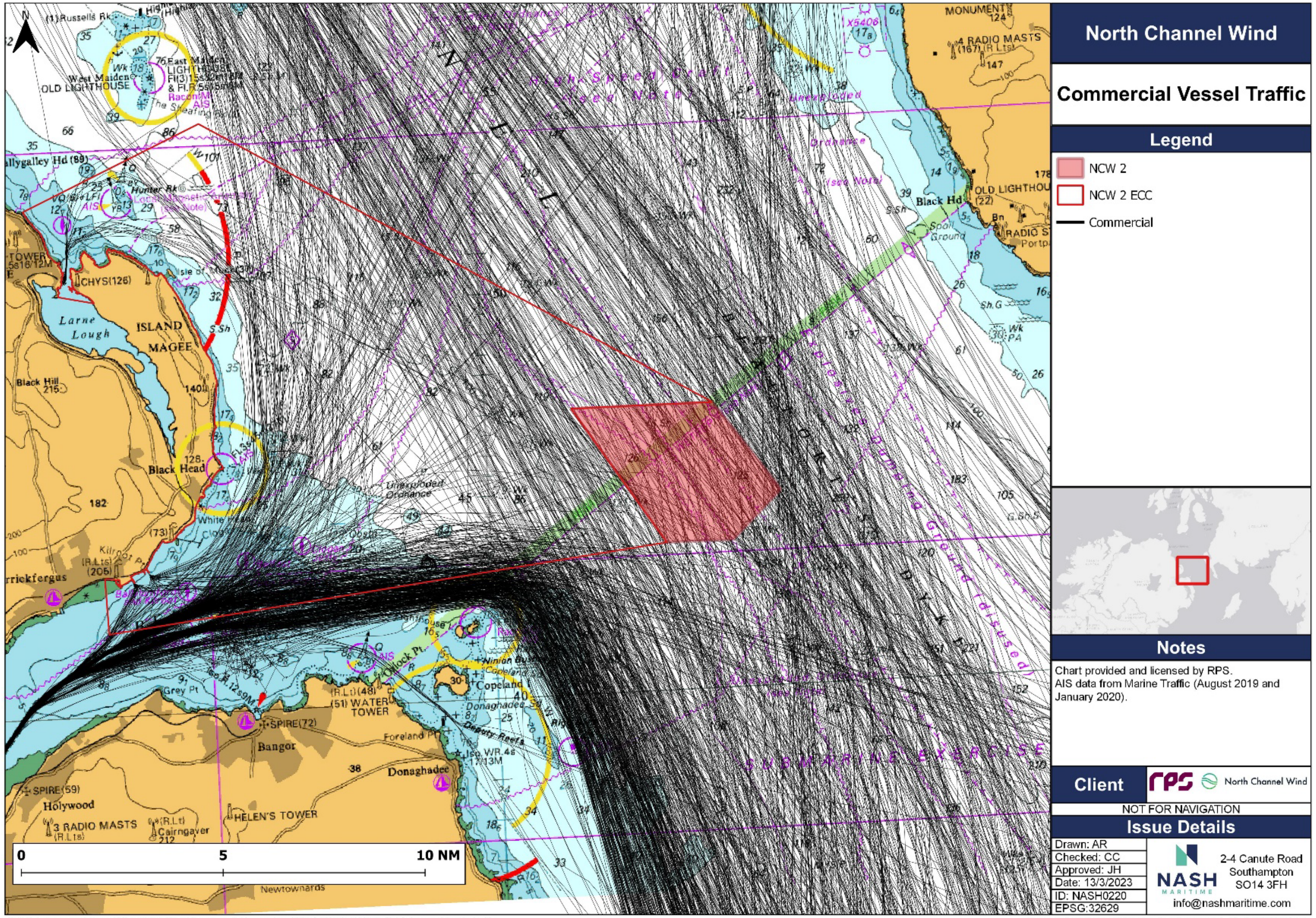

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Figure 12.8: Commercial Vessel Traffic in Study Area

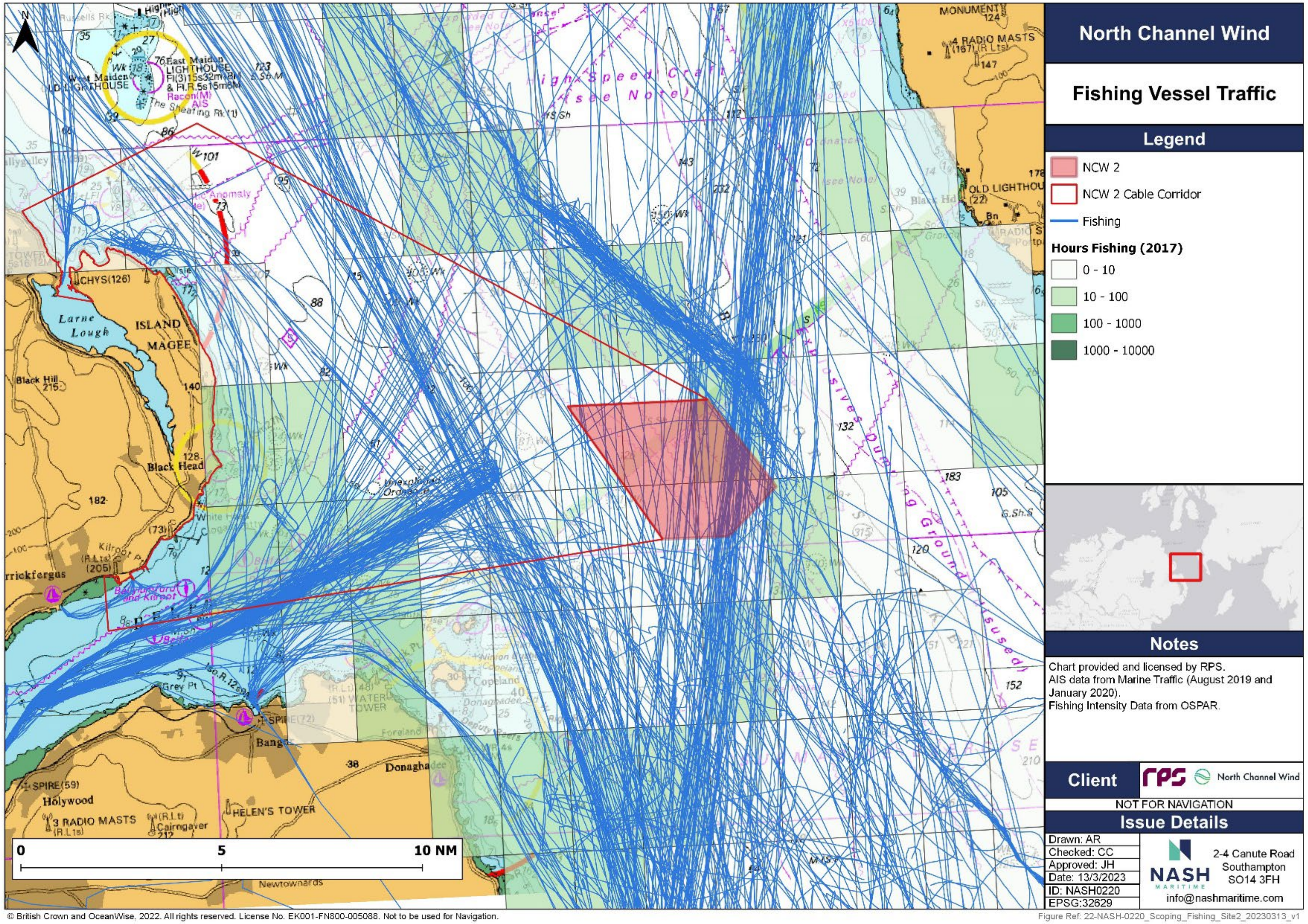

Figure 12.9: Fishing Vessel Traffic in Study Area

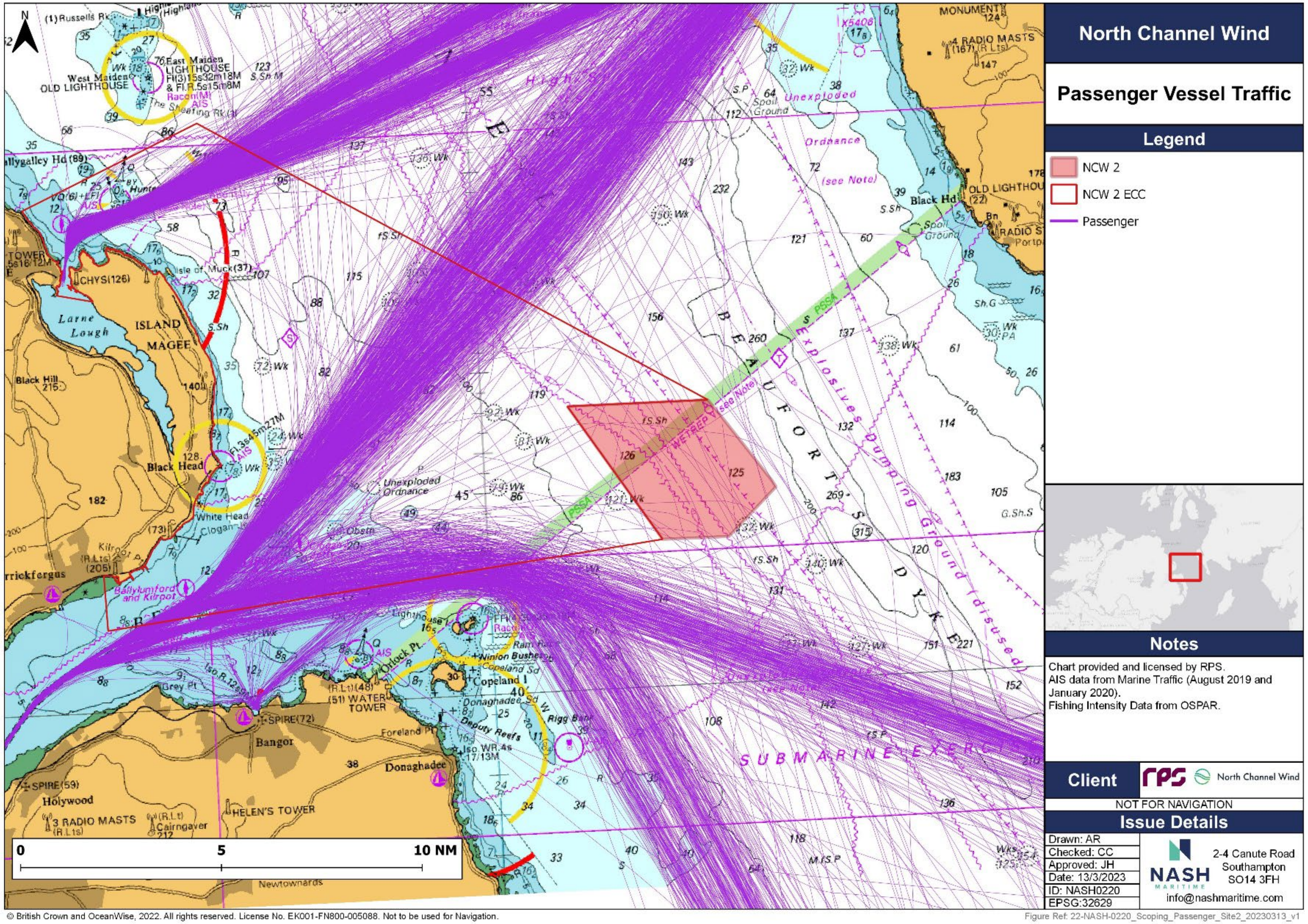

Figure 12.10: Passenger Vessel Traffic in Study Area

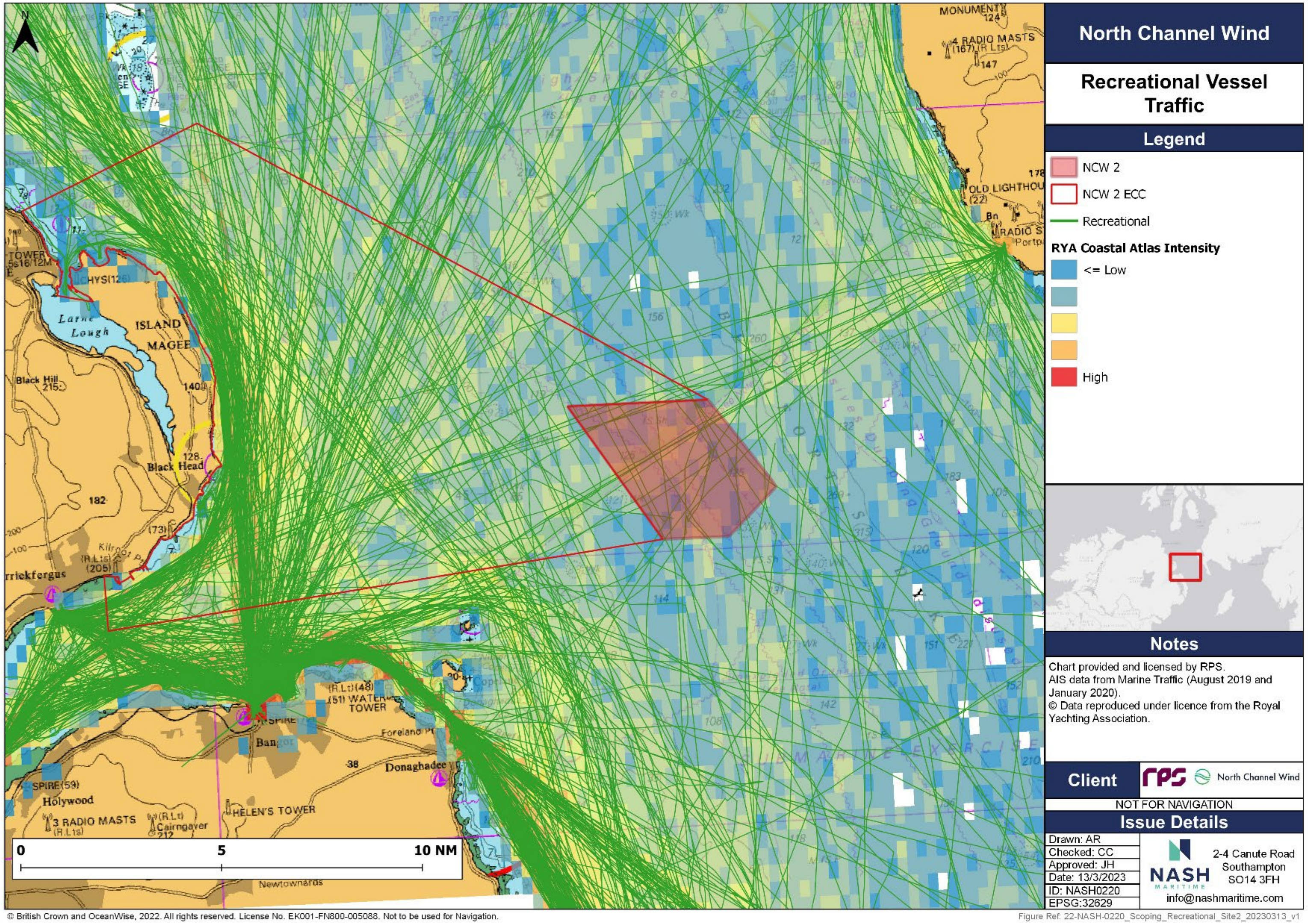

Figure 12.11: Recreational Vessel Traffic in Study Area

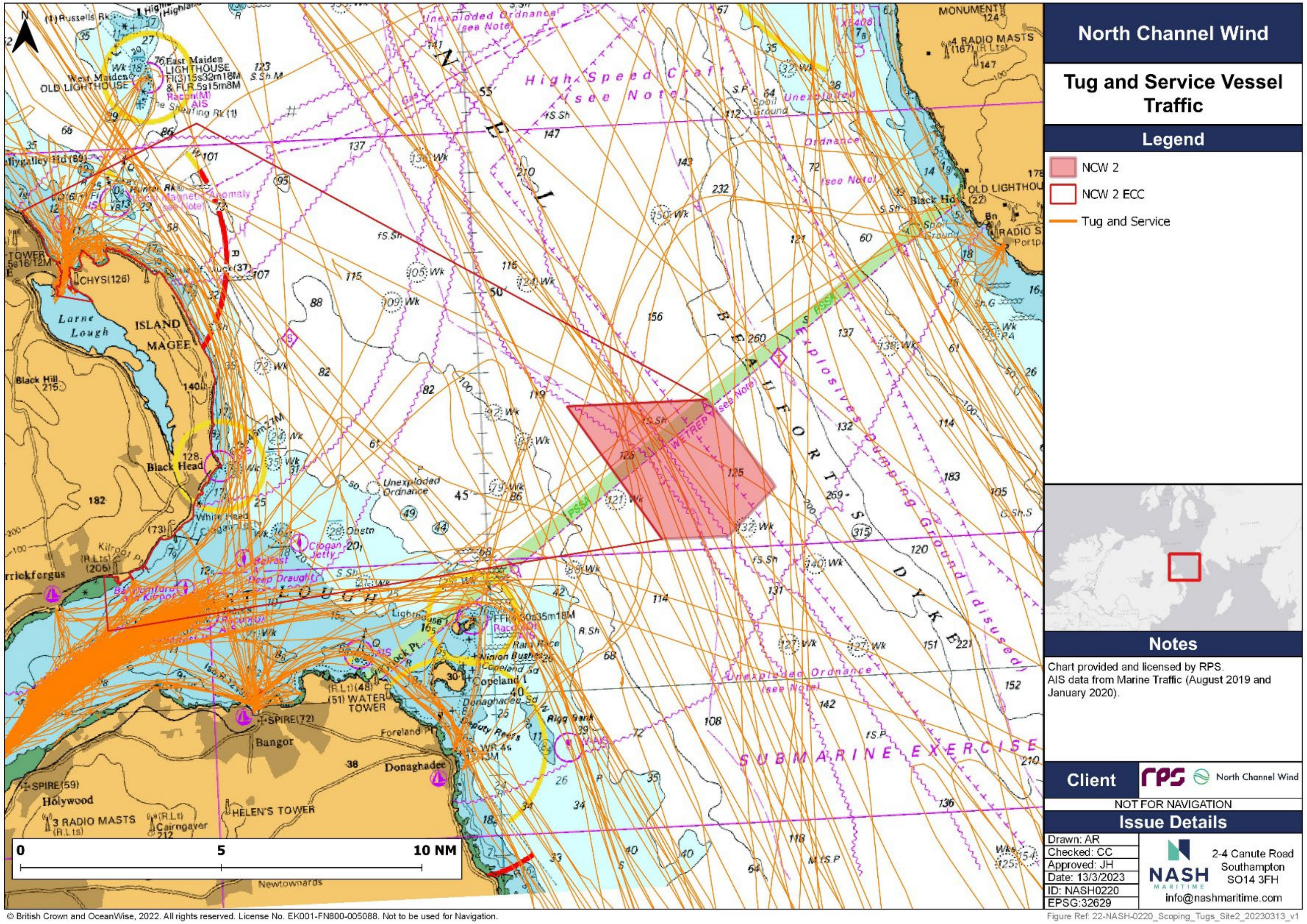

Figure 12.12: Tug and Service Vessel Traffic in Study Area

Marine Incidents

A total of 107 unique incidents were recorded in the MAIB database within 10 nm of the array area and 3 nm of the export cable corridor. Two collisions were reported within 3 nm of the cable corridor, one occurring within Carrickfergus Marina and the second in the approaches to Belfast, involving a ferry and cargo ship. One MAIB reported incident occurred within 1 nm of the array area, namely an engine failure on a Ro-Ro ferry.

The RNLI database identified 575 records within 10 nm of the array area and 3 nm of the export cable corridor. Of these, 493 (86%) involved responses to leisure vessels and 73 (13%) involved commercial craft. These incidents were mostly clustered inshore and within Belfast Lough.

Four RNLI reported incidents occurred within 1 nm of the array area, all of which involved mechanical issues with recreational craft. Incidents near to the array area are typically responded to by lifeboats from Donaghadee.

12.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 12.4 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

At this stage, no potential impacts to shipping and navigation have been scoped out of the assessment. A Navigation Risk Assessment (NRA) will be produced in compliance with MGN654, which will include additional collection, consultation and assessment, and will determine whether any of these impacts will be scoped out of the EIA.

Table 12.3: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Shipping and Navigation Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Increased Collision Risk due to Increased Activity	Y	Y	Y	Marine craft associated with the construction, operation and decommissioning of the project will be transiting to/from the area in all phases. There will be potential interaction with other vessels transiting the area which leads to an increased risk of collision.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Increased Collision Risk Due to Presence of Infrastructure	Y	Y	Y	The presence of the project will limit the available sea room for vessels to use when taking action to avoid collision. This means that there is potential for increased risk of collision between vessels navigating in the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA to assess the change in collision risk for vessels transiting the area.
Increased Contact Risk Due to Presence of Infrastructure	Y	Y	Y	Infrastructure in the area will create a risk of contact for either powered or drifting vessels transiting the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA for both powered and drifting vessels.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Increased Grounding Risk Due to Presence of Infrastructure	Y	Y	Y	Changes to vessel routeing as a result of the available infrastructure may lead to a potential increase in the risk of grounding.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Interference with Sea Lanes Essential to International Navigation	Y	Y	Y	The presence of the Project in relation to the existing sea lanes and the TSS in the North Channel will affect the routeing through the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the main routes will also be undertaken in the NRA.
Increased Risk of Collision for Vessels with Crossing Ferries	Y	Y	Y	The presence of infrastructure close to current ferry routes has the potential for loss of situational awareness of vessels, particularly close to the array areas. This may lead to increased risk of collision between coastal traffic and ferries that cross the general flow of vessel traffic.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Risk modelling will also be undertaken in the NRA to assess the change in collision risk for vessels transiting the area.
Increased Deviation of Commercial Vessels	Y	Y	Y	Commercial vessels will potentially be displaced from existing routes due to the presence of the Project.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
						and vessel safety for the main routes will also be undertaken in the NRA.
Impact on Fishing / Recreational Vessel Activity	Y	Y	Y	Fishing / recreational vessels may be displaced from their current routes due to the presence of infrastructure and activities associated with the Project.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the main routes will also be undertaken in the NRA.
Impact on Adverse Weather Routeing	Y	Y	Y	Ferry routes in the area vary based on the prevailing metocean conditions. The reduction in sea room associated with the Project has the potential to impact the weather routeing.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the adverse weather routes will be undertaken in the NRA.
Reduced Access into Ports and Harbours	Y	Y	Y	Access to local ports may be affected by the presence of the project and operations associated with it.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Reduction in Search and Rescue Capability	Y	Y	Y	The increase in vessel activity may result in an increase in incidents. This along with the potential for reduced access for SAR responders due to infrastructure may affect SAR capability.	Available incident data for the area and Department for Transport (DfT) SAR helicopter taskings for the area with used to characterise baseline incident rates.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Interference with Radar, Communications and Positioning Systems	Y	Y	Y	Communication and positioning systems may be affected by the presence of infrastructure.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Reduction in Under Keel Clearance	Y	Y	Y	Use of cable protection associated with the Project has the potential to reduce the available depth of water along the cable route. This would reduce the available under keel clearance for vessels transiting the area.	A dedicated vessel traffic survey will be required to characterise vessel movements in the area.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.
Risk of Snagging of Fishing Gear or Anchors	Y	Y	Y	The presence of cable, protection and other infrastructure associated with the project has the potential to increase the risk of snagging fishing gear or anchors.	A dedicated vessel traffic survey will be required to characterise fishing vessel transits and areas used for anchoring.	An NRA will be conducted including consultation with local and industry stakeholders to inform a formal risk assessment.

12.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The shipping and navigation EIA will follow the methodology set out in Chapter 3. Specific to the shipping and navigation EIA, the following guidance documents will also be considered:

- MGN654 Offshore Renewable Energy Installations (OREIs) – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021), including Annexes;
- Revised Guidelines for Formal Safety Assessment (FSA) (IMO, 2018);
- IALA G1162: The Marking of Offshore Man-Made Structures (IALA, 2021);
- The RYA's Position on Offshore Renewable Energy Developments: Wind Energy (RYA, 2019);
- PIANC WG161 Interaction Between Offshore Wind Farms and Maritime Navigation (PIANC, 2018);
- G+ IOER Good Practice Guidelines for Offshore Renewable Energy Developments (G+, 2019);
- The Shipping Industry and Marine Spatial Planning (Nautical Institute, 2013); and
- MGN372: OREIs: Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008).

The principal guidance for assessing impacts to shipping and navigation are described in MGN654 (MCA, 2021). Annex 1 to that document describes the methodology by which an NRA should be undertaken, including data collection and consultation requirements.

Two 14-day seasonally representative vessel traffic surveys will be undertaken to collect AIS, radar and visual data on all vessel movements. A longer-term AIS dataset for the study area and cable route will also be sought and other datasets where appropriate.

Consultation with key stakeholders will be used to inform the assessment. Meetings will be arranged either through teleconference or in-person to discuss activities in the study area and any potential impacts of the project on those activities. The list of consultees will likely include:

- Maritime and Coastguard Agency (MCA);
- Commissioners of Irish Lights (CIL);
- Northern Lighthouse Board (NLB);
- Chamber of Shipping;
- Ports and harbours (including Belfast Harbour Commissioners and Larne);
- Ferry operators (Stena Line, Isle of Man Steampacket Company, P&O);
- Royal National Lifeboat Institute (RNLI);
- Royal Yachting Association (RYA);
- Local yacht clubs;
- Local fishing organisations; and
- Commercial regular runners.

As per the MGN, the NRA will follow the IMO's FSA methodology, an internationally recognised approach for conducting maritime risk assessments. Hazards will be identified, and their likelihood and consequence scored to produce a risk score. Where necessary, risk controls will be identified in order to mitigate any unacceptable risks and reduce the risks to As Low as Reasonably Practicable (ALARP). This will be presented in the form of a hazard log and used to inform the EIA Impact Assessment.

12.3.6 POTENTIAL CUMULATIVE EFFECTS

There are potential cumulative effects as a result of the development on shipping and navigation receptors. A search area consisting of the northern Irish Sea up to 30nm from the development area will be screened to identify cumulative projects. By following MGN654 guidance, impacts assessed within the NRA will be considered both in isolation and in combination with other cumulative developments.

12.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

This section describes transboundary impacts which may arise from shipping and navigation due to the construction, operation and maintenance, and decommissioning from the Proposed Development.

There is the potential for transboundary impacts upon shipping and navigation due to construction, operational and maintenance, and decommissioning impacts of the Proposed Development. These include:

- Increased Collision Risk due to Increased Activity
- Increased Collision Risk Due to Presence of Infrastructure
- Increased Contact Risk Due to Presence of Infrastructure
- Increased Grounding Risk Due to Presence of Infrastructure
- Interference with Sea Lanes Essential to International Navigation
- Increased Risk of Collision for Vessels with Crossing Ferries
- Increased Deviation of Commercial Vessels
- Impact on Fishing / Recreational Vessel Activity
- Impact on Adverse Weather Routeing
- Reduced Access into Ports and Harbours
- Reduction in Search and Rescue Capability
- Interference with Radar, Communications and Positioning Systems
- Reduction in Under Keel Clearance
- Risk of Snagging of Fishing Gear or Anchors

12.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Shipping and Navigation?
- Do you agree that all receptors and impacts have been identified for Shipping and Navigation?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

13. AVIATION, MILITARY AND COMMUNICATIONS

13.1 DATA SOURCES

A number of sources were consulted in order to inform the aviation and radar section of the EIA Scoping Report and will be used to inform the EIA. These are summarised in Table 13.1.

In addition to existing data, the assessment will be informed through desk studies and potential computer modelling, including radar line of sight analysis. Other supporting data will be obtained from stakeholder consultation.

Table 13.1: Summary of key desktop datasets and reports

Title	Source	Year	Author
Visual Flight Rules (VFR) Data	NATS VFR Chart	2020	NATS
Search and Rescue (SAR) Locations	The Bristow Group	2021	The Bristow Group
Meteorological radar sites	The Met Office	2020	NATS
Helicopter Main Routes (HMRs)	NATS En-Route charting	2019	NATS
Aerodromes and Ground Aids (AGA), Surveillance Radars, Navigational Aid areas	NATS Safeguarding	2012	NATS
Air navigation characterisations	UK Aeronautical Information Publication	2021	NATS
Airfields	UK General Aviation (UKGA) Environmental Systems Research Institute (ESRI) Ordnance Survey Open Data	2022 2015 2021	UKGA ESRI Ordnance Survey
Military Practice and Exercise Areas (PEXAs)	Oceanwise	2021	Emapsite
Offshore platforms and consultation zones	Oil and Gas Authority	2021	Oil and Gas Authority

13.2 NCW 1 PROJECT

13.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of aviation, military and communications of relevance to the proposed North Channel Wind 1 (NCW 1) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on aviation, military and communications receptors.

13.2.2 STUDY AREA

For the purposes of identifying aviation and radar receptors for the North Channel Wind Proposed Developments a broad study area has been defined. The Aviation and Radar Study Area for the generation assets is presented in Figure 13.1 and is described as the airspace created when joining the following points:

- Mount Stuart, on the coastline on Western side of Isle of Bute, Scotland (55°47.561'N, 5°0.786' W);
- South Ayrshire, Scotland, approximately 1.5km Southwest of village of Straiton (55°18.284' N, 4°34.353' W);
- The South of Isle of Man, approximately 5 km Southeast of Dreswick Point (54°1.549' N, 4° 34.312' W);
- County Tyrone, Northern Ireland (54°28.292'N, 6°44.599'W), approximately 4km South of Dungannon; and
- the coastline at Laggan Bay on Western side of the Isle of Islay (55°42.817' N, 6°18.431' W), approximately 5km south of Bowmore.

This area has been defined to include the aviation radar systems (National Air Traffic Services (NATS) Navigation Aids) over Belfast, airfields and helicopter stations near to the Proposed Development and military features such as Military Practice and Exercise Areas (PEXAs).

This area has been defined to include the aviation radar systems that could potentially detect the maximum wind turbine blade tip height within the Array Area and to encompass other relevant aviation receptors in proximity to the Proposed Development.

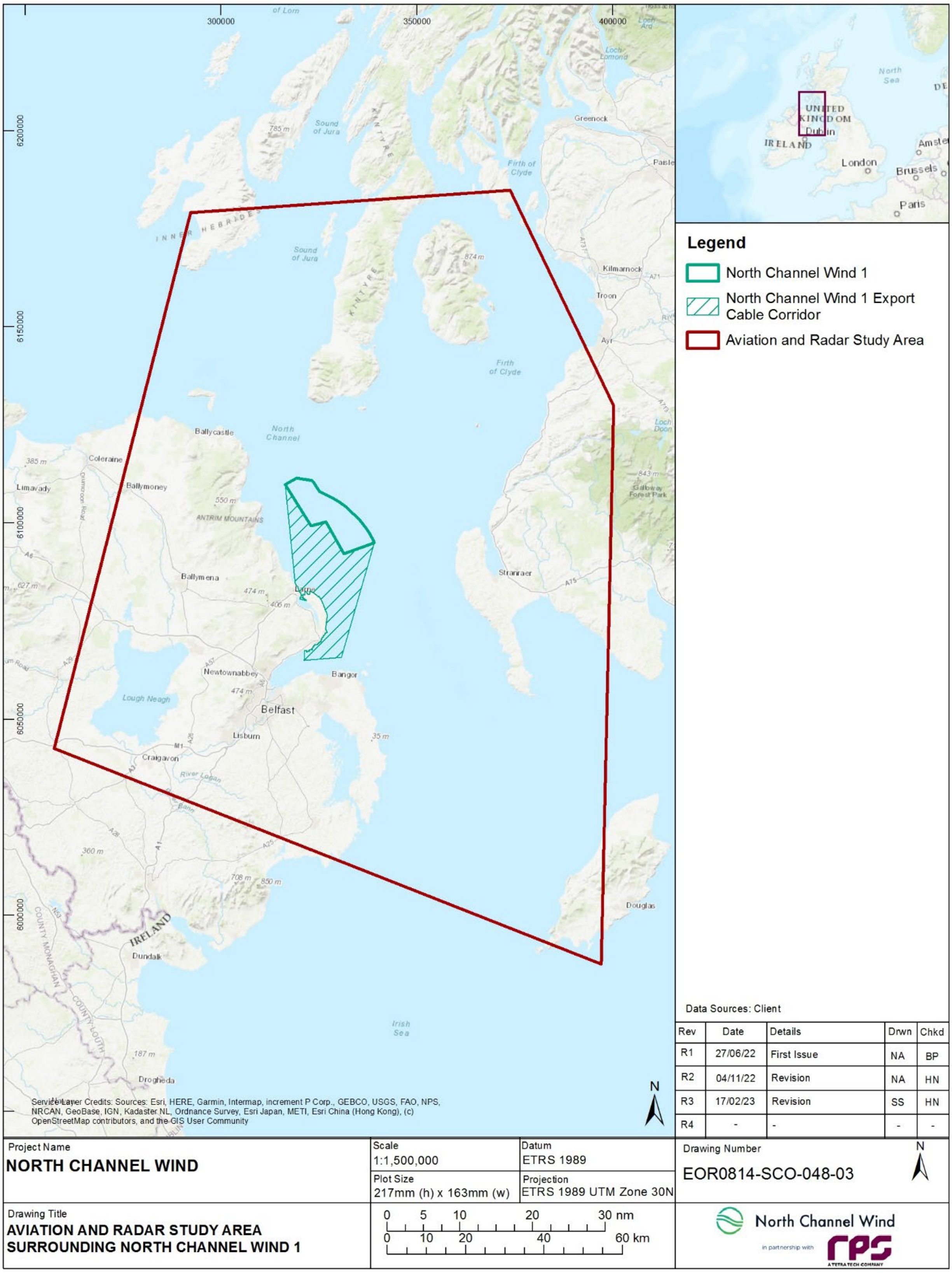

Figure 13.1: The Aviation and Radar Study Area for North Channel Wind 1 Proposed Development

13.2.3 BASELINE ENVIRONMENT

Airspace

The airspace within, above and surrounding the North Channel Wind Proposed is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

- Class G uncontrolled airspace: any aircraft can operate in an area of uncontrolled airspace without any mandatory requirement to be in communication with Air Traffic Control (ATC). Pilots of aircraft operating under VFR in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain and obstructions; or
- Class C and D Controlled airspace: all aircraft operating in this airspace must be in receipt of an Air Traffic Service (ATS).

The majority of the airspace above the North Channel Wind Proposed Development and within the Aviation and Radar Study area is within Class G uncontrolled airspace, established from the surface to Flight Level (FL) 195 (approximately 19,500 feet (ft)). Class G airspace covers the entire array area, however above FL 195, Class D controlled airspace is established over the southern parts of the cable routes (Figure 13.2). Class D airspace is for Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flying, and an Air Traffic Control (ATC) clearance is needed and compliance with ATC instructions is mandatory. Control areas around aerodromes are typically class D and a speed limit of 250 knots applies if the aircraft is below FL 100 (10,000 feet). A strip of Class E airspace is located from the Scottish coast towards Campbeltown airport. Class E airspace is for IFR and VFR use. IFR aircraft require ATC clearance and compliance with ATC instructions is mandatory for separation purposes. VFR traffic does not require clearance to enter class E airspace.

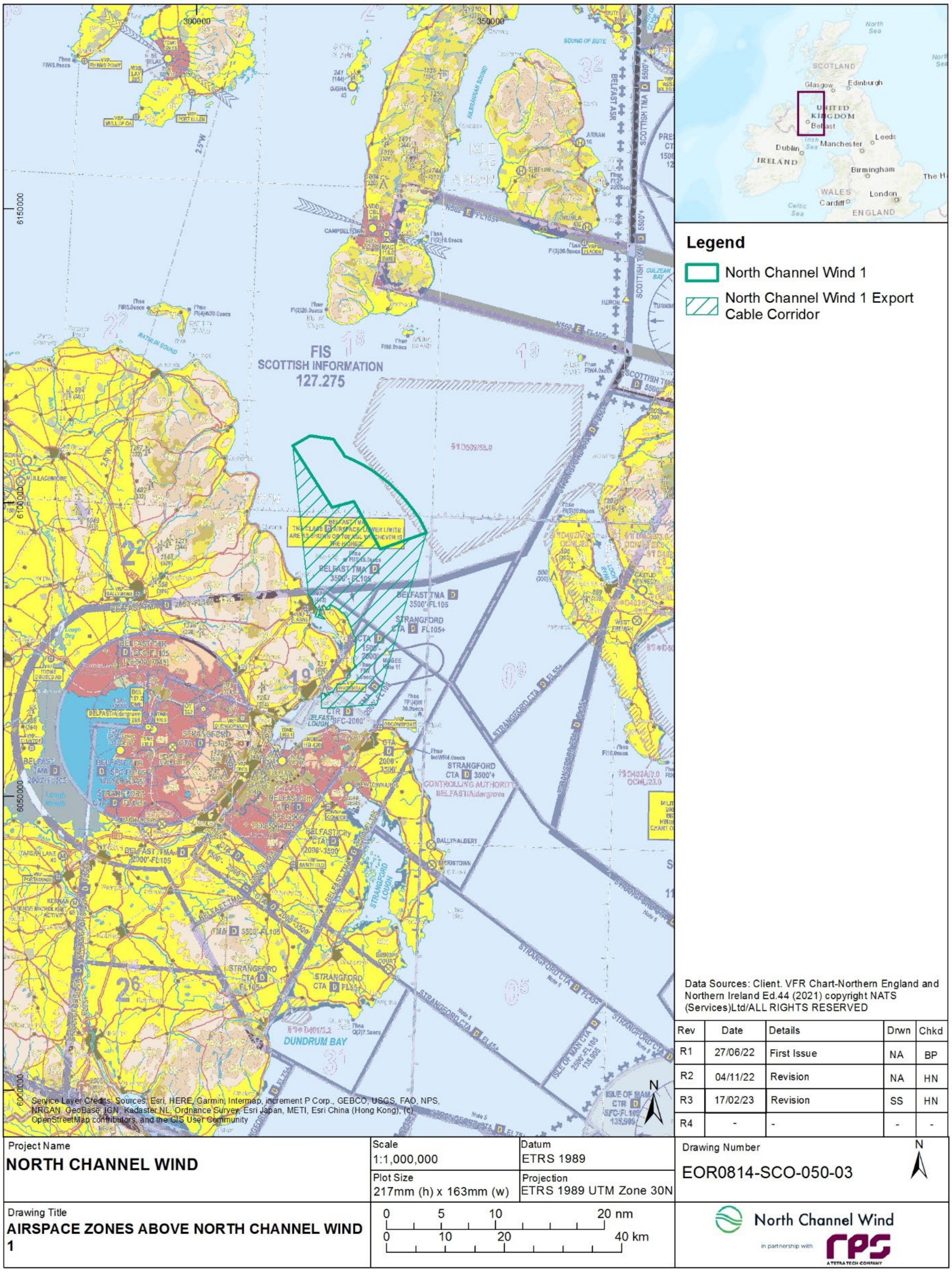

Figure 13.2: Airspace above the North Channel Wind 1

Civil Aviation

Helicopter Main Routes (HMRs) support the transport of personnel and equipment to offshore oil and gas installations. HMRs are routes typically and routinely flown by helicopters operating to and from offshore destinations and are promulgated for the purpose of signposting concentrations of helicopter traffic to other airspace users. HMR promulgation does not predicate the flow of helicopter traffic. Whilst HMRs have no airspace status and assume the background airspace classification within which they lie (in the case of Aviation and Radar Study Area, Class G), they are used by the Air Navigation Service Provider (ANSP) and helicopter operators for flight planning and management purposes. Civil Aviation Publication (CAP) 764 CAA Policy and Guidance on Wind Turbines (Civil Aviation Authority (CAA), 2016) states that HMRs have no defined lateral dimensions (only route centrelines are charted on navigation charts) and that 2nm either side of the route centreline should be kept obstacle free (CAA, 2016). No HMRs cross the Proposed Development.

Seven airfields are located in the Aviation and Radar Study Area (Figure 13.3). In the north-west of the Aviation and Radar study area, approximately 90km from the Proposed Development, Islay airport is also located in an aerodrome consultation Zone (Class G). Bute Airport is located in north-east of the Aviation and Radar Study Area (85.07 km from the Proposed development). Campbeltown airport, 36.64 km north of the Proposed development, has enroute navigational aids (NATS navigational aids) and aerodrome consultation zones- (Class G). Turnberry Airport is located 64.31 km north-east of the Proposed Development. Near Stranraer, 32.4 km east of the Proposed Development, lies civil airports Castle Kennedy and West Freugh airports, with West Freugh lying within primary surveillance radar site and en-route navigational aids. Approximately 114.58 km to the south-east of the Proposed Development, lies the Isle of Man Airport by Castletown.

Aerodrome consultation zones within the Aviation and Radar Study Area includes Ronaldsway Airport, Glasgow Prestwick Airport, Campbeltown Airport, Islay Airport, Belfast International Airport and Belfast City Airport.

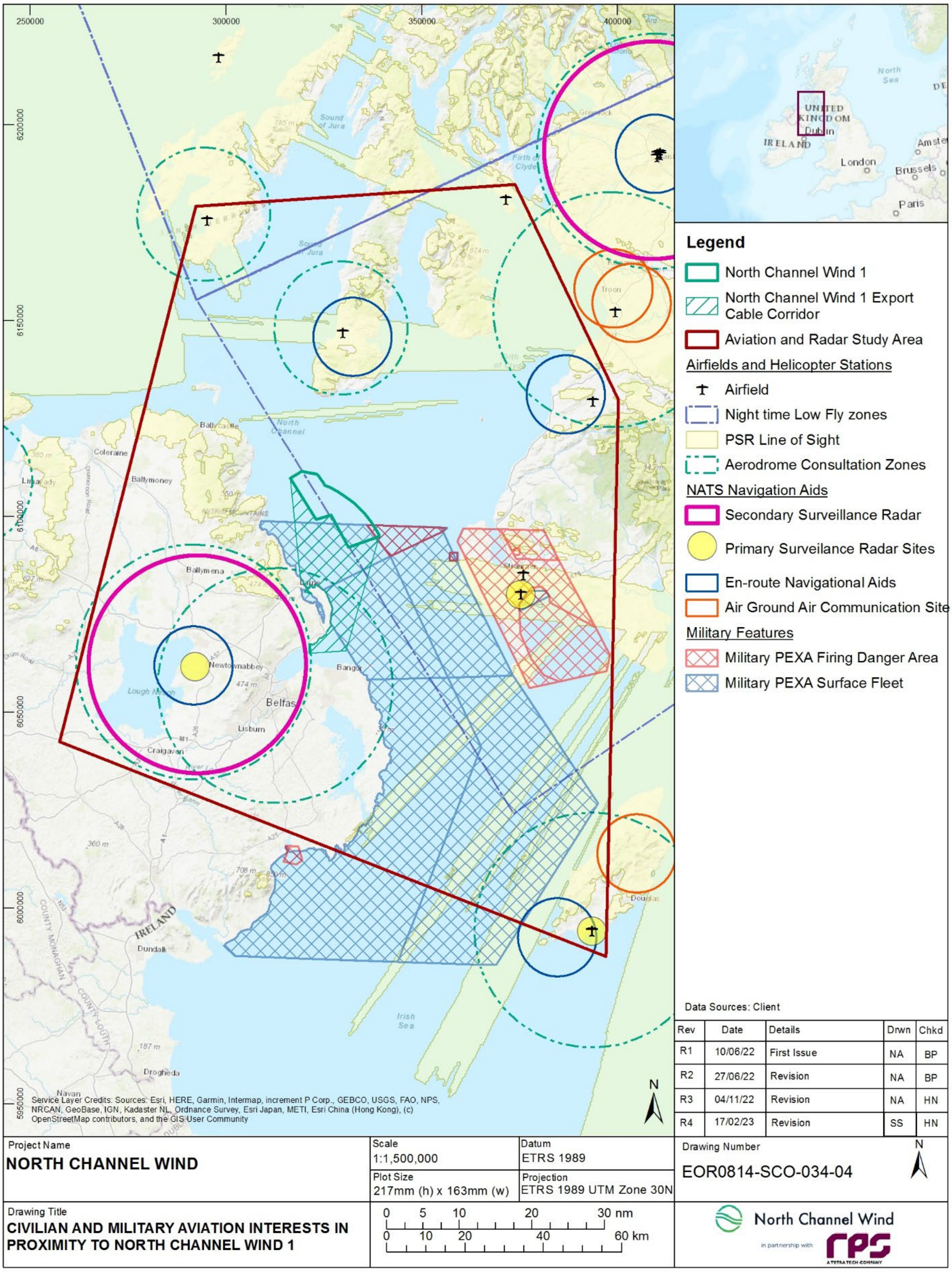

Figure 13.3: Civilian and military aviation interests in the Aviation and Radar Study Area over North Channel Wind 1

Oil and Gas Platform Access

In order to maintain a safe operating environment, the CAA recommend a consultation zone of 9nm radius around offshore installations serviced by helicopters (CAA, 2016). This consultation zone is not considered a prohibition on development, but a trigger for consultation between offshore helicopter operators, the operators of existing installations and developers of proposed offshore wind farms, in order to determine a solution that maintains safe offshore helicopter operations. A 9nm consultation zone should also be a trigger for consultation with the operators of any subsea infrastructure and wells where mobile drilling rigs or vessels may require helicopter access.

There are no oil and gas platforms within the Aviation and Radar Study Area.

Civil and Military Radar

UK airspace and air traffic surveillance and management infrastructure is comprised of the following systems which may be affected by the detection and proximity of wind turbines:

- Primary Surveillance Radar (PSR); and
- Secondary Surveillance Radar (SSR).

Radar detection of a rotating wind turbine by a PSR may create reflections from both stationary and moving elements: these provide different challenges for the radar. While the reflected radar signal from stationary elements, such as the tower, can be removed using stationary clutter filters in the radar processor, rotating wind turbine blades can impart a Doppler shift to any radar energy reflecting off the blades. Doppler shifts are used by a number of radars to differentiate between moving objects, namely aircraft, and stationary terrain with the latter being processed out and not displayed to the operator. The radar may therefore detect Doppler returns from moving wind turbine blades and display them as radar clutter on the radar screen. Furthermore, at sites with more than one turbine, the radar may illuminate a blade or blades from one turbine on one antenna sweep, then illuminate the blades of a different turbine on the next sweep. This can create the appearance on the radar screen of returns moving about within the area of the wind farm, sometimes described as a ‘twinkling’ appearance or ‘blade flash effect’. These moving returns can appear very similar to those that would be produced by a light aircraft. The appearance of multiple false targets in close proximity can trick the radar processor into initiating false aircraft tracks. False PSR returns can also ‘seduce’ real aircraft tracks away from their true returns as the radar attempts to update an aircraft track using the false return. This can lead to degradation of radar tracking capability (CAA, 2016). Within the Aviation and Radar Study Area, NATS operate PSRs located at West Freugh Airfield and Isle of Man Airport.

CAP 764 states that wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the wind turbines and the wind farm. These effects are typically only a consideration when the wind turbines are located very close to the SSR (i.e., less than 10km). There are no SSR radar systems within 10km of the North Channel Wind Proposed Development array area, but there is one located in the Aviation and Radar Study Area to the west of Belfast which may potentially lie within 10km of cable routes, dependent upon route selection.

Four en-route navigational aides are identified in the Aviation and Radar Study Area, and one air-ground air communication site.

Met Office Stations

The Statement of the European Union Meteorological Network Operational Programme for the Exchange of weather Radar information (OPERA) Group, on the cohabitation between meteorological weather radars and wind turbines, states that the deployment of wind turbines within 5 km of weather radar is prohibited (OPERA, 2009). The Meteorological (Met) Office radar infrastructure is safeguarded by the Met Office. The Met office works to wind turbine safeguarding guidelines that stipulate a 20 km separation between any development and a weather radar system. The closest Met office radar sites to the Proposed Development is Castor Bay but is not within the Aviation and Radar Study Area.

Airborne Search and Rescue Operations

The SAR helicopter force provides constant SAR cover in the UK from ten bases located across the UK. The bases are positioned close to SAR hotspots so aircraft can provide support as quickly and efficiently as possible. Bristow Helicopters was awarded the contract to provide helicopter SAR services for the UK in 2013, with the closest SAR base to the Proposed Development area being at Caernarfon Airport, Gwynedd, 222 km away.

Military Practice and Exercise Area

A military practice and exercise area (PEXA) is land set aside specifically to enable military forces to train and exercise for combat. Within the Aviation and Radar Study Area, there are several military PEXA Firing Danger Areas and military PEXA surface fleet areas. D402A Luce Bay is located to the south-east of the Proposed Development and is a danger area from Surface to 35,000 feet, whilst D509 Campbeltown is a managed danger area from Surface to 55,000 feet which overlaps with the eastern edge of the Proposed development array area, and designated for the use of ordinance, munitions, explosives and unmanned aircraft. D509 is primarily operated by the Royal Navy. There are several surface fleet areas which span the southern half of the Aviation and Radar Study Area towards the Isle of Man, which is used by the Royal Navy (submarine base, jetties and exercise areas).

13.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on aviation, military and communication receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the assessment are outlined in Table 13.2 together with a description of any additional data collection and supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline information currently available, potential impacts to be scoped out of the assessment are presented in Table 13.3 with justification.

Table 13.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Aviation, Military and Communications Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Creation of physical obstacles to aircraft operations.	✓	✓	✓	Construction and decommissioning infrastructure and the presence of wind turbines within the Proposed development may impinge on the routing of aircraft operating at low level in the vicinity of the array areas.	Consultation with airspace users to understand current airspace usage and potential for impact.	Qualitative assessment informed by consideration of the outcomes of consultation and taking into account the extant rules of the air.
Obstruction to SAR helicopter operations.	✓	✓	✓	The presence of infrastructure (and associated construction equipment) within a previously open sea area may cause an obstruction to SAR operations	Consultation will be carried out with SAR operators and the Maritime and Coastguard Agency (MCA) to understand requirements and to inform the assessment.	Qualitative assessment based on industry guidance informed through review of the project description against the outcomes of consultation with SAR operators and the MCA.

Table 13.3: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Aviation, Military and Communications

Impact	Justification
Construction	
Increased helicopter traffic to and from the Proposed Development may affect available airspace for other users.	The Proposed Development may require helicopter operations during the construction, operation and maintenance and decommissioning phases, which may affect the available airspace for other users. The majority of the airspace above the North Channel Wind Proposed Development (including the array area) and within the Aviation and Radar Study area is within Class G uncontrolled airspace, established from the surface to Flight Level (FL) 195 (approximately 19,500 feet (ft)). Control areas around aerodromes are typically class D and a speed limit of 250 knots applies if the aircraft if below FL 100 (10,000 feet). This, together with the availability of an air traffic service, will remove aviation traffic risk therefore it is proposed that this impact is scoped out of the EIA.
Disruption to meteorological radar.	The Met Office publish defined consultation zones for each meteorological radar system; the Proposed development is outside of these consultation zones and therefore it is proposed that this impact is scoped out of the EIA.
Impacts to SSR systems.	The CAA (2016) state that impact to SSR systems may be prevalent if wind turbines are located within 10km of the radar source; there are no SSR systems within 10km of the Proposed Development therefore it is proposed that this impact is scoped out of the EIA
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	The Proposed Development does not overlap with any 9nm consultation zones of oil and gas platforms. Therefore, the presence of physical obstructions in proximity to the airspace utilised by helicopters operating to and from oil and gas platforms is unlikely to disrupt helicopter operations to and from platforms.

Impact	Justification
Operation and Maintenance	
Potential interference to the NATS PSRs.	The array area does not directly overlap with any PSRs and therefore it is proposed that this impact is scoped out of the EIA.
Disruption to meteorological radar.	As for construction.
Increased helicopter traffic to and from the Proposed development may affect available airspace for other users.	As for construction.
Impacts to SSR systems.	As for construction.
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	As for construction.
Decommissioning	
Increased helicopter traffic to and from the Proposed development may affect available airspace for other users.	As for construction and operation and maintenance.
Disruption to meteorological radar.	As for construction and operation and maintenance.
Impacts to SSR systems.	As for construction and operation and maintenance.
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	As for construction and operation and maintenance.

The following measures adopted as part of the project are relevant to aviation and radar. These measures may evolve as the engineering design and the EIA progresses.

- Appropriate lighting and marking of wind turbines will be established in accordance with CAA regulations and guidance (CAA, 2016; 2021) and in consultation with the CAA and the Defence Infrastructure Organisation (DIO);
- Prior to the start of construction and decommissioning, the UK Hydrographic Office (UKHO) will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of activities, and the maximum height of any equipment to be used, to allow inclusion on Aviation Charts;
- The DIO will be informed of the construction start and end dates; the maximum height of construction equipment; and the latitude and longitude of each wind turbine;
- A minimum spacing of 500 m shall be maintained between blade tip to blade tip of all surface infrastructure. This is to facilitate access by SAR helicopters operating under Instrument Meteorological Conditions (IMC) flight rules, in line with MCA guidance (MCA, 2021b);
- Development of, and adherence to, an Emergency Response and Cooperation Plan (ERCoP), including consideration of helicopters undertaking SAR operations; and
- The North Channel Wind Project operator will issue, as necessary, requests to the UK Aeronautical Information Service to submit Notice to Airmen (NOTAM) in the event of any failure of aviation lighting.

The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

13.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The aviation, military and communications EIA will follow the methodology set out in Chapter 3. Specific to the aviation, military and communications EIA, the following guidance documents will also be considered:

- CAP 393: Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 (CAA, 2021);
- CAP 764: CAA Policy and Guidelines on Wind Turbines, Sixth Edition (CAA, 2016);
- CAP 670: Air Traffic Services Safety Requirements, Third Issue Amendment 1/2019 (CAA, 2019);
- OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response, MGN 654 (M+F) (MCA, 2021a); and
- Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response (MCA, 2021b).

13.2.6 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea where projects or activities could act collectively with the Proposed Development to affect aviation and radar receptors. The cumulative assessment will consider the maximum design scenarios for each of the identified projects or activities.

The following projects or activities will be considered within the Aviation and Radar study area:

- Other offshore wind farms; and
- Other infrastructure projects (e.g., cables and pipelines).

The cumulative effects assessment will follow the approach outlined in section 4 of the scoping report.

13.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

13.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Aviation, Military and Communications?
- Do you agree that all receptors and impacts have been identified for Aviation, Military and Communications?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

13.3 NCW 2 PROJECT

13.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of aviation, military and communications of relevance to the Proposed Development (North Channel Wind 2 – south site) and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on aviation, military and communications receptors.

13.3.2 STUDY AREA

For the purposes of identifying aviation and radar receptors for the North Channel Wind Proposed Developments a broad study area has been defined. The Aviation and Radar Study Area for the generation assets is presented in Figure 13.4 and is described as the airspace created when joining the following points:

- Mount Stuart, on the coastline on Western side of Isle of Bute, Scotland (55°47.561'N, 5°0.786' W);
- South Ayrshire, Scotland, approximately 1.5km Southwest of village of Straiton (55°18.284' N, 4°34.353' W);
- The South of Isle of Man, approximately 5 km Southeast of Dreswick Point (54°1.549' N, 4° 34.312' W);
- County Tyrone, Northern Ireland (54°28.292'N, 6°44.599'W), approximately 4km South of Dungannon; and
- the coastline at Laggan Bay on Western side of the Isle of Islay (55°42.817' N, 6°18.431' W), approximately 5km South of Bowmore.

This area has been defined to include the aviation radar systems that could potentially detect the maximum wind turbine blade tip height (see Chapter 2 Proposed Development) Wind turbines, of the EIA Scoping Report) within the Array Area and to encompass other relevant aviation receptors in proximity to the Proposed Development.

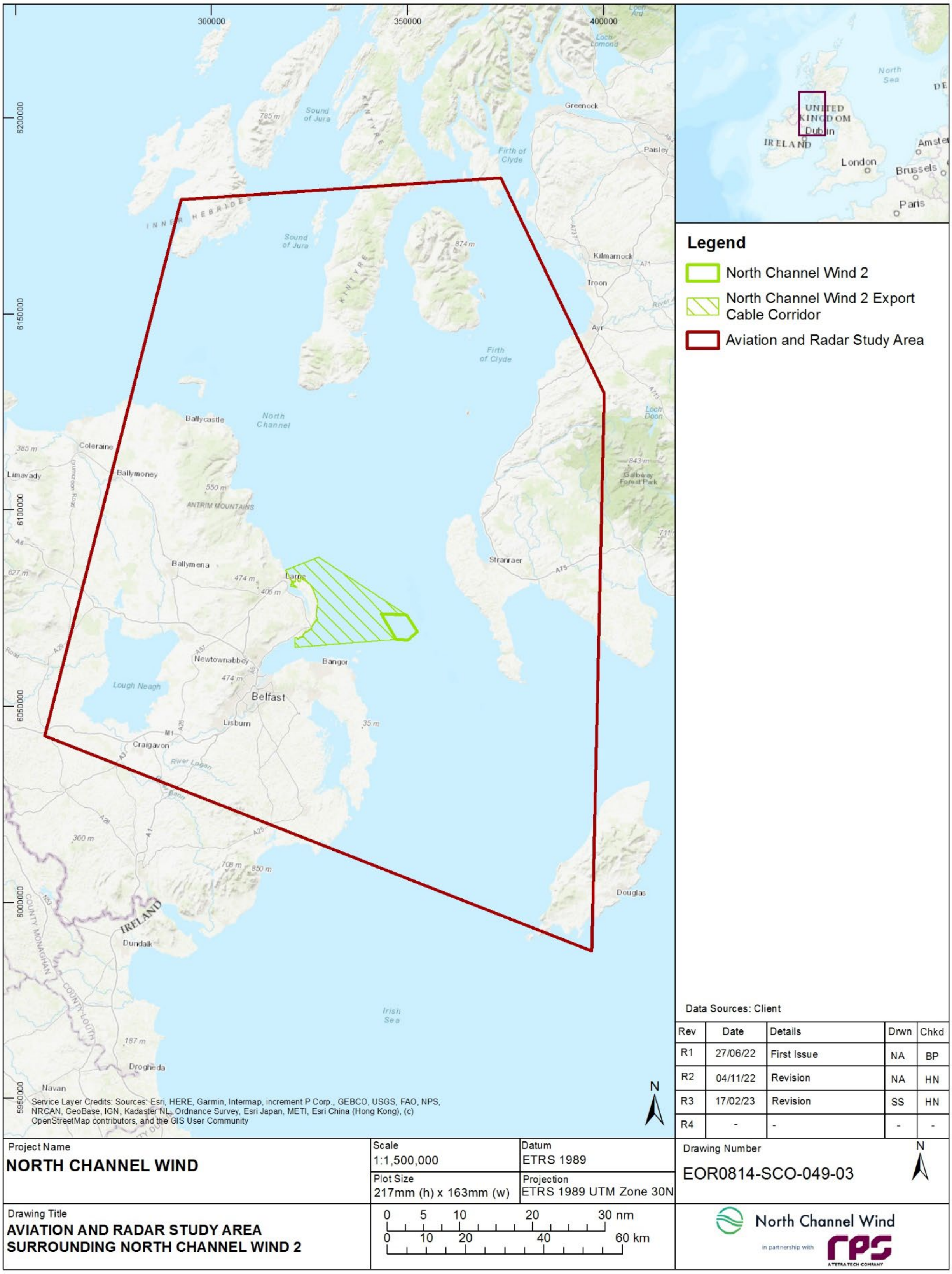

Figure 13.4: The Aviation and Radar Study Area for North Channel Wind 2 Proposed Development

13.3.3 BASELINE ENVIRONMENT

Airspace

The airspace within, above and surrounding the North Channel Wind Proposed Development (Figure 13.5) is used by both military and civil registered aircraft which observe the airspace rules dependent on the classification of airspace they are operating in as follows:

- Class G uncontrolled airspace: any aircraft can operate in an area of uncontrolled airspace without any mandatory requirement to be in communication with Air Traffic Control (ATC). Pilots of aircraft operating under VFR in Class G airspace are ultimately responsible for seeing and avoiding other aircraft, terrain and obstructions; or
- Class C and D Controlled airspace: all aircraft operating in this airspace must be in receipt of an Air Traffic Service (ATS).

The majority of the airspace above the North Channel Wind Proposed Development and within the Aviation and Radar Study area is within Class G uncontrolled airspace, established from the surface to Flight Level (FL) 195 (approximately 19,500 feet (ft)). Class G airspace covers the entire array area, however above FL 195, Class D controlled airspace is established the array areas and cable routes (Figure 13.5). Class D airspace is for Instrument Flight Rules (IFR) and Visual Flight Rules (VFR) flying, and an Air Traffic Control (ATC) clearance is needed and compliance with ATC instructions is mandatory. Control areas around aerodromes are typically class D and a speed limit of 250 knots applies if the aircraft is below FL 100 (10,000 feet). A strip of Class E airspace is located from the Scottish coast towards Campbeltown airport. Class E airspace is for IFR and VFR use. IFR aircraft require ATC clearance and compliance with ATC instructions is mandatory for separation purposes. VFR traffic does not require clearance to enter class E airspace.

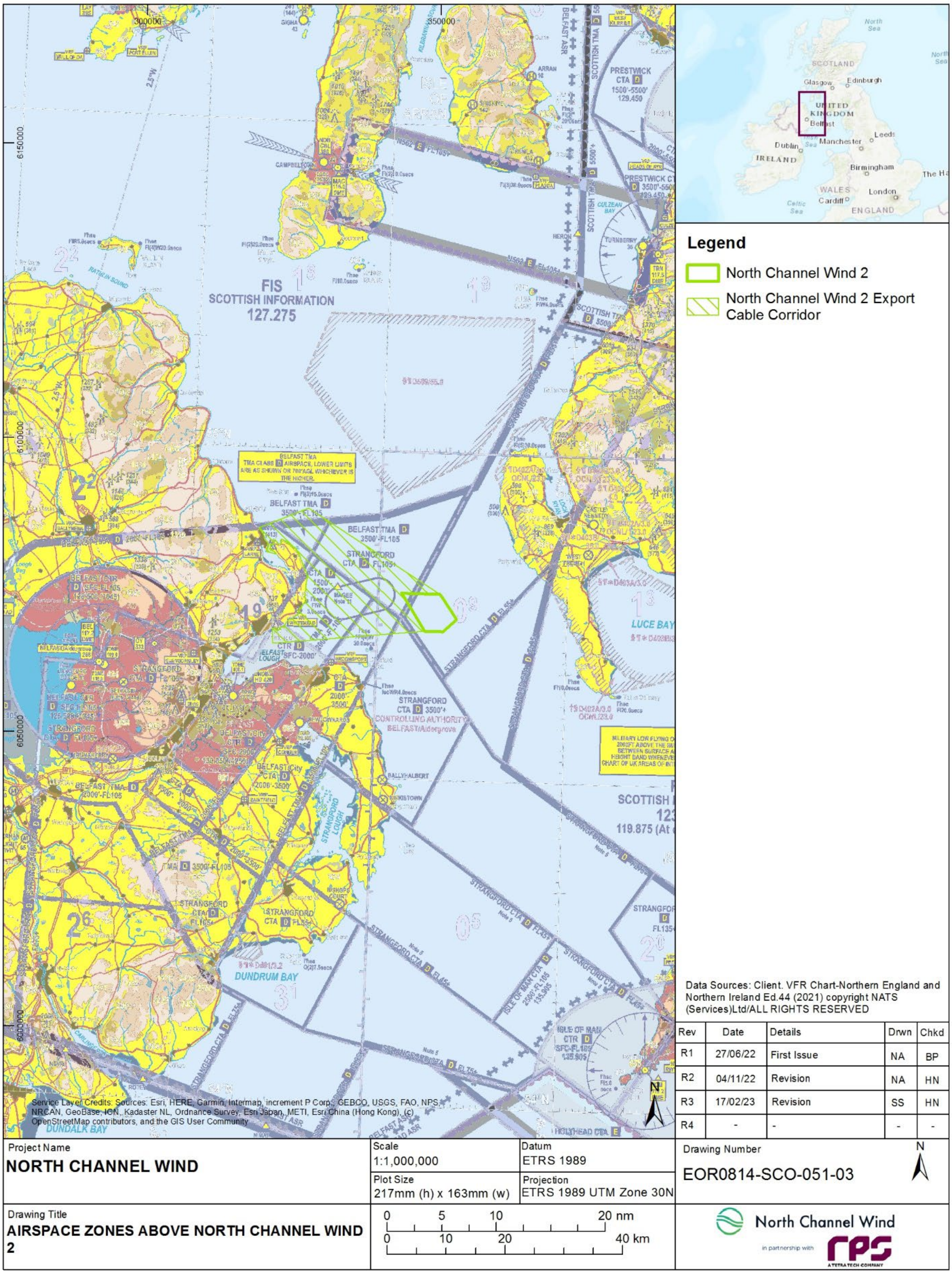

Figure 13.5: Airspace above the North Channel Wind 2.

Civil Aviation

Helicopter Main Routes (HMRs) support the transport of personnel and equipment to offshore oil and gas installations. HMRs are routes typically and routinely flown by helicopters operating to and from offshore destinations and are promulgated for the purpose of signposting concentrations of helicopter traffic to other airspace users. HMR promulgation does not predicate the flow of helicopter traffic. Whilst HMRs have no airspace status and assume the background airspace classification within which they lie (in the case of Aviation and Radar Study Area, Class D), they are used by the Air Navigation Service Provider (ANSP) and helicopter operators for flight planning and management purposes. Civil Aviation Publication (CAP) 764 CAA Policy and Guidance on Wind Turbines (Civil Aviation Authority (CAA), 2016) states that HMRs have no defined lateral dimensions (only route centrelines are charted on navigation charts) and that 2nm either side of the route centreline should be kept obstacle free (CAA, 2016). No HMRs cross the Proposed Development.

Seven airfields are located in the Aviation and Radar Study Area (Figure 13.6). In the north-west of the Aviation and Radar study area, approximately 90km from the Proposed Development, Islay airport is also located in an aerodrome consultation Zone (Class G). Bute Airport is located in north-east of the Aviation and Radar Study Area (109.81 km from the Proposed development). Campbeltown airport, 74.56 km north of the Proposed development, has en-route navigational aids (NATS navigational aids) and aerodrome consultation zones- (Class G). Turnberry Airport is located 71.18 km north-east of the Proposed Development. Near Stranraer, 24.61 km east of the Proposed Development, lies civil airports Castle Kennedy and West Freugh airports, with West Freugh lying within primary surveillance radar site and en-route navigational aids. Approximately 84.88 km to the south-east of the Proposed development, lies the Isle of Man Airport by Castletown.

Aerodrome consultation zones within the Aviation and Radar Study Area includes Ronaldsway Airport, Glasgow Prestwick Airport, Campbeltown Airport, Islay Airport, Belfast International Airport and Belfast City Airport.

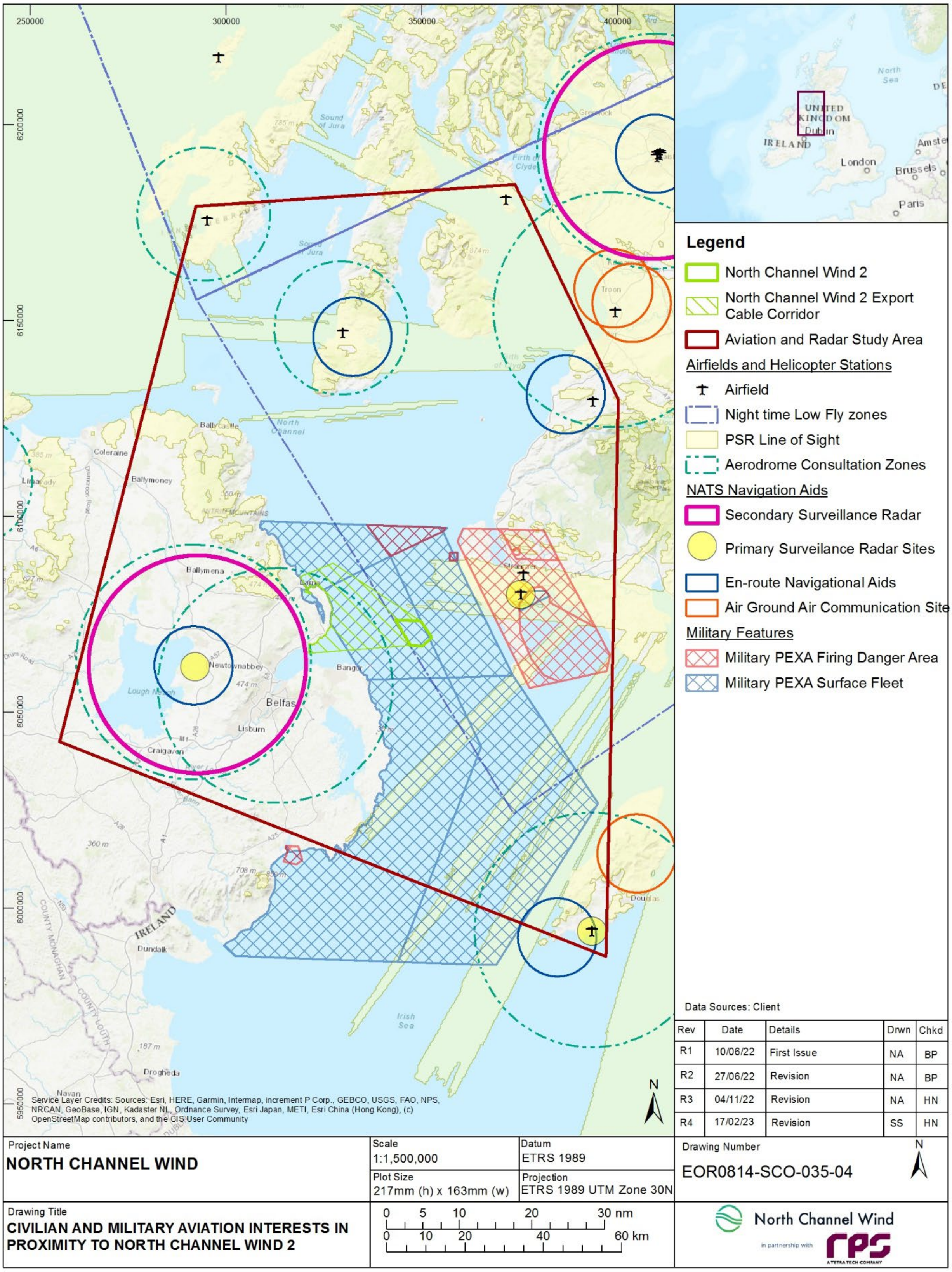

Figure 13.6: Civilian and military aviation interests in the Aviation and Radar Study Area over North Channel Wind 2

Oil and gas platform access

In order to maintain a safe operating environment, the CAA recommend a consultation zone of 9nm radius around offshore installations serviced by helicopters (CAA, 2016). This consultation zone is not considered a prohibition on development, but a trigger for consultation between offshore helicopter operators, the operators of existing installations and developers of proposed offshore wind farms, in order to determine a solution that maintains safe offshore helicopter operations. A 9nm consultation zone should also be a trigger for consultation with the operators of any subsea infrastructure and wells where mobile drilling rigs or vessels may require helicopter access.

There are no oil and gas platforms within the Aviation and Radar Study Area.

Civil and military radar

UK airspace and air traffic surveillance and management infrastructure is comprised of the following systems which may be affected by the detection and proximity of wind turbines:

- Primary Surveillance Radar (PSR)
- Secondary Surveillance Radar (SSR).

Radar detection of a rotating wind turbine by a PSR may create reflections from both stationary and moving elements: these provide different challenges for the radar. While the reflected radar signal from stationary elements, such as the tower, can be removed using stationary clutter filters in the radar processor, rotating wind turbine blades can impart a Doppler shift to any radar energy reflecting off the blades. Doppler shifts are used by a number of radars to differentiate between moving objects, namely aircraft, and stationary terrain with the latter being processed out and not displayed to the operator. The radar may therefore detect Doppler returns from moving wind turbine blades and display them as radar clutter on the radar screen. Furthermore, at sites with more than one turbine, the radar may illuminate a blade or blades from one turbine on one antenna sweep, then illuminate the blades of a different turbine on the next sweep. This can create the appearance on the radar screen of returns moving about within the area of the wind farm, sometimes described as a ‘twinkling’ appearance or ‘blade flash effect’. These moving returns can appear very similar to those that would be produced by a light aircraft. The appearance of multiple false targets in close proximity can trick the radar processor into initiating false aircraft tracks. False PSR returns can also ‘seduce’ real aircraft tracks away from their true returns as the radar attempts to update an aircraft track using the false return. This can lead to degradation of radar tracking capability (CAA, 2016). Within the Aviation and Radar Study Area, NATS operate PSRs located at West Freugh Airfield and Isle of Man Airport.

CAP 764 states that wind turbine effects on SSR are traditionally less than those on PSRs but can be caused due to the physical blanking and diffracting effects of the turbine towers, depending on the size of the wind turbines and the wind farm. These effects are typically only a consideration when the wind turbines are located very close to the SSR (i.e., less than 10km). There are no SSR radar systems within 10km of the North Channel Wind Proposed Development array area, but there is one located in the Aviation and Radar Study Area to the west of Belfast which may lie potentially within 10km of cable routes.

Four en-route navigational aides are identified in the Aviation and Radar Study Area, and one air-ground air communication sites.

Met office stations

The Statement of the European Union Meteorological Network Operational Programme for the Exchange of weather Radar information (OPERA) Group, on the cohabitation between meteorological weather radars and wind turbines, states that the deployment of wind turbines within 5km of weather radar is prohibited (OPERA, 2009). The Meteorological (Met) Office radar infrastructure is safeguarded by the Met Office. The Met office works to wind turbine safeguarding guidelines that stipulate a 20km separation between any development and a weather radar system. The closest Met office radar sites to the Proposed Development is Castor Bay but is not within the Aviation and Radar Study Area.

Airborne search and rescue operations

The SAR helicopter force provides constant SAR cover in the UK from ten bases located across the UK. The bases are positioned close to SAR hotspots so aircraft can provide support as quickly and efficiently as possible. Bristow Helicopters was awarded the contract to provide helicopter SAR services for the UK in 2013, with the closest SAR base to the Proposed Development area being at Caernarfon Airport, Gwynedd, 192.33 km away.

Military Practice and Exercise Area

A military practice and exercise area (PEXA) is land set aside specifically to enable military forces to train and exercise for combat. Within the Aviation and Radar Study Area, there are several military PEXA Firing Danger Areas and military PEXA surface fleet areas. D402A Luce Bay is located to the east of the Proposed Development and is a danger area from Surface to 35,000 feet, whilst D509 Campbeltown is a managed danger area from Surface to 55,000 feet which lies to the North of the Proposed development array area, and designated for the use of ordinance, munitions, explosives and unmanned aircraft. D509 is primarily operated by the Royal Navy. There are several surface fleet areas which span the southern half of the Aviation and Radar Study Area towards the Isle of Man, which is used by the Royal Navy (submarine base, jetties and exercise areas), in which the Proposed Development lies.

13.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on aviation, military and communication receptors have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the assessment are outlined Table 13.5, together with a description of any additional data collection and supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline information currently available, potential impacts to be scoped out of the assessment are presented in Table 13.6 with justification.

Table 13.4: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Aviation, Military and Communications Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Creation of physical obstacles to aircraft operations.	✓	✓	✓	Construction and decommissioning infrastructure and the presence of wind turbines within the Proposed development may impinge on the routing of aircraft operating at low level in the vicinity of the array areas.	Consultation with airspace users to understand current airspace usage and potential for impact.	Qualitative assessment informed by consideration of the outcomes of consultation and taking into account the extant rules of the air.
Obstruction to SAR helicopter operations.	✓	✓	✓	The presence of infrastructure (and associated construction equipment) within a previously open sea area may cause an obstruction to SAR operations	Consultation will be carried out with SAR operators and the Maritime and Coastguard Agency (MCA) to understand requirements and to inform the assessment.	Qualitative assessment based on industry guidance informed through review of the project description against the outcomes of consultation with SAR operators and the MCA.

Table 13.5: Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Aviation, Military and Communications

Impact	Justification
Construction	
Increased helicopter traffic to and from the Proposed Development may affect available airspace for other users.	The Proposed Development may require helicopter operations during the construction, operation and maintenance and decommissioning phases, which may affect the available airspace for other users. The majority of the airspace above the North Channel Wind Proposed Development (including the array area) and within the Aviation and Radar Study area is within Class G uncontrolled airspace, established from the surface to Flight Level (FL) 195 (approximately 19,500 feet (ft)). Control areas around aerodromes are typically class D and a speed limit of 250 knots applies if the aircraft if below FL 100 (10,000 feet). This, together with the availability of an air traffic service, will remove aviation traffic risk therefore it is proposed that this impact is scoped out of the EIA.
Disruption to meteorological radar.	The Met Office publish defined consultation zones for each meteorological radar system; the Proposed development is outside of these consultation zones and therefore it is proposed that this impact is scoped out of the EIA.
Impacts to SSR systems.	The CAA (2016) state that impact to SSR systems may be prevalent if wind turbines are located within 10km of the radar source; there are no SSR systems within 10km of the Proposed Development therefore it is proposed that this impact is scoped out of the EIA
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	The Proposed Development does not overlap with any 9nm consultation zones of oil and gas platforms. Therefore, the presence of physical obstructions in proximity to the airspace utilised by helicopters operating to and from oil and gas platforms is unlikely to disrupt helicopter operations to and from platforms.

Impact	Justification
Operation and Maintenance	
Potential interference to the NATS PSRs.	The array area does not directly overlap with any PSRs and therefore it is proposed that this impact is scoped out of the EIA.
Disruption to meteorological radar.	As for construction.
Increased helicopter traffic to and from the Proposed development may affect available airspace for other users.	As for construction.
Impacts to SSR systems.	As for construction.
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	As for construction.
Decommissioning	
Increased helicopter traffic to and from the Proposed development may affect available airspace for other users.	As for construction and operation and maintenance.
Disruption to meteorological radar.	As for construction and operation and maintenance.
Impacts to SSR systems.	As for construction and operation and maintenance.
Potential for disruption to helicopter access/egress to/from offshore oil and gas platforms.	As for construction and operation and maintenance.

The following measures adopted as part of the project are relevant to aviation and radar. These measures may evolve as the engineering design and the EIA progresses.

- Appropriate lighting and marking of wind turbines will be established in accordance with CAA regulations and guidance (CAA, 2016; 2021) and in consultation with the CAA and the Defence Infrastructure Organisation (DIO);
- Prior to the start of construction and decommissioning, the UK Hydrographic Office (UKHO) will be informed of the locations, heights and lighting status of the wind turbines, including estimated and actual dates of activities, and the maximum height of any equipment to be used, to allow inclusion on Aviation Charts;
- The DIO will be informed of the construction start and end dates; the maximum height of construction equipment; and the latitude and longitude of each wind turbine;
- A minimum spacing of 500 m shall be maintained between blade tip to blade tip of all surface infrastructure. This is to facilitate access by SAR helicopters operating under Instrument Meteorological Conditions (IMC) flight rules, in line with MCA guidance (MCA, 2021b);
- Development of, and adherence to, an Emergency Response and Cooperation Plan (ERCoP), including consideration of helicopters undertaking SAR operations; and
- The North Channel Wind Project operator will issue, as necessary, requests to the UK Aeronautical Information Service to submit Notice to Airmen (NOTAM) in the event of any failure of aviation lighting.

The requirement for and feasibility of any further mitigation will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

13.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The aviation, military and communications EIA will follow the methodology set out in Chapter **3.**. Specific to the aviation, military and communications EIA, the following guidance documents will also be considered:

- CAP 393: Regulations made under powers in the Civil Aviation Act 1982 and the Air Navigation Order 2016 (CAA, 2021);
- CAP 764: CAA Policy and Guidelines on Wind Turbines, Sixth Edition (CAA, 2016);
- CAP 670: Air Traffic Services Safety Requirements, Third Issue Amendment 1/2019 (CAA, 2019);
- OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response, MGN 654 (M+F) (MCA, 2021a); and
- Offshore Renewable Energy Installations: Requirements, guidance and operational considerations for SAR and Emergency Response (MCA, 2021b).

13.3.6 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to arise from other projects or activities within the east Irish Sea where projects or activities could act collectively with the Proposed Development to affect aviation and radar receptors. The cumulative assessment will consider the maximum design scenarios for each of the identified projects or activities.

The following projects or activities will be considered within the Aviation and Radar study area:

- Other offshore wind farms; and
- Other infrastructure projects (e.g., cables and pipelines).

The cumulative effects assessment will follow the approach outlined in section 3 of the scoping report.

13.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

13.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Aviation, Military and Communications?
- Do you agree that all receptors and impacts have been identified for Aviation, Military and Communications?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

14. MARINE ARCHAEOLOGY AND CULTURAL HERITAGE

14.1 DATA SOURCES

Table 14.1 lists the principal datasets that have been used in the desktop review of the baseline environment in this scoping chapter.

Table 14.1: Desktop sources that inform the Marine Archaeology and Cultural Heritage study area.

Desktop source	Authority
Historic Shipwreck Inventory	Department for Communities, Historic Environment Division
Sites and Monuments Record	Department for Communities, Historic Environment Division
Admiralty Charts	UKHO
European Marine Observation and Data Network (EMONnet).	www.emodnet.eu

14.2 NCW 1 PROJECT

14.2.1 INTRODUCTION

This section of the Scoping Report identifies marine archaeology and ordnance resources of relevance to the proposed North Channel 1 (NCW 1) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on marine archaeology and ordnance resources.

The assessment is based on a review of publicly accessible data sets that record the known archaeological sites under water and on land maintained by the Department for Communities (DfC), Historic Environment Division. The purpose of the assessment is to inform an engagement with the archaeological consenting authority that will agree the consenting conditions for archaeological survey. The assessment will also inform the known archaeological constraints within the project area that will in turn provide input to the final site selection and future final array marine site layout.

14.2.2 STUDY AREA

The Marine Archaeology and Cultural Heritage Study Area extends approximately 11.5 km seawards northeast of Garron Point, and 23 km seaward northeast of Ballygalley Headland in Co. Antrim. It also includes an Export Cable Corridor (ECC) Area of Search (AoS) region from the array area to potential landfall locations in a wide zone that extends from 3 km north of the Port of Larne to Carrickfergus.

14.2.3 BASELINE ENVIRONMENT

Data Limitations

In contrast to terrestrial archaeology which has been a principal research subject area in Ireland since the nineteenth century, maritime archaeology is a comparatively new discipline, with archaeological requirements that govern works on and under water only coming into force since the 1990s.

Consequently, it is the case that the registers of archaeological assets along the foreshore and under water are still very much in the early stages of compilation. Northern Ireland nevertheless has benefited from a robust inventory of Historic Shipwreck events maintained by the DfC.

In addition, AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA and the archaeological consenting process.

Topography

Located in deep water off the northeast coast of County Antrim, the seabed at the proposed NCW 1 array site area is relatively flat and does not indicate the presence of significant topographic variations. Closer inshore the seabed shallows, creating a steep slope inshore where the landfalls are being considered in the vicinity of Larne.

Submerged prehistoric potential

The EMODnet Geology project indicates a series of six palaeo coastlines that have been recorded around Ireland in addition to the present-day coastline.[5] The results are derived from computer modelling rather than empirical data for the most part, but they nevertheless suggest a necessary consideration in assessing archaeological risk.

In contrast to much of southern Ireland where the land area has submerged since the last glaciation, the northeast coast has risen, which means that the palaeo coastlines that would have existed when Ireland was being occupied by people in early prehistoric times are not located offshore today but are inland of the present coastline for the most part, where they are evident as raised beaches that lie above the High Water Mark. One exception to this occurs along the north shore of Belfast Lough, where the palaeo coastlines lie a short distance seaward of the present-day shoreline. A palaeo coastline that is thought to have existed to *c.* 10,000 years BP (Before Present, namely before 1950 AD) lies approximately 1km south of Carrickfergus, in the vicinity of where the southern part of the ECC AoS approach is being considered. At this time – known as the Mesolithic period – hunter-fisher-gatherers were actively exploiting the coastlines in what is regarded as the earliest evidence for occupation and activity. They would also have been making inroads along accessible river systems. The Mesolithic period lasted for some four millennia in Ireland and during this time the coastline witnessed several shifts. By *c.* 8,000 BP, the coastline had moved very slightly north and lay some 900m offshore. It was in more or less the same location *c.* 6,000 years BP. The present-day shoreline appears to have been established *c.* 4,000 BP.

In addition, there are instances where prehistoric stone tools have been found along the shoreline.[6] A single flint flake was recovered from a sub-tidal context during marine dredging operations in Larne Lough, Co. Antrim; portion of a pointed bone implement perhaps also from the Mesolithic period was found on the beach of Glynn in Larne Lough close to raised beach deposits; while Curran Point at the entrance to Larne Lough is a type site for Mesolithic period artefacts associated with the raised beach there.[7]

We can conclude from the computer-modelled palaeo coastlines that the shoreline along this part of Ireland's northeast coast has varied since early prehistory, and that when people started to be active in the area much of their coastline lies today as raised beaches above the High-Water Mark. The only exception

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[5] https://www.emodnet-geology.eu/map-viewer/?p=submerged_landscapes. This work draws on the research outlined in Anthony Brook Sarah Bradley, Robin Edwards and Nicola Goodwyn, 'The palaeogeography of Northwest Europe during the last 20,000 years', *Journal of Maps* 7.1 (2012), pp 573–587.

[66] Kieran Westley and Peter Woodman, 'Ireland: submerged prehistoric sites and landscapes', in G. Baliey et al., *The archaeology of Europe's drowned landscapes*, Coastal Research Library, 35 (2020), pp 221–248.

[77] Westley and Woodman, 'Ireland: submerged prehistoric sites and landscapes', pp 228, 232, 233.

to this within the project area lies to the east of Carrickfergus, where a series of palaeo coastlines exist up to 1km offshore. The presence of Mesolithic-period remains within Larne Lough highlights the archaeological sensitivity in the northern part of the ECC AoS , while the possibility that other material remains might exist along the submerged shorelines within Belfast Lough in the southern part of the ECC AoS should be allowed for.

Historic shipwreck events

The more obvious archaeological constraint offshore is associated with encountering shipwrecks. Lying across the mouth of Belfast Lough and reaching north and south of it, the study includes a large sea area where shipping navigated the North Channel to access Belfast, the Western Isles and points north and south within the Irish Sea. It is a strategic maritime zone, where traffic entering and leaving the North Atlantic trade routes would be funnelled along the narrow sea passage that often proved hazardous to shipping.

The Historic Shipwreck Inventory records a significant number of known shipwreck sites within the study area and summarises the known shipwreck sites in terms of quantity (Table 14.2).

Table 14.2: Known shipwreck sites within the proposed project areas.

Project Location	Number of known Shipwreck sites	Number of Known Shipwreck sites outside but within 1km of a project boundary
NCW 1 Array Site	5	2
NCW 1 ECC AoS, north part	11	0
NCW 1 ECC AoS, south part shared with NCW 2 ECC AoS	28	1
Totals	44	3

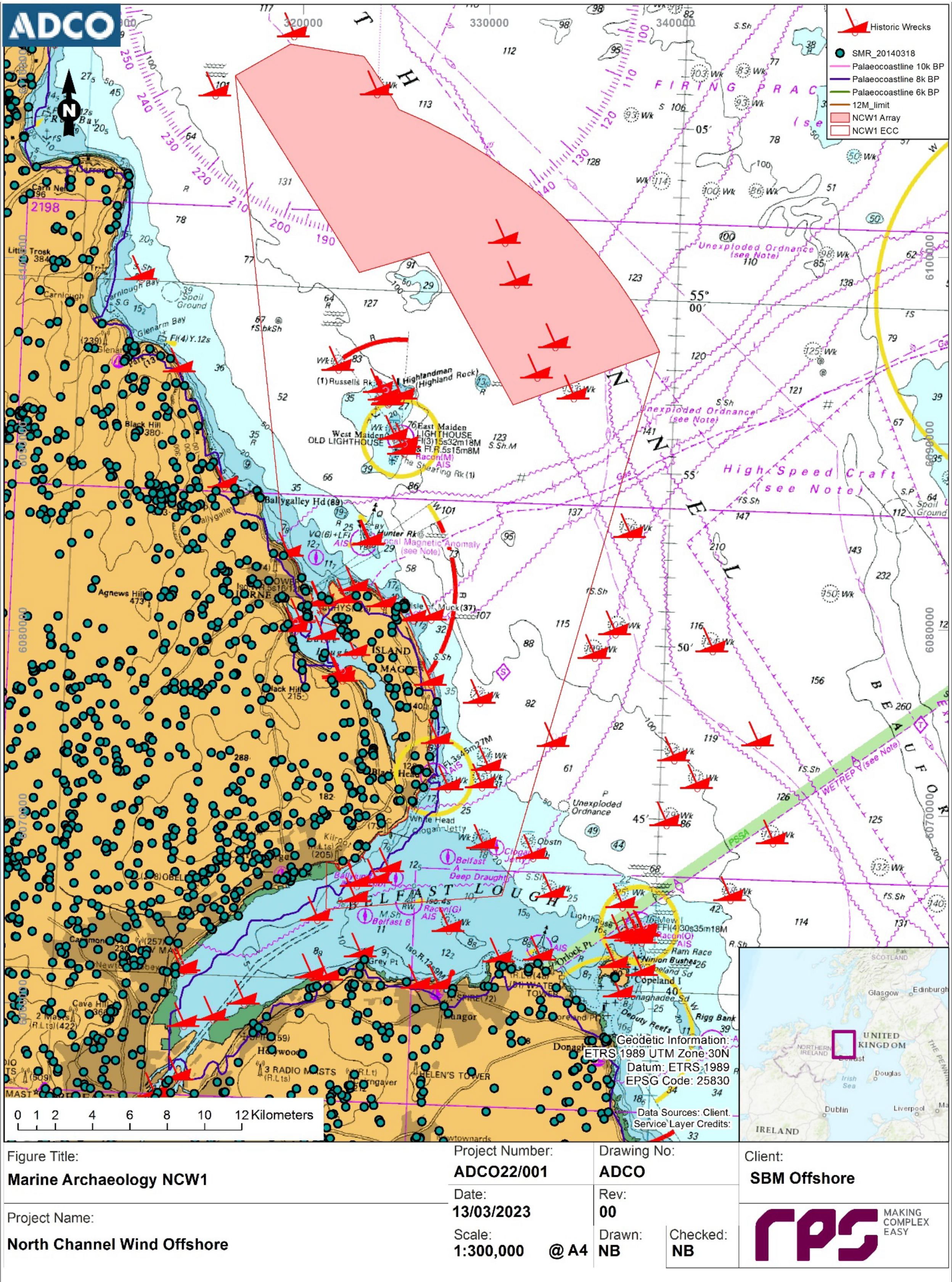

Figure 14.1: Marine Archaeology and Cultural Heritage map showing known assets and project area

There are five known shipwreck sites within proposed array NCW 1. There is a small number of known shipwreck sites outside the boundaries of the site within 1km distance from them.

There are larger numbers of known wreck sites in the ECC AoS. While the ECC AoS associated with NCW 1 has the largest number of known shipwrecks, many of these sites (10) are clustered around Highland Rock and East and West Maiden Rocks, with six of the remaining sites wrecked on the foreshore of Island Magee and one at Larne. The ECC AoS for NCW 1 and NCW 2 overlap within the 6 km zone inshore, where there are 28 known wreck sites.

Historic Ordnance

The Admiralty Chart records two areas of unexploded ordnance within the survey area, to the south and southeast of proposed array NCW 1.

Existing services

Existing subsea cables and related services present constraints across the project area, in both the proposed array areas and within the proposed ECC AoS area. However, there are fewer existing subsea services within NCW 1 array area.

Landfall locations

The proposed landfall locations retain archaeological potential as evidenced by the series of known archaeological finds that are recorded between Larne and Island Magee in the north, and east of Carlingford in the south. The intertidal foreshore is not a zone that has been traditionally recorded in the registered archaeological surveys, but it is a zone that retains the potential for new discovery. To further inform that baseline information for the EIA, archaeological intertidal survey is anticipated as part of the mitigation measures.

14.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 14.3 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

No impacts have been identified to be scoped out of the EIA.

Table 14.3: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Marine Archaeology and Cultural Heritage Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Sediment disturbance and deposition leading to effects on known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works, including seabed preparation, installation of anchors, and cable installation, may cause seabed disturbance and associated deposition, which could lead to effects on known and potential heritage assets. **Operational and maintenance phase** Maintenance operations, including cable repair activities, may cause seabed disturbance and associated deposition, which could lead to effects on known heritage assets.	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA. .	Review existing baseline data Review new survey data to be acquired for the project Mitigation to prioritise impact avoidance with known and potential archaeological assets
Direct damage to known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works could directly affect any shipwrecks present within the proposed array sites and ECC AoS. These effects will likely be localised, but should they occur, they could lead to adverse and	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				irreversible damage to known heritage assets. Where asset locations are already known, measures adopted as part of the Project for their avoidance and protection include the micro-siting of infrastructure to avoid any known archaeological constraints identified in pre-construction surveys. Effects from decommissioning are likely to be similar to effects from construction. **Operational and maintenance phase** Maintenance operations could directly affect any shipwrecks present within the proposed array sites and along the ECC AoS. These effects will likely be localised, but should they occur, they could lead to adverse and irreversible damage to known heritage assets. Where asset locations are already known, measures adopted as part of the Project include avoidance of any known archaeological constraints identified in pre-construction surveys.	backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA. .	Mitigation to prioritise impact avoidance with known and potential archaeological assets
Alteration of sediment transport regimes		✓		**Operational and maintenance phase** The physical presence of wind turbine and OSP foundations may lead to localised changes in tide and wave climate, affecting the distribution of sediment, which could be directed towards or away from known heritage	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				assets, causing damage. The maintenance of inter-array cabling and the offshore export cables may also lead to localised changes in the fluvial dynamics at or close to known heritage assets, causing damage.	during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA.	Mitigation to prioritise impact avoidance with known and potential archaeological assets
Sediment disturbance and deposition leading to effects on known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works, including seabed preparation, installation of anchors, and cable installation, may cause seabed disturbance and associated deposition, which could lead to effects on known and potential heritage assets. **Operational and maintenance phase** Maintenance operations, including cable repair activities, may cause seabed disturbance and associated deposition, which could lead to effects on known heritage assets.	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA. .	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Landfalls	✓		✓	***Construction and decommissioning phases*** Construction works, including seabed preparation and cable installation, may cause foreshore disturbance and associated deposition, which could lead to effects on known and potential heritage assets.	Archaeological Intertidal Survey of proposed landfall locations for EIA will further inform the baseline environment.	Review existing baseline data

14.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The marine archaeology and ordnance EIA will follow the methodology set out in chapter 3. Specific to the marine archaeology and ordnance EIA, the following guidance documents will also be considered:

- Protection of Wrecks Act 1973;
- Protection of Military Remains Act 1986;
- Ancient Monuments and Areas Act 1979;
- Merchant Shipping Act 1995;
- Marine Policy Statement 2011;
- Standard and guidance for historic environment desk -based assessment (Chartered Institute for Archaeologists, 2014);
- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995;
- Planning (Northern Ireland) Order 1991, Article 42/Lists of buildings of special architectural or historic interest;
- Planning Policy Statement 6 (PPS 6): Planning, Archaeology and the Built Heritage, which sets out the Department of the Environment's (DoE) (now DfC) planning policies for the protection and conservation of archaeological remains and features of built heritage;
- Development and Archaeology, NIEA Guidance Booklet relating to the Built Heritage;
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (c. 2006);
- Marine Geophysics Data Acquisition, Processing and Interpretation, Guidance Notes (English Heritage, 2013).
- European Convention on the Protection of the Archaeological Heritage (Valetta Convention) (1992);
- International Council on Monuments and Sites (ICOMOS) guidance, non-governmental international organisation dedicated to the conservation of the world's monuments and sites (1996); and
- United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage (2001). guidance, which seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity.
- The Crown Estate (2021) Archaeological Written Schemes of Investigation (WSI) for Offshore Wind Farm Projects
- English Heritage (2021). Commercial Renewable Energy Development and the Historic Environment. Historic England Advice Note 15. 24pp.
- Wessex Archaeology (2007). Collaborative Offshore Wind Research into the Environment (COWRIE), Historic Environment Guidance for the Renewable Energy Sector.
- The assessment will be informed by the Coastal Processes chapter of the EIA, which will rely on numerical modelling to represent the potential effects of the Project (see section 5).

Potential mitigation measures which may be required with regards to marine archaeology and cultural heritage will be identified in the EIA.

The following mitigation measures are likely to apply:

- Marine geophysical survey of the proposed array (or alternative) and ECC AoS to furnish a comprehensive and up-to-date record of the seabed. This would include multibeam bathymetry, high resolution side-scan sonar and magnetometry survey. The provision of sub-bottom profiling may be useful in identifying submerged palaeo landscapes.

- Archaeological intertidal survey of the proposed landfall locations will provide additional baseline information by covering a zone that is not currently recorded systematically in the statutory archaeological registers.
- Implementation of Archaeological Exclusion Zones (AEZs) will be applied around known heritage assets. The extent of these would vary depending upon the size of the heritage asset identified and would be agreed in consultation with the DfC as the development design progresses, and additional information becomes available.
- Implementation of a Protocol for Archaeological Discoveries or similar (WSI), setting out the principles and management actions for unexpected archaeological discoveries made during the course of development.

14.2.6 POTENTIAL CUMULATIVE EFFECTS

There are potential cumulative effects as a result of the proposed development on marine archaeology and cultural heritage receptors. A search will be conducted within the marine archaeology and cultural heritage study area to identify any other projects that could give rise to cumulative effects.

14.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

There are potential transboundary effects as a result of the proposed development on marine archaeology and cultural heritage receptors. A search will be conducted within the marine archaeology and cultural heritage study area to identify any transboundary effects.

14.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Marine Archaeology and Cultural Heritage?
- Do you agree that all receptors and impacts have been identified for Marine Archaeology and Cultural Heritage?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

14.3 NCW 2 PROJECT

14.3.1 INTRODUCTION

This section of the Scoping Report identifies marine archaeology and ordnance resources of relevance to the proposed North Channel 2 (NCW 2) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on marine archaeology and ordnance resources.

The assessment is based on a review of publicly accessible data sets that record the known archaeological sites under water and on land maintained by the Department for Communities (DfC), Historic Environment Division. The purpose of the assessment is to inform an engagement with the archaeological consenting authority that will agree the consenting conditions for archaeological survey. The assessment will also inform the known archaeological constraints within the project area that will in turn provide input to the final site selection and future final array marine site layout.

14.3.2 STUDY AREA

The Marine Archaeology and Cultural Heritage Study Area extends approximately 26 km seawards east of Black Head, Co. Antrim and 20 km northeast of Donaghadee, Co. Down. It includes an array area between 16 km and 26 km seaward of Black Head, and an Export Cable Corridor (ECC) Area of Search (AoS) from the array area to potential landfall locations in a wide zone that extends from 3 km north of the Port of Larne to Carrickfergus.

14.3.3 BASELINE ENVIRONMENT

Data Limitations

In contrast to terrestrial archaeology which has been a principal research subject area in Ireland since the nineteenth century, maritime archaeology is a comparatively new discipline, with archaeological requirements that govern works on and under water only coming into force since the 1990s. Consequently, it is the case that the registers of archaeological assets along the foreshore and under water are still very much in the early stages of compilation. Northern Ireland nevertheless has benefited from a robust inventory of Historic Shipwreck events maintained by the DfC.

In addition, AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA and the archaeological consenting process.

Topography

Located in deep water off the northeast coast of County Down, the seabed at the proposed NCW 2 array site area is relatively flat and does not indicate the presence of significant topographic variations. Closer inshore the seabed shallows, creating a steep slope inshore where the landfalls are being considered in the vicinity of Larne. The southern area of the ECC AoS landfall approach has a gradual inclination as the Export Cable Corridor (ECC) AoS enters the wide expanse of Belfast Lough.

Submerged prehistoric potential

The EMODnet Geology project indicates a series of six palaeo coastlines that have been recorded around Ireland in addition to the present-day coastline.[8] The results are derived from computer modelling rather than empirical data for the most part, but they nevertheless suggest a necessary consideration in assessing archaeological risk.

In contrast to much of southern Ireland where the land area has submerged since the last glaciation, the northeast coast has risen, which means that the palaeo coastlines that would have existed when Ireland was being occupied by people in early prehistoric times are not located offshore today but are inland of the present coastline for the most part, where they are evident as raised beaches that lie above the High Water Mark. One exception to this occurs along the north shore of Belfast Lough, where the palaeo coastlines lie a short distance seaward of the present-day shoreline. A palaeo coastline that is thought to have existed to *c.* 10,000 years BP (Before Present, namely before 1950 AD) lies approximately 1km south of Carrickfergus, in the vicinity of where the southern part of the ECC AoS approach is being considered. At this time – known as the Mesolithic period – hunter-fisher-gatherers were actively exploiting the coastlines in what is regarded as the earliest evidence for occupation and activity. They would also have been making inroads along accessible river systems.

[8] https://www.emodnet-geology.eu/map-viewer/?p=submerged_landscapes. This work draws on the research outlined in Anthony Brook Sarah Bradley, Robin Edwards and Nicola Goodwyn, 'The palaeogeography of Northwest Europe during the last 20,000 years', *Journal of Maps* 7.1 (2012), pp 573–587.

The Mesolithic period lasted for some four millennia in Ireland and during this time the coastline witnessed several shifts. By *c.* 8,000 BP, the coastline had moved very slightly north and lay some 900m offshore. It was in more or less the same location *c.* 6,000 years BP. The present-day shoreline appears to have been established *c.* 4,000 BP.

In addition, there are instances where prehistoric stone tools have been found along the shoreline.[9] A single flint flake was recovered from a sub-tidal context during marine dredging operations in Larne Lough, Co. Antrim; portion of a pointed bone implement perhaps also from the Mesolithic period was found on the beach of Glynn in Larne Lough close to raised beach deposits; while Curran Point at the entrance to Larne Lough is a type site for Mesolithic period artefacts associated with the raised beach there.[10]

We can conclude from the computer-modelled palaeo coastlines that the shoreline along this part of Ireland's northeast coast has varied since early prehistory, and that when people started to be active in the area much of their coastline lies today as raised beaches above the High-Water Mark. The only exception to this within the project area lies to the east of Carrickfergus, where a series of palaeo coastlines exist up to 1km offshore. The presence of Mesolithic-period remains within Larne Lough highlights the archaeological sensitivity in the northern part of the ECC AoS, while the possibility that other material remains might exist along the submerged shorelines within Belfast Lough in the southern part of the ECC AoS should be allowed for.

Historic shipwreck events

The more obvious archaeological constraint offshore is associated with encountering shipwrecks. Lying across the mouth of Belfast Lough and reaching north and south of it, the study includes a large sea area where shipping navigated the North Channel to access Belfast, the Western Isles and points north and south within the Irish Sea. It is a strategic maritime zone, where traffic entering and leaving the North Atlantic trade routes would be funnelled along the narrow sea passage that often proved hazardous to shipping.

The Historic Shipwreck Inventory records a significant number of known shipwreck sites within the study area and summarises the known shipwreck sites in terms of quantity (Table 14.5).

Table 14.4: Known shipwreck sites within the proposed project areas.

Project Location	Number of known Shipwreck sites	Number of Known Shipwreck sites outside but within 1km of a project boundary
NCW 2 Array Site	0	2
NCW 2 ECC AoS northern part shared with NCW 1 ECC AoS	28	1
NCW 2 ECC AoS, east part	9	3
Totals	37	6

99 Kieran Westley and Peter Woodman, 'Ireland: submerged prehistoric sites and landscapes', in G. Baliey et al., *The archaeology of Europe's drowned landscapes*, Coastal Research Library, 35 (2020), pp 221–248.

1010 Westley and Woodman, 'Ireland: submerged prehistoric sites and landscapes', pp 228, 232, 233.

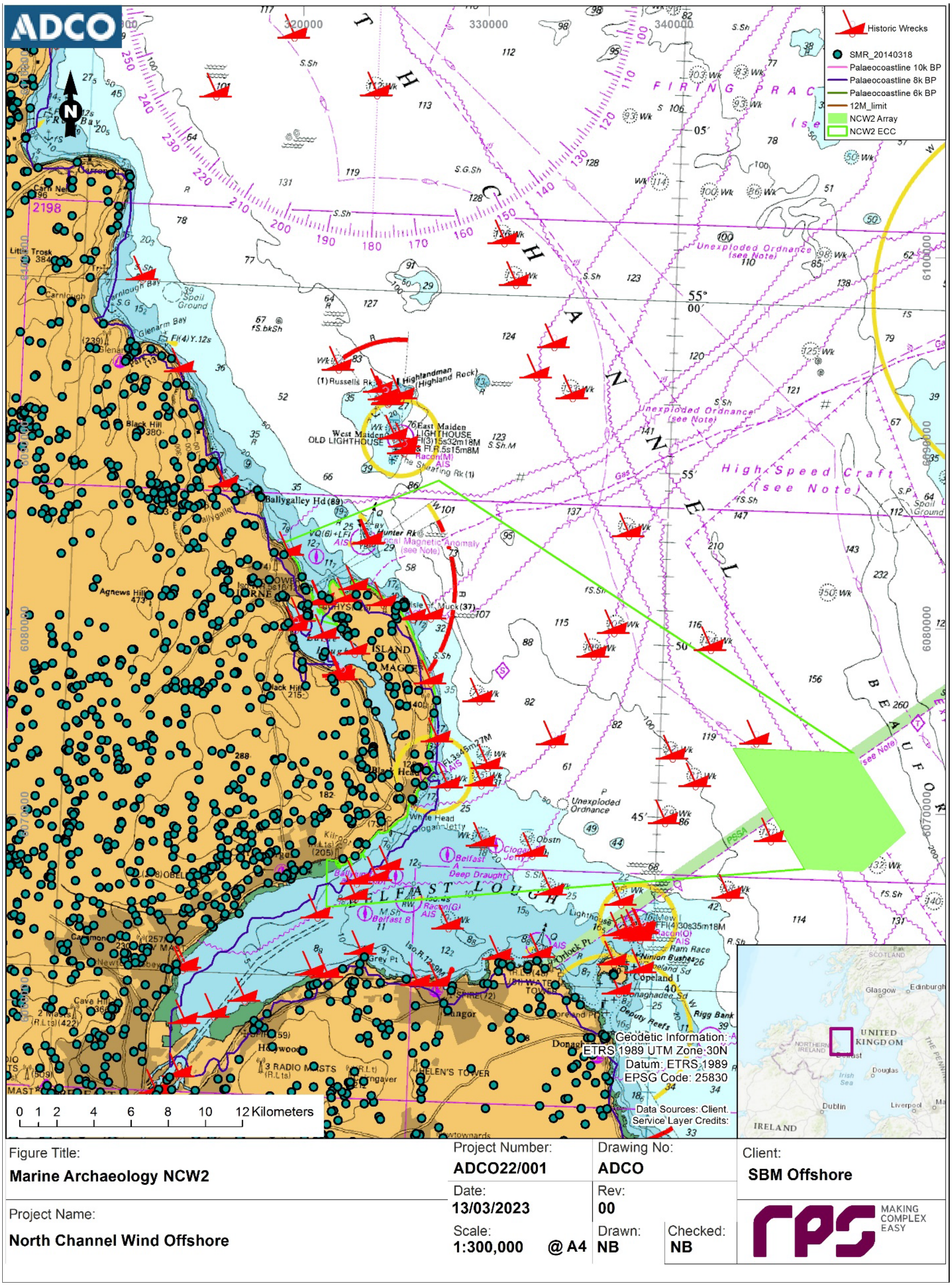

Figure 14.2: Marine Archaeology and Cultural Heritage map showing known assets and project area

There are no known shipwreck sites within proposed array NCW 1. There is a small number of known shipwreck sites outside the boundaries of the site within 1km distance from them.

There are larger numbers of known wreck sites in the ECC AoS. While the part of the NCW 2 ECC AoS region also associated with NCW 1 has the largest number of known shipwrecks, many of these sites are clustered around Highland Rock and East and West Maiden Rocks, with six of the remaining sites wrecked on the foreshore of Island Magee and one at Larne. The ECC AoS for NCW 1 and NCW 2 overlap within the 6 km zone inshore, where there are 28 known wreck sites. The sites within the northern part of the ECC AoS associated with NCW 2 are also located close inshore, running in a line south against the eastern shore of Island Magee. The known shipwreck sites located within and close to the southern OCC are distributed randomly offshore, with a cluster of four sites located inshore close to the landfall at Kilroot.

Historic Ordnance

The Admiralty Chart records two areas of unexploded ordnance within the survey area, to the south and southeast of proposed array NCW 1 but one in proximity to NCW 2.

Existing services

Existing subsea cables and related services present constraints across the project area, in both the proposed array areas and within the proposed ECC AoS (refer section 13.2).

Landfall locations

The proposed landfall locations retain archaeological potential as evidenced by the series of known archaeological finds that are recorded between Larne and Island Magee in the north, and east of Carlingford in the south. The intertidal foreshore is not a zone that has been traditionally recorded in the registered archaeological surveys, but it is a zone that retains the potential for new discovery. To further inform that baseline information for the EIA, archaeological intertidal survey is anticipated as part of the mitigation measures.

14.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 14.6 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g., modelling) that will be required to enable a full assessment of the impacts.

No impacts have been identified to be scoped out of the EIA.

Table 14.5: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Marine Archaeology and Cultural Heritage Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Sediment disturbance and deposition leading to effects on known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works, including seabed preparation, installation of anchors, and cable installation, may cause seabed disturbance and associated deposition, which could lead to effects on known and potential heritage assets. **Operational and maintenance phase** Maintenance operations, including cable repair activities, may cause seabed disturbance and associated deposition, which could lead to effects on known heritage assets.	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA.	Review existing baseline data Review new survey data to be acquired for the project Mitigation to prioritise impact avoidance with known and potential archaeological assets
Direct damage to known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works could directly affect any shipwrecks present within the proposed array sites and ECC AoS. These effects will likely be localised, but should they occur, they could lead to adverse and irreversible damage to known heritage	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				assets. Where asset locations are already known, measures adopted as part of the Project for their avoidance and protection include the micro-siting of infrastructure to avoid any known archaeological constraints identified in pre-construction surveys. Effects from decommissioning are likely to be similar to effects from construction. **Operational and maintenance phase** Maintenance operations could directly affect any shipwrecks present within the proposed array sites and along the ECC AoS routes. These effects will likely be localised, but should they occur, they could lead to adverse and irreversible damage to known heritage assets. Where asset locations are already known, measures adopted as part of the Project include avoidance of any known archaeological constraints identified in pre-construction surveys.	during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA.	Mitigation to prioritise impact avoidance with known and potential archaeological assets
Alteration of sediment transport regimes		✓		**Operational and maintenance phase** The physical presence of wind turbine and OSP foundations may lead to localised changes in tide and wave climate, affecting the distribution of sediment, which could be directed towards or away from known heritage assets, causing damage. The	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				maintenance of inter-array cabling and the offshore export cables may also lead to localised changes in the fluvial dynamics at or close to known heritage assets, causing damage.	2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA.	Mitigation to prioritise impact avoidance with known and potential archaeological assets
Sediment disturbance and deposition leading to effects on known heritage assets	✓	✓	✓	***Construction and decommissioning phases*** Construction works, including seabed preparation, installation of anchors, and cable installation, may cause seabed disturbance and associated deposition, which could lead to effects on known and potential heritage assets. **Operational and maintenance phase** Maintenance operations, including cable repair activities, may cause seabed disturbance and associated deposition, which could lead to effects on known heritage assets.	AFBI has commissioned several multibeam (MBES) surveys and holds data sets which are highly relevant to the NCW development areas and export cable corridor areas of search. The data includes bathymetry and backscatter information, collected during various surveys from 2008 to 2019, and covers the majority of the areas of interest. The gridded resolution of the data varies from 2m to 12m. These Marine Geophysical survey data sets of proposed array sites and ECC AoS will further inform the baseline environment as part of EIA.	Review existing baseline data Review new survey data to be acquired for the project

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Landfalls	✓		✓	***Construction and decommissioning phases*** Construction works, including seabed preparation and cable installation, may cause foreshore disturbance and associated deposition, which could lead to effects on known and potential heritage assets.	Archaeological Intertidal Survey of proposed landfall locations for EIA will further inform the baseline environment.	Review existing baseline data

14.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

1. The marine archaeology and ordnance EIA will follow the methodology set out in Chapter 3 Specific to the marine archaeology and ordnance EIA, the following guidance documents will also be considered:

- Protection of Wrecks Act 1973;
- Protection of Military Remains Act 1986;
- Ancient Monuments and Areas Act 1979;
- Merchant Shipping Act 1995;
- Marine Policy Statement 2011;
- Standard and guidance for historic environment desk -based assessment (Chartered Institute for Archaeologists, 2014);
- Historic Monuments and Archaeological Objects (Northern Ireland) Order 1995;
- Planning (Northern Ireland) Order 1991, Article 42/Lists of buildings of special architectural or historic interest;
- Planning Policy Statement 6 (PPS 6): Planning, Archaeology and the Built Heritage, which sets out the Department of the Environment’s (DoE) (now DfC) planning policies for the protection and conservation of archaeological remains and features of built heritage;
- Development and Archaeology, NIEA Guidance Booklet relating to the Built Heritage;
- Joint Nautical Archaeology Policy Committee (JNAPC) Code of Practice for Seabed Development (c. 2006);
- Marine Geophysics Data Acquisition, Processing and Interpretation, Guidance Notes (English Heritage, 2013).
- European Convention on the Protection of the Archaeological Heritage (Valetta Convention) (1992);
- International Council on Monuments and Sites (ICOMOS) guidance, non-governmental international organisation dedicated to the conservation of the world's monuments and sites (1996); and
- United Nations Educational, Scientific and Cultural Organization (UNESCO) Convention on the Protection of the Underwater Cultural Heritage (2001). guidance, which seeks to encourage the identification, protection and preservation of cultural and natural heritage around the world considered to be of outstanding value to humanity.
- The Crown Estate (2021) Archaeological Written Schemes of Investigation (WSI) for Offshore Wind Farm Projects
- English Heritage (2021). Commercial Renewable Energy Development and the Historic Environment. Historic England Advice Note 15. 24pp.
- Wessex Archaeology (2007). Collaborative Offshore Wind Research into the Environment (COWRIE), Historic Environment Guidance for the Renewable Energy Sector.
- The assessment will be informed by the Coastal Processes chapter of the EIA, which will rely on numerical modelling to represent the potential effects of the Project (see section 5).

Potential mitigation measures which may be required with regards to marine archaeology and cultural heritage will be identified in the EIA.

The following mitigation measures are likely to apply:

- Marine geophysical survey of the proposed array or alternative and ECC AoS to furnish a comprehensive and up-to-date record of the seabed. This would include multibeam bathymetry, high resolution side-scan sonar and magnetometry survey. The provision of sub-bottom profiling may be useful in identifying submerged palaeo landscapes.

- Archaeological intertidal survey of the proposed landfall locations will provide additional baseline information by covering a zone that is not currently recorded systematically in the statutory archaeological registers.
- Implementation of Archaeological Exclusion Zones (AEZs) will be applied around known heritage assets. The extent of these would vary depending upon the size of the heritage asset identified and would be agreed in consultation with the DfC as the development design progresses, and additional information becomes available.
- Implementation of a Protocol for Archaeological Discoveries or similar (WSI), setting out the principles and management actions for unexpected archaeological discoveries made during the course of development.

14.3.6 POTENTIAL CUMULATIVE EFFECTS

There are potential cumulative effects as a result of the proposed development on marine archaeology and cultural heritage receptors. A search will be conducted within the marine archaeology and cultural heritage study area to identify any other projects that could give rise to cumulative effects.

14.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

There are potential transboundary effects as a result of the proposed development on marine archaeology and cultural heritage receptors. A search will be conducted within the marine archaeology and cultural heritage study area to identify any transboundary effects.

14.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Marine Archaeology and Cultural Heritage?
- Do you agree that all receptors and impacts have been identified for Marine Archaeology and Cultural Heritage?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

15. SEASCAPE, LANDSCAPE AND VISUAL RESOURCES

15.1 DATA SOURCES

Information on the baseline Landscape, Seascape and Visual Amenity Impact Assessment within the study area for the offshore components of the Proposed Development was collected through a detailed desktop review of publications and datasets. These are summarised in Table 15.1 below.

Table 15.1: Summary of Key Desktop Reports.

Title	Source	Year	Author
Northern Ireland Regional Landscape Character Assessment	DAERA	2016	DAERA
Northern Ireland Landscape Character Assessment	DAERA	1999	NIEA
Northern Ireland Regional Seascape Character Assessment.	DAERA	2014	NIEA
Antrim Coast & Glens AONB Designation	Causeway Coast & Glens Heritage Trust	1988	NIEA
Number 94: Dumfries & Galloway Landscape Assessment	SNH	1998	Land Use Consultants
National Coastal Character Map	NatureScot	2018	NatureScot (SNH)

Site-specific field surveys have been undertaken to inform the Offshore Scoping Report for seascape, landscape, visual resources in the form of preliminary viewpoint photography for photomontages. Consultation with key stakeholders to identify potential visual receptors is a standard approach to seascape, landscape, visual resources assessments, and would include DAERA, NatureScot and Local Councils. This will also be used to inform the seascape, visual resources baseline and assessments included within the Offshore Environmental Statement.

15.2 NCW 1 PROJECT

15.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the seascape, landscape and visual environment and cultural heritage setting of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the seascape, landscape and visual environment.

15.2.2 STUDY AREA

To establish the baseline environment for the offshore elements of the Proposed Development, a Zone of Theoretical Visibility (ZTV) will be prepared at EIA stage. UK guidance (SNH, 2017b) on the landscape and visual effects of an offshore wind farm recommends a study area of a 50 km radius for wind turbines 150 m high to blade tip and taller. This reflects the distance that wind turbines of this height would potentially be visible to the human eye. A preliminary offshore landscape and visual ZTV has been prepared to a 50 km radius from the outer boundary of the array area to ensure that all coastal landscape and visual setting receptors that may experience significant effects are identified. This 50 km radius from the NCW 1 array area is defined as the Seascape, Landscape and Visual Resources array study area (refer Figure 15.1).

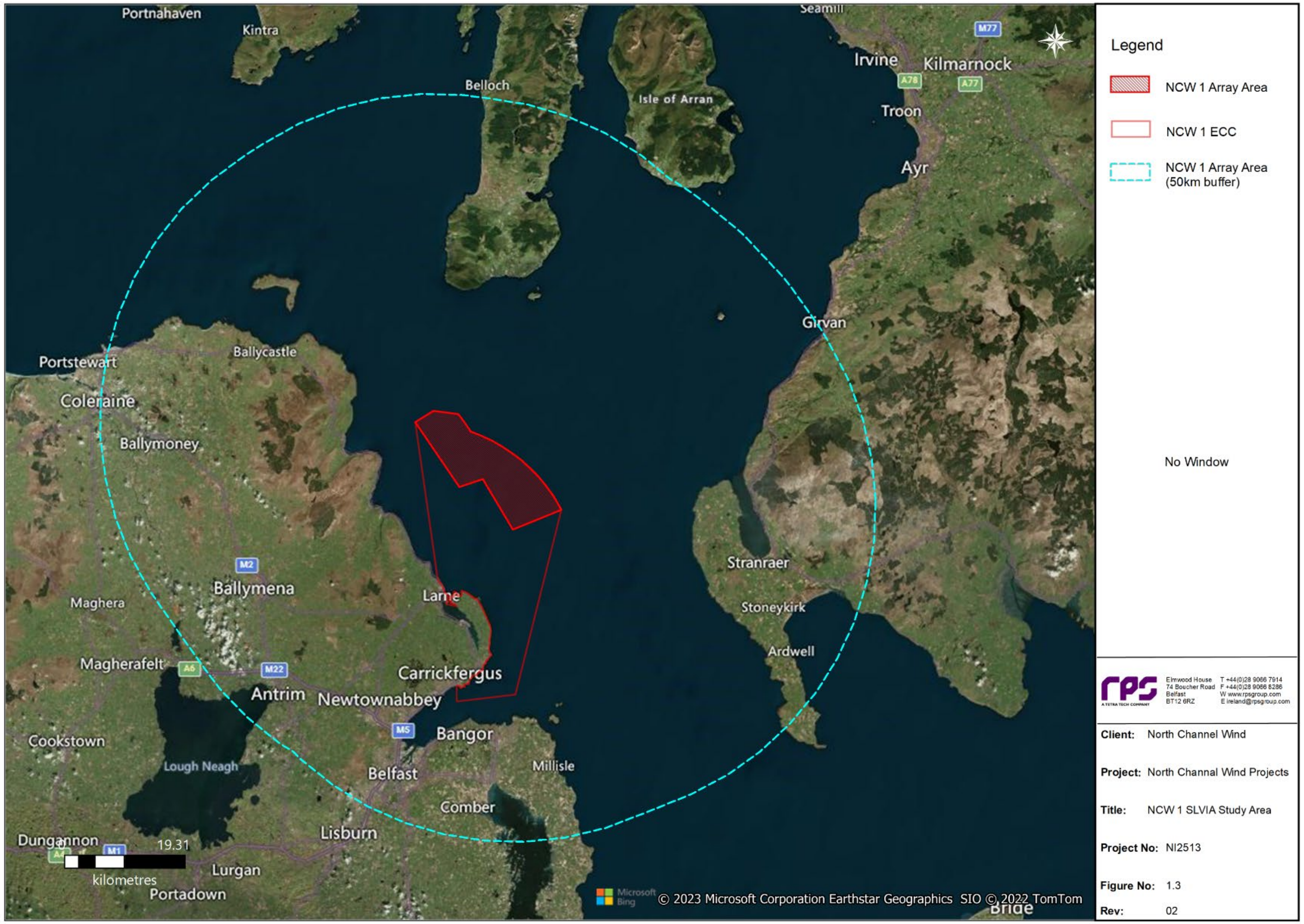

Figure 15.1: Seascape, Landscape and Visual Resources Study Area for North Channel Wind 1 Project

15.2.3 BASELINE ENVIRONMENT

The following forms a summary of the data collated, and work undertaken to date.

- preliminary review of legislative and policy context;
- review of landscape designations;
- preliminary review of national, regional and local landscape/coastal character assessments including landscape character areas (LCA) and types; and
- preparation of preliminary proposed ZTV's.

A preliminary appraisal of the existing baseline within the seascape, landscape and visual resources array study area has been undertaken as is presented below.

Landscape and Coastal Character

Seascape and landscape resources within the seascape, landscape and visual resources array study area may be affected either directly or indirectly by construction, operation and maintenance or decommissioning activities within the Proposed Development study area.

<u>Northern Ireland</u>

NI Regional Landscape Character

In recognising the importance of sustaining regional identity, the Northern Ireland Environment Agency (NIEA), commissioned the Northern Ireland Regional Landscape Character Assessment (NIRLCA), which resulted in the identification of distinct regional character areas within Northern Ireland.

The assessment provides a strategic overview of the Northern Ireland landscape and subdivides the countryside into 26 Regional Landscape Character Areas (RLCAs) based upon information on people and place and the combinations of nature, culture and perception which make each part of Northern Ireland unique and has been developed to meet commitments set out in Northern Ireland's Landscape Charter.

A review of the NIRLCA indicates that the study area for the Proposed Development lies the following 7 RLCA's; see Figure 15.2.

- 16 North Coast and Rathlin Island
- 18 Antrim Plateau and Glens
- 19 South Antrim Hills and Six Mile Water
- 20 Belfast Lough and Islandmagee
- 21 Belfast and Lagan Valley
- 22 Down Drumlins and Holywood Hills
- 26 Strangford, Ards and Lecale

NI Landscape Character

The Northern Ireland Landscape Character Assessment 2000 (NILCA 2000) contains landscape briefs for each of the 130 landscape character areas (LCAs) in Northern Ireland surveyed in 1999. It provides a baseline description of the landscape at a point in time based upon local patterns of geology, landform, land use, cultural and ecological features. This base information is still a valuable resource and has informed the 26 regional landscape character areas of the NIRLCA above. However, there has been substantial development in both rural and urban areas of Northern Ireland since the NILCA 2000 was surveyed which has impacted on many of its local landscape character areas. For the purpose of this scoping report only the coastal related LCAs located within 5 km of the coast have been scoped in.

A review of the NILCA 2000 indicates that the study area for the Proposed Development is located within 19 coastal LCAs as follows; refer to Figure 15.3;

- 57 Causeway Coast and Rathlin Island

- 92 Quoile Valley Lowlands
- 93 Portaferry and North Lecale
- 94 Strangford Drumlins and Islands
- 97 Belfast/Lisburn
- 99 Outer Ards Coast
- 100 Ards Farmlands and Estates
- 101 Scrabo
- 103 Bangor Coastline
- 114 Three and Six Mile Water Valleys
- 118 Moyle Moorlands & Forest
- 119 Ballycastle Glens
- 120 Fair Head
- 121 Moyle Glens
- 123 Larne Glens
- 126 Larne Coast
- 127 Larne Ridgeland
- 128 Islandmagee
- 129 Carrickfergus Shoreline

NI Regional Seascape Character

The Northern Ireland Environment Agency (NIEA) undertook a Regional Seascape Character Assessment of Northern Ireland with the aim to provide a strategic understanding of different areas of regional seascape character along the entire Northern Ireland coast, complementing similar assessments undertaken elsewhere in the UK. This aimed to contribute to the aims of the European Landscape Convention through promoting the protection, management and planning of the seascape, and to support European cooperation on landscape issues. The extent of the study includes the marine, intertidal and coastal terrestrial parts of the entire 650 km of the Northern Ireland coastline and extends up to 12 nautical miles offshore and 5 km inshore. Based on the NILCA 2000 a total of 24 seascape character areas (SCA) were identified. The SCAs in Northern Ireland located within the study area for the Proposed Development are listed below; refer to Figure 15.4;

- 4. The Skerries & Dunluce Coast
- 5. Causeway Coast
- 6. Ballycastle Coast
- 7. Rathlin
- 8. Torr Head Coast
- 9. Northern Glens Coast
- 10. Southern Glens Coast
- 11. The Gobbins
- 12. Larne Lough
- 13. Belfast Lough
- 14. Belfast Harbour
- 15. Ards Peninsula
- 16. Strangford Lough

- 22. Atlantic
- 23. North Channel
- 24. Irish Sea (South Down)

Areas of Outstanding Natural Beauty

These are designated either under the Amenity Lands Act (Northern Ireland) 1965 or the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. They cover huge areas of land, embracing a range of landscape types including limestone cliffs, sweeping moorlands and important geological landforms. They also include farmland, forest, lakes, coastline and settlement. They are generally subject to planning conditions.

The following AONB's are located within the study area; refer to Figure 15.5;

- Antrim Coast & Glens AONB
- Causeway Coast AONB
- Lagan Valley AONB
- Strangford & Lecale AONB

Scotland

National Coastal Character

At a national scale, the seascape, landscape and visual resources the Proposed Development study area would coincide with 5 of the 13 Scottish coastal character types that occur in 33 indicative National Seascape Character Areas. The following coastal character types are relevant to the seascape, landscape and visual resources impact assessment;

- Type 1: Remote High Cliffs
- Type 3: Deposition Coastline, Open Views
- Type 6: Narrow Coastal Shelf
- Type 9: Sounds' Narrows and Islands
- Type 10: Outer Firth and Islands
- Type 12: Deposition Coasts of Islands
- Type 13: Low Rocky Island Coasts

National Landscape Character

Scotland has a digital map based national LCA (published in 2019). This shows Landscape Character Types (LCTs) – i.e., areas of consistent and recognisable landscape character. The digital map is available on the NatureScot web site. A review of the national map has indicated that the study area for the Proposed Development coincides with the following LCTs; see Figure 15.3.

- LCT 36: Coastal Glens - Argyll
- LCT 39: Plateau Moor & Forest – Argyll
- LCT 53: Rocky Coastland - Argyll
- LCT 54: Rocky Coastland – Argyll
- LCT 59: Raised Beach Coast & Cliffs - Argyll
- LCT 61: Coastal Fringe with Agriculture - Argyll
- LCT 64: Coastal Fringe & Policies – Ayrshire
- LCT 72: Pastoral Valleys - Ayrshire

- LCT 76: Foothills - Ayrshire
- LCT 81: Southern Uplands - Ayrshire
- LCT 84: Rocky Islands - Argyll
- LCT 156: Peninsula – Dumfries & Galloway
- LCT 158: Coastal Flats – Dumfries & Galloway

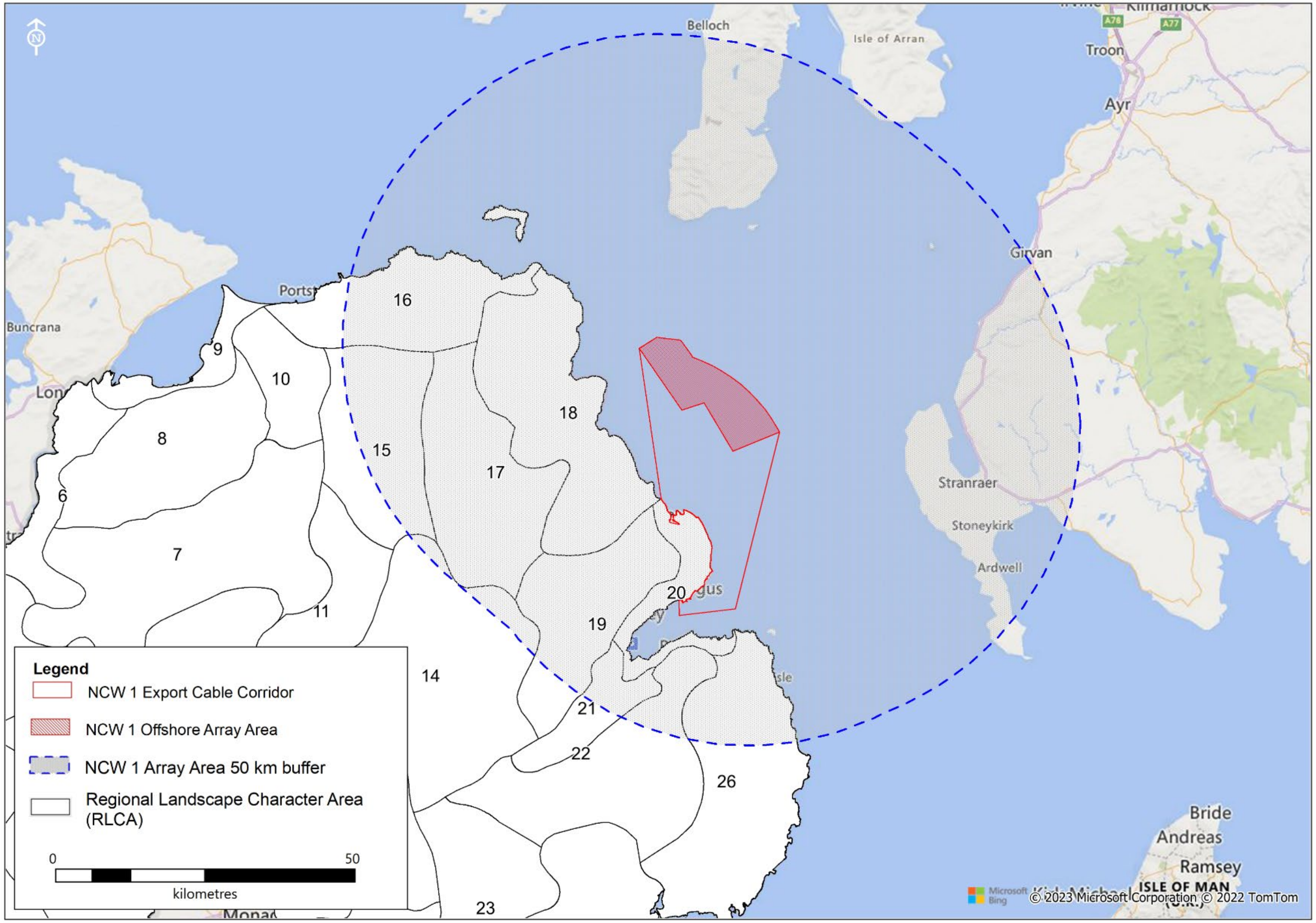

Figure 15.2: Northern Ireland Regional Landscape Character Areas within SLVIA Study Area for North Channel Wind 1 Project

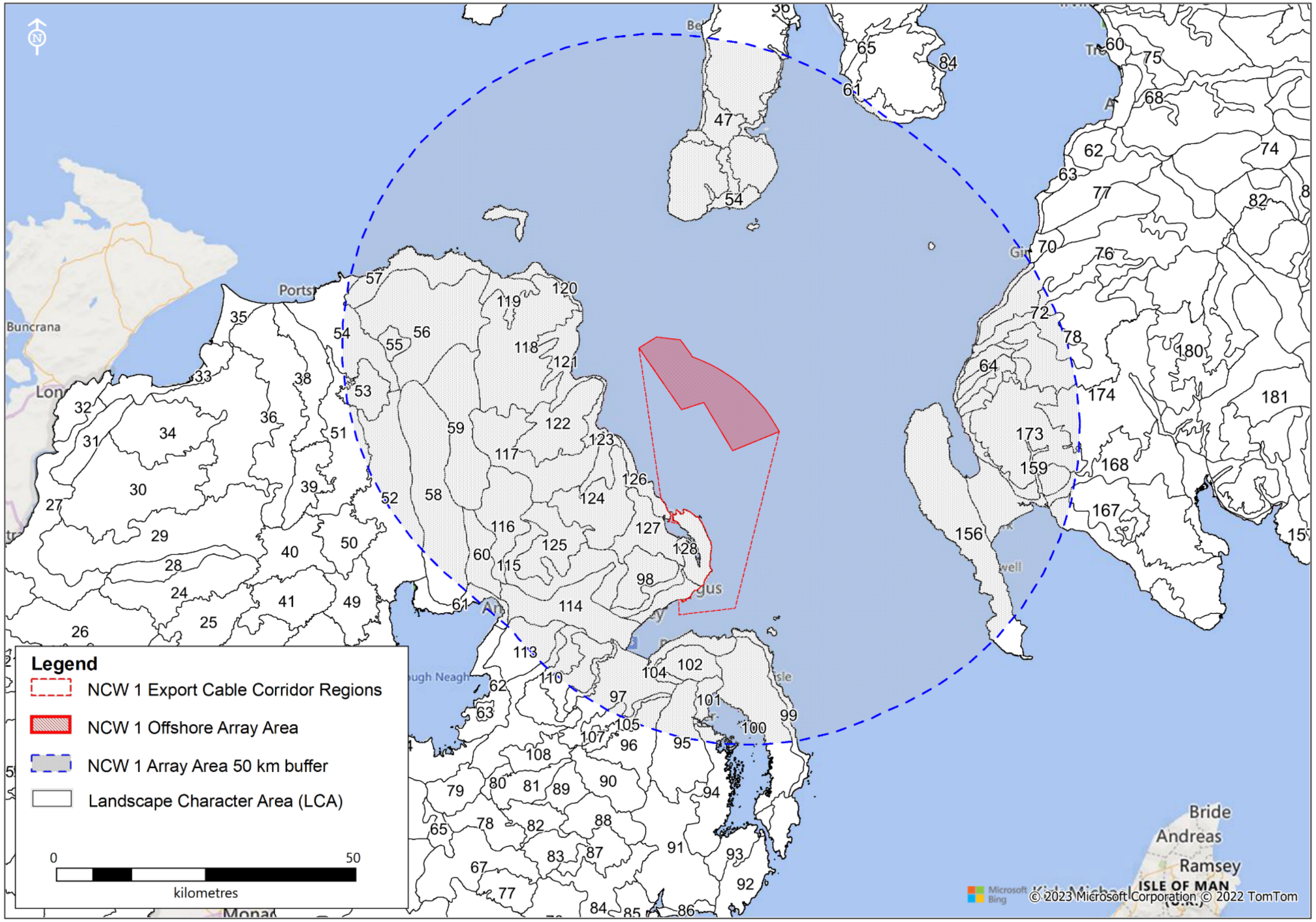

Figure 15.3: Landscape Character Areas (NI) and Types (Scotland) within SLVIA Study Area for North Channel Wind 1 Project

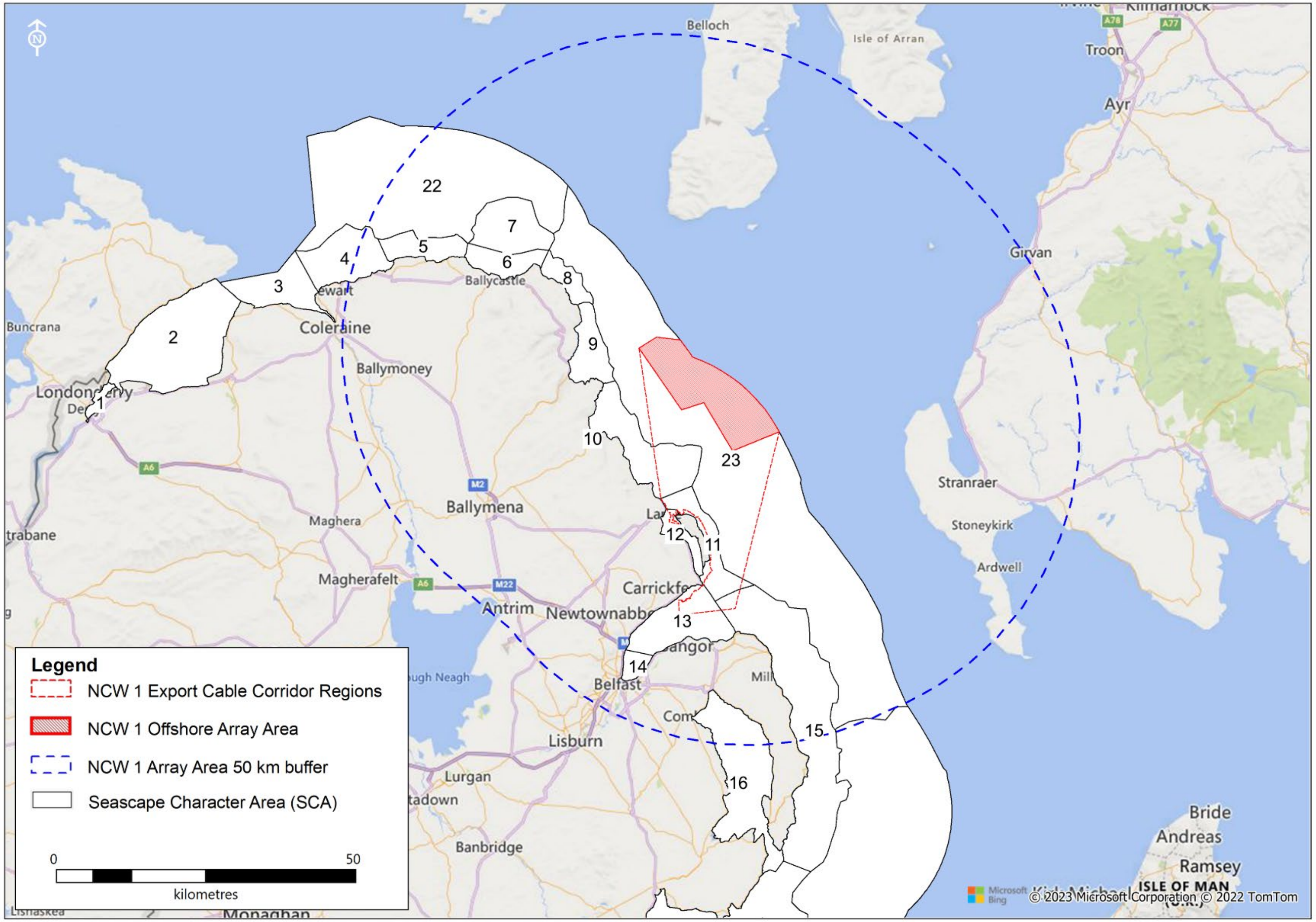

Figure 15.4: Northern Ireland Seascape Character Areas within SLVIA Study Area for North Channel Wind 1 Project

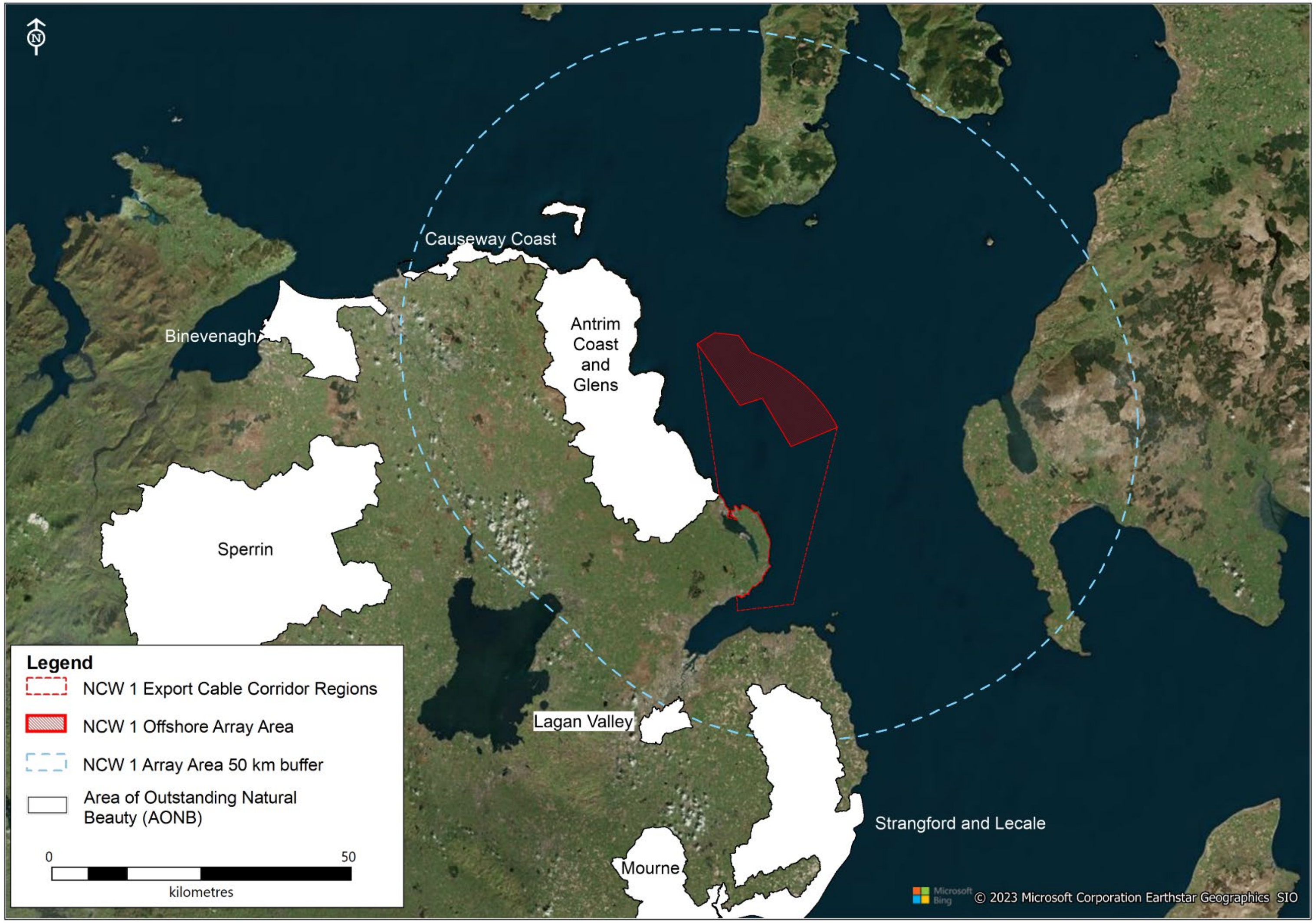

Figure 15.5: Areas of Outstanding Natural Beauty within SLVIA Study Area for North Channel Wind 1 Project

Argyll and Bute Council

SNH appointed Environmental Resources Management (ERM) to undertake a landscape characterisation of the Argyll and the Firth of Clyde. The Argyll and Firth of Clyde Landscape Assessment: No 78 was published in 1996. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

- LCT 36: Coastal Glens - Argyll
- LCT 39: Plateau Moor & Forest – Argyll
- LCT 53: Rocky Coastland - Argyll
- LCT 54: Rocky Coastland – Argyll
- LCT 59: Raised Beach Coast & Cliffs - Argyll
- LCT 61: Coastal Fringe with Agriculture - Argyll
- LCT 84: Rocky Islands - Argyll

North Ayrshire Council

SNH appointed Land Use Consultants to undertake a landscape characterisation of the Dumfries & Galloway. The Dumfries & Galloway Landscape Assessment: No 111 was published in 1998. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

- LCT 64: Coastal Fringe & Policies – Ayrshire
- LCT 72: Pastoral Valleys - Ayrshire
- LCT 76: Foothills - Ayrshire
- LCT 81: Southern Uplands - Ayrshire

Dumfries and Galloway Council

SNH appointed Land Use Consultants to undertake a landscape characterisation of the Dumfries & Galloway. The Dumfries & Galloway Landscape Assessment: No 94 was published in 1995. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

- LCT 156: Peninsula – Dumfries & Galloway
- LCT 158: Coastal Flats – Dumfries & Galloway

Key Visual Receptors

Land-based receptors within the coastal landscape of the ZTV's with potential to have views of either the construction, operation and maintenance or decommissioning activities of the Proposed Development are as follows;

- walkers, equestrians and cyclists using the public rights of way networks
- users of beaches, public open space and common land
- occupiers of coastal residential properties
- tourists and visitors using facilities such as hotels and cafes within settlements
- tourists and visitors at coastal caravan and camping sites
- tourists and visitors at attractions
- occupiers of vehicles travelling on the A2 (NI) coastal route

Marine Receptors

The sea area within the study area is relatively busy and is used by both commercial and recreational vessels.

A number of ferry routes operate between Northern Ireland and Scotland and England that cross the study area.

Recreational boating occurs in the area of sea associated with the coastline, particularly around Belfast Lough where a number of sailing clubs and marinas are located. These nearshore recreational receptors are likely to be impacted by the presence of the Proposed Development however these recreational receptors are typically transient visitors that are unlikely to be significantly impacted by the change to the marine seascape.

15.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on seascape, landscape and visual resources have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 15.2 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline seascape, landscape and visual resource information currently available and the Proposed Development description outlined in Chapter 2, a number of impacts are proposed to be scoped out of the assessment for seascape, landscape and visual resources. These impacts are outlined, together with a justification for scoping them out, in Table 15.3.

15.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The seascape, landscape and visual resources Environmental Statement chapter will follow the methodology set out in Chapter 3. Specific to the seascape, landscape and visual resources the following guidance documents will also be considered:

- Guidance: Assessing the Cumulative Effects of Wind Farms (SNH) (2012a);
- Guidance on the Assessment of the impact of offshore wind farm: Seascape and Visual Impact Report, published by Department of Trade and Industry (2001);
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3), published by the Landscape Institute and Institute of Environmental Management and Assessment (IEMMA) (2013);
- Guide to Best Practice in Seascape Assessment, Maritime Ireland/Wales INTERREG Report No. 5. Published by Countryside Council for Wales, Brady Shipman and Martin, University College Dublin (2001);
- Landscape Character Assessment: Guidance for England and Scotland, published by SNH and the Countryside Agency (2002a);
- Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals (September 2019);
- Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape (SNH) (2012b);
- Scottish Seascape in relation to Wind farms (SNH) (2005).
- The European Landscape Convention, Council of Europe, ETS No. 176 (2000, ratified 2006);
- The Siting and Design of Aquaculture in the landscape: Landscape and Visual Considerations (SNH) (2011); and
- Visual Representation of Wind Farms: Guidance, Version 2.2, published by SNH (2017b).

Table 15.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Seascape, Landscape and Visual Resources Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
SLVIA Onshore: Impacts on coastal landscape character and designations within 5 km of coast.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have indirect impacts on features, elements and characteristics of coastal landscapes and designations. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	DAERA, Local Council, NatureScot and NCC Landscape Character Assessments. Project specific site-based landscape analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.
SLVIA Onshore: Impacts on visual amenity within 5 km of coast.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have a direct effect on seaward views gained by land-based visual receptors. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	Site based visual analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.
SLVIA Marine: Impacts on seascape character and marine based visual receptors as a result of array.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have a direct effect on seascape character and views gained by sea-based visual receptors. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	DAERA, Local Council, NatureScot and NCC Landscape Character Assessments. Project specific site-based landscape analysis. Site based visual analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.

Table 15.3: Potential Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Seascape, Landscape and Visual Resources

Potential Impact	Justification
Construction	
SLVIA Onshore: Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Lighting associated with the array area construction activities are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Temporary impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.
Operation and Maintenance	
SLVIA Onshore: Long-term night-time impacts on coastal landscape character and visual amenity.	Aviation warning lights and navigation lights mounted on turbines are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Long term impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.
Decommissioning	

Potential Impact	Justification
SLVIA Onshore: Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Lighting associated with the array area decommissioning activities are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Temporary impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.

The seascape, landscape and visual resources impact assessment, including a summary of relevant legislative and planning policy context will be prepared detailing the proposed assessment methodology developed in consultation with relevant stakeholders. It is proposed that this will follow the EIA methodology set out in Chapter 3. Specific to the seascape, landscape, visual resources and cultural heritage setting impact assessment, the following will be considered:

- the baseline stage will evaluate the sensitivity or nature of receptors through the analysis of their susceptibility to change as a result of the Proposed Development, and value;
- the nature or magnitude of impact on receptors will be evaluated using current best practice guidance; and
- significance of effect will be assessed through a combination of sensitivity/susceptibility and magnitude to establish which are significant. Professional judgement informed by best practice guidance and consultation will be used to determine significance.

The seascape, landscape and visual resources impact assessment will define a 'maximum adverse scenario' and establish an indicative layout to form the basis for the assessment. The influence of wind turbine height, spacing and layout pattern would be considered in defining the maximum adverse scenario, and the layout option under consideration would be used to inform this assessment. The size and spacing of wind turbines have the potential to influence the nature of the visual effect of the offshore wind farm. These effects range from a complex 'massing' effect associated with a higher number of small capacity wind turbines which result in a dense wind turbine layout, to less complex but more visible wind turbines associated with lower numbers of larger capacity wind turbines, which result in a more widely spaced layout.

Offshore wind energy development, wherever it occurs, is usually visible in some form. The Proposed Development would have the following general attributes typical of most wind farms: engineered, large scale, simple in form, smooth texture, monochrome/muted colour and strong vertical form. Responses by people to wind farms can vary from 'beautiful' to 'offensive', with respondents perceiving wind turbines as potentially rhythmic, unusual, safe, interesting, invigorating, majestic and spiritual on the one hand and degrading, jarring, overbearing, industrial, clashing and ugly on the other. Wind energy development thus gives rise to a spectrum of responses from individuals and organisations who perceive its effects ranging from strongly adverse to strongly beneficial.

The likely significant seascape, landscape and visual effects will be described covering type (i.e., direct, indirect or cumulative), temporal nature (short, medium and long term, permanent or temporary), and valency (beneficial or positive and adverse or negative). For the purposes of this assessment, effects will be defined based on the scenario of an individual who may perceive the Proposed Development as a negative addition to the seascape or view. Effects will therefore be defined as adverse within the Environmental Statement; but may in fact be seen as beneficial or positive by large numbers of viewers. An individual who perceives offshore wind farms as a positive addition to the seascape or view may consider the same effects to be beneficial or neutral in nature.

Visualisations

Wirelines/photomontages will be used to illustrate the potential seascape, landscape and visual impact of the Proposed Development and it is proposed that the photomontages would follow recognised UK guidance for the visualisation of offshore wind farms.

Preliminary wirelines have been developed for the following viewpoints:

- VP01 Cushendun;
- VP02 Carnlough;
- VP03 Portmuck Harbour;
- VP04 Marine Parade Whitehead;
- VP05 Crawfordsburn Beach; and
- VP06 Donaghadee

The locations of these viewpoints and the wirelines are presented in Annex C to the Scoping Report.

15.2.6 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to occur with other plans or projects within the seascape, landscape and visual resources array study area.

The assessment of cumulative effects on seascape, landscape and visual resources will be undertaken in accordance with guidance within the SNH (2012) document Assessing the Cumulative Effects of Wind Farms. Cumulative effects occur when a combination of two or more developments influence the perception of seascape/landscape character. Cumulative visual effects occur in several ways, either arising when developments are visible in combination or succession from a particular viewpoint or appearing sequentially as multiple developments when moving through the landscape. Cumulative effects can also develop through a gradual change in perception over time. In establishing the baseline conditions, the seascape, landscape, visual resources and cultural heritage setting impact assessment would take account of the presence of other operational or consented coastal and offshore developments.

15.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out as part of the SLVIA, as there is potential for transboundary impacts upon seascape, landscape and visual resources due to the construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

15.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Seascape, Landscape and Visual Resources?
- Do you agree that all receptors and impacts have been identified for Seascape, Landscape and Visual Resources?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

15.3 NCW 2 PROJECT

15.3.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the seascape, landscape and visual environment and cultural heritage setting of relevance to the proposed North Channel Wind 2 (NCW 2) project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the seascape, landscape and visual environment.

15.3.2 STUDY AREA

To establish the baseline environment for the offshore elements of the Proposed Development, a Zone of Theoretical Visibility (ZTV) will be prepared at EIA stage. UK guidance (SNH, 2017b) on the landscape and visual effects of an offshore wind farm recommends a study area of a 50 km radius for wind turbines 150 m high to blade tip and taller. This reflects the distance that wind turbines of this height would potentially be visible to the human eye. A preliminary offshore landscape and visual ZTV has been prepared to a 50 km radius from the outer boundary of the array area to ensure that all coastal landscape and visual setting receptors that may experience significant effects are identified. This 50km radius from the NCW array area is defined as the Seascape, Landscape and Visual Resources array study area (refer Figure 15.6).

Figure 15.6: Seascape, Landscape and Visual Resources Study Area North Channel Wind 2 Project

15.3.3 BASELINE ENVIRONMENT

The following forms a summary of the data collated and work undertaken to date and is illustrated in Figure 15.7 to Figure 15.10.

- preliminary review of legislative and policy context;
- review of landscape designations;
- preliminary review of national, regional and local landscape/coastal character assessments including landscape character areas (LCA) and types; and
- preparation of preliminary proposed ZTV's.

A preliminary appraisal of the existing baseline within the seascape, landscape and visual resources array study area has been undertaken as is presented below.

Landscape and Coastal Character

Seascape and landscape resources within the seascape, landscape and visual resources array study area may be affected either directly or indirectly by construction, operation and maintenance or decommissioning activities within the Proposed Development study area.

<u>Northern Ireland</u>

NI Regional Landscape Character

In recognising the importance of sustaining regional identity, the Northern Ireland Environment Agency (NIEA), commissioned the Northern Ireland Regional Landscape Character Assessment (NIRLCA), which resulted in the identification of distinct regional character areas within Northern Ireland.

The assessment provides a strategic overview of the Northern Ireland landscape and subdivides the countryside into 26 Regional Landscape Character Areas (RLCAs) based upon information on people and place and the combinations of nature, culture and perception which make each part of Northern Ireland unique and has been developed to meet commitments set out in Northern Ireland's Landscape Charter.

A review of the NIRLCA indicates that the study area for the Proposed Development lies within the following 7 RLCA's; see Figure 15.7.

- 16 North Coast and Rathlin Island
- 18 Antrim Plateau and Glens
- 19 South Antrim Hills and Six Mile Water
- 20 Belfast Lough and Islandmagee
- 21 Belfast and Lagan Valley
- 22 Down Drumlins and Holywood Hills
- 26 Strangford, Ards and Lecale

NI Landscape Character

The Northern Ireland Landscape Character Assessment 2000 (NILCA 2000) contains landscape briefs for each of the 130 landscape character areas (LCAs) in Northern Ireland surveyed in 1999. It provides a baseline description of the landscape at a point in time based upon local patterns of geology, landform, land use, cultural and ecological features. This base information is still a valuable resource and has informed the 26 regional landscape character areas of the NIRLCA above. However, there has been substantial development in both rural and urban areas of Northern Ireland since the NILCA 2000 was surveyed which has impacted on many of its local landscape character areas. For the purpose of this scoping report only the coastal related LCAs located within 5 km of the coast have been scoped in.

A review of the NILCA 2000 indicates that the study area for the Proposed Development is located within 19 coastal LCAs as follows; refer to Figure 15.8;

- 57 Causeway Coast and Rathlin Island
- 92 Quoile Valley Lowlands
- 93 Portaferry and North Lecale
- 94 Strangford Drumlins and Islands
- 97 Belfast/Lisburn
- 99 Outer Ards Coast
- 100 Ards Farmlands and Estates
- 101 Scrabo
- 103 Bangor Coastline
- 114 Three- and Six-Mile Water Valleys
- 118 Moyle Moorlands & Forest
- 119 Ballycastle Glens
- 120 Fair Head
- 121 Moyle Glens
- 123 Larne Glens
- 126 Larne Coast
- 127 Larne Ridgeland
- 128 Islandmagee
- 129 Carrickfergus Shoreline

NI Regional Seascape Character

The Northern Ireland Environment Agency (NIEA) undertook a Regional Seascape Character Assessment of Northern Ireland with the aim to provide a strategic understanding of different areas of regional seascape character along the entire Northern Ireland coast, complementing similar assessments undertaken elsewhere in the UK. This aimed to contribute to the aims of the European Landscape Convention through promoting the protection, management and planning of the seascape, and to support European cooperation on landscape issues. The extent of the study includes the marine, intertidal and coastal terrestrial parts of the entire 650 km of the Northern Ireland coastline and extends up to 12 nautical miles offshore and 5 km inshore. Based on the NILCA 2000 a total of 24 seascape character areas (SCA) were identified. The SCAs in Northern Ireland located within the study area for the Proposed Development are listed below; refer to Figure 15.9;

- 4. The Skerries & Dunluce Coast
- 5. Causeway Coast
- 6. Ballycastle Coast
- 7. Rathlin
- 8. Torr Head Coast
- 9. Northern Glens Coast
- 10. Southern Glens Coast
- 11. The Gobbins
- 12. Larne Lough
- 13. Belfast Lough

- 14. Belfast Harbour
- 15. Ards Peninsula
- 16. Strangford Lough
- 22. Atlantic
- 23. North Channel
- 24. Irish Sea (South Down)

Areas of Outstanding Natural Beauty

These are designated either under the Amenity Lands Act (Northern Ireland) 1965 or the Nature Conservation and Amenity Lands (Northern Ireland) Order 1985. They cover huge areas of land, embracing a range of landscape types including limestone cliffs, sweeping moorlands and important geological landforms. They also include farmland, forest, lakes, coastline and settlement. They are generally subject to planning conditions.

The following AONB's are located within the study area; refer to Figure 15.10;

- Antrim Coast & Glens AONB
- Causeway Coast AONB
- Lagan Valley AONB
- Strangford & Lecale AONB

Scotland

National Coastal Character

At a national scale, the seascape, landscape and visual resources the Proposed Development study area would coincide with 5 of the 13 Scottish coastal character types that occur in 33 indicative National Seascape Character Areas. The following coastal character types are relevant to the seascape, landscape and visual resources impact assessment;

- Type 1: Remote High Cliffs
- Type 3: Deposition Coastline, Open Views
- Type 6: Narrow Coastal Shelf
- Type 9: Sounds' Narrows and Islands
- Type 10: Outer Firth and Islands
- Type 12: Deposition Coasts of Islands
- Type 13: Low Rocky Island Coasts

National Landscape Character

Scotland has a digital map based national LCA (published in 2019). This shows Landscape Character Types (LCTs) – i.e., areas of consistent and recognisable landscape character. The digital map is available on the NatureScot web site. A review of the national map has indicated that the study area for the Proposed Development coincides with the following LCTs; see Figure 15.8;

- LCT 36: Coastal Glens - Argyll
- LCT 39: Plateau Moor & Forest – Argyll
- LCT 53: Rocky Coastland - Argyll
- LCT 54: Rocky Coastland – Argyll
- LCT 59: Raised Beach Coast & Cliffs - Argyll
- LCT 61: Coastal Fringe with Agriculture - Argyll

- LCT 64: Coastal Fringe & Policies – Ayrshire
- LCT 72: Pastoral Valleys - Ayrshire
- LCT 76: Foothills - Ayrshire
- LCT 81: Southern Uplands - Ayrshire
- LCT 84: Rocky Islands - Argyll
- LCT 156: Peninsula – Dumfries & Galloway
- LCT 158: Coastal Flats – Dumfries & Galloway

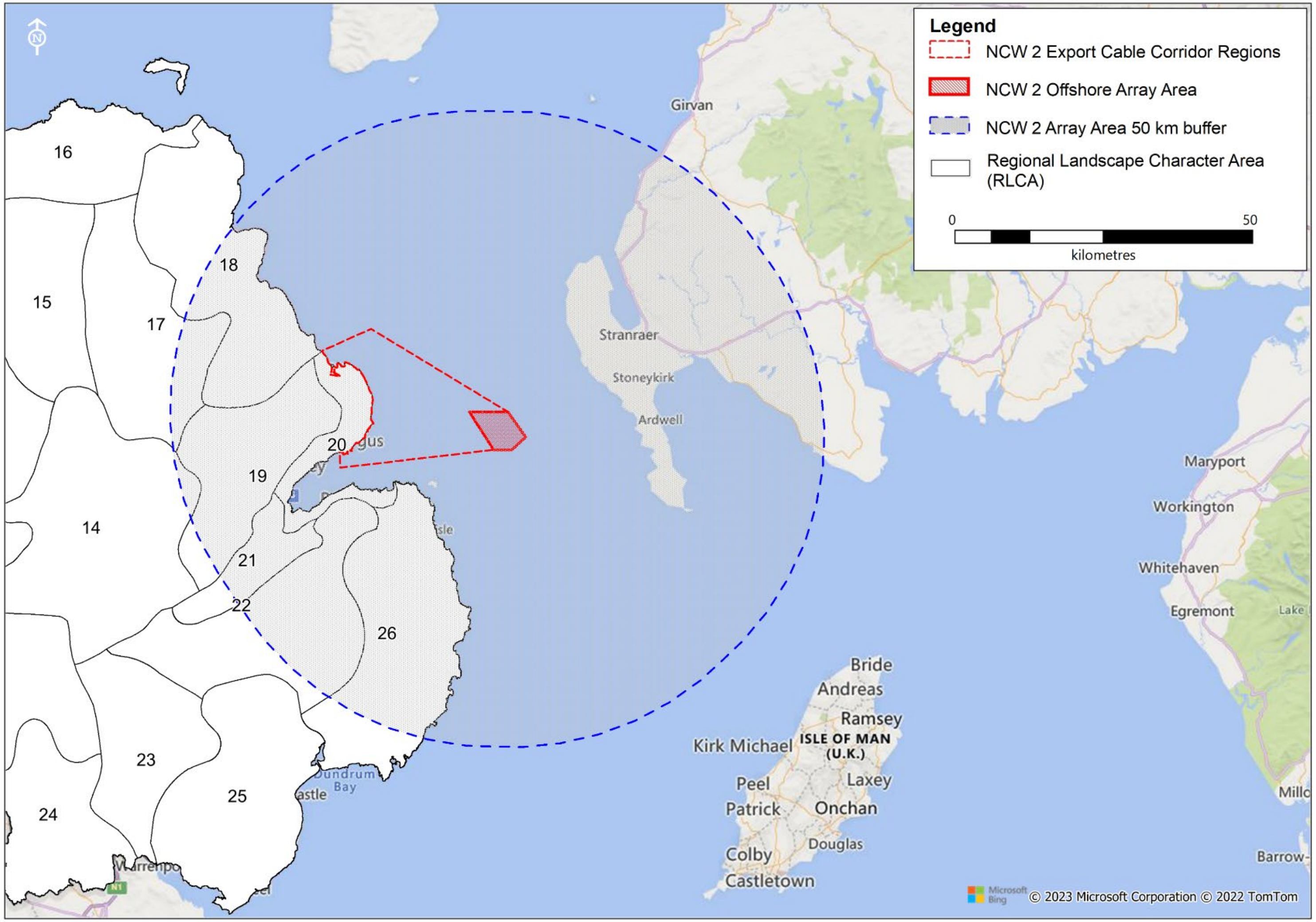

Figure 15.7: Northern Ireland Regional Landscape Character Areas within SLVIA Study Area for North Channel Wind 2 Project

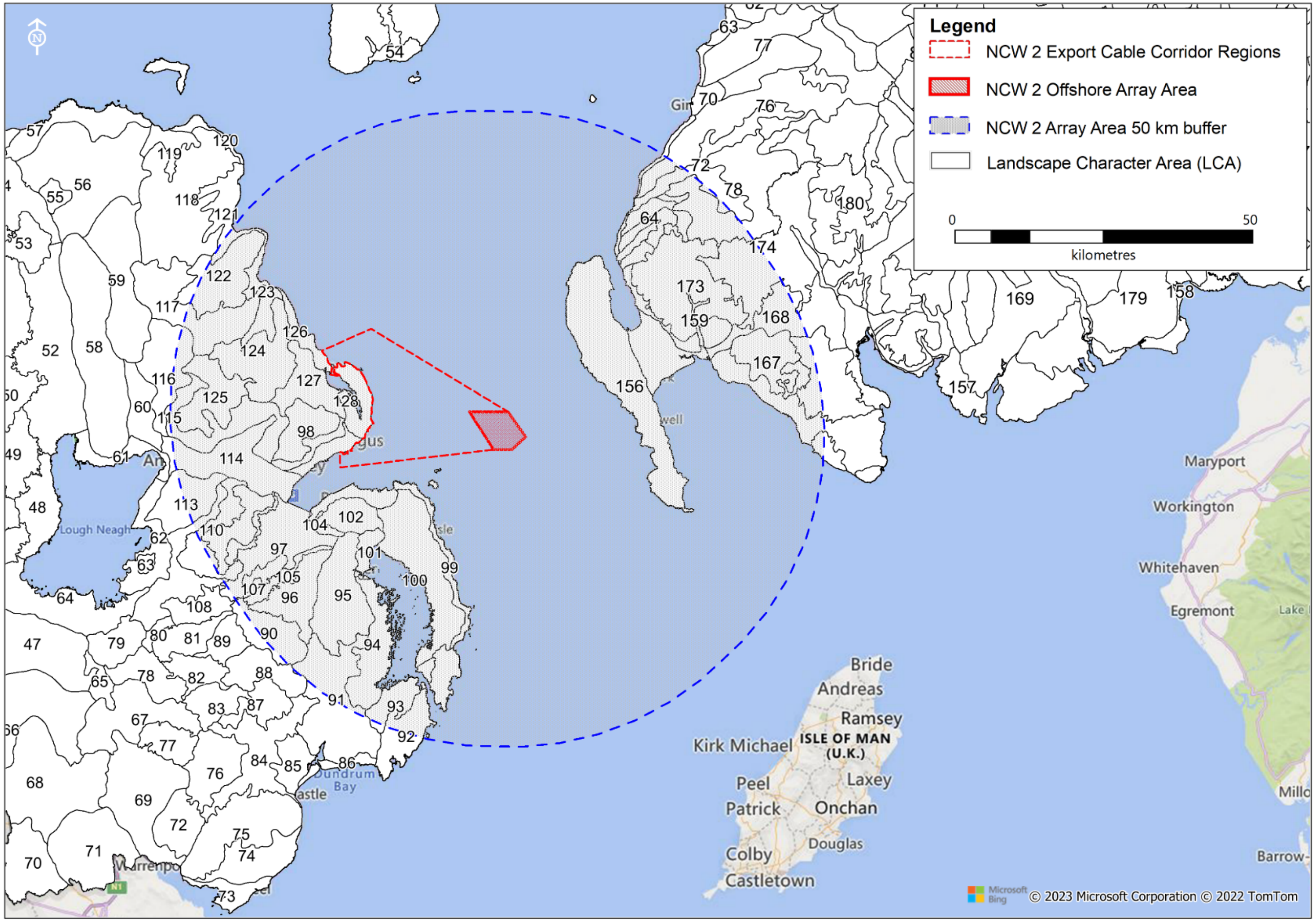

Figure 15.8: Landscape Character Areas (NI) and Types (Scotland) within SLVIA Study Area for North Channel Wind 2 Project

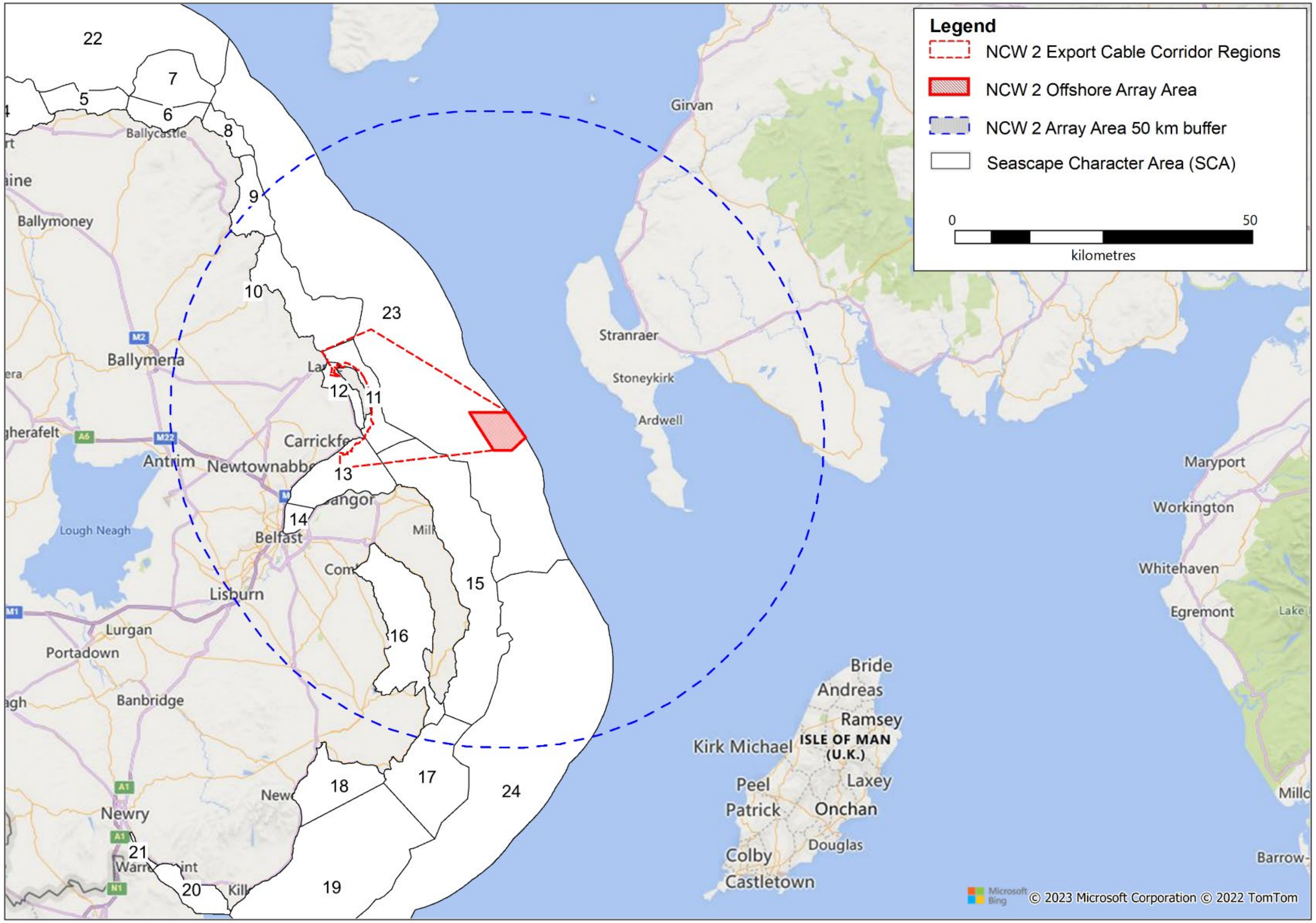

Figure 15.9: Northern Ireland Seascape Character Areas within SLVIA Study Area for North Channel Wind 2 Project

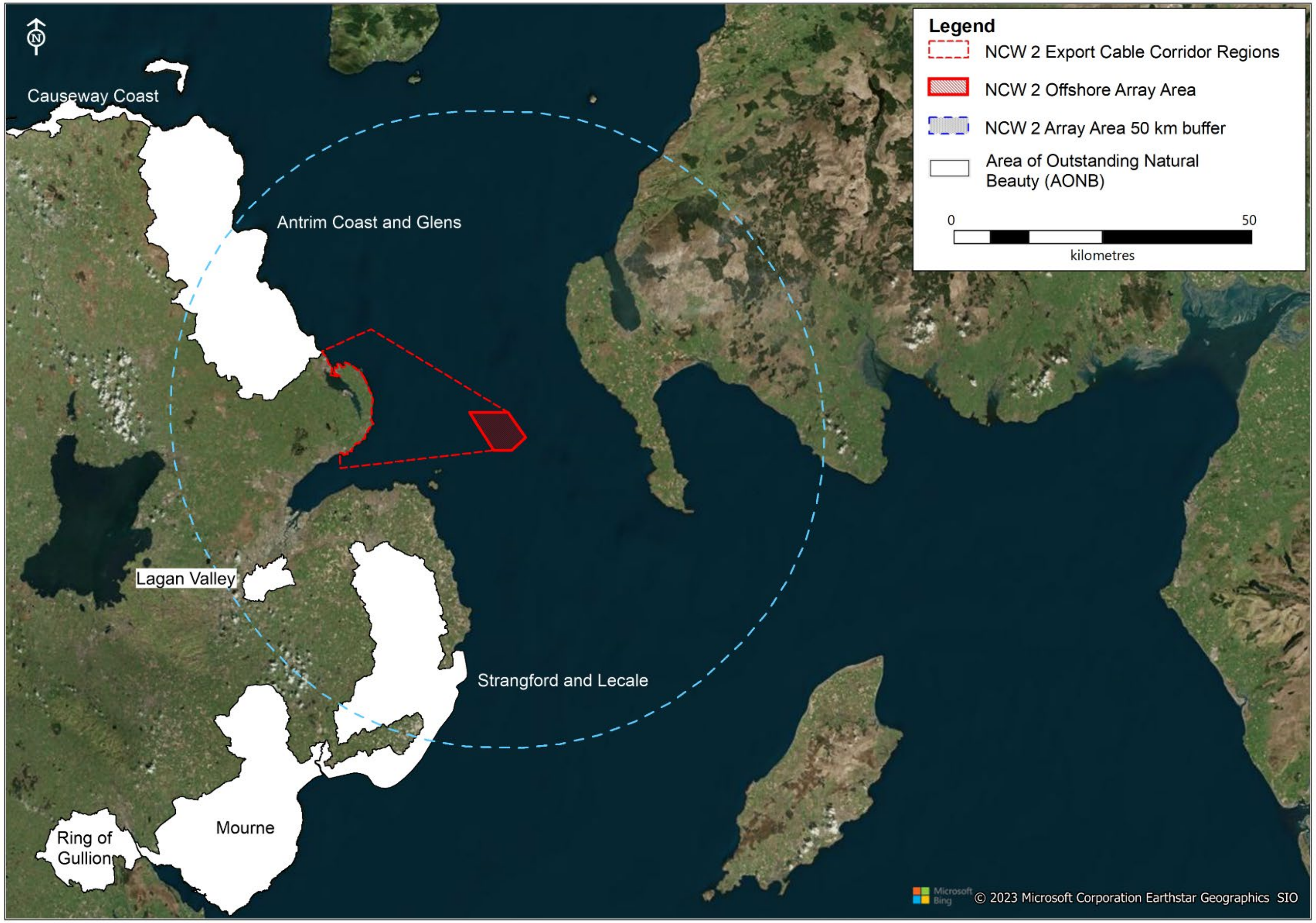

Figure 15.10: Areas of Outstanding Natural Beauty within SLVIA Study Area for North Channel Wind 2 Project

Argyll and Bute Council

SNH appointed Environmental Resources Management (ERM) to undertake a landscape characterisation of the Argyll and the Firth of Clyde. The Argyll and Firth of Clyde Landscape Assessment: No 78 was published in 1996. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

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- LCT 84: Rocky Islands - Argyll

North Ayrshire Council

SNH appointed Land Use Consultants to undertake a landscape characterisation of the Dumfries & Galloway. The Dumfries & Galloway Landscape Assessment: No 111 was published in 1998. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

- LCT 64: Coastal Fringe & Policies – Ayrshire
- LCT 72: Pastoral Valleys - Ayrshire
- LCT 76: Foothills - Ayrshire
- LCT 81: Southern Uplands - Ayrshire

Dumfries and Galloway Council

SNH appointed Land Use Consultants to undertake a landscape characterisation of the Dumfries & Galloway. The Dumfries & Galloway Landscape Assessment: No 94 was published in 1995. The seascape, landscape and visual resources study area coincides the 2 listed LCT above namely;

- LCT 156: Peninsula – Dumfries & Galloway
- LCT 158: Coastal Flats – Dumfries & Galloway

Key Visual Receptors

Land-based receptors within the coastal landscape of the ZTV's with potential to have views of either the construction, operation and maintenance or decommissioning activities of the Proposed Development are as follows;

- walkers, equestrians and cyclists using the public rights of way networks
- users of beaches, public open space and common land
- occupiers of coastal residential properties
- tourists and visitors using facilities such as hotels and cafes within settlements
- tourists and visitors at coastal caravan and camping sites
- tourists and visitors at attractions
- occupiers of vehicles travelling on the A2 (NI) coastal route

Marine Receptors

The sea area within the study area is relatively busy and is used by both commercial and recreational vessels.

A number of ferry routes operate between Northern Ireland and Scotland and England that cross the study area.

Recreational boating occurs in the area of sea associated with the coastline, particularly around Belfast Lough where a number of sailing clubs and marinas are located. These nearshore recreational receptors are likely to be impacted by the presence of the Proposed Development however these recreational receptors are typically transient visitors that are unlikely to be significantly impacted by the change to the marine seascape.

15.3.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

A range of potential impacts on seascape, landscape and visual resources have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 15.4 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

On the basis of the baseline seascape, landscape and visual resource information currently available and the Proposed Development description outlined in Chapter 2, a number of impacts are proposed to be scoped out of the assessment for seascape, landscape and visual resources. These impacts are outlined, together with a justification for scoping them out, in Table 15.5.

Table 15.4: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Seascape, Landscape and Visual Resources Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
SLVIA Onshore: Impacts on coastal landscape character and designations within 5 km of coast.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have indirect impacts on features, elements and characteristics of coastal landscapes and designations. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	DAERA, Local Council, NatureScot and NCC Landscape Character Assessments. Project specific site-based landscape analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.
SLVIA Onshore: Impacts on visual amenity within 5 km of coast.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have a direct effect on seaward views gained by land-based visual receptors. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	Site based visual analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.
SLVIA Marine: Impacts on seascape character and marine based visual receptors as a result of array.	✓	✓	✓	Justification: There is the potential that the Proposed Development may have a direct effect on seascape character and views gained by sea-based visual receptors. Embedded mitigation: Achieve appropriate design and layout of wind turbines within the array area.	DAERA, Local Council, NatureScot and NCC Landscape Character Assessments. Project specific site-based landscape analysis. Site based visual analysis.	Complete SLVIA in accordance with guidance. Preparation of ZTV; wirelines and photomontages.

Table 15.5: Potential Impacts Proposed to be Scoped Out of the Proposed Development Assessment for Seascape, Landscape and Visual Resources

Potential Impact	Justification
Construction	
SLVIA Onshore: Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the array zone.	Lighting associated with the array area construction activities are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Temporary impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.
Operation and Maintenance	
SLVIA Onshore: Long-term night-time impacts on coastal landscape character and visual amenity.	Aviation warning lights and navigation lights mounted on turbines are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Long term impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.
Decommissioning	
SLVIA Onshore: Temporary night-time impacts on coastal landscape character	Lighting associated with the array area decommissioning activities are highly unlikely to be visible/perceptible from the array area due to distance. Therefore, subject to consultation with the relevant stakeholders and

Potential Impact	Justification
and visual amenity as a result of temporary lighting within the array zone.	feedback received on this Offshore Scoping Report, the Applicant intends to scope this impact out of further consideration within the EIA.
LVIA Onshore: Temporary impacts on landscape character and visual amenity inland beyond 5 km.	Beyond 5 km inland from the coast the connection with the sea has been lost and through a combination of distance of view, topography and screening vegetation no significant effects are anticipated.

15.3.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The seascape, landscape and visual resources Offshore Environmental Statement chapter will follow the methodology set out in Chapter 3. Specific to the seascape, landscape and visual resources the following guidance documents will also be considered:

- Guidance: Assessing the Cumulative Effects of Wind Farms (SNH) (2012a);
- Guidance on the Assessment of the impact of offshore wind farm: Seascape and Visual Impact Report, published by Department of Trade and Industry (2001);
- Guidelines for Landscape and Visual Impact Assessment, Third Edition (GLVIA3), published by the Landscape Institute and Institute of Environmental Management and Assessment (IEMMA) (2013);
- Guide to Best Practice in Seascape Assessment, Maritime Ireland/Wales INTERREG Report No. 5. Published by Countryside Council for Wales, Brady Shipman and Martin, University College Dublin (2001);
- Landscape Character Assessment: Guidance for England and Scotland, published by SNH and the Countryside Agency (2002a);
- Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals (September 2019);
- Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape (SNH) (2012b);
- Scottish Seascape in relation to Wind farms (SNH) (2005).
- The European Landscape Convention, Council of Europe, ETS No. 176 (2000, ratified 2006);
- The Siting and Design of Aquaculture in the landscape: Landscape and Visual Considerations (SNH) (2011); and
- Visual Representation of Wind Farms: Guidance, Version 2.2, published by SNH (2017b).

The seascape, landscape and visual resources impact assessment, including a summary of relevant legislative and planning policy context will be prepared detailing the proposed assessment methodology developed in consultation with relevant stakeholders. It is proposed that this will follow the EIA methodology set out in Chapter 3. Specific to the seascape, landscape, visual resources and cultural heritage setting impact assessment, the following will be considered:

- the baseline stage will evaluate the sensitivity or nature of receptors through the analysis of their susceptibility to change as a result of the Proposed Development, and value;
- the nature or magnitude of impact on receptors will be evaluated using current best practice guidance; and
- significance of effect will be assessed through a combination of sensitivity/susceptibility and magnitude to establish which are significant. Professional judgement informed by best practice guidance and consultation will be used to determine significance.

The seascape, landscape and visual resources impact assessment will define a 'maximum adverse scenario' and establish an indicative layout to form the basis for the assessment. The influence of wind turbine height, spacing and layout pattern would be considered in defining the maximum adverse scenario, and the layout option under consideration would be used to inform this assessment. The size and spacing of wind turbines have the potential to influence the nature of the visual effect of the offshore wind farm. These effects range from a complex 'massing' effect associated with a higher number of small capacity wind turbines which result in a dense wind turbine layout, to less complex but more visible wind turbines associated with lower numbers of larger capacity wind turbines, which result in a more widely spaced layout.

Offshore wind energy development, wherever it occurs, is usually visible in some form. The Proposed Development would have the following general attributes typical of most wind farms: engineered, large scale, simple in form, smooth texture, monochrome/muted colour and strong vertical form. Responses by people to wind farms can vary from 'beautiful' to 'offensive', with respondents perceiving wind turbines as potentially rhythmic, unusual, safe, interesting, invigorating, majestic and spiritual on the one hand and degrading, jarring, overbearing, industrial, clashing and ugly on the other.

Wind energy development thus gives rise to a spectrum of responses from individuals and organisations who perceive its effects ranging from strongly adverse to strongly beneficial.

The likely significant seascape, landscape and visual effects will be described covering type (i.e., direct, indirect or cumulative), temporal nature (short, medium and long term, permanent or temporary), and valency (beneficial or positive and adverse or negative). For the purposes of this assessment, effects will be defined based on the scenario of an individual who may perceive the Proposed Development as a negative addition to the seascape or view. Effects will therefore be defined as adverse within the Offshore Environmental Statement; but may in fact be seen as beneficial or positive by large numbers of viewers. An individual who perceives offshore wind farms as a positive addition to the seascape or view may consider the same effects to be beneficial or neutral in nature.

Visualisations

Wirelines/photomontages will be used to illustrate the potential seascape, landscape and visual impact of the Proposed Development and it is proposed that the photomontages would follow recognised UK guidance for the visualisation of offshore wind farms.

Preliminary wirelines have been developed for the following viewpoints:

- VP01 Cushendun;
- VP02 Carnlough;
- VP03 Portmuck Harbour;
- VP04 Marine Parade Whitehead;
- VP05 Crawfordsburn Beach; and
- VP06 Donaghadee

The locations of these viewpoints and the wirelines are presented in Annex C to the Scoping Report.

15.3.6 POTENTIAL CUMULATIVE EFFECTS

There is potential for cumulative effects to occur with other plans or projects within the seascape, landscape and visual resources array study area.

The assessment of cumulative effects on seascape, landscape and visual resources will be undertaken in accordance with guidance within the SNH (2012) document Assessing the Cumulative Effects of Wind Farms. Cumulative effects occur when a combination of two or more developments influence the perception of seascape/landscape character. Cumulative visual effects occur in several ways, either arising when developments are visible in combination or succession from a particular viewpoint or appearing sequentially as multiple developments when moving through the landscape. Cumulative effects can also develop through a gradual change in perception over time. In establishing the baseline conditions, the seascape, landscape, visual resources and cultural heritage setting impact assessment would take account of the presence of other operational or consented coastal and offshore developments.

15.3.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out as part of the SLVIA, as there is potential for transboundary impacts upon seascape, landscape and visual resources due to the construction, operational and maintenance, and decommissioning impacts of the Proposed Development.

15.3.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Seascape, Landscape and Visual Resources?
- Do you agree that all receptors and impacts have been identified for Seascape, Landscape and Visual Resources?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?

- Do you agree with the proposed approach assessment?

16. INFRASTRUCTURE AND OTHER USERS OF THE SEA

16.1 NCW 1 PROJECT

16.1.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the infrastructure and other users of relevance to the Proposed North Channel Wind 1 Project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the infrastructure and other users' receptors.

16.1.2 STUDY AREA

The North Channel Wind 1 project is part of Northern Ireland's first offshore wind farm and its development area is shown in Figure 16.1. Available data has been collated for structures and activities within a defined study area of a range of 100km to support the development of the 'infrastructure and other sea users' section. This range allows for consideration of the potential effects of transport of sediment suspended during the construction or operational phases of the project, which are mostly likely to cause an impact on activities susceptible to increases in suspended sediment concentrations, especially:

- Disposal sites; and
- Recreational diving.

16.1.3 BASELINE ENVIRONMENT

Information regarding the infrastructure and other sea users' section has been collated through a detailed and comprehensive review of currently accessible studies and datasets. Key data sources are listed in Table 16.1, noting that this list is not exhaustive. This section provides a high-level overview of the infrastructure and other sea users baseline environment within the development area of the proposed North Channel Wind 1 floating offshore wind farm.

This section considers the extent of potential direct physical overlap between the proposed North Channel Wind 1 project and the following receptors:

- Oil and Gas Operations;
- Pipelines;
- Marine Aggregate Extraction and Disposal Sites;
- Offshore Wind Farms;
- Cables;
- Sailing and Motor Cruising;
- Recreational Diving; and
- Carbon Capture System (CCS).
- The following topics are further considered as separate sections within this Offshore Scoping Report: Chapters 11 Commercial Fisheries; 12 Shipping and Navigation; 13 Aviation, Military and Communications; 14 Marine Archaeology; 15 Seascape, Landscape and Visual Resources, and 17 Population and Human Health.

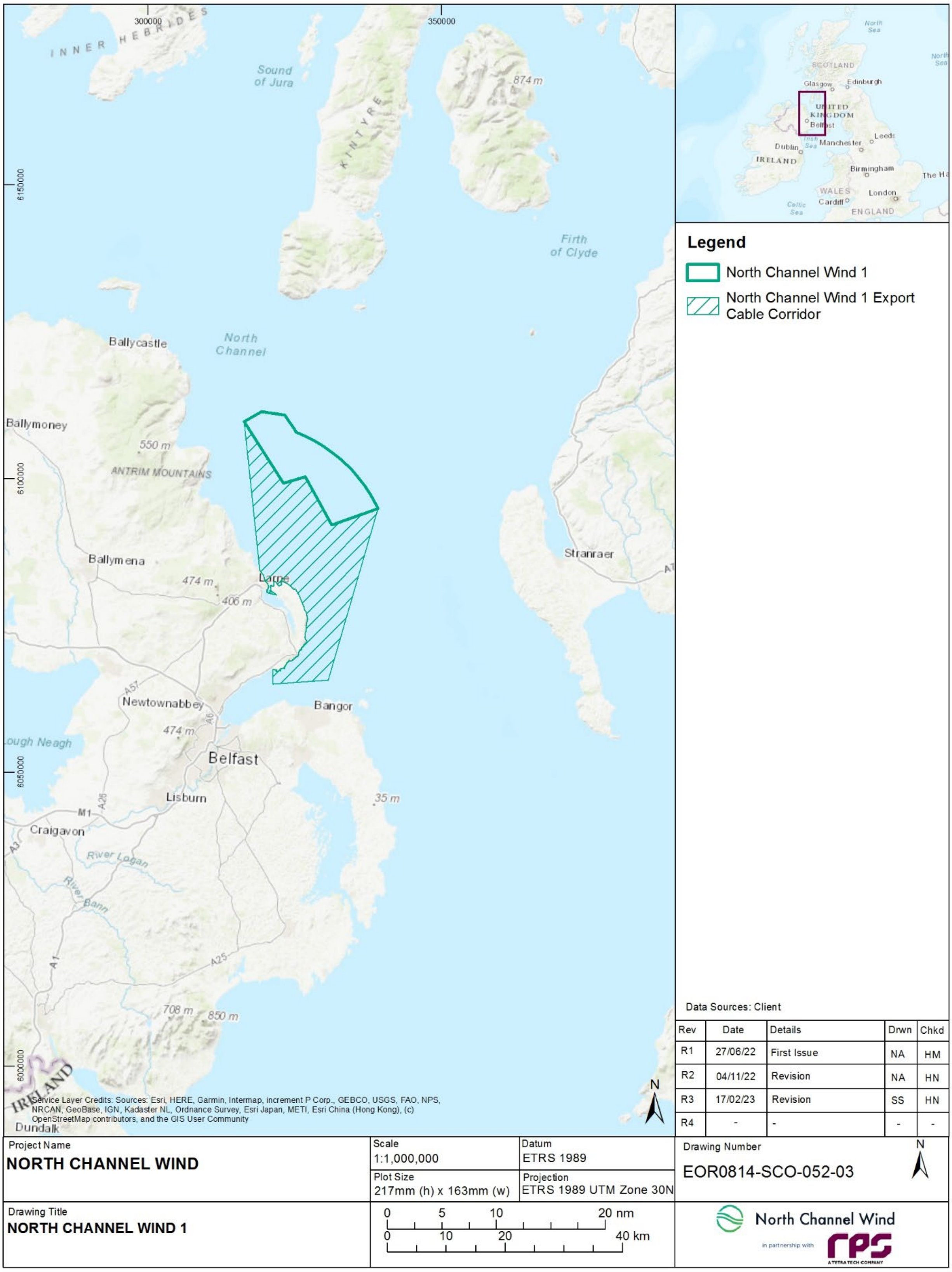


Figure 16.1: Outline of North Channel Wind 1 Development Area

Table 16.1: Desktop sources that inform the Infrastructure and other Sea Users Scoping Assessment

Data	Source	Year	Author
Cable routes	Kis-Orca	2022	Kis-Orca
Disposal sites	EMODnet	2022	EMODnet
Marine Aggregate Extraction	EMODnet	2022	EMODnet
Offshore wind farms	The Crown Estate (TCE)	2022	TCE
CCS	TCE	2022	TCE
Pipelines	OGA	2021	OGA
Wells	OGA	2021	OGA
Oil and gas platforms	OGA	2021	OGA
Subsurface structures	OGA	2021	OGA
Oil and gas licence block	OGA	2021	OGA
United Kingdom Continental Shelf (UKCS) block	OGA	2021	OGA
Marinas	UK Coastal Atlas of Recreational Boating	2018	Royal Yachting Association (RYA)
Recreational activities	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA clubs	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA training centres	UK Coastal Atlas of Recreational Boating	2018	RYA
General boating areas	UK Coastal Atlas of Recreational Boating	2018	RYA
Diving sites (typically wrecks)	UKDiving.co.uk	2010	UK Diving

Desktop Study

Oil and Gas Operations

The Export Cable Corridor overlaps with one oil and gas terminal, at Ballylumford, connected to the Scotland to Northern Ireland pipeline and the terminal at Stranraer, with no other direct overlaps (Oil and Gas UK, 2021), as shown in Figure 16.2.

The nearest wells are the BG International Limited 111/15- 1 abandoned dry well approximately 49.73 km to the south-east, off the coast of Stranraer, and the ELF Exploration UK Limited 111/25- 1A abandoned dry well approximately 70 km to the south of the development area. Eight license blocks for oil and gas extraction are in use to the far south-east of the development area, but the approximately 110km distance from the North Channel Wind 1 development area lies outside of the defined 100km study area, and the presence of the Isle of Man directly between the two areas places these blocks outside of the defined study area.

Subsurface structures (including protective structures, pipe junctions, manifolds, wellheads, trees, and valves) are usually protected by a 500m safety zone. One berm subsurface structure exists near to the pipeline terminal at Stranraer, although this is beyond the 500m safety zone and likely will not influence any phase of the North Channel Wind 1 farm development. However, this does fall within the defined study area of 100km.

One natural gas pipeline, the Twynholm to Ballylumford Scotland to Northern Ireland pipeline passes through the southern region of the North Channel Wind 1 Export Cable Corridor.

Pipelines

The Scotland to Northern Ireland pipeline crosses through the south of the North Channel Wind 1 Export Cable Corridor development area, in an approximately east-west direction from Twynholm to Ballylumford (Oil and Gas UK, 2021), and this pipeline transports natural gas (Figure 16.2). One pipeline crosses Belfast Lough, to the south-west of the Export Cable Corridor, with this being used to transport natural gas. Two other interconnector pipelines (IC1 and IC2) are located 80.83 km and 83.87 km south of the development area respectively, running in a south-west to north-east direction between Scotland and Ireland, with these pipelines transporting natural gas.

Carbon Capture Systems

No Carbon Capture & Storage System (CCS) developments are present or currently planned within the defined study area surrounding the North Channel Wind development area (TCE, 2022), and so this can be screened out of this assessment. Although not a CCS project, the Islandmagee natural gas salt cavern storage project located on the peninsula east of Larne is within the defined study area and is within approximately 5km of the onshore components of the Export Cable Corridor.

Marine Aggregate Extraction and Disposal Sites

There are four UK and Ireland disposal sites that overlap with the proposed North Channel Wind 1 development area (EMODnet, 2022). These are primarily urban wastewater outflows, with the Blackhead site in the Export Cable Corridor being used for dredged material disposal. Eleven relatively small mostly coastal urban wastewater disposal sites are located to the south-west, north-west, and south-east of the development area, with nine of these being based in Belfast Lough to the south-west. Two major disposal sites are located 8.66 km south-east of the development area, in the area called Beaufords Dyke, based around the coast of Stranraer, with these sites being used historically for the disposal of unexploded munitions. All nearby disposal sites are shown on Figure 16.3.

There are no disposal sites for explosive material, chemical munitions (post 1945) or radioactive waste sites (1946 to 1993) located within the North Channel Wind 1 development area. There are also no marine aggregate extraction sites within the defined study area surrounding the North Channel Wind 1 development area (EMODnet, 2022).

Offshore Wind Farms

Offshore wind farms in the Northern Irish Sea are shown in Figure 16.3. There are no offshore wind farms within the 100km defined study area of the North Channel Wind 1 project development area (TCE, 2022). Outside of the defined study area, five offshore wind farms are located nearby, which are likely to be screened out but are included for completeness. In order of proximity, these are Oriel Wind Farm (114.46 km south-west); Cooley Point (111.25 km south-west); the Walney Offshore wind farm, specifically extension 3 (139.15 km south-east), and SSE Renewables Braymore Point and Clogher Head (both approximately 122.25 km south-west).

The nearest offshore wind farm locations currently being considered for leasing by the Crown Estate are Round 4 Area 6 (134.47 km south-east) and Round 4 Area 5 (171.37 km south-east). No wind farm projects have so far been confirmed on these sites.

Cables

No subsea cables directly overlap with the North Channel Wind 1 development area or Export Cable Corridor route, but five cables are positioned within ten kilometres to the east northeast of the development area (Kis-Orca, 2022). Four of these terminate in Scotland, with one directed towards Northern Ireland, as shown in Figure 16.3.

Sailing and Motor Cruising

Recreational sailing is generally divided into two categories: offshore and nearshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Nearshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Nearshore racing takes place around racing marks and navigational buoyage.

Recreational vessel intensity, as measured by RYS Automatic Identification System data (RYA, 2018), was found to be highest throughout the south of the Export Cable Corridor area, due to the overlap with the heavily trafficked Belfast Lough, as shown in Figure 16.4. The vessel activity drops from medium to low intensity in the actual North Channel Wind 1 development area, with a general trend of decreasing vessel activity moving north into the middle of the Northern Irish Sea.

Two joint RYA clubs and RYA training centres overlap with the Export Cable Corridor area, with one present in the southern coastal region of each. Within 10km, there are eight other RYA clubs, and eight other RYA training centres, mostly centred around Belfast Lough to the south-west of the development area, with only one of each type found to the north-west. A marina is also in use at Glenarm Marina directly west of the North Channel Wind 1 development area, although this is associated with very low levels of vessel traffic.

Recreational Diving

There are two wrecks – Tiberia and Ulrica - within the Export Cable Corridor area, and one – Chirapo – that is popular with recreational divers (UK Diving, 2010). These are shown in Figure 16.4. A nearby wreck – Troutpool - is also popular with recreational divers and located on the southern side of Belfast Lough outside of any part of the Proposed Development area, but within approximately 1km of the south side of the Export Cable Corridor area. These sites range in depth from 7m (Ulrica) to 63m (Tiberia).

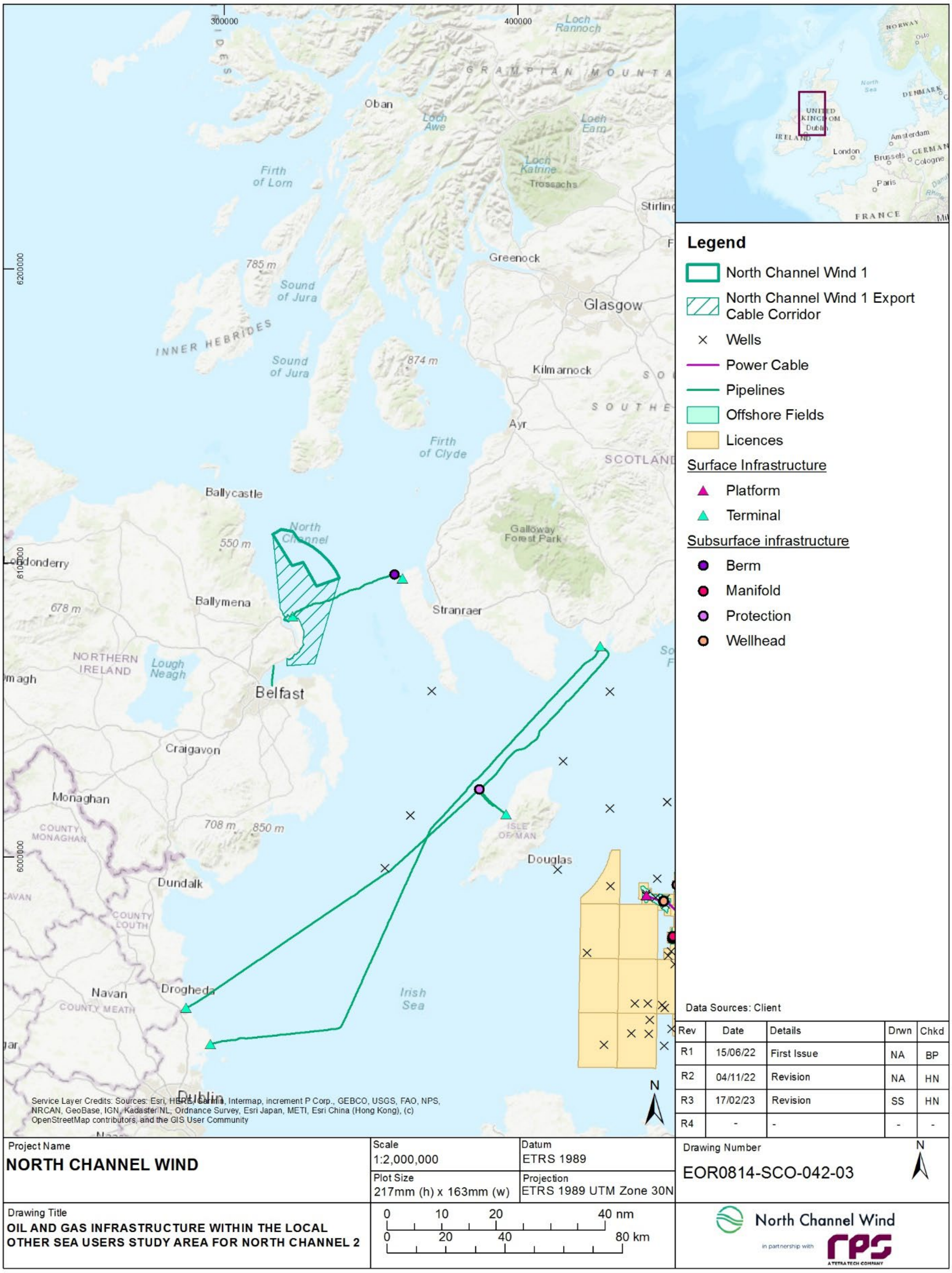


Figure 16.2: Oil and Gas infrastructure within the proposed North Channel Wind 1 study area

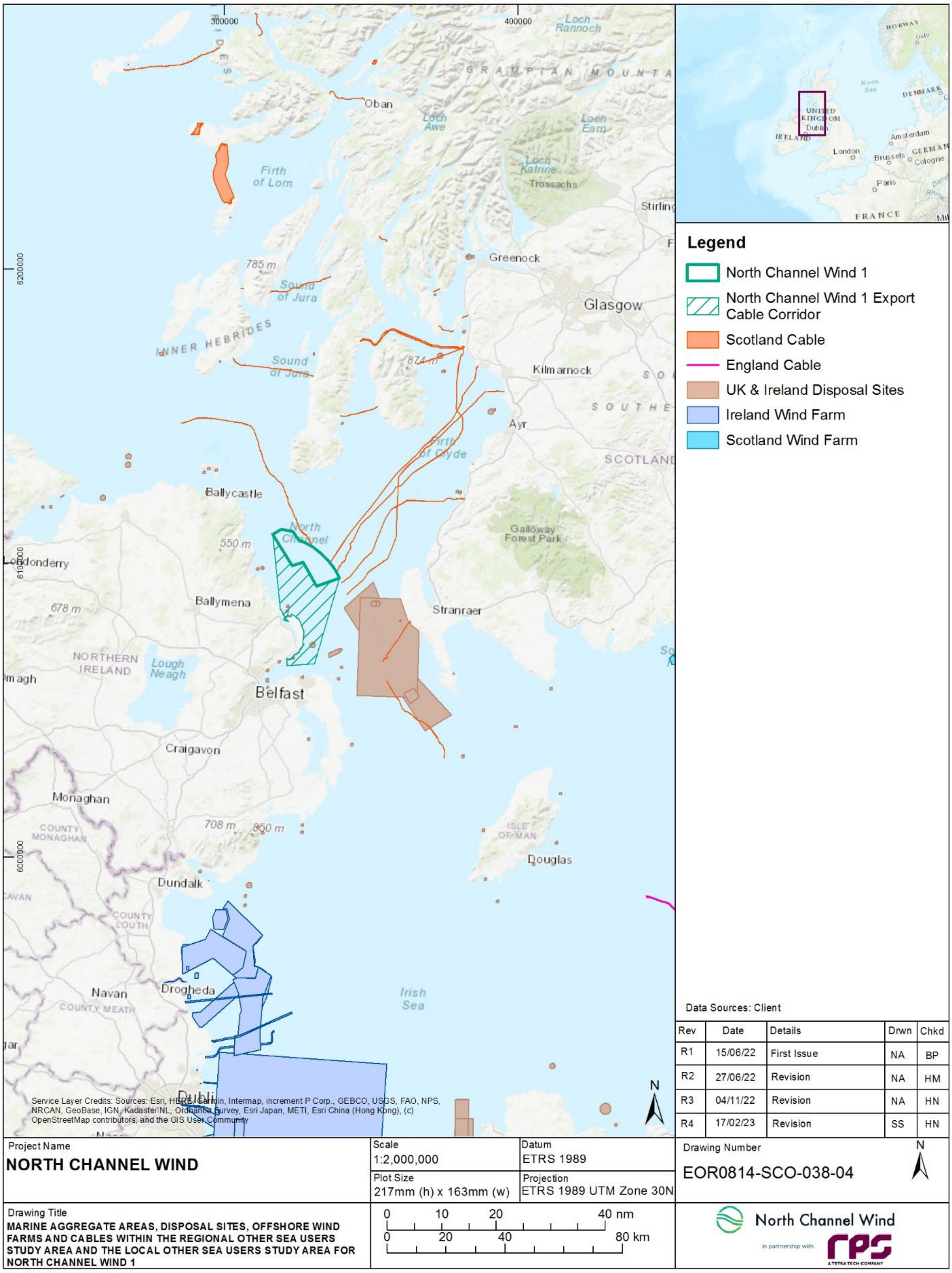


Figure 16.3: Offshore Wind Farm infrastructure and Disposal Sites within the proposed North Channel Wind 1 study area

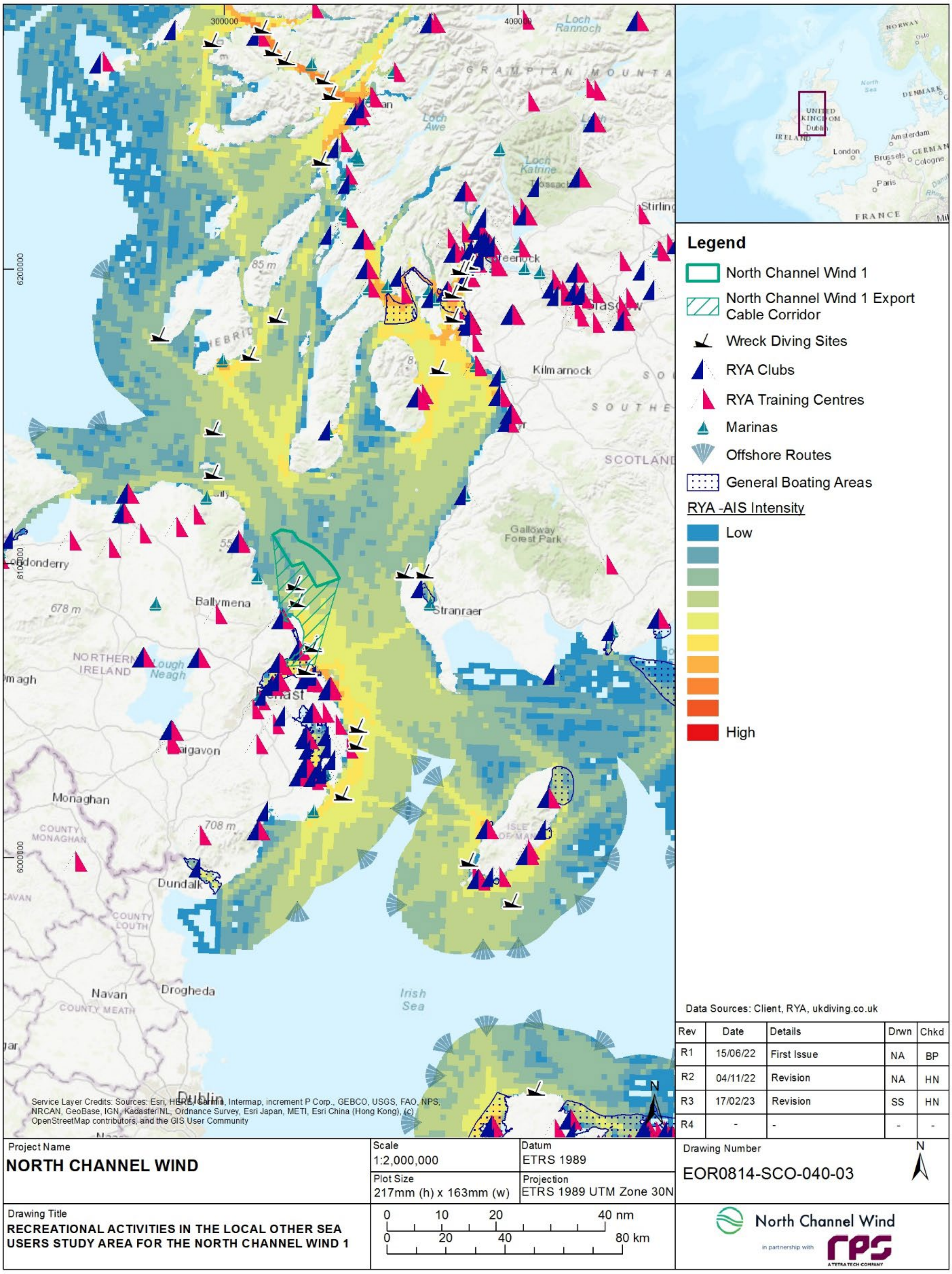


Figure 16.4: Recreational activity levels, other sea users, and wrecks within the proposed North Channel Wind 1 study area

Proposed Additional Data Collection

Supporting data and information will also be obtained through consultation with relevant other sea users' receptors with activities and interest in proximity to the development area of the North Channel Wind 1 project.

Data utilised for the scoping report and therefore the ES will be comprised of a mixture of project design data and published reference data. In specific cases where project data will be difficult and timely to collect, reliance will be on published studies to be used as proxy data.

Purchasing of further data concerning obstructions and wrecks; administrative areas; industrial users, and transport in the area is also being considered.

16.1.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 16.2.

At this stage, potential impacts to marine aggregate extraction activities are proposed to be scoped out of the assessment related to infrastructure and other sea users due to a lack of extraction sites in the vicinity of the development area.

Table 16.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Infrastructure and Other Users of the Sea

Potential Impact	Project Phase C	Project Phase O	Project Phase D	Justification (including consideration of embedded mitigation measures)
Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓	The active cables near to and pipeline crossing the North Channel Wind 1 development area have the potential to cause restrictions on access to cables and the pipeline from installation, maintenance and decommissioning activities. Installation of infrastructure over or adjacent to existing or future cables or pipelines will be subject to crossing or proximity agreements between the two parties, prior to the start of the construction phase.
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the North Channel Wind 1 development area.	✓	✓	✓	The installation, operation and maintenance, and decommissioning of infrastructure associated with the proposed North Channel Wind 1 project may reduce or restrict oil and gas exploration activities, specifically the siting of new wells or pipelines, within the development area. Consultation with oil and gas operators and other energy infrastructure operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.
Displacement of recreational activities.	✓	✓	✓	Safety zones and advisory clearance distances established during construction, maintenance and decommissioning activities may displace recreational activities. Mitigation could include effective communication of information advising on the nature, timing and location of activities, including through Notices to Mariners.
Increased suspended sediment concentrations and associated deposition affecting recreational diving sites.	✓	✓	✓	Increased suspended sediment concentrations and associated deposition arising from construction, maintenance and decommissioning activities could affect diving near the wrecks within the Export Cable Corridor, or further offshore in the main North Channel Wind 1 development area.

Note: Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

16.1.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The assessment of infrastructure and other sea users in the ES will consider the potential impacts of the construction, operational and maintenance and decommissioning phases of the North Channel Wind 1 project and will follow the methodology outlined in Chapter 3. Specific to the infrastructure and other users EIA, the following guidance documents will also be considered:

- European Subsea Cables UK Association (ESCA) guideline no 6, the proximity of offshore renewable energy installations and submarine cable infrastructure in UK waters (ESCA, 2016);
- The International Cable Protection Committee (ICPC) recommendation No.2. Recommended routing and reporting criteria for cables in proximity to others (ICPC, 2015); and
- Pipeline crossing agreement and proximity agreement pack (Oil and Gas UK, 2021).

The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

16.1.6 POTENTIAL CUMULATIVE EFFECTS

The potential effects related to the construction, operation and maintenance, and decommissioning of the North Channel Wind 1 project on infrastructure and other sea users will be assessed alongside the potential cumulative effects that could occur on these receptors related to alternate projects and/or activities that take place in the vicinity of the North Channel Wind 1 project

16.1.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

16.1.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Infrastructure and other users of the sea?
- Do you agree that all receptors and impacts have been identified for Infrastructure and other users of the sea?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

16.2 NCW 2 PROJECT

16.2.1 INTRODUCTION

This section of the Scoping Report identifies the elements of the infrastructure and other users of relevance to the Proposed North Channel Wind 2 Project and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the infrastructure and other users' receptors.

16.2.2 STUDY AREA

The North Channel Wind 2 project is part of Northern Ireland's first offshore wind farm, and its development area is shown in Figure 16.5. Available data has been collated for structures and activities within a defined study area of a range of 100km to support the development of the 'infrastructure and other sea users' section. This range allows for consideration of the potential effects of transport of sediment suspended during the construction or operational phases of the project, which are mostly likely to cause an impact on activities susceptible to increases in suspended sediment concentrations, especially:

- Disposal sites; and

- Recreational diving.

16.2.3 BASELINE ENVIRONMENT

Information regarding the infrastructure and other sea users' section has been collated through a detailed and comprehensive review of currently accessible studies and datasets. Key data sources are listed in Table 16.3 noting that this list is not exhaustive. This section provides a high-level overview of the infrastructure and other sea users baseline environment within the development area of the proposed North Channel Wind 1 floating offshore wind farm.

This section considers the extent of potential direct physical overlap between the proposed North Channel Wind 1 project and the following receptors:

- Oil and Gas Operations;
- Pipelines;
- Marine Aggregate Extraction and Disposal Sites;
- Offshore Wind Farms;
- Cables;
- Sailing and Motor Cruising;
- Recreational Diving; and
- Carbon Capture System (CCS).

The following topics are further considered as separate sections within this Offshore Scoping Report: Chapters 11 Commercial Fisheries; 12 Shipping and Navigation; 13 Aviation, Military and Communications; 14 Marine Archaeology; 15 Seascape, Landscape and Visual Resources, and 17 Population and Human Health.

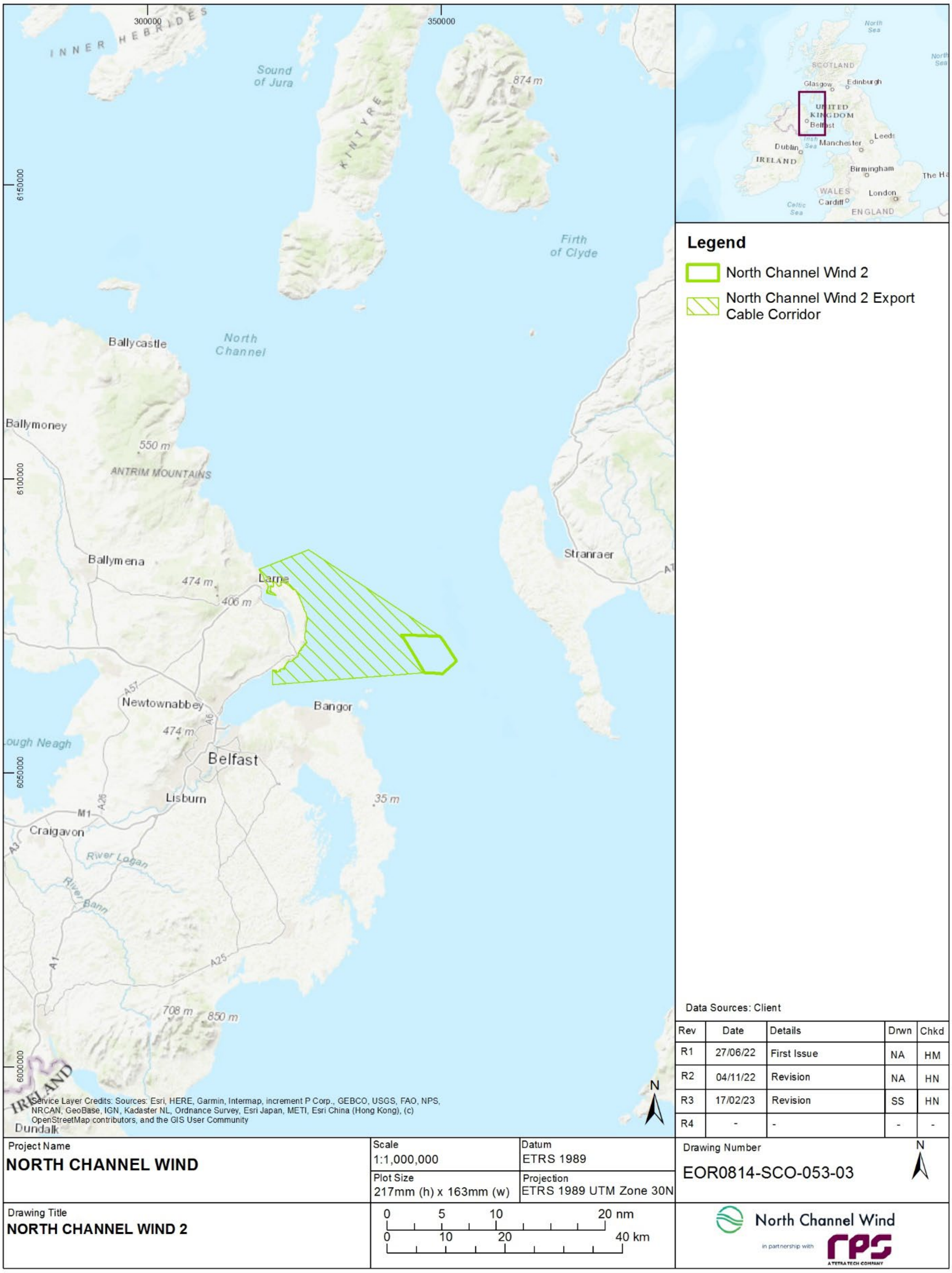


Figure 16.5: Outline of North Channel Wind 2 Development Area

Table 16.3: Desktop sources that inform the Infrastructure and other Sea Users Scoping Assessment

Data	Source	Year	Author
Cable routes	Kis-Orca	2022	Kis-Orca
Disposal sites	EMODnet	2022	EMODnet
Offshore wind farms	The Crown Estate (TCE)	2022	TCE
CCS	TCE	2022	TCE
Pipelines	OGA	2021	OGA
Wells	OGA	2021	OGA
Oil and gas platforms	OGA	2021	OGA
Subsurface structures	OGA	2021	OGA
Oil and gas licence block	OGA	2021	OGA
United Kingdom Continental Shelf (UKCS) block	OGA	2021	OGA
Marinas	UK Coastal Atlas of Recreational Boating	2018	Royal Yachting Association (RYA)
Recreational activities	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA clubs	UK Coastal Atlas of Recreational Boating	2018	RYA
RYA training centres	UK Coastal Atlas of Recreational Boating	2018	RYA
General boating areas	UK Coastal Atlas of Recreational Boating	2018	RYA
Wrecks (diving sites)	UKDiving.co.uk	2010	UK Diving

Desktop Study

Oil and Gas Operations

The North Channel Wind 2 development area does not overlap directly with any oil and gas operations infrastructure and is located approximately 5km south of the terminal at Ballylumford, with the entire development area situated parallel to the Scotland to Northern Ireland pipeline at the same distance (Oil and Gas UK, 2021), as shown in Figure 16.6. The nearest wells are the BG International Limited 111/15- 1 abandoned dry well 22.06 km to the south-east, off the coast of Stranraer, and the ELF Exploration UK Limited 111/25-1A abandoned dry well approximately 50km to the south of the development area. Eight license blocks for oil and gas extraction are in use approximately 80km south-east of the North Channel Wind 2 development area, with these falling within the defined study area, although the Isle of Man is situated directly between the two areas (Figure 16.6).

Subsurface structures (including protective structures, pipe junctions, manifolds, wellheads, trees, and valves) are usually protected by a 500m safety zone. One berm subsurface structure exists near to the pipeline terminal at Stranraer, north-east of the North Channel Wind 2 development area, although this is beyond the 500m safety zone and will not influence any phase of the North Channel Wind 2 offshore wind farm development. However, this does fall within the defined study area of 100km.

Pipelines

No pipelines directly overlap with the North Channel Wind 2 array area, but one pipeline (Oil and Gas UK, 2021) is overlapping the North Channel Wind 2 Export Cable Corridor (Figure 16.6). One pipeline crosses Belfast Lough, to the west of the Export Cable Corridor, with this being used to transport natural gas. The Scotland to Northern Ireland runs east to west from Twynholm to Ballylumford, approximately 5km north of the development area and Export Cable Corridor and this pipeline transports natural gas. Two other interconnector pipelines (IC1 and IC2) are located 53.69 km and 57.14 km south of the development area respectively, running in a south-west to north-east direction between Scotland and Ireland, with these both transporting natural gas.

Carbon Capture Systems

No Carbon Capture System (CCS) developments are present or currently planned within the defined study area surrounding the North Channel Wind development area (TCE, 2022), and so this can be screened out of this assessment. Although not a CCS project, the Islandmagee natural gas salt cavern storage project located on the peninsula east of Larne is within the defined study area and is within approximately 5km of the onshore components of the Export Cable Corridor.

Marine Aggregate Extraction and Disposal Sites

There are five UK and Ireland disposal sites that overlap with the proposed North Channel Wind 2 development area (EMODnet, 2022). The three smaller disposal sites, which overlap with the Export Cable Corridor to the west, are actively used for disposal of urban wastewater and unwanted dredging aggregate materials. The largest two of these are located west of Stranraer on top of Beaufort’s Dyke and overlap directly with the development area. These were historically used for disposal of unexploded munitions. The Beaufort’s Dyke disposal sites contains explosive material or chemical munitions (post 1945), with approximately one million tons of unexploded munitions disposed of in this area historically.

Fourteen relatively small disposal sites are located to the west, north, and south-east of the development area, with five of these being based in Belfast Lough to the west. There are no marine aggregate extraction sites within the defined study area surrounding the North Channel Wind 2 development area (EMODnet, 2022). All nearby disposal sites are shown in Figure 16.7.

Offshore Wind Farms

Offshore wind farms in the Northern Irish Sea are shown in Figure 16.7. There are 5 offshore wind farms within the defined study area of the North Channel Wind 2 project development area (TCE, 2022). In order of proximity, these are Oriel Wind Farm (97.11 km south-west); Cooley Point (94 km south-west); the Walney Offshore wind farm, specifically extension 3 (112.57 km south-east), and SSE Renewables Braymore Point and Clogher Head (both approximately 105.4 km south-west).

The nearest offshore wind farm locations currently being considered for leasing by the Crown Estate are Round 4 Area 6 (106.73 km south-east) and Round 4 Area 5 (143.58 km south-east). No wind farm projects have so far been confirmed on these sites.

Cables

No subsea cables directly overlap with the North Channel Wind 2 development area or Export Cable Corridor route, but two cables are positioned within five kilometres to the east and south-east of the development area (Kis-Orca, 2022). One of these terminates in Scotland, with one connecting other offshore infrastructure, as shown in Figure 16.6.

Sailing and Motor Cruising

Recreational sailing is generally divided into two categories: offshore and nearshore. Offshore sailing is usually undertaken by yachts in the form of either cruising or organised offshore racing. Nearshore sailing is typically undertaken by smaller vessels including dinghies and recreational vessels that are used for either cruising at leisure or racing. Cruising may include day trips between local ports and often includes a return journey to the home port on the same day. Nearshore racing takes place around racing marks and navigational buoyage.

Recreational vessel intensity, as measured by RYS Automatic Identification System data (RYA, 2018), was found to be highest throughout the west and south-west of the Export Cable Corridor area, due to the overlap with the heavily trafficked Belfast Lough, as shown in Figure 16.8. The vessel activity remains at moderate levels throughout the entire development area, due to being located on the direct shipping route between Belfast and Stranraer.

One joint RYA club and RYA training centre overlaps with the Export Cable Corridor area, present in the western coastal region. Within 10km, there are nine other RYA clubs, and nine other RYA training centres, mostly centred around Belfast Lough to the west of the development area, with only one of each type found to the north-west. A marina is also in use at Glenarm Marina north-west of the North Channel Wind 2 development area, although this is approximately 20km away and is associated with very low levels of vessel traffic.

Recreational Diving

There is one recreational diving wreck – Chirapo - within the Export Cable Corridor area (UK Diving, 2010), as shown in Figure 16.8. A nearby recreational diving wreck – Troutpool is located on the southern side of Belfast Lough outside of any part of the Proposed Development area, but within approximately 1km of the south side of the Export Cable Corridor area. The Chirapo dive site has a minimum depth of 18m.

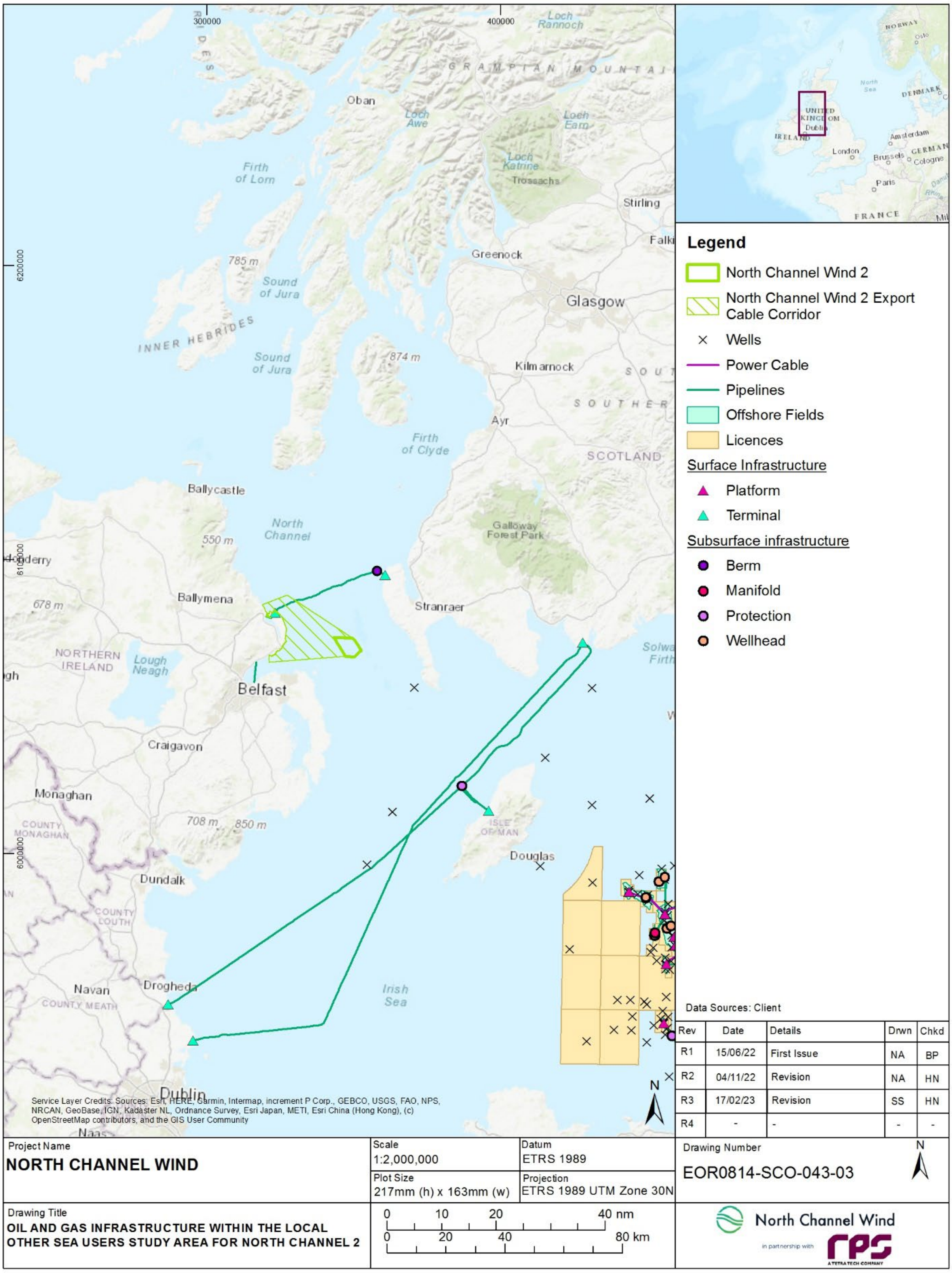
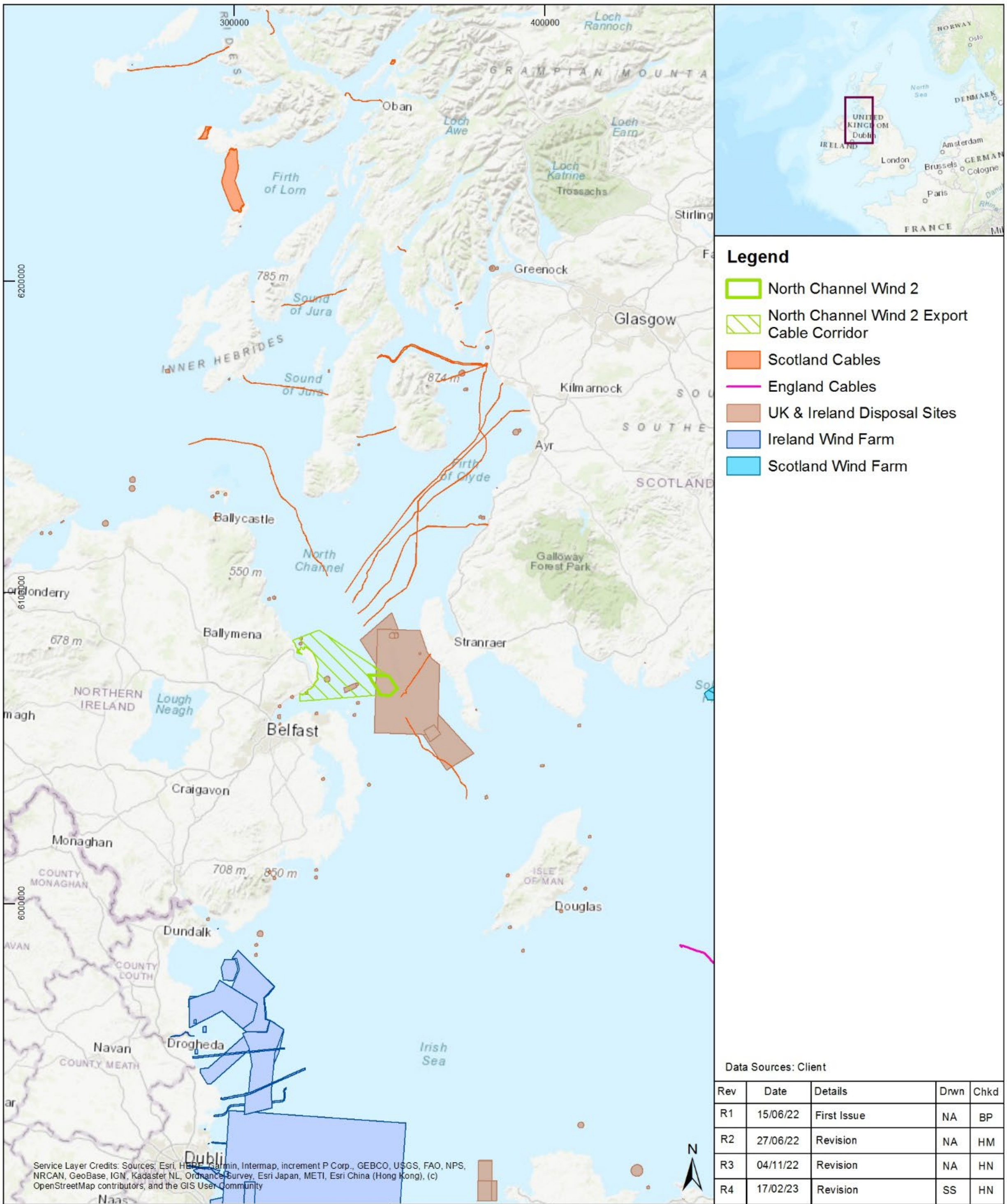


Figure 16.6: Oil and Gas infrastructure within the proposed North Channel Wind 2 study area



Rev	Date	Details	Drwn	Chkd
R1	15/06/22	First Issue	NA	BP
R2	27/06/22	Revision	NA	HM
R3	04/11/22	Revision	NA	HN
R4	17/02/23	Revision	SS	HN

Project Name: NORTH CHANNEL WIND	Scale: 1:2,000,000	Datum: ETRS 1989	Drawing Number: EOR0814-SCO-039-04
	Plot Size: 217mm (h) x 163mm (w)	Projection: ETRS 1989 UTM Zone 30N	
Drawing Title: MARINE AGGREGATE AREAS, DISPOSAL SITES, OFFSHORE WIND FARMS AND CABLES WITHIN THE REGIONAL OTHER SEA USERS STUDY AREA AND THE LOCAL OTHER SEA USERS STUDY AREA FOR NORTH CHANNEL WIND 2	0 10 20 40 nm / 0 20 40 80 km		North Channel Wind in partnership with rps

Figure 16.7: Offshore Wind Farm infrastructure and Disposal Sites within the proposed North Channel Wind 2 study area

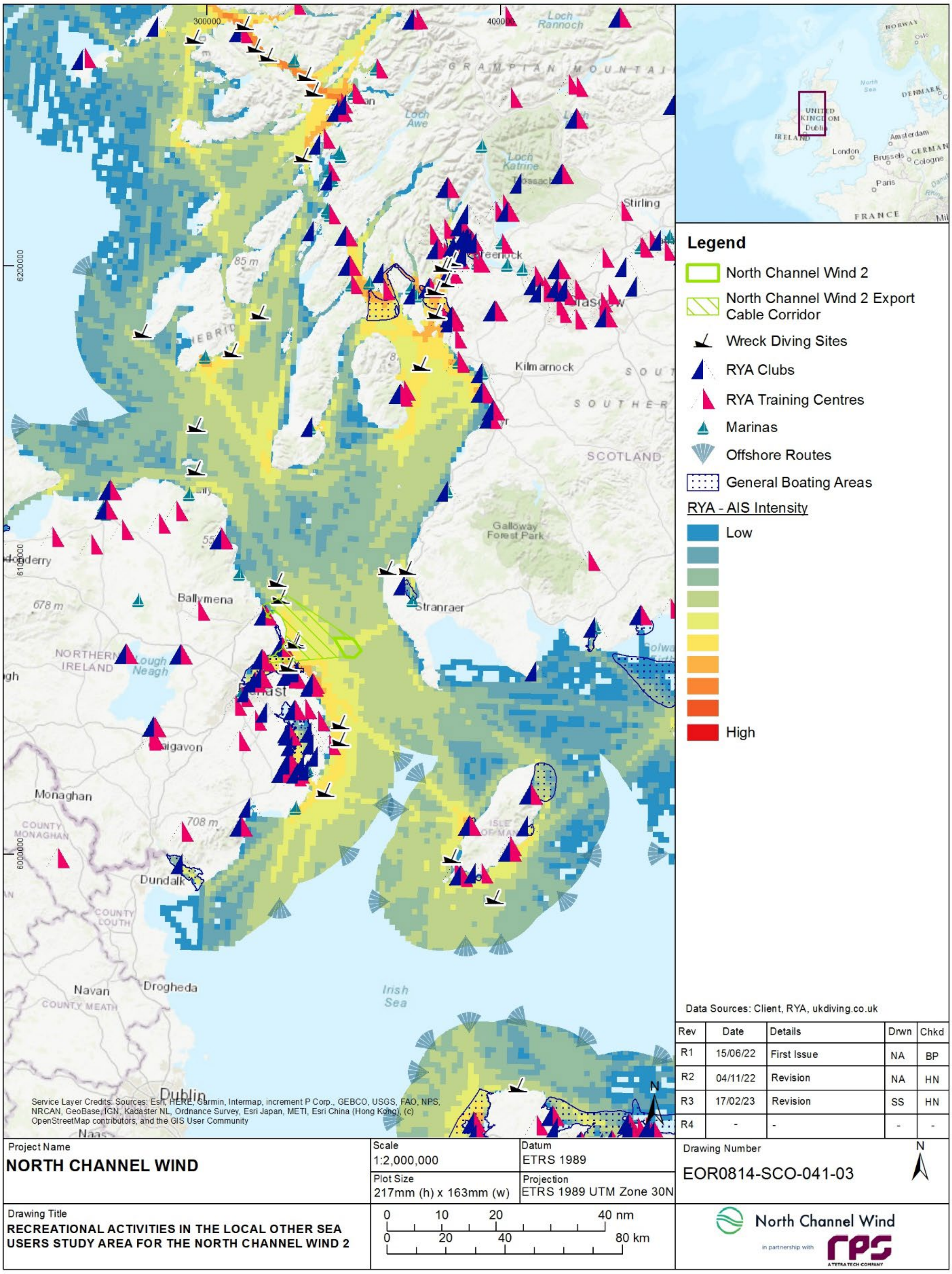


Figure 16.8: Recreational activity levels, other sea users, and wrecks within the proposed North Channel Wind 2 study area

Proposed Additional Data Collection

Supporting data and information will also be obtained through consultation with relevant other sea users' receptors with activities and interest in proximity to the development area of the North Channel Wind 2 project.

Data utilised for the scoping report and therefore the ES will be comprised of a mixture of project design data and published reference data. In specific cases where project data will be difficult and timely to collect, reliance will be on published studies to be used as proxy data.

Purchasing of further data concerning obstructions and wrecks; administrative areas; industrial users, and transport in the area is also being considered.

16.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

The impacts that have been scoped into the Proposed Development assessment are outlined in Table 16.4.

At this stage, potential impacts to marine aggregate extraction activities are proposed to be scoped out of the assessment related to infrastructure and other sea users due to a lack of extraction sites in the vicinity of the NCW 2 development area.

Table 16.4: Potential Impacts Proposed to be Scoped into the Proposed NCW 2 Assessment for Infrastructure and Other Users of the Sea

Potential Impact	Project Phase C	Project Phase O	Project Phase D	Justification (including consideration of embedded mitigation measures)
Potential Impacts to existing cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓	The active cables near to and pipeline crossing the North Channel Wind 2 development area have the potential to cause restrictions on access to cables and the pipeline from installation, maintenance and decommissioning activities. Installation of infrastructure over or adjacent to existing or future cables or pipelines will be subject to crossing or proximity agreements between the two parties, prior to the start of the construction phase.
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure) within the North Channel Wind 2 development area.	✓	✓	✓	The installation, operation and maintenance, and decommissioning of infrastructure associated with the proposed North Channel Wind 2 project may reduce or restrict oil and gas exploration activities, specifically the siting of new wells or pipelines, within the development area. Consultation with oil and gas operators and other energy infrastructure operators will promote and maximise cooperation between parties and minimise both spatial and temporal interactions between conflicting activities.
Displacement of recreational activities.	✓	✓	✓	Safety zones and advisory clearance distances established during construction, maintenance and decommissioning activities may displace recreational activities. Mitigation could include effective communication of information advising on the nature, timing and location of activities, including through Notices to Mariners.
Increased suspended sediment concentrations and associated deposition affecting recreational diving sites.	✓	✓	✓	Increased suspended sediment concentrations and associated deposition arising from construction, maintenance and decommissioning activities could affect diving near the wrecks within the Export Cable Corridor, or further offshore in the main North Channel Wind 2 development area.

Note: Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

16.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The assessment of infrastructure and other sea users in the ES will consider the potential impacts of the construction, operational and maintenance and decommissioning phases of the North Channel Wind 2 project and will follow the methodology outlined in Chapter 3. Specific to the infrastructure and other users EIA, the following guidance documents will also be considered:

- European Subsea Cables UK Association (ESCA) guideline no 6, the proximity of offshore renewable energy installations and submarine cable infrastructure in UK waters (ESCA, 2016);
- The International Cable Protection Committee (ICPC) recommendation No.2. Recommended routing and reporting criteria for cables in proximity to others (ICPC, 2015); and
- Pipeline crossing agreement and proximity agreement pack (Oil and Gas UK, 2021).

The requirement for and feasibility of any mitigation measures will be dependent on the significance of effects and will be consulted upon with statutory consultees throughout the EIA process.

16.2.6 POTENTIAL CUMULATIVE EFFECTS

The potential effects related to the construction, operation and maintenance, and decommissioning of the North Channel Wind 1 project on infrastructure and other sea users will be assessed alongside the potential cumulative effects that could occur on these receptors related to alternate projects and/or activities that take place in the vicinity of the North Channel Wind 2 project.

16.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

16.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Infrastructure and other users of the sea?
- Do you agree that all receptors and impacts have been identified for Infrastructure and other users of the sea?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

17. POPULATION AND HUMAN HEALTH

17.1 NCW 1 PROJECT

17.1.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of population and human health of relevance to the Proposed Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the population and human health receptors. This includes airborne noise and air quality on all receptors, and offshore socio-economics and tourism receptors.

17.1.2 STUDY AREA

Airborne Noise Study Area

The airborne noise study area associated with the potential effects resulting from construction, operation and maintenance and decommissioning activities of offshore infrastructure on onshore receptors is a 2 km buffer around the proposed offshore export cable corridor (Figure 17.1). Significant noise and vibration effects are not expected beyond this distance. For construction-related vibration, the study area is a buffer of up to 100 m from any vibration generating construction activity.

The airborne noise study areas have been developed to reflect receptors' increased sensitivity to noise at night, where night-time noise effects from construction and operation are possible.

The airborne noise study area will be reviewed and amended as the proposed offshore export cable corridor is refined and a landfall location is selected through the iterative design and EIA process.

Air Quality Study Area

The onshore air quality study area includes the following in accordance with the Institute of Air Quality Management (IAQM) guidance:

- Designated ecological receptors within 50 m of potential landfall construction activities; and
- Human Receptors (Residential Properties and public amenity areas) within 350 m of potential landfall construction activities.

Socio-Economics and Tourism Study Area

The selection of the study areas for the socio-economic impact analysis will take account of the spatial scale at which impacts upon different receptors are likely to materialise. This is likely to vary across receptors and will therefore require a localised study area and a larger regional study area. The study area will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

The local socio-economics study area will cover the Proposed Development and coastline authorities of Mid & East Antrim Council, and Ards and North Down Council. It will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

A larger regional socio-economics study area will also be defined to reflect the wider reach of Northern Ireland Gross Value Added (GVA) and employment impacts that are likely to materialise through the supply chain and provision of labour. This regional study area will be defined following review of the results of the socio-economics assessment being undertaken.

Figure 17.1: Airborne Noise Study Area extending 2 km from Export Cable Corridor Regions for Assessment of Population and Human Health for Offshore Infrastructure associated with North Channel Wind 1 Project

17.1.3 DATA SOURCES

Desktop

There are a number of baseline datasets to inform air quality, socio-economics and tourism. These are summarised at Table 17.1 below.

Table 17.1: Desktop sources that inform the Air Quality, Socio-economic and Tourism Scoping Assessment

Data	Source	Year	Author
Offshore Energy SEA 3, Appendix 1E: Air Quality	DECC	2016	DECC
Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 2005-2019	Department for Environment, Food and Rural Affairs (Defra), The Scottish Government, The Welsh Government and The Northern Ireland Department for Agriculture, Environment and Rural Affairs	2021	National Atmospheric Emissions Inventory
IAQM Guidance on the assessment of dust from demolition and construction V1.1	Institute of Air Quality Management	2014	Holman *et al.*
Northern Ireland Labour Force Survey Annual Tables 2020	NISRA	2021	NISRA
Northern Ireland Labour Force Survey Annual Report 2019	NISRA	2020	NISRA
Mid-2020 Population Estimates for Northern Ireland	NISRA	2021	NISRA
Tourism NI Annual Report 2017-2018	Tourism NI	2018	NISRA

17.1.4 BASELINE ENVIRONMENT

Airborne Noise

Seaward of MLWS

The Project array area of Site 1 is located approximately 10km to the east of the closest point of the Antrim coast. The Project array area of Site 2 is located approximately 14km to the east of the closest point of the coast. There are currently a number of potential landfall locations on the East Antrim coast, at Ballylumford or Kilroot. The offshore receptors that might potentially occur in the North Channel and be potentially sensitive to offshore airborne noise include:

- offshore oil and gas installations, and manned working platforms (refer Section 16);
- closest commercial shipping route (refer Section 12);
- fishing vessels (refer section 12); and
- nearshore leisure and recreational users including recreational fishing; motor cruising; water sports and scuba diving (refer section 16).

Landward of MLWS

The baseline environment within the airborne noise study area is mainly rural, however there are a number of settlements including Larne, Whitehead and Carrickfergus located along the East Antrim coast. Noise in this area is likely to be dominated by road traffic, rail traffic and industrial sites including Ballylumford Power Station, Kilroot Power Station, the Irish Salt Mine, and Larne Port.

A desk-based review and consultation will be undertaken to identify potentially sensitive receptors. Background noise monitoring will be undertaken at residential properties where the potential for significant noise effects from offshore activities is identified, and where needed to inform the construction assessment. Any surveys will be agreed in consultation with Mid and East Antrim Council (MEA) throughout the EIA process and will be carried out for a sufficient period to allow typical sound levels to be established, taking account of different types of noise sources and weather conditions that occur. Noise surveys may be accompanied by the acquisition of supplementary non-acoustic data (rainfall and wind records), as required.

Air Quality

The UK agreed to set emission ceilings through the National Emission Ceilings Directive (NECD), which was revised in 2016 (NECD 2016/2284/EU) to set emission reduction commitments for total emissions of NOx, SOx, non-methane volatile organic compounds (NMVOC), Ammonia (NH3) and particulate matter (PM2.5) in 2020 and 2030. The UK has met these reduction targets for all of these pollutants for each year since 2010 inclusive with the exception for NOx for the year 2010 (NECD, 2020).

In 2019, the National Atmospheric Emissions Inventory undertook a review of the emissions in Northern Ireland for the eight priority air pollutants: ammonia (NH3), carbon monoxide (CO), NOx, NMVOCs, PM10, PM2.5, SO2, lead (Pb) and dioxins (PCDD/F) and benzo(a)pyrene B[a]p. Between 2005 and 2019 there were decreases of 31% for carbon monoxide; 45% for nitrogen oxides (NOx); 11% for NMVOCs; 0.9% for PM10; and 69% for SO2 (National Atmospheric Emissions Inventory, 2021).

The baseline air quality environment will be established by desktop review of records of existing pollution monitoring locations and results undertaken by the local authority, MEABC. Reference will also be made to Department for Environment, Food and Rural Affairs (DEFRA) background pollution estimates for the area surrounding the proposed redevelopment site.

Socio-Economics and Tourism

While the Proposed Development occurs offshore, the impacts associated with recreation value will also occur onshore. The socio-economic and tourism baseline environment will provide an overview of the following topic areas within the onshore and offshore environment:

- population;
- employment and economic activity;
- industry;
- income and wealth;
- transport and commuting; and
- tourism and leisure.

Socio-Economics Overview

In mid-2020, the median age across the local authorities within the Regional Study Area ranged from 36.2 years of age in Belfast, to 44.4 years of age in Ards and North Down (Nisra, 2021). The percentage of the population in the working age group varied from 59.9% of the population of Ards and North Down, to 65% in Belfast. These percentage contributions were also reflected within the pensionable age demographics, with Belfast having the lowest total percentage within the pensionable age category (14.9%) compared to the highest in Ards and North Down (21%) (NISRA, 2021).

A review of Northern Ireland's labour market (2021) suggests that in 2020 the fifth highest employment rate across Northern Ireland was in Mid and East Antrim with 74.4% employment, followed by Ards and North Down which had the sixth highest employment rate with 73.5% (Nisra, 2021). Across Northern Ireland, the employment rate has increased in 9 local authorities and decreased in 2 since 2015 (Nisra, 2020). Young people (16 to 24 years old) make up a comparatively high concentration of the workforce in the distribution, hotels and restaurants sectors. Meanwhile, workers aged 50 and over make up a comparatively high concentration of the workforce in the public admin, education and health sectors (Nisra, 2020).

A survey by the Office of National Statistics in 2020 suggested that there were around 5,000 full-time employees in the Northern Irish renewable energy sector, and turnover from the renewable energy sector in Northern Ireland for 2020 was estimated to be £0.9 billion.

GVA is a key indicator used to measure economic performance. Total GVA in the UK is £2,214 billion, and in Northern Ireland is £48 billion. Annual GVA growth of 1.3% and 0.3% has been recorded in the UK and Northern Ireland, respectively (Office for National Statistics, 2019). The GVA per head in the UK was estimated at £32,876 compared to £25,656 in Northern Ireland (Office for National Statistics, 2019). Statistics on GVA per head provide an overview of the value added by production activity in an area to the resident population of that area. However, these stats can be subject to distortion due to the effects of commuting and variations in the age distribution of the population.

Tourism Overview

Due to the offshore nature of the Proposed Development boundary, it is unlikely to support recreational or tourism activities. The Project array area of Site 1 is located approximately 10 km to the east of the nearest coastline, and the Project array area of Site 2 is located approximately 14 km to the east of the nearest coastline. There are a number of tourist destinations along the Antrim coastline; Brown's Bay is a popular summer destination, Islandmagee boat club is located at the mouth of Larne Lough and Whiteharbour Marina is also located to the south of the village of Whitehead. There are wrecks located close to the array area and within the proposed export cable corridor, but the depths of many of these wrecks exceed those which attract recreational divers. Likewise, the seabed within the array area and proposed export cable corridor is relatively featureless and does not contain notable features which typically attract recreational divers. The nearshore and inshore waters which the proposed export cable corridor crosses may support recreational sea angling.

The coastline around Northern Ireland supports popular activities such as walking, wildlife and birdwatching, golf, beach activities, horse-riding, camping, sailing, recreational angling, sea bathing, water and jet skiing and canoeing. The draft Marine Plan for Northern Ireland (2018) states that the coastal area is a key element of Northern Ireland's appeal as a tourism destination and an integral part of the visitor experience. A review of the tourism in the Council area associated within the landfall locations (Ballylumford and Kilroot, Mid and East Antrim) indicates that between 2017-2019, only 5% of tourists to Northern Ireland visited the Mid and East Antrim Council area.

17.1.5 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

Airborne Noise

Offshore piling and ground anchoring is likely to represent the greatest increase in offshore airborne noise therefore, the assessment of airborne noise effects on offshore noise sensitive receptors will concentrate on these types of activities and will assume the maximum design scenario put forward as part of the ES.

The potential impacts associated with construction and decommissioning noise are considered to be temporary, and may arise as a result of:

- activities carried out in the intertidal area below MHWS;
- piling associated with wind turbine and other offshore infrastructure installation;
- construction activities at nearshore locations (e.g., jack-up barges, drilling, dredging, cable laying vessels working close to the shore); and
- construction vessels.

Landward of MLWS, the potential impacts associated with construction noise are considered to be temporary, and may arise as a result of:

- activities carried out in the intertidal area below MHWS;
- piling associated with wind turbine and other offshore infrastructure installation;
- construction activities at nearshore locations (e.g., jack-up barges, drilling, dredging, cable laying vessels working close to the shore); and
- construction vessels.

An overview of the impacts scoped in for the assessment of airborne noise landward of MLWS is provided in Table 17.2.

Air Quality

Atmospheric emissions from Proposed Development may arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide (SO2) and carbon dioxide (CO2), oxides of nitrogen (NOX) which represents the sum of nitrogen dioxide (NO2) and nitrogen oxide (NO), and particulate matter (PM10 and PM2.5).

Based on the project description outlined in chapter 2 and the absence of any offshore receptors sensitive to air quality, all potential offshore air quality impacts are proposed to be scoped out of further assessment. Onshore receptors can potentially be affected by air quality impacts, even temporarily and an assessment of air quality effects on onshore receptors landward of MLWS as a result of the construction, operation and maintenance and decommissioning of offshore infrastructure will be undertaken. This assessment will dovetail into and align with any onshore ES prepared for applications for development consent under the planning code.

Socio-Economics and Tourism

A range of potential impacts on socio-economics and tourism have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 17.2 together with a description of any additional data collection (e.g. site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

Table 17.2: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Population and Human Health. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
Change in Noise Level – Human Receptors	✓		✓	There is the potential for activities associated with the construction of the Proposed Development to temporarily increase the noise levels experienced at identified human receptors throughout the airborne noise study area during offshore and nearshore construction activities.	Baseline survey measurements will be conducted in accordance with current guidance including BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound, and BS 7445-2:1991 Description and measurement of environmental noise.	BS5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014) details the "ABC method", which specifies a construction noise limit based on the existing ambient noise level and for different periods of the day. The predicted construction noise levels will be assessed against noise limits derived from advice within Annex E of BS 5228.
Temporary Air Quality effects	✓		✓	Atmospheric emissions from Proposed Development may arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide (SO2) and carbon dioxide (CO2), oxides of nitrogen (NOX) which represents the sum of nitrogen dioxide (NO2) and nitrogen	It is proposed that the air quality assessment will comprise a review of the most recent MEABC air quality reports and assessments and DEFRA background levels at the closest locations to the proposed development.	• **Demolition Phase and Construction Phase** - The air quality impacts are assessed in accordance with the requirements of IAQM (2014): Guidance on the Assessment of Dust from Demolition and Construction. • **Biodiversity** - The air quality impacts on ecology are assessed (as appropriate) in accordance with the requirements of IAQM (2020): A guide to the assessment of air quality impacts on designated nature conservation sites.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				oxide (NO), and particulate matter (PM10 and PM2.5).		• **Industrial Sources** (Local Air Quality Management Technical Guidance 2016 (LAQM.TG16)) Renewable energy generation facilities are unlikely to make a significant contribution to annual mean concentrations, but may contribute to elevated short-term concentrations, which may lead to exceedances of the short-term air quality objectives (e.g., 15-minute mean for SO_2, 1-hour mean for NO_2 or 24-hour mean for PM_{10}). An assessment is still undertaken in this case by use of the Industrial Emissions Screening Tool.
Construction & decommissioning Vibration	✓		✓	Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors, which at higher levels can cause disturbance to residents. In extreme cases, cosmetic or structural building damage can occur, however vibration levels have to be very high for this effect to be manifested and such cases are rare (BSI, 1993). High vibration levels generally arise	As above.	Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting (BSI, 2008). For construction vibration from sources other than blasting, the vibration level and effects will be adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction. The use of piling and ground anchoring during the construction of the Proposed Development may be required. Consideration will be given to potential sources of vibration associated with the offshore construction phase in proximity to residential and other sensitive receptors (i.e., nearshore vibration generating activities).		
Noise and vibration impacts to Ecological/Geological receptors.	✓		✓	Noise and vibration during offshore and nearshore construction activities may cause disturbance to wildlife, including protected species and designated sites. Vibration impacts may cause disturbance to designated geological sites.	As above.	Predictions of noise and vibration at identified ecological and geological receptors will be undertaken and provided to geologists and ecologists to undertake the assessment of noise and vibration impacts on such receptors.
Impact on employment in construction, operation and	✓	✓	✓	Potential expenditure from the construction to support employment in local companies that are directly engaged in the construction supply	A desk-based review will be undertaken to develop a baseline understanding of the socio-	An economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of the Proposed

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
maintenance, and decommissioning in the supply chain.				chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider industry supply chain.	economic and tourism related conditions.	Development in the socio-economics study area will be developed.
Impact on the amount of GVA supported by construction, operation and maintenance, and decommissioning activity.	✓	✓	✓	Potential expenditure on the construction of the Proposed Development to support GVA in local companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider supply chain.	As above.	An economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on construction of Proposed Development in the socio-economics study area will be developed.
Impact on access to construction, operation and maintenance, and decommissioning-related employment amongst local residents.	✓	✓	✓	Direct and indirect employment associated with the construction phase could increase the range and supply of employment opportunities that are accessible to residents of the area.	As above.	No specific modelling is required for this impact assessment.

Potential Impact	Project Phase			Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
	C	O	D			
Impact on the demand for housing, accommodation and local services	✓	✓	✓	Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase.	As above.	No specific modelling is required for this impact assessment.
Impact on tourism and recreation activity.	✓	✓	✓	The construction of the Proposed Development could lead to disruption of local tourism and recreational resources.	A desk-based review will be undertaken to develop a baseline understanding of the tourism related conditions.	No specific modelling is required for this impact assessment.

17.1.6 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The population and human health EIA will follow the methodology set out in Chapter 3. Specific to the population and human health EIA, the following aspects will be considered in more detail:

Human Health Assessment

In November 2022, IEMA launched guidance on determining significance for human health in Environmental Impact Assessment (IEMA, 2022). This guidance allows for wider determinants of health approach to be considered. In addition to bio-physical determinants of health (such as air quality and noise), the health assessment must now also consider social, behavioural, economic and institutional health determinants. There is also a focus on population health, including vulnerable groups and health inequalities. The guidance sets a clear expectation for an ES health chapter that explains the public health implications of the project for a health stakeholder audience. The assessment section of the new guidance provides detailed new methods to triangulate public health evidence sources to identify the likely significant effects for population health.

Airborne Noise and Air Quality

Noise and vibration impacts associated with the construction and decommissioning of the offshore components of the North Channel Wind Farm will be assessed using the guidance contained in BS 5228:2009+A1:2014, which defines the accepted prediction methods and source data for various construction plant and activities. Additional guidance would be sought in consultation with MEA for assessment of the particular impacts associated with offshore piling activities.

The following data sources will be used in the ES:

- ordnance Survey mapping;
- topographical data;
- on-site noise monitoring data;
- construction data;
- DWG/DFX drawings;
- construction and O&M vessel numbers;
- noise modelling and propagation calculations, including the use of Parabolic Equations to predict noise from offshore piling operations at onshore receptors; and
- consultation with all relevant local authorities.

Construction noise and air quality impacts will be based on the likely construction programme and associated activities outlined in the ES Project Description. This will include the type and nature of plant required for construction within the intertidal area, and the main sources of noise and air pollution from offshore construction will be identified.

Socio-Economics and Tourism

The assessment will consider likely significant effects associated with the offshore infrastructure on onshore and offshore receptors. The socio-economic impacts of the construction and operation of the Proposed Development have the potential to be significant and will impact at a regional and local level.

The assessment will be based on a desktop review of existing relevant studies and national datasets and indicators and will be supported by the development of a socio-economic model. The assessment will also draw on the information provided in other topics such as commercial fisheries (section 11), shipping and navigation (section 12), aviation, military and communications (section 13), marine archaeology (section 14), seascape and visual resources (section 15), and infrastructure and other sea users (section 16).

The economic impacts and benefits will be quantified in terms of Northern Irish GVA and expected jobs in Northern Ireland. The methodology for the socio-economic assessment will consider the results from the economic impact model that takes account of all possible impacts: direct, indirect, induced, supply chain effects, and potential for local production and maintenance.

A Project level socio-economics Technical Report will be developed and will support the ESs socio-economics and tourism assessments. This Technical Report will be appended to the ES.

There are no embedded mitigations considered for socio-economics receptors, as it is anticipated that the overriding socio-economic impacts of the Proposed Development will be positive in nature. Consultation will be carried out with local stakeholders and public sector bodies, such as Northern Ireland Enterprise, and through other activities that raise awareness of the opportunities that the Proposed Development provide to maximise the positive socio-economic impacts.

Several opportunities which could be considered to enhance the positive impacts include:

- the use of locally manufactured content where possible;
- the use of local contractors during construction for onshore infrastructure and potential offshore construction work where possible;
- employment and training possibilities for local people on the operation and maintenance of a wind farm where feasible; and
- supporting the community through sponsorship of local groups and teams.

17.1.7 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects of the Proposed Development on socio-economics are considered to be localised, there is potential for cumulative effects to occur from other projects or activities within the regional socio-economics study area. Projects and activities which will be considered include:

- onshore energy generation projects;
- road and rail projects;
- major residential, commercial and leisure projects; and
- minerals extraction and landfill projects.

17.1.8 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

17.1.9 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Population and Human Health?
- Do you agree that all receptors and impacts have been identified for Population and Human Health?
- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

17.2 NCW 2 PROJECT

17.2.1 INTRODUCTION

This section of the Offshore Scoping Report identifies the elements of population and human health of relevance to the proposed NCW 2 Development and considers the potential impacts from the construction, operation and maintenance, and decommissioning of the offshore and intertidal components (seaward of the MHWS mark) of the Proposed Development on the population and human health receptors. This includes airborne noise and air quality on all receptors, and offshore socio-economics and tourism receptors.

17.2.2 STUDY AREA

Airborne Noise Study Area

The airborne noise study area associated with the potential effects resulting from construction, operation and maintenance and decommissioning activities of offshore infrastructure on onshore receptors is a 2 km buffer around the proposed offshore export cable corridor (Figure 17.2). Significant noise and vibration effects are not expected beyond this distance. For construction-related vibration, the study area is a buffer of up to 100 m from any vibration generating construction activity.

The airborne noise study areas have been developed to reflect receptors' increased sensitivity to noise at night, where night-time noise effects from construction and operation are possible.

The airborne noise study area will be reviewed and amended as the proposed offshore export cable corridor is refined and a landfall location is selected through the iterative design and EIA process.

Air Quality Study Area

The onshore air quality study area includes the following in accordance with the Institute of Air Quality Management (IAQM) guidance:

- Designated ecological receptors within 50 m of potential landfall construction activities; and
- Human Receptors (Residential Properties and public amenity areas) within 350 m of potential landfall construction activities.

Socio-Economics and Tourism Study Area

The selection of the study areas for the socio-economic impact analysis will take account of the spatial scale at which impacts upon different receptors are likely to materialise. This is likely to vary across receptors and will therefore require a localised study area and a larger regional study area. The study area will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

The local socio-economics study area will cover the Proposed Development and coastline authorities of Mid & East Antrim Council, and Ards and North Down Council. It will be linked to the selection of construction, and operation and maintenance ports and the supply of a range of inputs and services for the Proposed Development.

A larger regional socio-economics study area will also be defined to reflect the wider reach of Northern Ireland Gross Value Added (GVA) and employment impacts that are likely to materialise through the supply chain and provision of labour. This regional study area will be defined following review of the results of the socio-economics assessment being undertaken.

Figure 17.2: Airborne Noise Study Area extending 2 km from Export Cable Corridor Region for Assessment of Population and Human Health for Offshore Infrastructure associated with North Channel Wind 2 Project Data Sources

Desktop

There are a number of baseline datasets to inform air quality, socio-economics and tourism. These are summarised at Table 17.3 below.

Table 17.3: Desktop sources that inform the Air Quality, Socio-economic and Tourism Scoping Assessment

Data	Source	Year	Author
Offshore Energy SEA 3, Appendix 1E: Air Quality	DECC	2016	DECC
Air Pollutant Inventories for England, Scotland, Wales, and Northern Ireland: 2005-2019	Department for Environment, Food and Rural Affairs (Defra), The Scottish Government, The Welsh Government and The Northern Ireland Department for Agriculture, Environment and Rural Affairs	2021	National Atmospheric Emissions Inventory
IAQM Guidance on the assessment of dust from demolition and construction V1.1	Institute of Air Quality Management	2014	Holman *et al.*
Northern Ireland Labour Force Survey Annual Tables 2020	NISRA	2021	NISRA
Northern Ireland Labour Force Survey Annual Report 2019	NISRA	2020	NISRA
Mid-2020 Population Estimates for Northern Ireland	NISRA	2021	NISRA
Tourism NI Annual Report 2017-2018	Tourism NI	2018	NISRA

17.2.3 BASELINE ENVIRONMENT

Airborne Noise

<u>Seaward of MLWS</u>

The Project array area of Site 1 is located approximately 10km to the east of the closest point of the Antrim coast. The Project array area of Site 2 is located approximately 14km to the east of the closest point of the coast. There are currently a number of potential landfall locations on the East Antrim coast, at Ballylumford or Kilroot for NCW 1 Project, and at Kilroot for NCW 2 Project. The offshore receptors that might potentially occur in the North Channel and be potentially sensitive to offshore airborne noise include:

- offshore oil and gas installations, and manned working platforms (refer Section 16);
- closest commercial shipping route (refer Section 12);
- fishing vessels (refer section 12); and
- nearshore leisure and recreational users including recreational fishing; motor cruising; water sports and scuba diving (refer section 16).

Landward of MLWS

The baseline environment within the airborne noise study area is mainly rural, however there are a number of settlements including Larne, Whitehead and Carrickfergus located along the East Antrim coast. Noise in this area is likely to be dominated by road traffic, rail traffic and industrial sites including Ballylumford Power Station, Kilroot Power Station, the Irish Salt Mine, and Larne Port.

A desk-based review and consultation will be undertaken to identify potentially sensitive receptors. Background noise monitoring will be undertaken at residential properties where the potential for significant noise effects from offshore activities is identified, and where needed to inform the construction assessment. Any surveys will be agreed in consultation with Mid and East Antrim Council (MEA) throughout the EIA process and will be carried out for a sufficient period to allow typical sound levels to be established, taking account of different types of noise sources and weather conditions that occur. Noise surveys may be accompanied by the acquisition of supplementary non-acoustic data (rainfall and wind records), as required.

Air Quality

The UK agreed to set emission ceilings through the National Emission Ceilings Directive (NECD), which was revised in 2016 (NECD 2016/2284/EU) to set emission reduction commitments for total emissions of NOx, SOx, non-methane volatile organic compounds (NMVOC), Ammonia (NH3) and particulate matter (PM2.5) in 2020 and 2030. The UK has met these reduction targets for all of these pollutants for each year since 2010 inclusive with the exception for NOx for the year 2010 (NECD, 2020).

In 2019, the National Atmospheric Emissions Inventory undertook a review of the emissions in Northern Ireland for the eight priority air pollutants: ammonia (NH3), carbon monoxide (CO), NOx, NMVOCs, PM10, PM2.5, SO2, lead (Pb) and dioxins (PCDD/F) and benzo(a)pyrene B[a]p. Between 2005 and 2019 there were decreases of 31% for carbon monoxide; 45% for nitrogen oxides (NOx); 11% for NMVOCs; 0.9% for PM10; and 69% for SO2 (National Atmospheric Emissions Inventory, 2021).

The baseline air quality environment will be established by desktop review of records of existing pollution monitoring locations and results undertaken by the local authority, MEABC. Reference will also be made to Department for Environment, Food and Rural Affairs (DEFRA) background pollution estimates for the area surrounding the proposed redevelopment site.

Socio-Economics and Tourism

While the Proposed Development occurs offshore, the impacts associated with recreation value will also occur onshore. The socio-economic and tourism baseline environment will provide an overview of the following topic areas within the onshore and offshore environment:

- population;
- employment and economic activity;
- industry;
- income and wealth;
- transport and commuting; and
- tourism and leisure.

Socio-Economics Overview

In mid-2020, the median age across the local authorities within the Regional Study Area ranged from 36.2 years of age in Belfast, to 44.4 years of age in Ards and North Down (Nisra, 2021). The percentage of the population in the working age group varied from 59.9% of the population of Ards and North Down, to 65% in Belfast. These percentage contributions were also reflected within the pensionable age demographics, with Belfast having the lowest total percentage within the pensionable age category (14.9%) compared to the highest in Ards and North Down (21%) (NISRA, 2021).

A review of Northern Ireland's labour market (2021) suggests that in 2020 the fifth highest employment rate across Northern Ireland was in Mid and East Antrim with 74.4% employment, followed by Ards and North Down which had the sixth highest employment rate with 73.5% (Nisra, 2021). Across Northern Ireland, the employment rate has increased in 9 local authorities and decreased in 2 since 2015 (Nisra, 2020). Young people (16 to 24 years old) make up a comparatively high concentration of the workforce in the distribution, hotels and restaurants sectors. Meanwhile, workers aged 50 and over make up a comparatively high concentration of the workforce in the public admin, education and health sectors (Nisra, 2020).

A survey by the Office of National Statistics in 2020 suggested that there were around 5,000 full-time employees in the Northern Irish renewable energy sector, and turnover from the renewable energy sector in Northern Ireland for 2020 was estimated to be £0.9 billion.

GVA is a key indicator used to measure economic performance. Total GVA in the UK is £2,214 billion, and in Northern Ireland is £48 billion. Annual GVA growth of 1.3% and 0.3% has been recorded in the UK and Northern Ireland, respectively (Office for National Statistics, 2019). The GVA per head in the UK was estimated at £32,876 compared to £25,656 in Northern Ireland (Office for National Statistics, 2019). Statistics on GVA per head provide an overview of the value added by production activity in an area to the resident population of that area. However, these stats can be subject to distortion due to the effects of commuting and variations in the age distribution of the population.

Tourism Overview

Due to the offshore nature of the Proposed Development boundary, it is unlikely to support recreational or tourism activities. The array area of NCW 2 is located approximately 14km to the east of the nearest coastline. There are a number of tourist destinations along the Antrim coastline; Brown's Bay is a popular summer destination, Islandmagee boat club is located at the mouth of Larne Lough and Whiteharbour Marina is also located to the south of the village of Whitehead. There are wrecks located close to the array area and within the proposed export cable corridor, but the depths of many of these wrecks exceed those which attract recreational divers. Likewise, the seabed within the array area and proposed export cable corridor is relatively featureless and does not contain notable features which typically attract recreational divers. The nearshore and inshore waters which the proposed export cable corridor crosses may support recreational sea angling.

The coastline around Northern Ireland supports popular activities such as walking, wildlife and birdwatching, golf, beach activities, horse-riding, camping, sailing, recreational angling, sea bathing, water and jet skiing and canoeing. The draft Marine Plan for Northern Ireland (2018) states that the coastal area is a key element of Northern Ireland's appeal as a tourism destination and an integral part of the visitor experience. A review of the tourism in the Council area associated within the landfall locations (Ballylumford and Kilroot, Mid and East Antrim) indicates that between 2017-2019, only 5% of tourists to Northern Ireland visited the Mid and East Antrim Council area.

17.2.4 POTENTIAL PROPOSED DEVELOPMENT IMPACTS

Airborne Noise

Offshore piling and ground anchoring is likely to represent the greatest increase in offshore airborne noise therefore, the assessment of airborne noise effects on offshore noise sensitive receptors will concentrate on these types of activities and will assume the maximum design scenario put forward as part of the Offshore ES.

The potential impacts associated with construction and decommissioning noise are considered to be temporary, and may arise as a result of:

- activities carried out in the intertidal area below MHWS;
- piling associated with wind turbine and other offshore infrastructure installation;
- construction activities at nearshore locations (e.g., jack-up barges, drilling, dredging, cable laying vessels working close to the shore); and
- construction vessels.

Landward of MLWS, the potential impacts associated with construction noise are considered to be temporary, and may arise as a result of:

- activities carried out in the intertidal area below MHWS;
- piling associated with wind turbine and other offshore infrastructure installation;
- construction activities at nearshore locations (e.g., jack-up barges, drilling, dredging, cable laying vessels working close to the shore); and
- construction vessels.

An overview of the impacts scoped in for the assessment of airborne noise landward of MLWS is provided in Table 17.2.

Air Quality

Atmospheric emissions from Proposed Development may arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide (SO2) and carbon dioxide (CO2), oxides of nitrogen (NOX) which represents the sum of nitrogen dioxide (NO2) and nitrogen oxide (NO), and particulate matter (PM10 and PM2.5).

Based on the project description outlined in Chapter 2 and the absence of any offshore receptors sensitive to air quality, all potential offshore air quality impacts are proposed to be scoped out of further assessment. Onshore receptors can potentially be affected by air quality impacts, even temporarily and an assessment of air quality effects on onshore receptors landward of MLWS as a result of the construction, operation and maintenance and decommissioning of offshore infrastructure will be undertaken. This assessment will dovetail into and align with any onshore ES prepared for applications for development consent under the planning code.

Socio-Economics and Tourism

A range of potential impacts on socio-economics and tourism have been identified which may occur during the construction, operation and maintenance, and decommissioning phases of the Proposed Development. The impacts that have been scoped into the Proposed Development assessment are outlined in Table 17.2 together with a description of any additional data collection (e.g., site-specific surveys) and/or supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

Table 17.4: Potential Impacts Proposed to be Scoped into the Proposed Development Assessment for Population and Human Health. Project phase refers to construction (C), operation and maintenance (O) and decommissioning (D) phase of the Proposed Development

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
Change in Noise Level – Human Receptors	✓		✓	There is the potential for activities associated with the construction of the Proposed Development to temporarily increase the noise levels experienced at identified human receptors throughout the airborne noise study area during offshore and nearshore construction activities.	Baseline survey measurements will be conducted in accordance with current guidance including BS 4142:2014+A1:2019 Method for rating and assessing industrial and commercial sound, and BS 7445-2:1991 Description and measurement of environmental noise.	BS5228:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites (BSI, 2014) details the “ABC method”, which specifies a construction noise limit based on the existing ambient noise level and for different periods of the day. The predicted construction noise levels will be assessed against noise limits derived from advice within Annex E of BS 5228.
Temporary Air Quality effects	✓		✓	Atmospheric emissions from Proposed Development may arise from the combustion of fuel used to power both vessels and helicopters used in the construction, operation and maintenance, and decommissioning of the offshore wind farm. The pollutants from vessels and helicopters include sulphur dioxide (SO_2) and carbon dioxide (CO_2), oxides of nitrogen (NO_X) which represents the sum	It is proposed that the air quality assessment will comprise a review of the most recent MEABC air quality reports and assessments and DEFRA background levels at the closest locations to the proposed development.	**Demolition Phase and Construction Phase** - The air quality impacts are assessed in accordance with the requirements of IAQM (2014): Guidance on the Assessment of Dust from Demolition and Construction. **Biodiversity** - The air quality impacts on ecology are assessed (as

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				of nitrogen dioxide (NO2) and nitrogen oxide (NO), and particulate matter (PM10 and PM2.5).		appropriate) in accordance with the requirements of IAQM (2020): A guide to the assessment of air quality impacts on designated nature conservation sites. • **Industrial Sources** (Local Air Quality Management Technical Guidance 2016 (LAQM.TG16)) Renewable energy generation facilities are unlikely to make a significant contribution to annual mean concentrations, but may contribute to elevated short-term concentrations, which may lead to exceedances of the short-term air quality objectives (e.g., 15-minute mean for SO_2, 1-hour mean for NO_2 or 24-hour mean for PM_{10}). An assessment is still undertaken in this case by use of the Industrial

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
						Emissions Screening Tool.
Construction & decommissioning Vibration	✓		✓	Ground-borne vibration can result from construction works and may lead to perceptible levels of vibration at nearby receptors, which at higher levels can cause disturbance to residents. In extreme cases, cosmetic or structural building damage can occur, however vibration levels have to be very high for this effect to be manifested and such cases are rare (BSI, 1993). High vibration levels generally arise from 'heavy' construction works such as piling, deep excavation, or dynamic ground compaction. The use of piling and ground anchoring during the construction of the Proposed Development may be required. Consideration will be given to potential sources of vibration associated with the offshore construction phase in proximity to residential and other sensitive	As above.	Guidance on the human response to vibration in buildings is found in BS 6472-1:2008 Guide to evaluation of human exposure to vibration in buildings, Part 1, Vibration sources other than blasting (BSI, 2008). For construction vibration from sources other than blasting, the vibration level and effects will be adopted based on Table B-1 of BS 5228-2. These levels and effects are based on human perception of vibration in residential environments.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				receptors (i.e., nearshore vibration generating activities).		
Noise and vibration impact to Ecological/Geological receptors.	✓		✓	Noise and vibration during offshore and nearshore construction activities may cause disturbance to wildlife, including protected species and designated sites. Vibration impacts may cause disturbance to designated geological sites.	As above.	Predictions of noise and vibration at identified ecological and geological receptors will be undertaken and provided to geologists and ecologists to undertake the assessment of noise and vibration impacts on such receptors.
Impact on employment in construction, operation and maintenance, and decommissioning in the supply chain.	✓	✓	✓	Potential expenditure from the construction to support employment in local companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could also go on to support employment indirectly in the wider industry supply chain.	A desk-based review will be undertaken to develop a baseline understanding of the socio-economic and tourism related conditions.	An economic impact model to estimate the direct, indirect and induced employment impact of expenditure on construction of the Proposed Development in the socio-economics study area will be developed.
Impact on the amount of GVA supported by construction, operation and maintenance, and decommissioning activity.	✓	✓	✓	Potential expenditure on the construction of the Proposed Development to support GVA in local companies that are directly engaged in the construction supply chain. The construction of the Proposed Development could	As above.	An economic impact model to estimate the direct, indirect and induced GVA impact of expenditure on construction of Proposed Development in the socio-economics study area will be developed.

Potential Impact	Project Phase C	O	D	Justification (including consideration of embedded mitigation measures)	Data Collection and Analysis Required to Characterise the Baseline Environment for the EIA	Summary of Proposed Approach to Assessment
				also go on to support employment indirectly in the wider supply chain.		
Impact on access to construction, operation and maintenance, and decommissioning-related employment amongst local residents.	✓	✓	✓	Direct and indirect employment associated with the construction phase could increase the range and supply of employment opportunities that are accessible to residents of the area.	As above.	No specific modelling is required for this impact assessment.
Impact on the demand for housing, accommodation and local services	✓	✓	✓	Direct and indirect employment generated during the construction phase could increase demand for housing, accommodation and local services during the construction phase.	As above.	No specific modelling is required for this impact assessment.
Impact on tourism and recreation activity.	✓	✓	✓	The construction of the Proposed Development could lead to disruption of local tourism and recreational resources.	A desk-based review will be undertaken to develop a baseline understanding of the tourism related conditions.	No specific modelling is required for this impact assessment.

17.2.5 PROPOSED APPROACH TO THE ENVIRONMENTAL IMPACT ASSESSMENT

The population and human health EIA will follow the methodology set out in Chapter 3. Specific to the population and human health EIA, the following aspects will be considered in more detail:

Human Health Assessment

In November 2022, IEMA launched guidance on determining significance for human health in Environmental Impact Assessment (IEMA, 2022). This guidance allows for wider determinants of health approach to be considered. In addition to bio-physical determinants of health (such as air quality and noise), the health assessment must now also consider social, behavioural, economic and institutional health determinants. There is also a focus on population health, including vulnerable groups and health inequalities. The guidance sets a clear expectation for an ES health chapter that explains the public health implications of the project for a health stakeholder audience. The assessment section of the new guidance provides detailed new methods to triangulate public health evidence sources to identify the likely significant effects for population health.

Airborne Noise and Air Quality

Noise and vibration impacts associated with the construction and decommissioning of the offshore components of the North Channel Wind Farm will be assessed using the guidance contained in BS 5228:2009+A1:2014, which defines the accepted prediction methods and source data for various construction plant and activities. Additional guidance would be sought in consultation with MEA for assessment of the particular impacts associated with offshore piling activities.

The following data sources will be used in the Offshore EIA Report:

- ordnance Survey mapping;
- topographical data;
- on-site noise monitoring data;
- construction data;
- DWG/DFX drawings;
- construction and O&M vessel numbers;
- noise modelling and propagation calculations, including the use of Parabolic Equations to predict noise from offshore piling operations at onshore receptors; and
- consultation with all relevant local authorities.

Construction noise and air quality impacts will be based on the likely construction programme and associated activities outlined in the Offshore EIA Report Project Description. This will include the type and nature of plant required for construction within the intertidal area, and the main sources of noise and air pollution from offshore construction will be identified.

Socio-Economics and Tourism

The assessment will consider likely significant effects associated with the offshore infrastructure on onshore and offshore receptors. The socio-economic impacts of the construction and operation of the Proposed Development have the potential to be significant and will impact at a regional and local level.

The assessment will be based on a desktop review of existing relevant studies and national datasets and indicators and will be supported by the development of a socio-economic model. The assessment will also draw on the information provided in other topics such as commercial fisheries (section 11), shipping and navigation (section 12), aviation, military and communications (section 13), marine archaeology (section 14), seascape and visual resources (section 15), and infrastructure and other sea users (section 16).

The economic impacts and benefits will be quantified in terms of Northern Irish GVA and expected jobs in Northern Ireland. The methodology for the socio-economic assessment will consider the results from the economic impact model that takes account of all possible impacts: direct, indirect, induced, supply chain effects, and potential for local production and maintenance.

A Project level socio-economics Technical Report will be developed and will support the Offshore EIA Reports socio-economics and tourism assessments. This Technical Report will be appended to the Offshore EIA Report.

There are no embedded mitigations considered for socio-economics receptors, as it is anticipated that the overriding socio-economic impacts of the Proposed Development will be positive in nature. Consultation will be carried out with local stakeholders and public sector bodies, such as Northern Ireland Enterprise, and through other activities that raise awareness of the opportunities that the Proposed Development provide to maximise the positive socio-economic impacts.

Several opportunities which could be considered to enhance the positive impacts include:

- the use of locally manufactured content where possible;
- the use of local contractors during construction for onshore infrastructure and potential offshore construction work where possible;
- employment and training possibilities for local people on the operation and maintenance of a wind farm where feasible; and
- supporting the community through sponsorship of local groups and teams.

17.2.6 POTENTIAL CUMULATIVE EFFECTS

Although the predicted effects of the Proposed Development on socio-economics are considered to be localised, there is potential for cumulative effects to occur from other projects or activities within the regional socio-economics study area. Projects and activities which will be considered include:

- onshore energy generation projects;
- road and rail projects;
- major residential, commercial and leisure projects; and
- minerals extraction and landfill projects.

17.2.7 POTENTIAL TRANSBOUNDARY IMPACTS

A screening of transboundary impacts will be carried out within the ES to consider potential impacts beyond the footprint of the Proposed Development across boundaries.

17.2.8 SCOPING QUESTIONS TO CONSULTEES

- Do you agree with the data sources which are suggested for the assessment of Population and Human Health?
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- Do you agree with the suggested designed in measures and is this mitigation appropriate?
- Do you agree with the proposed approach assessment?

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JNCC (2013c) JNCC conservation assessment - S1350 - Common dolphin (*Delphinus delphis*)

JNCC (2013d) JNCC conservation assessment - S2030 - Risso's dolphin (*Grampus griseus*)

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ANNEX A MARINE PROCESSES BASELINE ENVIRONMENT

A.1 SITE-SPECIFIC SURVEY DATA

This section provides an overview of potential project specific data sources of relevance to marine processes.

To support the acquisition of marine processes data, there are several surveys required for example:

- Deployment of at least two ADCPs for approximately one month within the Proposed Development Array Area, to calibrate and validate the hydrodynamic models.
- Recent bathymetry survey data to form the basis of model domains.
- It is likely that two or three floating LiDAR buoys(s) will be deployed pre-construction to collect wind profile data as well as other metocean information.

A.2 BASELINE CHARACTERISATION

This section provides an overview of the baseline for marine processes established through wave and wind analysis.

2. Wave and wind roses shown in Figure A3 and Figure A4 illustrate the conditions at 55° 0.000'N, 5° 30.000'W, this offshore location is shown in Figure A1 and Figure A2.

3. Analysis of the offshore location as shown in Figure A5, established that over 55% of the wave energy experienced at this location had peak wave periods in excess of 5 s, indicating that the majority of waves at this location are generated from local winds (wind sea).

4. It will be seen that this location in the North Channel can be subject to waves of greater than 4.5 m wave height and peak wave periods of greater than 8 s.

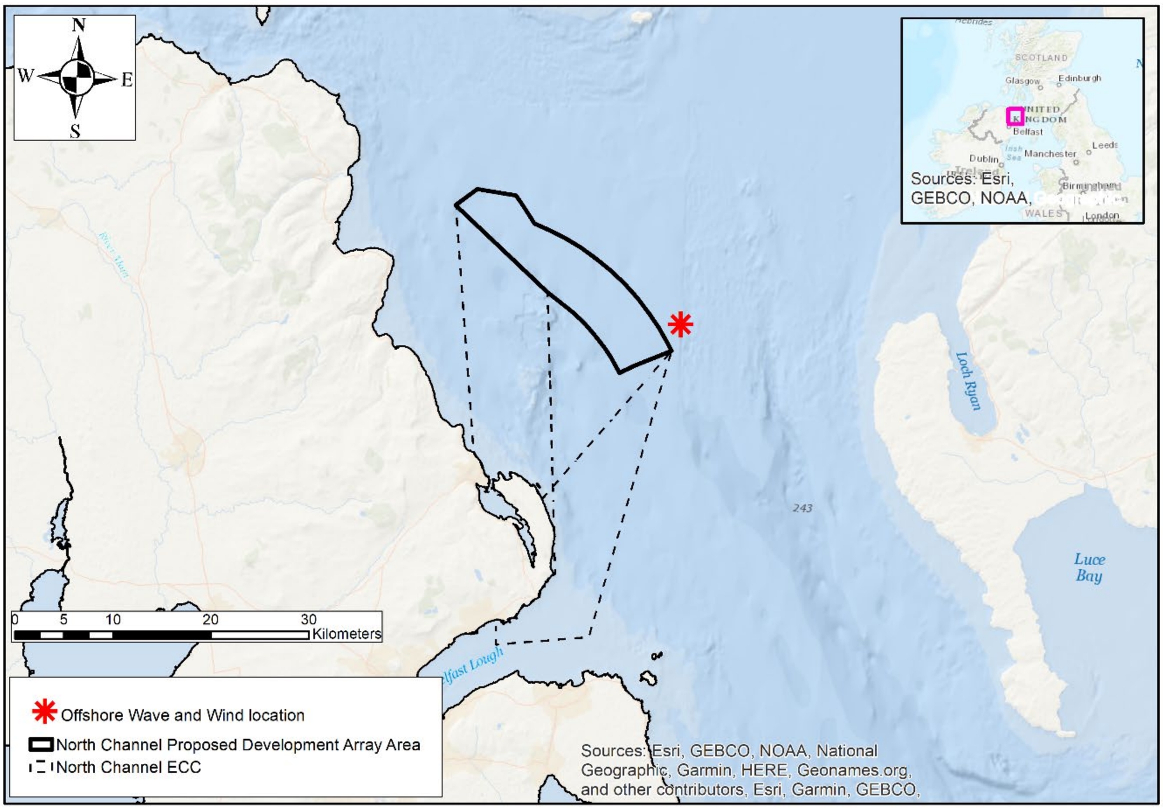

Figure A1: Location of offshore wind and wave point in relation to the northern Proposed Development and used to inform the baseline environment.

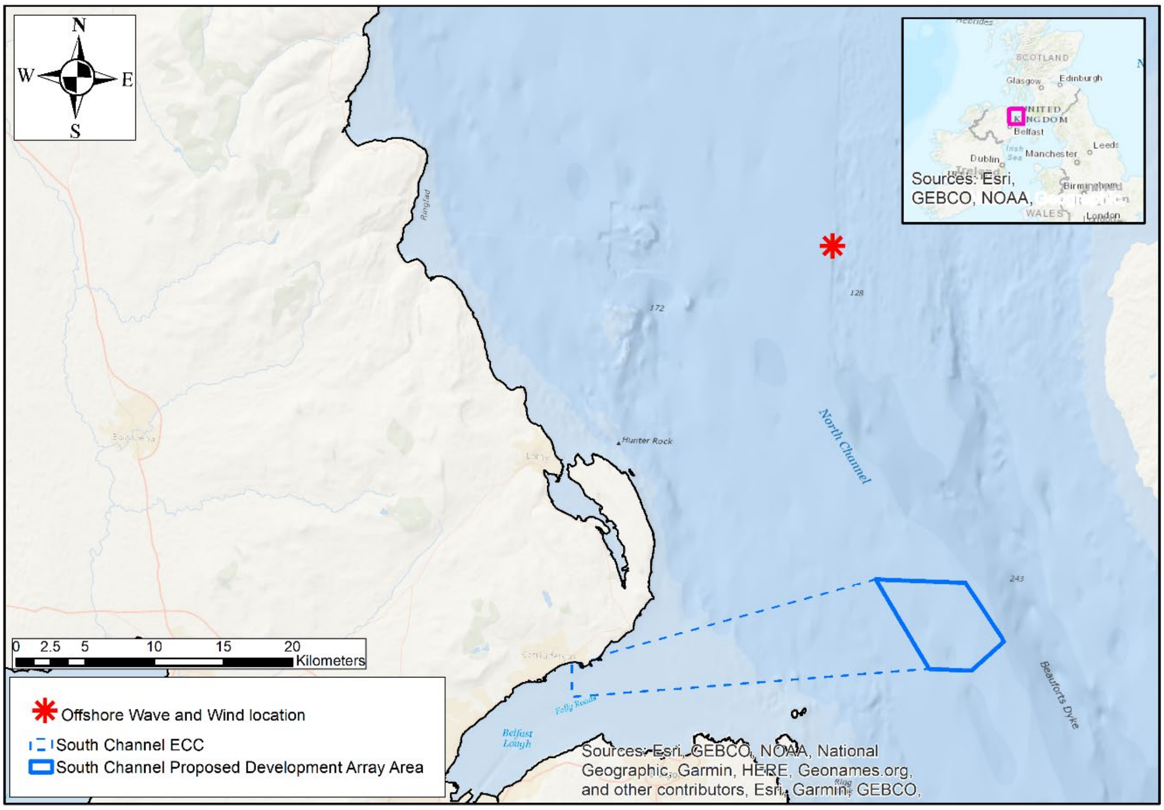

Figure A2: Location of offshore wind and wave point in relation to the southern Proposed Development and used to inform the baseline environment.

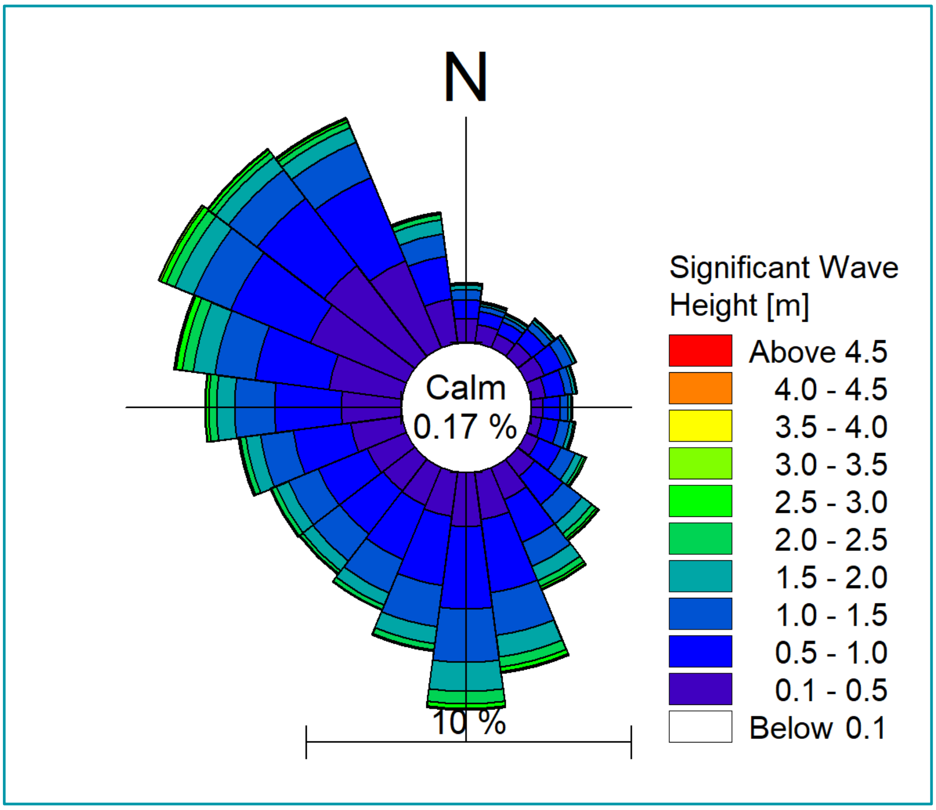

Figure A3: Long-term offshore wave rose for North Channel

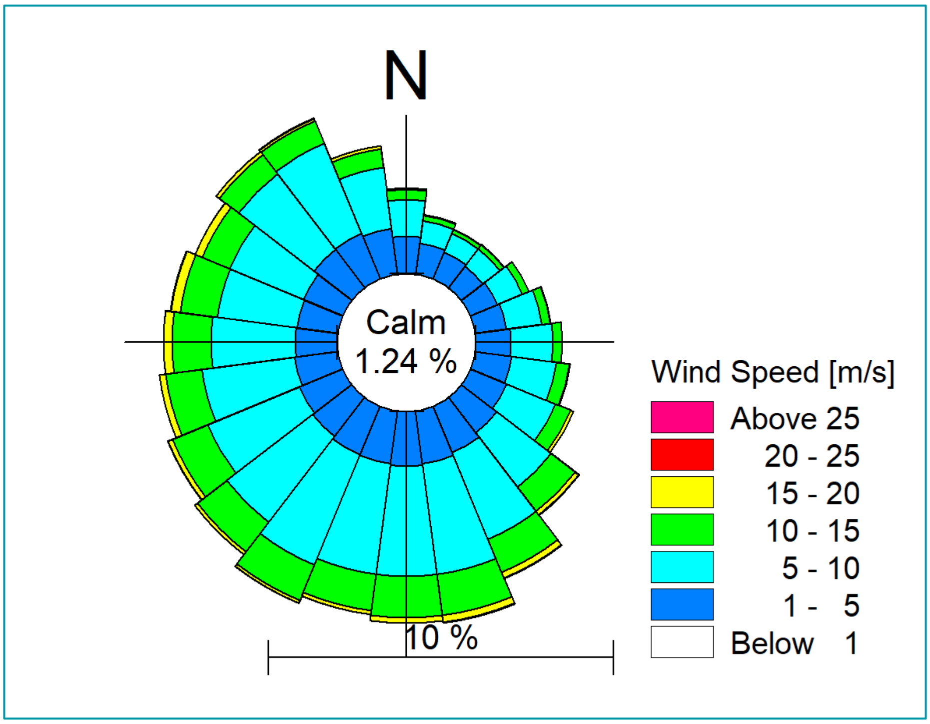

Figure A4: Long-term offshore wind rose for North Channel

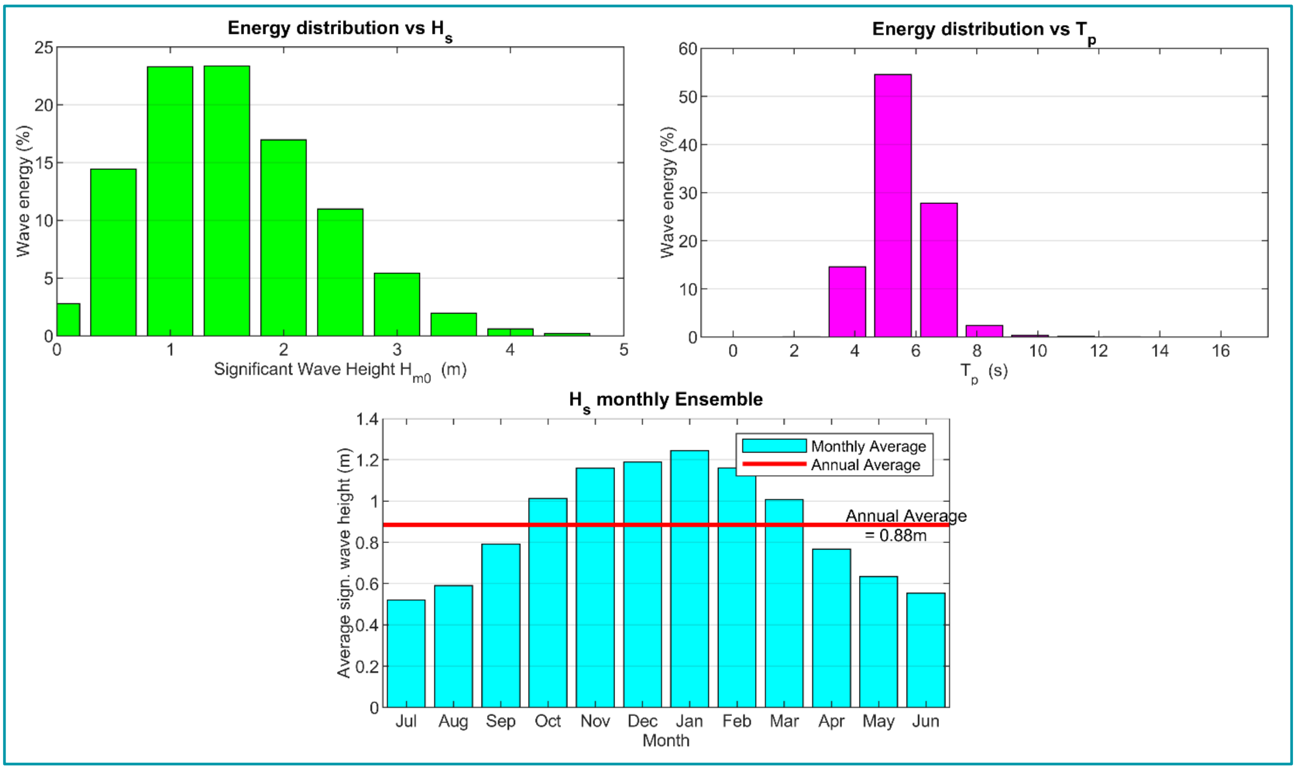

Figure A5: Summary statistics of long-term offshore wave climate at 55° 0.000'N, 5° 30.000'W

ANNEX B OFFSHORE AND INTERTIDAL ORNITHOLOGY BASELINE ENVIRONMENT

B.1 DESKTOP STUDY

An initial desk-based review of literature and data sources to support this Offshore Scoping Report has identified baseline datasets in the form of pre-existing and non-Proposed Development specific datasets. These are summarised at B.1 below. Other sources of data will be sought as the assessment progresses and all such sources of information will be referenced appropriately in the ES.

Table B.1: Summary of Key Desktop Study Inputs

Title	Source	Year	Author
Special Protection Areas, proposed marine Special Protection Areas, and Areas of Special Scientific Interest (NI)	*DAERA*	*Accessed 2022*	*DAERA*: Protected areas | Department of Agriculture, Environment and Rural Affairs (daera-ni.gov.uk)
Special Protection Areas, proposed marine Special Protection Areas and Natural Heritage Areas. (RoI)	*NPWS*	*Accessed 2022*	*NPWS:* Protected Sites in Ireland | National Parks & Wildlife Service (npws.ie)
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (Scotland)	*SNH SiteLink*	*Accessed 2022*	*SNH:* https://sitelink.nature.scot
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (Wales)	*NRW*	*Accessed 2022*	*NRW:* Natural Resources Wales / Protected areas of land and seas
Special Protection Areas, proposed marine Special Protection Areas and Sites of Special Scientific Interest (England)	*Natural England*	*Accessed 2022*	*NE:* Planning and development: Protected sites and species - detailed information - GOV.UK (www.gov.uk)
Special Protection Areas and proposed marine Special Protection Areas	*JNCC*	*Accessed 2022*	JNCC - Adviser to Government on Nature Conservation
Seabird colony data	*Seabirds Count and the Seabird Monitoring Programme*	*2020*	*JNCC:* https://jncc.gov.uk/our-work/seabird-monitoring-programme/#smp-results-data
Migration Zones	*British trust for Ornithology (BTO)*	*Accessed 2022*	*BTO:* Migration Zone Shapefiles | BTO - British Trust for Ornithology
Non-estuarine Coastal Waterbird Survey	*British trust for Ornithology (BTO)*	*2015/16*	*BTO:* https://app.bto.org/webs-reporting/?tab=news
Seabird records submitted by the public	*National Biodiversity Data Centre*	*Accessed 2022*	Home - Biodiversity Maps (biodiversityireland.ie)
Northern Ireland Seabird Reports 2013-2021	*BTO*	*Accessed 2022*	Northern Ireland Seabird Report | BTO - British Trust for Ornithology
SEA678 Data Report for Offshore Seabird Populations	*Coastal and Marine Resources Centre*	*Accessed 2022*	Mackey, M. & Gimenez, D.P. https://assets.publishing.service.gov.uk/government/uploads/sy

Title	Source	Year	Author
			stem/uploads/attachment_data/file/197026/SEA678_Seabirds.pdf
Distribution maps of cetacean and seabird populations in the North-East Atlantic	*Journal of Applied Ecology*	*2019*	Waggitt et al. Distribution maps of cetacean and seabird populations in the North-East Atlantic - Waggitt - 2020 - Journal of Applied Ecology - Wiley Online Library

B.1.1 SEA678 DATA

This research utilised the European Seabirds at Sea (ESAS) dataset (version 1) which is maintained by the JNCC and is inclusive of data gathered in north-west European marine waters between 1979 and 2003 and is based only on ship-based surveys undertaken within this period. While this survey information is relatively dated it provides valuable historical context to the relative importance of the project site and its surrounds for seabirds.

The methodology utilised for these boat-based surveys is a strip-transect, undertaken in appropriate weather conditions. Observations were made within a 90° arc of the ships trackline. Surveys were conducted throughout the year on various vessels which were scheduled to be within the study areas for period of days or weeks. Data was divided into sample blocks measuring 15’ latitude by 20’ longitude which is a JNCC standard arrangement for the displaying of seabird survey effort and abundance.

It is noted that the sample blocks in which all aspects of the works associated with the project are proposed, in addition to the offshore ornithology study area, were all subject to the highest category of survey effort, with more than 80km^2 within the sample blocks subject to survey. Survey effort as largely focussed on the winter, breeding and post-breeding periods, with lower relative coverage in the autumn.

This information has been reviewed in light of the proposed project with Table B.2 below detailing the maximum density of each species recorded within the site of the proposed project and within each portion of the survey season.

Table B.2: Summary of SEA678 Data for the Offshore Ornithology Study Area

Species	Maximum Mean Density (Birds/km^2) within sample blocks inside the Project Site and Offshore Ornithology Study Area (SEA678)			
Common Name	**Winter**	**Breeding**	**Post-Breeding**	**Autumn**
Northern Fulmar	0.000001 - 1	0.000001 - 1	2.000001 - 10	0.000001 - 1
Great Shearwater	No sightings	No sightings	No sightings	No sightings
Sooty Shearwater	No sightings	No sightings	>0.14	No sightings
Manx Shearwater	No sightings	2.000001 - 8	>8	No sightings
European Storm-Petrel	No sightings	0.000001 – 0.3	0.000001 – 0.3	No sightings
Leach’s Storm-Petrel	No sightings	No sightings	0.000001 – 0.07	No sightings
Northern Gannet	0.800001 – 2.5	0.800001 – 2.5	0.800001 – 2.5	0.800001 – 2.5
Great Cormorant	>1	0.200001 - 1	No sightings	0.000001 – 0.1
European Shag	0.300001 – 1	0.000001 – 0.15	0.150001 – 0.3	>1
Pomarine Skua	No sightings	No sightings	No sightings	No sightings

Species	Maximum Mean Density (Birds/km^2) within sample blocks inside the Project Site and Offshore Ornithology Study Area (SEA678)			
Arctic Skua	No sightings	0.000001 - 0.03	0.000001 - 0.03	No sightings
Long-tailed Skua	No sightings	No sightings	No sightings	No sightings
Great Skua	No sightings	0.000001 – 0.04	0.000001 – 0.04	No sightings
Black-headed Gull	>1	0.000001 – 0.2	No sightings	0.200001 – 0.4
Common Gull	0.200001 – 0.6	0.100001 – 0.2	0.000001 – 0.1	0.000001 – 0.1
Herring Gull	1.000001 - 5	>5	0.000001 – 0.5	>5
Lesser Black-backed Gull	0.000001 – 0.2	0.000001 – 0.2	0.000001 – 0.2	0.000001 – 0.2
Great Black-backed Gull	0.000001 – 0.15	0.000001 – 0.15	0.150001 – 0.3	0.150001 – 0.3
Black-legged Kittiwake	0.000001 – 0.25	0.500001 - 2	0.500001 - 2	>2
Common Tern	No sightings	0.080001 – 0.15	0.000001 – 0.08	No sightings
Arctic Tern	No sightings	0.000001 – 0.15	0.000001 – 0.15	No sightings
Black Guillemot	0.300001 - 1	0.300001 - 1	0.000001 – 0.15	0.150001 – 0.3
Common Guillemot	1.000001 - 2	2.000001 - 5	>5	2.000001 - 5
Razorbill	0.500001 - 1	>2	>2	1.000001 - 2
Atlantic Puffin	No sightings	0.000001 – 0.5	0.000001 – 0.5	0.000001 – 0.5

This data indicates that the project site and offshore ornithology study area are likely to be of relative importance for a range of seabird species including several which appear to be present on a seasonal basis only, as in the case of manx and sooty shearwater, Leach's storm-petrel, arctic skua, great skua, common tern and arctic tern. This is as expected given the ecology of these migratory species. Several species are present throughout much of the year in varying densities including cormorant, black-headed gull, and puffin.

Fulmar, gannet, shag, common gull, herring gull, lesser black-backed gull, great black-backed gull, kittiwake, black guillemot, common guillemot and razorbill were present throughout the year at varying densities.

B.1.2 SEABIRD COLONY DATA

- Seabird colony data, available as part of the Seabird Monitoring Programme (SMP) and published by the JNCC, was reviewed in respect of a number of species which are known to be breeding in the locality of the project and offshore ornithology study area. This data was filtered according to the published mean-maximum foraging ranges (plus one standard deviation (+1 S.D.)) in Woodward et al. (2019) or where unavailable Thaxter et al. 2012, which apply to each of the species concerned. A maximum radius equal to that of northern gannet (Mean Max. of 315.2 km ± 194.2 km) was used in respect of a number of species which support known foraging ranges greater than this species. These include northern fulmar *Fulmarus glacialis,* manx shearwater *Puffinus puffinus* and great skua *Stercorarius skua* all of which are known to have mean foraging ranges which are well within the offshore ornithology regional study area distance buffer.

B.1.3 WAGGITT ET AL. 2019

Data published as part of this study was gathered through the collation of a range of different sources of survey including aerial digital and observational surveys and vessel surveys and incorporating differing methodologies and observation methods. Data used for the study analysis dates from between 1980 and 2018. Species distribution models were applied to the data for each species to account for variations in survey coverage and distribution predictions generated.

This study provides concentration data in a similar manner to the SEA678 data and is provided at a 10km resolution. This data was reviewed for each species to establish the maximum density recorded per month within the offshore ornithology study area. A summary of this data is set out below in Table B.3.

In general, this data shows similar trends across the year to that reported in the SEA678 data for the areas within the offshore ornithology study area, this is unsurprising given that such trends are typically associated with the behaviour and ecology of each individual species. It is noted however that the Waggitt et al. data predicts significantly lower bird concentrations across a number of species than recorded within the SEA678 data for each month/season. An example of this is European shag, were concentrations recorded in the SEA678 data were a factor of ten lower for particular times of the year, however this was not consistent across months/seasons. Similar differences are present in respect of manx shearwater, herring gull, lesser black-backed gull, common guillemot and razorbill.

For other species concentrations were more consistent across both sets of data, such as in the case of kittiwake and puffin.

Table B.3: Summary of Waggitt et al. 2019 Data for the Offshore Ornithology Study Area

Species	Maximum Predicted Concentration (Birds/km^2) within 10km^2 blocks within Offshore Ornithology Study Area (Waggitt et al. 2019)											
Common Name	January	February	March	April	May	June	July	August	September	October	November	December
Northern Fulmar	0.92	0.89	0.98	1.12	1.19	1.29	1.40	1.47	1.34	1.16	1.06	0.98
Manx Shearwater	0.0098	0.0079	0.029	0.15	0.21	0.35	0.55	0.71	0.19	0.035	0.021	0.014
European Storm-Petrel	0.00081	0.00068	0.00065	0.0029	0.015	0.025	0.039	0.051	0.049	0.0096	0.0016	0.0011
Northern Gannet	0.17	0.16	0.27	0.60	0.66	0.74	0.82	0.87	0.86	0.51	0.24	0.20
European Shag	0.12	0.11	0.11	0.10	0.12	0.12	0.13	0.13	0.13	0.13	0.14	0.13
Great Skua	0.0062	0.0050	0.0039	0.0038	0.0055	0.0097	0.016	0.028	0.031	0.022	0.014	0.0086
Herring Gull	0.35	0.38	0.37	0.33	0.27	0.20	0.15	0.13	0.14	0.17	0.23	0.29
Lesser Black-backed Gull	0.0086	0.0077	0.017	0.040	0.017	0.063	0.082	0.045	0.019	0.016	0.013	0.010
Black-legged Kittiwake	0.72	0.74	0.61	0.48	0.44	0.41	0.39	0.37	0.47	0.62	0.67	0.70
Common Guillemot	2.2	2.0	1.8	1.5	1.4	1.3	1.2	1.4	1.6	1.9	2.0	2.1
Razorbill	0.47	0.48	0.61	0.74	0.71	0.66	0.61	0.46	0.40	0.42	0.46	0.40
Atlantic Puffin	0.052	0.053	0.079	0.13	0.14	0.17	0.20	0.23	0.15	0.089	0.075	0.064

B.1.4 MIGRATING BIRD SPECIES

Limited data is available on the use of the proposed development site and the offshore ornithology study area by migrating bird species. The BTO provides shapefiles indicating broad migration zones for all migratory bird species within the British Isles (Wright et al. 2012). While these shapefiles have some utility it is noted that they are provided at a broad scale indicating the potential for presence or absence of migrating species during the relevant seasonal period. As such, the shapefiles show that the proposed development site lies within the migration zone of a large number of bird species, for which the known migration zones are comprised of the majority of coastal regions around the UK and Ireland.

Several studies have been published on the migration routes utilised by various species as discovered through the use of GPS tracking. All such studies are limited in terms of sample size and as such the relative statistical power of any drawn conclusions is low. Such studies do however provide an indication for the location and preference for use of particular migratory flight lines.

Whooper swan, barnacle geese, Greenland white-fronted geese and light-bellied brent geese populations wintering in England were found to largely avoid the Irish sea and the proposed development site and primarily utilise flight lines along the west coast of Scotland (Griffin et al. 2011). Greenland white-fronted goosed populations wintering in Ireland have been recorded to utilise migratory flight lines which avoid the Irish sea and proceed directly to the north-west (Fox et al. 2003).

While limited data is available for migrating waders Marchant (2002) identifies migration flight lines utilised by a range of waders of which flight lines of turnstone and common snipe were overlapping the proposed site boundary on a fairly regular basis.

Further data is likely to be available in respect of a range of migrating bird species, however at this stage in the process it is considered that large number of migratory bird species, particularly waterfowl and waders breeding in the more northern latitudes are likely to pass through the proposed development site and the offshore ornithology study area in variable numbers and further survey and assessment will be undertaken as part of the EIA.

B.1.5 DATA LIMITATIONS

It is noted that the available data, including the SEA678 and Waggitt et al. 2019, are focussed on the use of open waters by seabirds which rely on these waters to support breeding sites, as such this data contains significant omissions including the presence of wintering and passage divers (*Gavia sp.*) which are known to be present, given the inclusion of red-throated diver *Gavia stellata* as a qualifying feature of the East Coast (NI) Marine proposed SPA. Seaducks and grebes (*Podiceps sp.*) are also not included within the available data and also likely to be presence within the site during the winter and on passage.

Available data also omits the potential use of the proposed development site and offshore ornithology study area by migrating species on passage. Passage movements have traditionally been difficult to assess comparatively, using boat-based or aerial survey methods, as they are time-limited to relatively short periods and migration may also take place at high altitudes and under cover of darkness, when detection is difficult. Groups of particular relevance include migratory waterfowl waders.

B.2 SITE-SPECIFIC SURVEY DATA

Two year aerial bird and mammals surveys started in Sept 2022

B.3 BASELINE CHARACTERISATION

Breeding Species

Available data indicate that the most numerous species in the Proposed Development Site area are northern fulmar *Fulmarus glacialis,* manx shearwater *Puffinus puffinus,* herring gull *Larus argentatus,* common guillemot *Uria aalge*, black legged kittiwake *Rissa tridactyla*, gannet *Morus bassanus*, and razorbill *Alca torda*. For these species, numbers are typically highest during the pre-breeding period when birds forage further from their breeding colonies and during post-breeding dispersal. High numbers of shag *Phalacrocorax aristotelis* and cormorant *Phalacrocorax carbo* may also be present in winter.

- The Proposed Development lies within the core foraging range of gannets from the Monreith Cliffs and Scar Rocks colony, which supports some 2,394 pairs and the Ailsa Craig colony, which supports approximately 35,825 pairs. Further colonies are present at greater distances (within the core foraging range) including at the Garvan Isles, Lambay Island and Ireland's Eye with a number of large colonies also supported off the north-west coast of Scotland.
- The Proposed Development also lies in proximity to, and within the core foraging range of a number of manx shearwater colonies including a number along the west coasts of Scotland and Wales, however of particular note is the manx shearwater colonies at the Copeland Islands (SPA) which support around 3444 and 1406 birds on the respective islands (SMP 2007). These colonies lie within 30km of the development site (North)/15km of the proposed development (South).
- Data published in Dean et al. (2015) sets out the results of GPS tracking studies of manx shearwater associated with colonies at Rum, Lundy, Skomer and Copeland. In general, these results indicate that foraging was focused in the locality of the colony, particularly during incubation, with a larger foraging range during chick rearing. The distribution of foraging birds subject to GPS tracking within this study was entirely outside of the proposed development site, however birds from the Copeland Islands, Rum and Skomer were distributed along the east coast of Northern Ireland, to the south of the site, during incubation and rearing. Birds from each of these three colonies were also recorded to forage along the west coast of Scotland to the north of the proposed development site. As such, populations from Rum, Skomer and the Copeland Islands are likely to pass through the proposed development site on route to and from these foraging areas. This data, in respect of birds from Skomer, is further evidenced within the findings detailed by Guilford et al. (2008) which detailed the findings of a GPS tracking exercise of 400 birds from that colony. In this study none of the 400 tracked birds were recorded to utilise the proposed development site for foraging however birds did utilise shallower waters along the western coast of Scotland along the Mull of Kintyre. In a further study on the rafting behaviour of manx shearwater from the Copeland Islands colony Leonard et al. (2011) used GPS tracking to establish the areas which are principally used for rafting birds and thus the extent to which marine habitats may be included within a wider boundary for the Copeland Islands SPA. This study, similar to previous, identified areas outside of the boundary of the proposed development site as being of importance for the population, principally at the mouth of Belfast Lough and along the coast of County Down.
- Breeding colonies for a range of further species, are distributed fairly uniformly across the offshore ornithology regional study area including those of fulmar *Fulmarus glacialis*, gulls including herring, lesser black-backed *L. fuscus*, great black backed *L. marinus,* common *Larus canus* and black-headed *Chroicocephalus ridibundus* gulls, cormorant, European shag, common guillemot and razorbill.
- Several notable seabird breeding colonies are present in relative proximity to the proposed development, namely:
- The Gobbins which supports nesting cormorant (12 pairs), shag (18 pairs), fulmar (up to 200 pairs), herring gull (2 pairs), great black-backed gull (2 pairs), kittiwake (up to 1145 pairs), common guillemot (2675 pairs), razorbill (882 pairs) and puffin (up to 63 pairs);
- Muck Island which supports nesting fulmar (43 pairs), shag (38 pairs), common gull (up to 51 pairs), herring gull (up to 184 pairs), lesser black-backed gull (40 pairs), great black-backed gull (4 pairs), kittiwake (up to 519 pairs), common guillemot (2926 pairs), razorbill (1118 pairs) and puffin (up to 7 pairs);

- The Maidens which supports nesting shag (20 pairs), herring gull (2 pairs), lesser black-backed gull (7 pairs), great black-backed gull (8 pairs) and black guillemot (up to 47 pairs); and
- The Copeland Islands which in addition to manx shearwater (as discussed above), support black-headed gull (up to 775 pairs), common gull (up to 954 pairs), herring gull (up to 1200 pairs), lesser black-backed gulls (up to 1100 pairs), great black-backed gull (up to 12 pairs), common tern (up to 87 pairs), arctic tern (up to 1900 pairs) and black guillemot (up to 108 pairs).

Several studies have been undertaken to establish the use of areas of marine habitat by auks and kittiwake populations associated with internationally important breeding colonies along the Ireland coastline. In a GPS tracking study of kittiwake (Chivers et al. 2012) populations associated with the Rathlin Island SPA and Lambay Island SPA, recorded that a small number of kittiwake, from Rathlin, flew through the proposed development site, to forage or on route to or from foraging habitats. It is noted however that the vast majority of the tagged birds (total of 42 birds tagged) were recorded to utilise foraging habitats to the north and north-east of Rathlin Island or in proximity to Lambay island and as such did not forage within or pass through the proposed development site. Further study of kittiwake (Chivers et al. 2013) identified a range of parameters of relevance to the potential suitability of marine habitats for foraging kittiwake. Consideration of these parameters informed the extent of proposed marine protected areas (MPAs) surrounding the Rathlin Island SPA and Lambay Island SPA. These proposed MPA extents, identified as being areas of relatively higher value for kittiwake, were not located within or in proximity to, the proposed development site. Similar findings in respect of areas used by foraging kittiwake and common guillemot were reported by Curry (2010) were reported for bird populations on Rathlin Island and Lambay Island.

It is considered that the abundances of the key species within the available data for the proposed development site, including gannet, kittiwake, auks, terns and manx shearwater is consistent with the presence of internationally important breeding seabird colonies around the nearby coast, including the Larne Lough SPA, Outer Ards SPA, Copeland Islands SPA, Belfast Lough SPA and the Ailsa Craig SPA in addition to more distant SPAs in Scotland.

Wintering Species

Available data indicate that in winter, fulmar, gannet, cormorant, shag, gull species including kittiwake and auks are the most common species within the offshore ornithology study area with numbers of cormorant, kittiwake, black-headed gull and herring gull likely to be peaking at this time of year.

Seaducks, divers, grebes and waders which winter within Belfast, Strangford and Larne Loughs and along the west coast of Scotland in nationally important numbers are also likely to be present within the offshore ornithology study area, with particular attention drawn to the population of red-throated diver which forms a qualifying interest of the East Coast (NI) Marine proposed SPA.

Passage Species

As set out above the use of a site by migrating birds can present difficulties due to the potential for these movements to occur at night or at high altitude, thus preventing the collection of reliable records through boat-based or aerial surveys. As discussed above limitations of the available data include for the lack of data on the use of the site by migrant waterfowl and waders.

The SPAs of Belfast Lough, Strangford Lough, Larne Lough and Outer Ards, in addition to sites along the west coast of Wales, England and Scotland support large populations of wintering migrants including, sea ducks, divers, grebes and waders. Passerine species are known to cross the Irish Sea in large numbers moving to and from Britain, continental Europe and Scandinavia. However, they also are unrepresented in the available data.

Between MLWS and MHWS

The intertidal and near shore bird populations supported within the intertidal ornithology study area will be subject to significant seasonal variation, across the breeding, wintering and passage periods. In the absence of any concentrations of breeding seabirds, as discussed above, or other species of conservation concern however, the key feature of these habitats occur during winter and passage. The Belfast Lough and its shoreline is internationally and nationally important for its wader and wildfowl assemblages over these periods, reflected in the designation of the Belfast Lough SPA and Belfast Lough Open Water SPA.

Furthermore, the East Coast (NI) Marine SPA within which the proposed cable connection will be situated is designated on account of the supported wintering populations of great crested grebe *Podiceps cristatus* and red-throated diver both of which are likely to utilise the intertidal area for the purposes of foraging.

The preferred landfalls while the preferred landfall location is yet to be finalised, options are largely outside of sites designated primarily for ornithology features, with the exception of the East Coast (NI) Marine pSPA. It is anticipated that the specific intertidal locations in the immediate vicinity of the landfall potentially comprise over-wintering and passage assemblages of national to international importance. Further consideration will be required to establish the extent of the use of the proposed finalised landfall locations by birds.

<u>Conservation Sites</u>

There are many protected areas for ornithology receptors in the east of Northern Ireland and the Republic, in addition to along the west coasts of Scotland, England and Wales which lie within the offshore ornithology regional study area. A full screening of European sites with qualifying ornithology interest features will be undertaken in the HRA Screening Report for the Proposed Development. Relevant ornithology notified interest features of European sites screened into the ornithology assessment will be fully considered and assessed in the ES chapter with the assessment on the European site itself deferred to the HRA report. Designated sites for ornithological interest, including SPAs and proposed SPAs (pSPA), will be identified through the process described for identification of the offshore ornithology study area and offshore ornithology cumulative study areas.

This will generate a 'long-list' of designated sites with potential connectivity derived from seabirds' large foraging ranges (mean-maximum + 1 S.D.). Due to their proximity to the site and based on the site location and the location and qualifying features of nearby SPAs, the assessment is likely to focus on the potential effects on:

- East Coast (NI) Marine pSPA;
- Belfast Lough SPA;
- Belfast Lough Open Water SPA;
- Larne Lough SPA;
- Copeland Islands SPA;
- Outer Ards SPA;
- Ailsa Craig SPA;
- Sound of Gigha SPA; and
- Loch of Inch and Torrs Warren SPA;

The screening to be undertaken in the ornithology ES chapter will also include national designations, including SSSIs and MPAs.

ANNEX C SEASCAPE, LANDSCAPE AND VISUAL RESOURCES

C.1 PHOTOMONTAGES