CALEDONIA
Offshore Wind Farm

Code UKCAL1-ARP-GEN-ENV-RPT-00001

Caledonia Offshore Wind Farm

Offshore Scoping Report

Caledonia Offshore Wind Farm Limited

Title

Caledonia Offshore Wind Farm

Offshore Scoping Report

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Acronyms and Abbreviations

AA	Appropriate Assessment
AARA	Air to Air Refuelling Area
AD&OW	Air Defence & Offshore Wind
ADSFB	Association of District Salmon Fisheries Board
AIP	Aeronautical Information Publication
AIS	Automatic Identification System
AMSL	Above Mean Sea Level
ANO	Air Navigation Order
AST	Atlantic Salmon Trust
ATC	Air Traffic Control
ATS	Air Traffic Service
BEIS	Department for Business, Energy and Industrial Strategy
BGS	British Geological Society
BoCC	Birds of Conservation Concern
BOWL	Beatrice Offshore Windfarm Limited
BRES	Business Register and Employment Survey
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CaP	Cable Plan
CAP	Civil Aviation Publication
CCC	Committee on Climate Change
CCR	Climate Change Resilience

CCS	Carbon Capture and Storage
Cefas	Centre for Environment, Fisheries and Aquaculture Science
CES	Crown Estate Scotland
CfD	Contracts for Difference
CFLO	Company Fisheries Liaison Officer
CIA	Cumulative Impact Assessment
CIEEM	Chartered Institute for Ecology and Environmental Management
CIfA	Chartered Institute for Archaeologists
CMS	Construction Method Statement
CoCP	Code of Construction Practice
COD	Commercial Operation Date
COP26	Conference of the Parties (26), hosted in Glasgow 2021
CPA	Coast Protection Act 1949
CPT	Cone Penetration Test
CTA	Control Area
DDV	Drop Down Video
DECC	Department of Energy and Climate Change
DEFRA	Department for Environment, Food and Rural Affairs
DGC	Defence Geographic Centre
DM	Do-Minimum
DSLP	Development Specification and Layout Plan
DP	Decommissioning Programme
DTI	Department of Trade and Industry
ECC	Export Cable Corridor

ECR	Export Cable Route
EDR	Effective Deterrence Range
EEA	Exclusive Economic Area
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMF	Electromagnetic Fields
EMODnet	European Marine Observation and Data Network
EMP	Environmental Management Plan
EPS	European Protected Species
ERCoP	Emergency Response and Cooperation Plan
ESCA	European Subsea Cables Association
ESO	Electricity System Operator
EU	European Union
EUNIS	European Nature Information System
FEPA	Food and Environment Protection Act 1985
FIR	Flight Information Region
FL	Flight Level
FLiDAR	Floating Light Detection And Ranging
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables Group
FMMS	Fisheries Management and Mitigation Strategy
FRP	Fully Restrained Platform
FSA	Formal Safety Assessment
Ft	Feet

GBP	Great British Pounds
GBS	Gravity Based Structure
GDP	Gross Domestic Product
GHG	Greenhouse Gas
GPP	Guidance for Pollution Prevention
GSD	Ground Survey Distance
GVA	Gross Value Added
GW	Gigawatts
HDD	Horizontal Directional Drill
HER	Historic Environment Record
HES	Historic Environment Scotland
HMRI	Helicopter Main Routing Indicator
HMS	His or Her Majesty's Ship
HRA	Habitats Regulations Appraisal
HSE	Health and Safety Executive
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IALA	International Association of Marine Aids to Navigation and Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
ICAO	International Civil Aviation Organisation
ICCI	In-combination Climate Change Impact
ICES	International Council for the Exploration of the Sea
ICPC	International Cable protection Committee
IEEM	Institute of Ecology and Environmental Management

IEMA	Institute of Environmental Management and Assessment
IFP	Instrument Flight Procedure
IFR	Instrument Flight Rules
IMO	International Maritime Organization
INNS	Invasive Non-native Species
INTOG	Innovation and Targeted Oil and Gas
IOF	Important Ornithological Feature
IPCC	Intergovernmental Panel on Climate Change
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
km	Kilometre
KV	Kilovolt
LARS	Lower Airspace Radar Service
LAT	Lowest Astronomical Tide
LiDAR	Light Detection and Ranging
LMP	Lighting and Marking Plan
LOD	Limit of Detection
LSE	Likely Significant Effect
LUC	Land Use Consultants
m	Metres
MAIB	Marine Accident Investigation Branch
MarESA	Marine Evidence-based Sensitivity Assessment
MarLIN	The Marine Life Information Network
MCA	Maritime and Coastguard Agency

MGN	Marine Guidance Note
MHWS	Mean High Water Springs
MLWS	Mean Low Water Springs
mm	Millimetres
MMMP	Marine Mammal Mitigation Plan
MMO	Marine Management Organisation
MORL	Moray Offshore Renewables Limited
MSA	Minimum Sector Altitude
MSL	Mean Sea Level
MS-LOT	Marine Scotland Licensing Team
MSS	Marine Scotland Science
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MW	Megawatts
NATS	National Air Traffic Safeguarding
NCMPA	Nature Conservation Marine Protected Area
NERL	NATS (En Route) plc
NETS	National Electricity Transmission System
NLB	Northern Lighthouse Board
NM	Nautical Miles
NMPi	National Marine Plan Interactive
NPF	National Performance Framework
NPS	National Planning Statement
NNR	National Nature Reserves

NRA	Navigational Risk Assessment
NSP	Navigational Safety Plan
NTSLF	National Tide and Sea Level Facility
O&M	Operation and Maintenance
OEM	Original Equipment Manufacturer
OfTI	Offshore Transmission Infrastructure
ONS	Office for National Statistics
OnTI	Onshore Transmission Infrastructure
OREI	Offshore Renewable Energy Installations
ORJIP	Offshore Renewables Joint Industry Programme
OSP	Offshore Substation Platform
OWF	Offshore Wind Farm
OWIC	Offshore Wind Industry Council
OWSMRF	Offshore Wind Strategic Monitoring and Research Forum
PAC	Pre-application Consultation
PAD	Protocol for Archaeological Discoveries
PEMP	Project Environmental Monitoring Programme
PEXA	Practice and Exercise Areas
PMF	Priority Marine Feature
PRMS	Primary Radar Mitigation Scheme
PS	Piling Strategy
pSPA	Proposed Special Protection Area
PSR	Primary Surveillance Radar
PTS	Permanent Threshold Shift

RAF	Royal Air Force
RD	Rotor Diameter
RLoS	Radar Line of Sight
RIAA	Report to Inform Appropriate Assessment
RNLI	Royal National Lifeboat Institution
RYA	Royal Yachting Association
SAC	Special Area of Conservation
SAR	Swept Area Ratio
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SCDS	Supply Chain Development Statement
SCOS	Special Committee on Seals
SEPA	Scottish Environment Protection Agency
SFF	Scottish Fishermen's Federation
SLVIA	Seascape, Landscape and Visual Impact Assessment
SMP	Sectoral Marine Plan
SMR	Scottish Marine Region
SNCB	Statutory Nature Conservation Body
SPA	Special Protected Area
SSC	Suspended Sediment Concentration
SSEN	Scottish and Southern Electricity Networks
SSR	Secondary Surveillance Radar
SSSI	Site of Special Scientific Interest
SWFPA	Scottish White Fish Producers Association
tCO_2e	Tonnes of Carbon Dioxide Equivalent

TJB	Transition Joint Bay
TMZ	Transponder Mandatory Zone
TOPA	Technical and Operational Assessment
TRA	Temporary Reserved Area
TRSA	Tourism and Recreation Study Area
TTS	Temporary Threshold Shift
UHMPE	Ultra-High Molecular Weight Polyethylene
UKCP18	United Kingdom Climate Projections
UK	United Kingdom
UKHO	United Kingdom Hydrographic Office
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
VMS	Vessel Monitoring System
VMP	Vessel Management Plan
WDC	Whale and Dolphin Conservation Society
WFD	Water Framework Directive
WSI	Written Scheme of Investigation
WTG	Wind Turbine Generators
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility

Definitions

Array Area	The area of the Proposed Development within the Moray Firth in which the Wind Turbine Generators (WTGs) and inter-array/interconnector cables and offshore substation platforms (OSP) would be located.
Caledonia Offshore Wind Farm	The wind farm and all associated offshore and onshore components.
Foundations	The subsea infrastructure which supports the WTGs or OSP.
Grid Connection Point	The Transmission Interface Point (TIP) substation which connects to the National Electricity Transmission System (NETS).
Landfall Site	The area of Aberdeenshire coast in which the offshore transmission infrastructure makes land.
Offshore Transmission Infrastructure (OfTI)	The Offshore Transmission Infrastructure associated with the Caledonia OWF comprising OSP, offshore export cables and landfall, up to Mean High Water Springs (MHWS).
OfTI Site	The area of the Moray Firth within which the OfTI will be located. It includes all offshore infrastructure associated with transmission of the power generated.
Offshore Substation Platform (OSP)	The offshore platform that facilitates the transfer of power from the WTGs and inter-array cables to the offshore export cables.
Onshore Cable Corridor	100 m wide corridor within which the onshore circuits will be contained.
Onshore Transmission Infrastructure (OnTI)	The Onshore Transmission Infrastructure associated with the Caledonia OWF.
Onshore Substation	The onshore substation for the Proposed Development.
Proposed Development	It is proposed this differs within the Onshore and Offshore Scoping Reports. For offshore scoping, this includes all offshore aspects comprising Array Area, inter-array and interconnector cables, OSP, Offshore Export Cable Corridor (ECC) and landfall (up to MHWS). For onshore scoping, this would include all onshore aspects comprising landfall, landward from Mean Low Water Springs (MLWS), onshore export cable circuits, onshore substation and associate ancillary works such as compound and laydown areas.
Wind Turbine Generators (WTGs)	The wind turbines that generate electricity consisting of tubular towers, blades and the nacelle which houses the electrical generating equipment.

Executive Summary

In response to the Scottish Government's target of net-zero emissions of all greenhouse gases by 2045 and the aim to generate 50% of Scotland's overall energy consumption from renewable sources by 2030, the Crown Estate Scotland (CES) launched the ScotWind Leasing process in 2021, which released new areas of seabed within Scottish waters for future offshore development. The ambition was to offer 10 Gigawatts (GW) of offshore capacity within a series of Plan Options identified by the Scottish Government as the most suitable area for development as set out within the Sectoral Marine Plan for Offshore Wind.

In January 2022, as part of the ScotWind bidding round, Ocean Winds was successfully awarded an Option Agreement (granting exclusive rights) to develop an offshore wind farm (OWF) within the NE4 Plan Option, which is located within the Moray Firth, off the northeast coast of Scotland. Ocean Winds are now currently progressing the proposals for this OWF, which has been named the Caledonia Offshore Wind Farm (Caledonia OWF).

The Terms of the Agreement are dependent upon Ocean Winds being awarded all key consents and permissions to construct and operate the OWF from the relevant regulatory authorities. This process will be subject to Environmental Impact Assessment (EIA), with an EIA Report (EIAR) covering both offshore and onshore elements to be prepared to underpin any applications.

The Array Area is located within the NE4 Plan Option and is approximately 429 km^2 in size, with the northern limit approximately 22 km from Wick and the southern limit approximately 38 km from Banff. Ocean Winds is targeting a capacity of 2 GW for the Caledonia OWF. A maximum of 150 wind turbine generators (WTGs) will be located within the Array Area, with WTG capacities ranging from 14 to 25 Megawatts (MW).

Although water depths in the Array Area vary from 40 to 100 m, most of the area is shallow enough to allow construction using the fixed foundation technology which is already familiar in the Moray Firth. This offers the preferred, lowest cost, lowest risk solution and, using current technology, indicatively 75% of the Array Area could be constructed using fixed foundations (this figure is likely to increase as technology advances).

Caledonia OWF is considering the use of floating foundations for the balance of the site. Floating foundations have already been successfully proven off the Aberdeenshire coast, and the opinion of stakeholders is sought on their introduction to the Moray Firth, to determine whether, how and where they could best be deployed to maximise the energy output from the seabed available.

The Proposed Development has secured a connection to the National Electricity Transmission System (NETS). National Grid Electricity System Operator (ESO) has stated that the Grid Connection Point will be at New Deer. The offshore elements of the Proposed Development, for which this Offshore Scoping Report relates, will incorporate infrastructure within the Array Area (WTGs and foundations, as well as inter-array and interconnector cables) and export cables between the Array Area and landfall location within an Offshore Export Cable Corridor (ECC).

The Proposed Development also includes Onshore Transmission Infrastructure (OnTI) to facilitate connection of the Caledonia OWF to the NETS at New Deer. The OnTI and grid connection will be considered separately within an Onshore Scoping Report to be submitted separately to Aberdeenshire Council.

This Offshore Scoping Report, which is being submitted to Marine Scotland – Licensing Operations Team (MS-LOT), has been prepared to support two purposes, as follows:

- To gather further information on constraints to siting the Proposed Development and assist in refining the design envelope; and
- To seek the opinion of statutory and non-statutory consultees on the scope of the EIA which will be submitted with the application for the relevant consents required for the construction, operation and maintenance (O&M) of the Proposed Development.

Details of the Proposed Development, based on the scoping design envelope, along with baseline environmental information currently available are provided in this Offshore Scoping Report. The report also summarises key legislation and policy, outlines the proposed EIA methodology, identifies potential impacts that may arise as a result of the Proposed Development and describes how these impacts are proposed to be assessed. Within this Offshore Scoping Report, studies and surveys are proposed in order to inform the EIA process and preliminary discussion on potential mitigation measures are included.

1 Introduction

1.1 Background

1.1.1.1 In response to the Scottish Government's target of net-zero emissions of all greenhouse gases by 2045 and the aim to generate 50% of Scotland's overall energy consumption from renewable sources by 2030, the Crown Estate Scotland (CES) launched the ScotWind Leasing process in 2021, which released new areas of seabed within Scottish waters for future offshore development. The ambition was to offer 10 Gigawatts (GW) of offshore capacity within a series of Plan Options identified by the Scottish Government as the most suitable areas for development as set out within the Sectoral Marine Plan (SMP) for Offshore Wind (Scottish Government, 2020).

1.1.1.2 In January 2022, as part of the ScotWind bidding round, Ocean Winds (the Developer) was successfully awarded an Option Agreement (granting exclusive rights) to develop an offshore wind farm (OWF) within the NE4 Plan Option, which is located within the Moray Firth, off the northeast coast of Scotland. Ocean Winds are now currently progressing the proposals for this OWF, which has been named the Caledonia OWF (see Figure 1.1). The Terms of the Agreement are dependent upon Ocean Winds being awarded all key consents and permissions to construct and operate the OWF from the relevant regulatory authorities, including Marine Scotland.

1.1.1.3 Ocean Winds (via its 100% owned subsidiary Caledonia Offshore Wind Farm Limited) therefore intend to apply for the relevant consents and permissions required to enable construction, operation and maintenance (O&M) of the Caledonia OWF. This process includes the requirement for an Environmental Impact Assessment (EIA), with an EIA Report (EIAR) covering both offshore and onshore elements to be prepared to underpin any consent applications. In 2021, Ocean Winds commenced site-specific baseline characterisation surveying and data gathering to inform the EIA, and this data gathering process and pre-application consultation is currently ongoing.

1.1.1.4 Ocean Winds is in an advantageous position in developing the Caledonia OWF by having considerable knowledge and experience in the Moray Firth region through the development of the Moray Projects and the construction and operation of the Moray East OWF. The advantages include:

- An extensive local, regional and national network of stakeholders built through 12+ years of engagement;
- Successfully constructing the 950 Megawatts (MW) Moray East OWF in the Moray Firth using foundation technology currently proposed for the Caledonia OWF in steel jackets.
- Closure of major contracts and the soon to be installation of XXL monopiles in the Moray Firth through the construction of the Moray West OWF;
- Potential for synergies with the Moray Firth Projects through data sharing, cost sharing and use of existing infrastructure;
- Good understanding of environmental baseline conditions through project-specific data collection/monitoring programmes and strategic research projects within the Moray Firth;
- Tried and tested mitigation measures in the Moray Firth; and

- Ongoing strategic engagement of the Caledonia team with industry and research steering groups through the involvement of both Moray projects.

1.1.1.5 These advantages will ensure the Caledonia OWF does not have a standing start and will ensure to build on the lessons learned through the development of both Moray Projects.

1.2 Document Purpose

1.2.1.1 The purpose of this document is to request a Scoping Opinion from Marine Scotland – Licensing Operations Team (MS-LOT) in relation to the scope of the Offshore EIA and the content of the supporting EIAR for the Caledonia OWF. A Scoping Opinion is requested under Regulation 12 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended), Regulation 13 and Schedule 4 of the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) (for Scottish offshore waters) and Regulation 14 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (for Scottish inshore waters) (herein referred to as "the EIA Regulations").

1.2.1.2 This Offshore Scoping Report provides the background to, a description of and the need for the offshore elements of the Caledonia OWF (Array Area and associated Offshore Transmission Infrastructure (OfTI); referred to as the Proposed Development), the legislative and planning context, an overview of the site selection and development design undertaken to date, a summary of the proposed EIA methodology including cumulative assessment, the proposed receptors and impacts to be included (scoped in) and excluded (scoped out) from the EIA, and a preliminary list of mitigation measures. A separate Onshore EIA scoping exercise is being progressed in respect of the onshore elements of the Proposed Development (OnTI) for which the Local Authority will be responsible for providing an onshore Scoping Opinion. With a grid connection currently identified by National Grid ESO at New Deer, the relevant Local Authority is identified as Aberdeenshire Council.

1.2.1.3 For the purpose of EIA and provision of clarity regarding the onshore and offshore consenting regimes in relation to the intertidal area located between Mean High Water Springs (MHWS) and Mean Low Water Springs (MLWS), the following distinctions are made:

- The Offshore Scoping Report (this document) considers all activities associated with the Proposed Development extending seawards from MHWS. This includes the Array Area, the inter-array and interconnector cabling, any offshore substation platform (OSP) infrastructure requirements, the offshore export cables and landfall location; and
- The Onshore Scoping Report will consider all activities associated with the OnTI aspects of the Proposed Development extending landwards from MLWS. This includes landfall infrastructure, onshore cabling, onshore substation and associated ancillary infrastructure (such as jointing pits, construction compounds and lay down areas).

1.2.1.4 Where there is an overlap in jurisdiction of consenting and regulatory regimes (i.e., within the intertidal area between MHWS and MLWS), both the Offshore Scoping Report and the Onshore Scoping Report, as well as the subsequent EIAR, will present relevant technical assessments.

450000
500000
550000
600000
6500000
6450000
6400000

Legend

- Array Area
- Offshore Export Cable Corridor

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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REF: UKCAL1_GO_WNF_GEN_MAP_00010		

Figure 1.1

Location of Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

1.3 The Developer

1.3.1.1 Ocean Winds is an international offshore wind developer, created in 2019, as a 50:50 joint venture by EDP Renewables (EDPR) and ENGIE. Both companies share the vision in which renewables, particularly offshore wind, play a key role in the global energy transition.

1.3.1.2 EDPR and ENGIE combined their offshore wind assets and project pipeline under Ocean Winds, with 1.5 GW in operation, 0.03 GW under construction and 13.0 GW under development (totalling 14.53 GW in gross capacity), with the target of reaching 5-7 GW of projects in operation or construction and 5-10 GW under advanced development by 2025. It is noted that after the results of the ScotWind Clearing process, Ocean Winds' portfolio of projects now reaches 6.1 GW of gross capacity in Scotland.

1.3.1.3 Ocean Winds' primary target markets are in Europe, the United States, South America and selected Asian countries, from where most of the growth is expected to come. The main office supporting the Proposed Development is in Scotland, based in Edinburgh. As noted in Section 1.1, Ocean Winds has considerable knowledge and experience in the Moray Firth region through the development of the Moray East and Moray West OWFs and the construction and operation of the Moray East OWF.

1.3.1.4 Madrid-based EDPR is a global leader in the renewable energy sector and the world's fourth-largest wind energy producer. EDPR was created in 2007 to operate the Energias de Portugal (EDP) group's renewable power business.

1.3.1.5 ENGIE is a French multinational energy and services company, with its headquarters in La Défense, Courbevoie. It focuses on the production and supply of energy, services and regeneration. It was established in 2008 by Gaz de France and Suez.

1.4 Overview of the Proposed Development

1.4.1.1 As indicated above, the Proposed Development is located within the NE4 Plan Option identified in the Scottish Government's SMP for Offshore Wind Energy (Scottish Government, 2020a). The Array Area is located within the NE4 Plan Option and is approximately 429 km^2 in size, located within the Moray Firth off the northeast coast of Scotland, with the north limit of the site being approximately 22 km from Wick and the southern limit of the site being approximately 38 km from Banff.

1.4.1.2 As part of the ScotWind Leasing process, Ocean Winds was awarded an option agreement to develop an OWF within the NE4 Plan Option (the Caledonia OWF). Ocean Winds is targeting a capacity of 2 GW for the Caledonia OWF. A maximum of 150 wind turbine generators (WTGs) will be located within the Array Area, with WTG capacities ranging from 14 to 25 MW. Most of the Array Area is shallow enough to allow construction using fixed foundation technology which offers the preferred, lowest cost, lowest risk solution. Using current technology, indicatively 75% of the WTGs could be constructed using fixed foundations (this figure is likely to increase as technology advances). Caledonia OWF seeks the opinion of stakeholders on the introduction of floating technology to the Moray Firth to allow construction on the balance of the site. It is unlikely that floating foundations would be installed in water depths more suitable for fixed bottom technology. The threshold for floating technology is nominally defined as above 60 m water depth (Figure 1.2).

1.4.1.3 The Proposed Development has secured a connection to the National Electricity Transmission System (NETS). National Grid Electricity System Operator (ESO) has stated that the Grid Connection Point will be at New Deer. The Proposed Development will incorporate various offshore infrastructure within the Array Area and offshore export cables between the Array Area and preferred landfall location. The footprint of the Proposed Development being considered as part of this Offshore Scoping exercise is presented within Figure 1.1 and includes the Array Area, the Offshore Export Cable Corridor (ECC) and landfall location. The proposed development also comprises of the onshore component above the MLWS which includes the OnTI that facilitates connection of the Caledonia OWF to the NETS at New Deer. The OnTI and grid connection will be considered separately within the Onshore Scoping Report, which will be submitted separately to Aberdeenshire Council.

1.4.1.4 Further details of the Proposed Development are provided in Chapter 3 (Proposed Development Description), specifically the individual offshore elements of relevance to this Offshore Scoping Report. This includes the design envelope for infrastructure within the Array Area and associated OfTI such as (among other details) the number of WTGs, foundation types, inter-array and export cables, and other supporting infrastructure such as the OSP.

520000
540000
6460000
6440000
Fixed
(307km^2)
Floating
(122km^2)

Legend

- Array Area
- Offshore Export Cable Corridor
- Fixed
- Floating

Scale at A3: 1:175,000

0 2.5 5 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 1.2
Indicative spatial distribution of fixed and floating foundations for the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

1.5 Consenting Process

1.5.1.1 The Proposed Development is located within the Scottish Territorial Waters (extending to 12 nautical miles (nm) from shore) and the United Kingdom (UK) Exclusive Economic Zone (EEZ; between 12 and 200 nm). The Scottish Ministers are the Regulatory Authority in respect of the necessary consents and licences required for the construction and operation of an OWF project. To allow the Scottish Ministers to properly consider the development proposals, developers are required to provide information which demonstrates compliance with the relevant legislation and allows adequate understanding of the material considerations.

1.5.1.2 Where an offshore energy project, such as an OWF, requires Section 36 Consent and a Marine Licence (see Chapter 2: Legislation and Policy), MS-LOT, on behalf of the Scottish Ministers, are able to process both consent applications jointly ('deemed consent'). Table 1.1 outlines the high-level consenting process that will be followed.

Table 1.1. Consenting process summary for OWF developments in Scotland.

Development Stage	Activities Undertaken
Pre-application	Undertaking of preparatory works, scoping, EIA and consultation on the proposed project.
Application	Submission of application to MS-LOT, circulation of information to consultees and public advertisement of the application.
Consideration of Application	Consultees make representations on the application.
Application Evaluation	Consultation responses and the application are reviewed by MS-LOT and recommendation provided to the Scottish Ministers.
Application Determination and Announcement	Scottish Ministers provide the determination on the application, which is then publicly announced and published.
Post-decision	Developer compliance with conditions associated with consent under Section 36 of the Electricity Act 1989 (as amended) and relevant Marine Licence(s).

1.6 Objective of the Offshore Scoping Report

1.6.1.1 The Offshore Scoping Report (this document) supports a request to MS-LOT, on behalf of the Scottish Ministers, for a formal Scoping Opinion in relation to the offshore elements of the Proposed Development. It is anticipated that the Scoping Opinion issued by MS-LOT will be based on and informed by responses to this Offshore Scoping Report that are received from statutory and non-statutory consultees, and that the Scoping Opinion will then be used to guide the Developer in progressing the EIA. The EIA process is outlined in Chapter 4 (EIA Methodology) and this Offshore Scoping Report fits into the early EIA work associated with the 'Pre-application' stage as shown in Table 1.1.

1.6.1.2 The primary objective of this Offshore Scoping Report is to engage with the Scottish Ministers, MS-LOT and other relevant statutory and non-statutory consultees as part of the early stages of the EIA process, inviting each organisation to provide relevant information and to comment on the proposed approach to the EIA, to ensure that a robust and proportionate EIAR is submitted in support of any future consenting applications.

1.6.1.3 In order to engage in an informed manner, the Offshore Scoping Report provides information on the following:

- The Proposed Development;
- Offshore topics considered and proposed for scoping into the EIA, where potentially significant effects may result from the Proposed Development on the physical, biological and human environment;
- Offshore topics considered and proposed for scoping out of the EIA, where significant effects are not anticipated with consideration of embedded and industry best practice mitigation; and
- An outline of the proposed approach to be adopted in order to gain a full understanding of existing baseline conditions associated with the Proposed Development (and the future baseline assuming that the Proposed Development is not progressed) and to allow a robust environmental assessment of potential effects through the EIA process.

1.6.1.4 This Offshore Scoping Report sets out the potential environmental effects and identifies those that are considered significant and, therefore, proposed to be scoped into the EIA process. It also identifies those considered not significant and subsequently proposed for scoping out of the EIA process. The final list of topics to be considered in the EIA process for the Proposed Development will be confirmed following receipt of the Scoping Opinion and through further consultation with MS-LOT, NatureScot and other key stakeholders and consultees.

1.6.1.5 A proportionate EIA approach will be adopted as far as possible, with this Offshore Scoping Report seeking to scope out those issues which are increasingly shown (from repeated assessment in OWF EIA) to be non-significant. The report will also aim to confirm the scope of the cumulative impact assessment (CIA) and relevant transboundary impacts that also require consideration. Caledonia OWF welcomes the opportunity for early engagement with stakeholders in order to obtain feedback on the Proposed Development and the proposed scope of offshore assessment within the EIAR.

1.7 Document Structure

1.7.1.1 The structure of this Offshore Scoping Report is set out in Table 1.2. Note, Appendices A and B are provided as accompanying Excel spreadsheets.

Table 1.2. Structure of the Offshore Scoping Report.

Chapter / Appendix	Chapter Title	Overview
1	Introduction	This chapter provides an introduction to the Developer and the Proposed Development and outlines the key objective of the Offshore Scoping Report.
2	Legislation and Policy	Sets out the need for the Proposed Development and the relevant policy and legislative context.
3	Proposed Development Description	Provides a description of the key components that comprise the Proposed Development.
4	EIA Methodology	Describes the EIA methodology proposed and demonstrates the measures taken to progress a proportionate EIA.
5	Consultation Process	Outlines the approach to stakeholder consultation for the Proposed Development.
6 - 19	Offshore Scoping Topics	Each topic-specific chapter covers: ▪ An outline of the baseline characterisation; ▪ Scoping of potential impacts and significant effects, including embedded mitigation; ▪ Identification of potential cumulative and transboundary effects; and ▪ An outline of the proposed approach to the EIA. Offshore scoping topics include: ▪ Marine and Coastal Processes (Chapter 6); ▪ Marine Water and Sediment Quality (Chapter 7); ▪ Benthic Subtidal and Intertidal Ecology (Chapter 8); ▪ Fish and Shellfish Ecology (Chapter 9); ▪ Offshore Ornithology (Chapter 10); ▪ Marine Mammals and Other Megafauna (Chapter 11); ▪ Commercial Fisheries (Chapter 12); ▪ Shipping and Navigation (Chapter 13); ▪ Marine Archaeology and Cultural Heritage (Chapter 14); ▪ Military and Civil Aviation (Chapter 15); ▪ Seascape, Landscape and Visual Impact (Chapter 16); ▪ Socio-economics, Tourism and Recreation (Chapter 17); ▪ Climate (Chapter 18); and ▪ Other Human Activities (Chapter 19).
20	Summary of Offshore EIA Scoping	Provides a summary of the approach taken to scoping and the key findings of the Offshore Scoping Report.
21	Proposed Structure of the EIA Report (EIAR)	Outlines the proposed structure of the EIAR, including Offshore and Onshore elements of the Proposed Development.
-	References	Sets out full reference to documents and publications used to inform the Offshore Scoping Report.
Appendix A	Impact Register	Sets out the Proposed Development impacts and will form a live register during the EIA process.
Appendix B	Mitigation Commitment Register	Sets out a record of the embedded mitigation that the Proposed Development will commit to and will be further developed as required during the EIA process.

2 Legislation and Policy

2.1 Background

2.1.1.1 The need for a secure energy supply in the face of climate change has led to a number of international, national and local legislation and policies being put in place, designed to help guide development within the renewable energy sector. A number of these legislation and policies are of relevance to the Proposed Development. This chapter considers some of the key relevant legislation and guidance which relate to the development of OWFs, and thus of relevance to the consenting process for the Proposed Development.

2.2 Climate Change and Renewable Energy Policy

2.2.1.1 In reviewing legislation and policy relevant to renewable energy development, there is also the need to consider the legislative action required in the face of climate change, decarbonisation and driving the need to promote renewable energy generation.

2.2.1.2 The challenges of climate change, energy supply and security of supply are driving governmental policy and decision making on renewable energy developments. There are now a significant number of national and international policies, strategies and regulations relating to climate change and the development of renewable energy in Europe, the UK and Scotland. Scotland's long-term climate change targets will require net-zero greenhouse gas (GHG) emissions by 2045, in line with advice from the Committee on Climate Change (CCC). The ongoing development of the renewable energy sector will be required to meet these targets, with offshore wind playing a significant role as the development and operation costs are reduced. The recent Contracts for Difference (CfD) Allocation Round 4 has confirmed offshore wind to be one of the more competitively priced technologies to assist with delivery of energy targets.

2.2.1.3 The Scottish Offshore Wind Energy Policy Statement (Scottish Government, 2020a), building upon the ambitions outlined within the Scottish Energy Strategy (Scottish Government, 2017), sets out the Scottish Government's ambition to capitalise on the potential that offshore wind development can bring to Scotland and the role this technology could play in meeting our commitment to reach net zero by 2045. The British Energy Security Strategy (HM Government, 2022) sets out the UK Government's ambition to deliver up to 50 GW of offshore wind energy development by 2030, including up to 5 GW of innovative floating wind, which aligns with Scottish Governments National ambitions of the same.

2.2.1.4 There are four key drivers for the shift in energy production to low carbon sources in the UK and Scotland, including renewable energy, which are:

- The urgent need to tackle climate change;
- The need to secure energy supply;
- The need for new energy infrastructure; and
- The need to maximise economic opportunities.

2.2.1.5 The Proposed Development will make an important contribution in helping to achieve the relevant International, European, UK and Scottish policy aims.

2.3 Marine Planning Framework

2.3.1 National Marine Plan

2.3.1.1 In March 2015, the Scottish Government published Scotland's National Marine Plan (Scottish Government, 2015a). It sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nm (i.e., the contribution of waters offshore from Scotland to the UK's EEZ). It is required to be compatible with the UK Marine Policy Statement (HM Government, 2011) and existing marine plans across the UK, in particular where there is interaction between England's inshore and offshore marine plans and Northern Ireland's Marine Plans. Sector-specific objectives (Offshore Wind and Marine Renewable Energy) of Scotland's National Marine Plan to the Proposed Development are shown in Table 2.1 (Scottish Government, 2015a).

Table 2.1. Offshore wind and marine renewable energy objectives of Scotland's National Marine Plan.

Objective
Sustainable development of offshore wind, wave and tidal renewable energy in the most suitable locations.
Economic benefits from offshore wind, wave and tidal energy developments maximised by securing a competitive local supply chain in Scotland.
Alignment of marine and terrestrial planning and efficient consenting and licensing processes including but not limited to data sharing, engagement and timings, where possible.
Aligned marine and terrestrial electricity transmission grid planning and development in Scottish waters.
Contribute to achieving the renewables target to generate electricity equivalent to 100% of Scotland's gross annual electricity consumption from renewable sources by 2020.
Contribute to achieving the decarbonisation target of 50 g CO_2/kWh by 2030 (to cut carbon emissions from electricity generation by more than four-fifths).
Sustainable development and expansion of test and demonstration facilities for offshore wind and marine renewable energy devices.
Co-ordinated government and industry-wide monitoring

2.3.2 Sectoral Marine Plan for Offshore Wind

2.3.2.1 The first Sectoral Marine Plan for Offshore Wind Energy (Marine Scotland, 2011a) was adopted in 2011. In July 2013, Marine Scotland published the Draft Sectoral Marine Plan for Offshore Wind, Wave and Tidal energy in Scotland. It identified potential future options for commercial scale offshore wind energy developments. These draft plans were never formally adopted by Scottish Ministers, but the draft options were included in Scotland's National Marine Plan and are retained on Marine Scotland Maps for reference (Scottish Government, 2019a).

2.3.2.2 In November 2017, CES announced their intention to run a further leasing round for commercial scale offshore wind energy projects in Scottish Waters. To inform the spatial development of this leasing round, MS-LOT, as Planning Authority for Scotland's Seas, were required to undertake a planning exercise in accordance with relevant UK and Scottish legislation.

2.3.2.3 The SMP for Offshore Wind Energy (Scottish Government, 2020a), published in October 2020, provided the strategically planned spatial footprint for offshore wind development in Scotland. It identified the most sustainable Plan Options for the future development of commercial-scale offshore wind energy in Scotland, including deep water wind technologies and covered both Scottish inshore and offshore waters. It also contributed to achieving Scottish and the UK's energy and

climate change objectives and was developed to ensure consistency with Scotland's National Marine Plan. In the recent ScotWind Leasing process, a total of 20 proposed OWF projects were awarded option agreements within 15 of these Plan Options, for a total of 27.6 GW of capacity. This includes 17 proposed OWF projects awarded in January 2022, with a further three sites awarded in August 2022 as part of the ScotWind 'Clearing' process.

2.3.2.4 The SMP for Offshore Wind Energy (Scottish Government, 2020a) suggested that the NE4 Plan Option is likely to be important as a foraging area for seabirds, including kittiwake from multiple designated sites, and has been classified as subject to 'high levels of ornithological constraint'. It also identifies that there is potential for development in the NE4 Plan Option to have significant consequences for navigational safety, due to a large overlap with the key shipping route around the Scottish coastline. Relatively low socio-economic costs (compared to other Plan Options) were identified as potentially arisings from development within the NE4 Plan Option, associated with commercial shipping and fishing. These key issues relating to offshore ornithology, shipping and navigation and commercial fisheries will be addressed as part of the EIA (and parallel Habitats Regulations Appraisal (HRA) process for nature conservation designated sites).

2.3.2.5 Ocean Winds acknowledges that Marine Scotland will undertake an iterative SMP review and will engage with this process, while attempting to facilitate the necessary evidence to inform the review of the NE4 Plan Option. It is noted that if the assessment of the Proposed Development concludes adverse effects on integrity, it may be necessary for the Caledonia OWF to seek a derogation and agreement on compensation measures.

2.3.3 Regional Marine Plan

2.3.3.1 Regional marine plans are currently in the process of being prepared within those Scottish Marine Regions (SMRs) where there is an established Regional Marine Planning Partnership. The planning competence of these Regional Marine Planning Partnerships extends out to 12 nm. Regional marine plans are required to be developed in accordance with Scotland's National Marine Plan (unless relevant considerations indicate otherwise) and will be required to consider the Plan Option areas identified via the sectoral marine planning process, as well as co-ordination with CES's ScotWind Leasing regime and any relevant grid requirements and initiatives.

2.3.3.2 Elements of the Proposed Development are within the Moray Firth SMR which encompasses the coastal waters from Fraserburgh to Duncansby Head, extending from MHWS out to 12 nm.

2.4 Application and Consenting Process

2.4.1 Electricity Act 1989 (as amended)

2.4.1.1 The Proposed Development will be subject to an application to the Scottish Ministers under Section 36 of the Electricity Act 1989 (as amended) for consent to construct and operate an electricity generating station. The scope of this consent will include the construction, installation and O&M of WTGs and inter-array cables. In addition, the Scottish Ministers may make a declaration under Section 36A of the Electricity Act 1989 (as amended) extinguishing the public rights of navigation for the locations of the proposed WTGs and OSP structures.

2.4.1.2 In summary, consent under Section 36 of the Electricity Act 1989 (as amended) is required for any proposal to construct, extend or operate a generating station (an OWF) situated in:

- Scottish Territorial Waters (from baselines out to 12 nm), with a generation capacity in excess of 1 MW; or
- Scottish Offshore Region (from 12 to 200 nm), with a generating station in excess of 50 MW.

2.4.1.3 Scottish Minsters can grant consent under Section 36 of the Electricity Act 1989 with consideration of input and recommendations from MS-LOT.

2.4.2 Marine (Scotland) Act 2010

2.4.2.1 The Marine (Scotland) Act 2010 provides the legislative and management framework for the marine environment within Scottish Territorial Waters (from MHWS out to 12 nm). Under the Marine (Scotland) Act 2010, the Proposed Development requires a Marine Licence for the construction and deposition of structures below MHWS.

2.4.2.2 Part 4 (Marine Licensing) of the Marine (Scotland) Act 2010 includes licensable marine activities (Section 21) for which the following would apply to the Proposed Development (noting other licensable activities may be identified as the project description is defined during the EIA):

(1) To deposit any substance or object within the Scottish marine area, either in the sea or on or under the seabed, from any of the following:

(a) a vehicle, vessel, aircraft or marine structure,
(b) a container floating in the sea, or
(c) a structure on land constructed or adapted wholly or mainly for the purpose of depositing solids in the sea.

(2) To deposit any substance or object anywhere in the sea or on or under the seabed from a vehicle, vessel, aircraft, marine structure or floating container which was loaded with the substance or object either:

(a) in Scotland, or
(b) in the Scottish marine area.

(5) To construct, alter or improve any works within the Scottish marine area either:

(a) in or over the sea, or
(b) on or under the seabed.

(6) To use a vehicle, vessel, aircraft, marine structure or floating container to remove any substance or object from the seabed within the Scottish marine area.

(7) To carry out any form of dredging within the Scottish marine area (whether or not involving the removal of any material from the sea or seabed).

2.4.2.3 The Scottish Ministers can grant a Marine Licence under Part 4 of the Marine (Scotland) Act 2010 with consideration of input and recommendations from MS-LOT.

2.4.3 Marine and Coastal Access Act 2009

2.4.3.1 The Marine and Coastal Access Act 2009 provides devolved authority to Scottish Ministers for marine planning and conservation powers in the Scottish Offshore Region (from 12 to 200 nm). Under the Marine and Coastal Access Act 2009 (in the context of the Scottish Offshore Region), the Proposed Development requires a Marine Licence for the construction and deposition of structures beyond 12 nm.

2.4.3.2 Part 4 (Marine Licensing) of the Marine and Coastal Access Act 2009 includes licensable marine activities (Section 66) for which broadly the same activities listed above for the Marine (Scotland) Act 2010 would apply to the Proposed Development (e.g., deposits, removals and construction). Scottish Minsters can grant a Marine Licence under Part 4 of the Marine and Coastal Access Act 2009 with consideration of input and recommendations from MS-LOT.

2.4.4 The Energy Act 2004

2.4.4.1 The Energy Act 2004 makes provision for, among other aspects, the development, regulation and encouragement of the use of renewable energy sources and giving effect to international agreements relating to pipelines and offshore installations.

2.4.4.2 Under Section 95 of the Energy Act 2004, where a renewable energy installation is proposed to be constructed, and the Scottish Ministers consider it appropriate for safety reasons, designated areas may be declared as safety zones. Safety zones are intended to ensure the safety of the renewable energy installation or other installations in the vicinity during construction, operation, extension or decommissioning. Safety zones may exclude non-OWF vessels from navigating through a designated area for a specific period. The Proposed Development expects to apply for standard safety zones during construction and major maintenance activities, and around certain offshore structures (i.e., floating WTGs and OSPs) during the operational phase.

2.4.4.3 Sections 105 to 114 of the Energy Act 2004 require a decommissioning scheme for an offshore renewable energy installation in Scottish Waters to be approved by the Scottish Ministers.

2.4.5 Harbours Act 1964

2.4.5.1 Works associated with the Proposed Development which are to be carried out within statutory Harbour and Port Limits, may require a Works Licence under the Harbours Act 1964 and local harbour legislation from the relevant Port or Harbour authority (Harbour Works Consent). The purpose of a Works Licence is to ensure that all relevant consultations have been carried out and that there are no adverse effects on the safety of navigation within the Harbour or Port area. This may be required depending on the final Offshore Export Cable Route (ECR) and landfall site.

2.4.6 The Town and Country Planning (Scotland) Act 1997

2.4.6.1 The onshore aspects of the Proposed Development (not considered within this Offshore Scoping Report) require separate planning consent under the Town and Country Planning (Scotland) Act 1997 (as amended). A separate Onshore Scoping Report will be produced to support the EIA and associated planning application. The Town and Country Planning (Scotland) Act 1997 extends to MLWS, while the Marine (Scotland) Act 2010 extends up to MHWS, hence there will be an overlap between the marine and onshore planning regimes. As such, the intertidal area needs to be considered within both the Offshore Scoping Report and the Onshore

Scoping Report, as well as the EIAR (which will combine both offshore and onshore elements).

2.5 Environmental Impact Assessment

2.5.1.1 Requirements for EIA are defined in the EIA Directive (2011/92/EU, as amended by Directive 2014/52/EU) which has been transposed into Scottish law. The purpose of the EIA Directive is to ensure that the potential effects of a project on the environment are taken into consideration before relevant consents are granted. If a development is deemed to have the potential to have a significant effect on the environment by virtue of its scale, size and location, then an EIA is required. The competent authority cannot grant consent for an EIA development without taking into account the EIAR.

2.5.1.2 The requirements of the EIA Directive are enacted through relevant Scottish legislation for electricity generation projects requiring consent under Section 36 of the Electricity Act 1989 by the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended). In relation to marine licensing under the Marine (Scotland) Act 2010 and Marine and Coastal Access Act 2009, the requirements of the EIA Directive are enacted by the Marine Works (Environmental Impact Assessment) Regulations 2007 (as amended) and the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended). These EIA Regulations set out the statutory process and minimum requirements for EIA, to which the Proposed Development will adhere.

2.6 Nature Conservation Legislation and Policy

2.6.1 Habitats Regulations

2.6.1.1 Article 3 of the European Union (EU) Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora, commonly known as the Habitats Directive (92/43/EEC), requires the establishment of a European network of important high-quality conservation sites known as Special Areas of Conservation (SACs) that will contribute to conserving habitats and species identified in Annexes I and II of the Directive. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds). In accordance with Article 4 of the EU Directive on the conservation of wild birds, commonly known as the Birds Directive (2009/147/EC), Special Protection Areas (SPAs) are strictly protected sites classified for rare and vulnerable birds (Annex I of the Directive), and for regularly occurring migratory species.

2.6.1.2 For Scotland's terrestrial and marine environment, the requirements of the Habitats and Birds Directives are largely transposed by the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) (up to 12 nm), the Conservation of Habitats and Species Regulations 2017 (of relevance to consents under Section 36 of the Electricity Act 1989), the Conservation of Offshore Marine Habitats and Species Regulations 2017 (beyond 12 nm), the Offshore Petroleum Activities (Conservation of Habitats) Regulations 2001 and the Wildlife and Countryside Act 1981 (as amended).

2.6.1.3 Following the UK's departure from the EU on 31 December 2020, the UK is no longer an EU Member State. Notwithstanding, the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 and the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 have transferred functions from the European Commission to the appropriate authorities in the UK/Scotland, with SACs and SPAs in the UK no longer forming part of the EU's Natura 2000 ecological network. These Habitats Regulations have created the UK's

National Site Network on land and at sea, including both the inshore and offshore marine areas in the UK. This includes all existing SACs and SPAs, and new SACs and SPAs designated under the Habitats Regulations, noting policy on the protections and standards afforded to these sites remains unchanged. These European sites are still protected in Scotland and the rest of the UK and the terms "European site", "European marine site" and "European offshore marine site" have been retained.

2.6.1.4 Under Scottish Government policy, Ramsar sites are also protected under the same statutory regimes, although there is no need to consider Ramsar sites separately if they overlap with SACs and/or SPAs. Ramsar sites are wetlands of international importance designated under the Ramsar Convention (adopted in 1971 and came into force in 1975), providing a framework for the conservation and wise use of wetlands and their resources.

2.6.1.5 The Habitats Regulations require that wherever a plan, project or activity, that is not directly connected to, or necessary to the management of a European/Ramsar site, is likely to have a significant effect (LSE) on a European/Ramsar site (directly, indirectly, alone or in-combination with other plans, projects or activities), then an Appropriate Assessment (AA) of the implications of that site in view of that site's Conservation Objectives must be undertaken by the competent authority. The HRA process, comprising Stage 1 (HRA Screening) and, if required, Stage 2 (AA), must be carried out before consent or authorisation can be given for the proposed development and there is no regulatory timescale for the competent authority to provide a HRA consent.

2.6.1.6 The HRA process will be progressed alongside the EIA, but it will be reported upon separately. The EIA and HRA will draw from, and cross reference, similar ecological information. An HRA Screening Report will be submitted to MS-LOT alongside this Offshore Scoping Report, detailing the outcome of LSE screening on the qualifying features of relevant European sites for the Proposed Development.

2.6.2 Nature Conservation Marine Protected Areas (NCMPAs)

2.6.2.1 Under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, MS-LOT is required to consider whether a licensable activity is capable of affecting (other than insignificantly) a protected feature of a Nature Conservation Marine Protected Area (NCMPA) or any protected ecological or geomorphological process on which the conservation of any protected feature of an NCMPA is dependant. Impacts on relevant NCMPAs will be considered within the EIAR.

2.6.3 European Protected Species

2.6.3.1 European protected species (EPS) are animals and plants listed within Annex IV of the Habitats Directive and as such protected under the Habitats Regulations. Under these Regulations certain activities likely to cause disturbance or injury to EPS (e.g., through the introduction of underwater noise) which would otherwise constitute an offence, can be carried out legally under an EPS Licence, as follows:

- Within 12 nm of the coast (Scottish Territorial Water): An EPS Licence may be required under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) where there is potential for the presence of vessels or underwater noise from the proposed survey activities to injure or cause disturbance to an EPS. EPS Licences are granted by NatureScot (for scientific research) or MS-LOT on behalf of the Scottish Ministers (e.g., for commercial activities such as geophysical surveys).

- Outside 12 nm (Scottish Offshore Region): An EPS Licence may be required under the Conservation of Offshore Marine Habitats and Species Regulations 2017 where there is potential for the presence of vessels or underwater noise from the proposed survey activities to injure or cause significant disturbance to an EPS (population level effect rather than individual animals). MS-LOT is the licencing authority for EPS Licences.

2.6.3.2 Caledonia OWF will apply for EPS Licences as appropriate, including for relevant construction works. Should additional pre-construction licences be required (e.g., survey works), these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Proposed Development.

2.6.4 Basking Shark

2.6.4.1 Basking sharks (*Cetorhinus maximus*) are protected under Schedule 5 of the Wildlife and Countryside Act 1981 (as amended) which prohibits the killing, injuring or taking by any method of those wild animals listed on Schedule 5 of the Act. The Nature Conservation (Scotland) Act 2004, Part 3 and Schedule 6 make amendments to the Wildlife and Countryside Act 1981 (as amended), strengthening the legal protection for threatened species to include 'reckless' acts. The Act makes it an offence to intentionally or recklessly disturb basking sharks.

2.6.4.2 Licensing requirements under the Wildlife and Countryside Act 1981 (as amended) are similar to those for EPS described above. For Basking sharks, a licence is required for commercial survey activities (e.g., geophysical surveys) and MS-LOT (on behalf of the Scottish Ministers) is the licensing authority under the Wildlife and Countryside Act 1981 (as amended).

2.6.5 Priority Marine Features

2.6.5.1 In July 2014, Scottish Ministers adopted a list of 81 priority marine features (PMFs), many of which are features characteristic of the Scottish marine environment. The list, which covers a variety of habitats and species that are a priority for conservation in Scotland's seas, was developed by Marine Scotland, the Joint Nature Conservation Committee (JNCC) and Scottish Natural Heritage (SNH)[1]. PMFs include a range of intertidal and continental shelf habitats, deep sea habitats, mammals, fish, shellfish and other invertebrates.

2.7 Pre-Application Consultation (PAC)

2.7.1.1 The Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013, commonly referred to as the PAC Regulations, apply to activities occurring within Scottish Territorial Waters (i.e., from MHWS out to 12 nm). Whilst these requirements do not apply in respect of relevant applications in the Scottish Offshore Region (beyond 12 nm), the principles of the PAC Regulations will be followed for all offshore aspects of the Proposed Development.

2.7.1.2 For a prescribed class of activity, within which offshore wind developments is captured, the PAC Regulations require developers to notify the Marine and Coastguard Agency (MCA), Northern Lighthouse Board (NLB), NatureScot and Scottish Environment Protection Agency (SEPA) along with any delegate for a relevant marine region. Developers must hold at least one pre-application event for which notification is given to these bodies, and members of the public may provide comments to the developer. Developers must publish, within at least one

[1] In November 2019, it was announced that SNH would be re-branded as NatureScot; however, its legal persona and statutory functions remain unchanged.

local newspaper, a notice containing a description of the activity, detail where further information may be obtained, the date and place of the pre-application event and how and when comments should be submitted to the developer. A PAC Report must then be submitted alongside the Marine Licence application to MS-LOT. Refer to Chapter 5 (Consultation Process) for further details of planned consultation to support the Proposed Development.

2.8 Relevant Scottish Marine Policy

2.8.1.1 Various policy documentation is available from the UK/Scottish Government and from industry leaders which will be used to inform the EIA process. Table 2.2 sets out the key policy documents that will be reviewed as part of the EIA.

Table 2.2. Key UK and Scottish Marine Policy.

Subject Matter	Policy
All Topic Areas	UK Renewable Energy Roadmap: 2013 update (HM Government, 2013)
	UK Clean Growth Strategy (2017) (HM Government, 2017a)
	UK Industrial Strategy (2017) (HM Government, 2017b)
	UK Marine Policy Statement (HM Government, 2011)
	National Planning Framework 3 (Scottish Government, 2014a) – note, the draft National Planning Framework 4 was under consultation until March 2022
	Scottish Planning Policy (Scottish Government, 2014b)
	National Marine Plan (Scottish Government, 2015a)
	Sectoral Marine Plan for Offshore Wind Energy (Scottish Government, 2020a)
	Scottish Electricity Generation Policy Statement (Scottish Government, 2013)
	Scottish Energy Strategy (Scottish Government, 2017)
	Climate Change Plan, Third Report on Proposals and Policies (2018-2032) (Scottish Government, 2018a) and update (Scottish Government, 2020b)
Ornithology	The European Biodiversity Strategy for 2030 (European Commission, 2020)
	The Scottish Biodiversity Strategy (Scottish Government, 2022a)
Marine Mammals	Scottish Priority Marine Features (NatureScot, 2020a)
	The Scottish Biodiversity Strategy (Scottish Government, 2022a)
Benthic Ecology	As above for Marine Mammals
Landscape and Seascape	Position Statement on Renewable Energy and the Natural Heritage (SNH, 2014)
Commercial Fishing	Assessments have made reference to general policy and topic specific guidance rather than topic-specific policy

3 Proposed Development Description

3.1 Introduction

3.1.1.1 This chapter provides a high-level description of the Proposed Development based on the information available at the time of writing this Offshore Scoping Report. It sets out the location, design and main components of the Proposed Development, including the Array Area infrastructure and OfTI. It also describes the key activities that will be undertaken during construction, O&M and decommissioning of the Proposed Development. Detailed project design will be ongoing throughout the EIA and pre-construction phase; therefore, the description of the Proposed Development provided here is indicative at this early stage and only intended to provide context for the wider document. The location of the Proposed Development, including the Array Area and Offshore ECC is illustrated in Figure 1.1.

3.1.2 Site Selection and Alternatives

3.1.2.1 The site selection process was primarily driven by the Scotwind Leasing process, with Ocean Winds recognising the potential to develop the NE4 Plan Option. On choosing to bid for the NE4 Plan Option, Ocean Winds undertook extensive desktop reviews on constraints, grid and geology, among other factors. A comprehensive site selection process for ScotWind saw Ocean Winds commence with 20+ options for potential project areas, which was refined to five options that were eventually bid on.

3.1.2.2 Site-selection of the Offshore ECC was informed through securing a grid connection to the NETS as part of the Offshore Transmission Network Review (OTNR) process and the Holistic Network Design (HND) study. National Grid ESO has stated that the Grid Connection Point for Caledonia OWF will be at New Deer, located within Aberdeenshire, and potential landfall locations were subsequently assessed along a stretch of coastline between Sandend Bay and Old Haven. Through this process, a landfall area of search has been identified for inclusion within the Offshore Scoping Report. The process to refine this landfall location will be ongoing until a preferred landfall site is identified through the consideration of key factors including environmental, engineering/technical and cost constraints and risks. Refinement will also occur once further information is available from offshore and onshore surveys as well as being informed by the consultation process. The EIAR will provide a full description of the site selection process including alternatives considered.

3.1.2.3 It is noted that various offshore export routes to the Grid Connection Point were previously developed and, in defining the Offshore ECC for scoping, historic Moray East OWF data was re-visited. An alternative option to route the Offshore ECC east of the Southern Trench was assessed but ruled out due to the distance which would have almost certainly pushed the Proposed Development to High Voltage Direct Current (HVDC) rather than High Voltage Alternating Current (HVAC).

3.1.2.4 Ocean Winds has invested in other OWF projects in the Moray Firth, and thus benefits from knowledge and experience in submitting applications for such developments in the region. The Moray East OWF[2], located immediately adjacent to the Proposed Development (to the west), was fully commissioned in April 2022

[2] https://www.morayeast.com

(950 MW), while all necessary consents for the Moray West OWF[3] were secured in 2019 with construction currently underway (882 MW).

3.1.2.5 In terms of the offshore elements of the Proposed Development, the process of confirming design parameters has been based on regional experience in order to develop an initial high-level design envelope for the purposes of scoping (see Section 3.1.3). This is a phased process where the design envelope will become more detailed as site-specific survey work is undertaken and the EIA progresses. This includes consideration of potential landfall sites to align with the Onshore ECC to facilitate connection of the Caledonia OWF to the NETS at New Deer[4]. Historic data from the development of Moray East OWF was used to identify ten suitable landfall points which allowed the Offshore ECC to be formed. This will be refined as more detailed landfall assessments are undertaken. The Offshore ECC will be refined significantly for the EIA once further information following offshore surveys is obtained and this will also be informed by the consultation process. The Array Area red line boundary is considered unlikely to change.

3.1.2.6 The EIAR will provide a full description of the site selection process including alternatives considered.

3.1.3 Application of Design Envelope Approach

3.1.3.1 Caledonia OWF is following good practice and have adopted a design envelope approach to inform the EIA for the Proposed Development. At this time in the early stages of development, although Ocean Winds has comprehensive knowledge of the Moray Firth region, it is not possible for Caledonia OWF to define exact specifications for infrastructure for the Proposed Development. In the offshore wind sector, improvements in technology and construction methodologies occur frequently and information provided as part of the consent application could become rapidly outdated, resulting in an uneconomical and potentially unbuildable project. Furthermore, key contracts are not placed until later in the development phase closer to construction, and detailed site investigation works will be required to inform the final design and EIA. In addition, the floating technology concept is yet to be developed at a commercial level and there are many innovative and novel floating designs becoming available to the market. As such, the design envelope approach being applied allows for flexibility in design options where the final details of a Proposed Development are not known.

3.1.3.2 It is worth noting that Ocean Winds has used experience of deploying fixed foundations in the region to select the most viable options for the Proposed Development. Caledonia OWF has also actively removed foundation types from consideration at an early stage. For floating foundations, the potential concepts are relatively immature, albeit there are numerous concepts available; however, Caledonia OWF has selected only the two most viable options in semi-submersible and tension leg platform. Another option of a floating barge has been removed from the design envelope given the highly mobile conditions in the Moray Firth which would not be conducive to the use of this foundation type. The floating barge is also relatively immature technology and would not be suitable for the installation of large WTGs included within the design envelope for the Proposed Development. This shows intent by Caledonia OWF to narrow the design envelope as early as possible.

[3] https://www.moraywest.com
[4] Caledonia OWF has been offered a 1.5 GW connection at New Deer, with a further 500 MW expected to be offered in HND2. Design and consents outlined in this Offshore Scoping Report assume an indicative connection of 2 GW.

3.1.3.3 The design envelope allows a range of parameters for each aspect of the Proposed Development to be defined in the EIAR and the realistic worst-case scenario for a particular receptor and/or impact will be used in the impact assessment. A more detailed project design envelope will be presented in the EIAR in comparison to the Offshore Scoping Report, which will provide the maximum envelope of the consent sought, allowing appropriate flexibility to enable the refinement of the proposed development design after consent (if granted). Each topic specific assessment within the EIAR will consider the relevant design parameters that give rise to the greatest potential impact for the receptors in question, while only considering realistic solutions. Any design parameter that is equal or less than those assessed will have an equal or lesser impact.

3.1.3.4 By employing the design envelope approach, Caledonia OWF seeks to retain a reasonable level of flexibility in the design of the Proposed Development within certain maximum extents and ranges, all of which will be fully assessed in the EIAR. The design envelope will be developed in parallel with the wider EIA process and will be influenced by the results of environmental and technical studies and where relevant, stakeholder consultation.

3.1.3.5 Guidance has been prepared by Marine Scotland and the Energy Consents Unit on using the design envelope approach for applications under Section 36 of the Electricity Act 1989 where flexibility is required in applications (Scottish Government, 2022b). This guidance will be referred to in refining the design envelope to inform the EIA.

3.2 Key Proposed Developed Components and Design Parameters

3.2.1.1 The following offshore components are expected to be included in the design envelope as part of the Proposed Development:

- Offshore WTGs including their associated generating infrastructure (nacelle and blades) and foundations;
- OSP (for collecting, transforming and exporting the power generated by the WTGs) and associated foundations;
- Scour protection around foundations;
- Inter-array and interconnector cables – subsea cables between the WTGs and between the WTGs and OSPs, and between the OSPs;
- Offshore export cables – subsea cables between the OSP and the shore; and
- External cable protection on unburied sections of cables as required.

3.2.1.2 These parameters and their indicative values for the Proposed Development are listed within Table 3.1.

Table 3.1. Indicative offshore design envelope of the Proposed Development.

Description	Design Parameter
Array Area (within the NE4 Plan Option)	429 km^2, assuming an indicative split of 307 km^2 for fixed in the north section and 122 km^2 for floating in the south section (see Figure 1.2). To be confirmed as part of the EIA.
Maximum capacity	2 GW, with an indicative split of 75% fixed and 25% floating. To be confirmed as part of the EIA.
Landfall location	Multiple landfall locations are currently being considered along the Aberdeenshire coastline of the Moray Firth, broadly between Sandend and Macduff (see Figure 1.1). To be confirmed as part of the EIA.
Number of WTGs	150 – 84 (minimum), with an indicative split of up to 111 fixed foundations and 39 floating foundations. To be confirmed as part of the EIA.
Proposed WTG capacity	14 – 25 MW.
WTG rotor diameter	310 – 236 m (minimum).
Maximum nacelle height	200 m above Mean Sea Level (MSL).
Maximum blade tip height	350 m above MSL.
Minimum blade clearance	35 m above MSL.
WTG foundations	The final type and design for the WTG foundations will be subject to further site investigations, detailed design and procurement negotiations. Fixed (monopile; fully restrained platform (FRP); jacket with pin piles; jacket with suction caissons; gravity based structure (GBS)) and floating (semi-submersible; tension leg platform) foundations are all currently under consideration.
Inter-array and interconnector cables	The length and number of inter-array cables will be determined as more detailed technical work is undertaken and assessed in the EIAR. Total inter-array cable length is assumed to be up to 720 km. Assumed up to five interconnector cables with a total length of up to 135 km.
Export cables	Up to six export cables, with an indicative total cable length of 610 km.
Cable protection	Cables will be buried wherever practicable, with mechanical protection where intended depth of burial not achieved (e.g., concrete mattresses, rock placement, grout bags).
OSP	Up to six. The final type and design for the foundations will be subject to further site investigations and procurement negotiations, with jacket with pin piles, jacket with suction caissons, monopile and GBS currently under consideration.
Maximum OSP height	35 – 75 m above Lowest Astronomical Tide (LAT).
Length and width of OSP topsides	Length: 25 – 75 m; Width: 25 – 75 m.

3.3 Offshore Wind Farm Infrastructure

3.3.1 Wind Turbine Generators (WTG)

3.3.1.1 The WTG converts wind energy into electrical energy. Each WTG is a complex system composed of a high number of components. The main components are:

- Rotor assembly, composed of three blades and a hub;
- Nacelle, containing the generator, shaft and gearbox (if applicable), power electronic converter and transformer; and
- Tower containing lifting equipment and, if applicable, the switchgear.

3.3.1.2 The selection of the WTG envelope has been driven by the expected Commercial Operation Date (COD) of the Proposed Development (2030) and with consideration given to the WTG development roadmap. Ocean Winds is in close contact with the WTG Original Equipment Manufacturers (OEMs) for its global portfolio of projects and has gained a deep understanding of the market and technical considerations through this engagement. To date, the WTG with the highest rated power currently in operation is a Siemens Gamesa Renewable Energy (SGRE) with a Rotor Diameter (RD) of 222 m and a nominal power of 14 MW, which is currently undergoing prototype testing in Østerild, Denmark. It is noted that WTGs with a capacity boosted up to 14.7 MW will be installed for the Moray West OWF, located to the southwest of the Proposed Development.

3.3.1.3 The WTG with the highest rated power currently presented to the market and under development is a Vestas V236 with an RD of 236 m and nominal power of 15 MW, which is expected to undergo type certification within 2024. Larger rated WTGs not officially presented to the market have been disclosed to Ocean Winds under non-disclosure agreement, directly by the WTG OEMs, supporting the definition of the WTG design envelope.

3.3.1.4 A WTG envelope as outlined in Table 3.1 has been developed based upon the expected COD, published reference WTG and WTG OEMs information. The final WTG model that will be used for the Proposed Development will be selected post-consent. The EIA will be undertaken on a range of WTG parameters ensuring the worst-case is assessed for each receptor.

3.3.2 Offshore Substation Platforms (OSP)

3.3.2.1 The OSP required for the Proposed Development will utilise HVAC substations. The design envelope includes a maximum of six OSPs, each consisting of a foundation and topside facilities. The OSPs may vary in size, and specific parameters for each platform are detailed within Table 3.1. OSPs form the interface between the inter-array cables and the export cables, and transform the electricity generated by the WTGs to a higher voltage allowing a more efficient transmission to shore.

3.3.2.2 The OSPs will be mounted on foundations secured to the seabed. The foundations for the OSPs will be jackets with pin piles, jackets with suction caissons, monopiles or GBS. OSP colouring, lighting, marking and foghorn requirements will be as per current relevant standards and guidance. The Proposed Development Description in the EIAR will provide further detail on the design and specification of the OSPs.

3.3.3 WTG and OSP Foundations

3.3.3.1 The WTGs and OSPs will be permanently attached to the seabed with foundation structures. The foundations are typically fabricated from steel and/or concrete. A

limited number of foundation options are currently under consideration (see Table 3.1 and Figure 3.1). The final selection will depend on factors including WTG type, seabed conditions, water depth, wave, wind and tidal conditions, economics and procurement approach. As site conditions vary across the Array Area, it is possible that more than one foundation type is used. An indicative spatial distribution on fixed foundations (approximately 307 km^2 to the north of the Array Area) and floating foundations (approximately 122 km^2 to the south of the Array Area) is shown in Figure 1.2.

3.3.3.2 The EIA will consider different foundation types based on the most recent understanding of the Proposed Development. The maximum design parameters of each foundation type (e.g., number of foundations, diameter, footprint) will be considered within the EIA. An overview of the different foundation options and associated installation methods in provided in Table 3.2. Some form of seabed preparation is likely to be required for each foundation type, including, but not limited to, seabed levelling and removing subsurface and surface debris and/or unexploded ordnance (UXO).

3.3.4 Mooring Systems

3.3.4.1 The floating foundations proposed will rely on mooring lines for their station keeping system. Semi-submersible platforms will rely on spread-mooring systems which can be catenary or semi-taut. These mooring lines may use a combination of steel studless chain, synthetic ropes (nylon, polyester or Ultra High Molecular Weight Polyethylene (UHMPE)), clump weights, buoy and different types of steel connectors. Depending on the sizing, site and soil conditions, these mooring lines may connect to a drag embedded anchor or alternatively to a pile type anchor.

3.3.4.2 The tension leg platform will use mooring tendons in steel or synthetic ropes (UHPME) to connect to vertical load anchors. For this system drag embedded anchors are not suitable, and pile design will be required.

3.3.5 Scour Protection

3.3.5.1 In order to protect the foundations and seabed from scour, material may be required to be deposited on the seabed to protect the WTG and OSP foundations from current and wave action. The requirement for scour protection will depend on the foundation concept as well as the environmental conditions present. The EIA will consider the anticipated type and maximum volume of scour protection required.

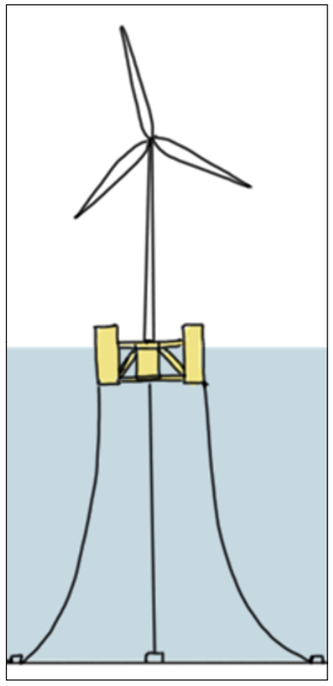
Table 3.2. Description of different foundation types and the associated installation methods.

Fixed/Floating	Foundation Type	Description	Installation Method	Justification for Inclusion in the Design Envelope
Fixed	Monopile	Typically consist of a single cylindrical section and a transition piece. Under some specific conditions, the transition piece can be substituted by an extension of the monopile.	Largely driven into the seabed from either a floating vessel or a jack-up barge using hydraulic or vibratory hammers. In areas of hard soil or bedrock close to the seabed surface, where piling with a hammer is difficult or impossible, drilling may be used to assist piling. Monopile and the transition piece are typically connected offshore through a bolted connection and a covering grout skirt.	Ocean Winds will be installing XXL monopiles in Moray West from this year in similar water depths.
Fixed	Fully Restrained Platform (FRP)	Monopile with mooring lines and piled anchors, and a transition piece.	Innovative fixed foundation concept by Entrion with mooring lines for additional stability, therefore combining characteristics of fixed and floating technologies to extend monopile feasibility to 80+ m water depth. Monopile installation as per above. Mooring system consists of three driven piles as anchor, with two lines per anchor for redundancy, connected to a transition piece that could maintain the same design and connection method as for the classic monopile in shallower waters.	Deeper water to the south. This solution potentially offers an opportunity to extend the fixed foundation design into deeper waters. Potentially no need for traditional floating solution with larger mooring spread.

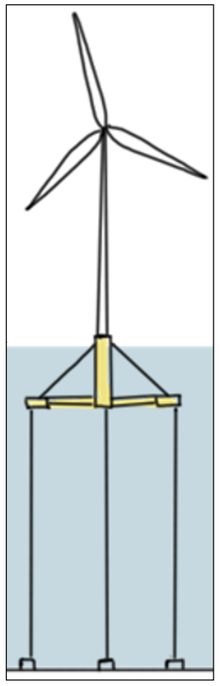
Fixed/Floating	Foundation Type	Description	Installation Method	Justification for Inclusion in the Design Envelope
Fixed	Jacket Foundation with Pin Piles	A steel lattice construction (comprising tubular steel members and welded joints) secured to the seabed by driven and/or drilled pin piles attached to the jacket feet. The diameter of any piles used will be dependent on the specific design.	Pin piles driven and/or drilled into the seabed from either a floating vessel or a jack-up barge using hydraulic or vibratory hammers or drilled into the seabed. In WTG foundations, pin piles are typically installed offshore before the jacket and connected to it through a grouted connection (there is also a possibility of a post-piling strategy where jackets are installed, followed by piles driven through the jackets). In some cases, jacket installation needs to be assisted by additional stability until grouting is cured (pile grippers).	Jacket with pin piles installed as part of the Moray East OWF in similar water depth.
Fixed	Jacket with Suction Caissons	A steel lattice construction which will be fixed to the seabed by suction buckets. The suction buckets are typically hollow cylinders, capped at the upper end, fitted at the end of each of the jacket legs.	Transported to site by vessel or floated and then lowered onto the seabed. When on the seabed water is pumped out of each bucket. The buckets are pressed down into the seabed by the resulting differential pressure.	Suction caissons included as may be more suitable with jackets in the Array Area (site investigations will confirm).
Fixed	Gravity Based Structure (GBS)	Concrete and steel structure which acts under the force of gravity to remain positioned on the seabed. The structure incorporates holes/ cells which, following installation on the seabed (or while at the surface), can be filled with ballast.	Seabed preparation likely to be required involving a gravel bed for stabilisation (which also acts as scour protection). Structure transported (floated or lift-installed) to site by vessel and positioned on seabed. Filled with ballast (concrete, sand or gravel) to achieve final design weight to ensure stability and suitable load resistance.	GBS included as sections of the Array Area may be suitable for this type of foundation (site investigations will confirm).

Fixed/Floating	Foundation Type	Description	Installation Method	Justification for Inclusion in the Design Envelope
Floating	Semi-submersible	Column stabilised platform with variable draft, allowing the turbine to be installed on a quay-side and towed to site.	The complete hull and turbine are assembled and pre-commissioned onshore and towed to site using regular tug boats. Once on site these are connected to the pre-installed mooring lines. These connect to anchors on the seabed. The anchors will be installed using a range of methods dependent on the anchor type, including dragging, piling, drilling, suction, and placement.	Ocean Winds has installed this concept successfully in multiple projects, including Windfloat1, Windfloat Atlantic and from 2023 Eoliennes flotantes du Golfe du Lion (EFGL). Ocean Winds understand it could be a suitable option for the Caledonia OWF.
Floating	Tension Leg Platform	Floating foundation with extra buoyancy restrained by taut mooring lines, typically vertically connected to the seabed.	Floating foundations are held in place by mooring lines connected to anchors on the seabed. As this type of platform relies on mooring lines to achieve stability, additional buoyancy elements are required to assemble the turbine onshore. The anchors will be installed using a range of methods dependent on the anchor type, including piling, drilling or suction, but the anchor will need to withstand vertical loads.	Alternative floating option to offer a solution should ground conditions or project constraints mean that semi-submersible is not possible/feasible for the Caledonia OWF. This solution also offers a smaller seabed footprint compared with a spread-mooring design.

1.
Floating
Semi-Submersible

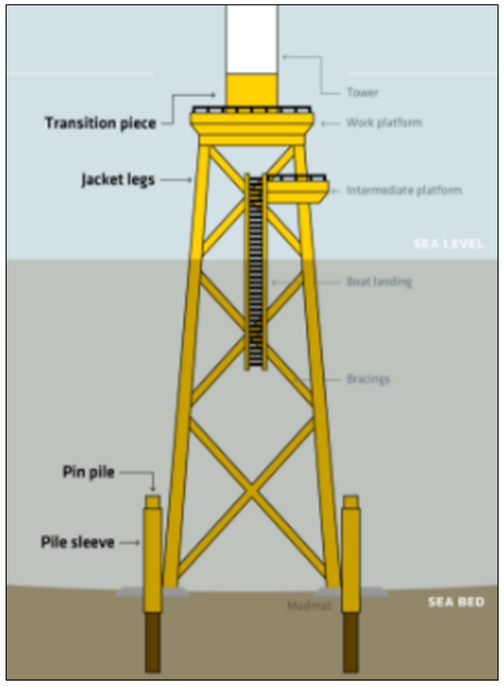


2.
Floating
Tension Leg Platform

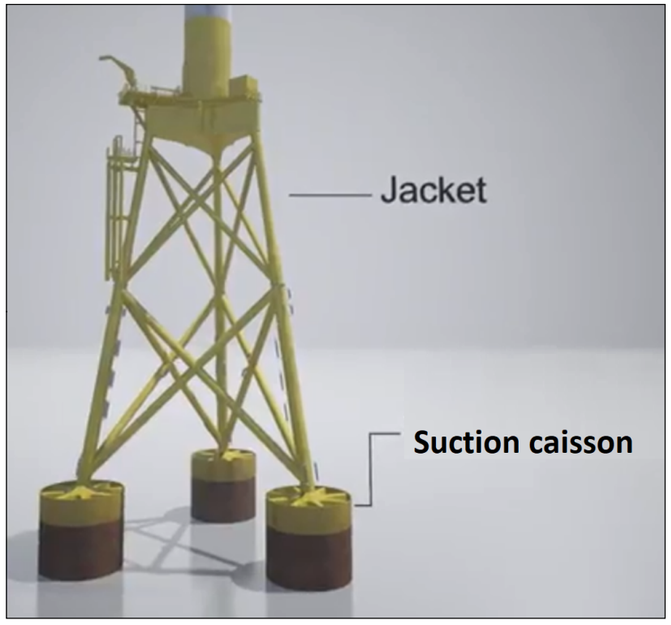


3.
Gravity Based
Structure (GBS)

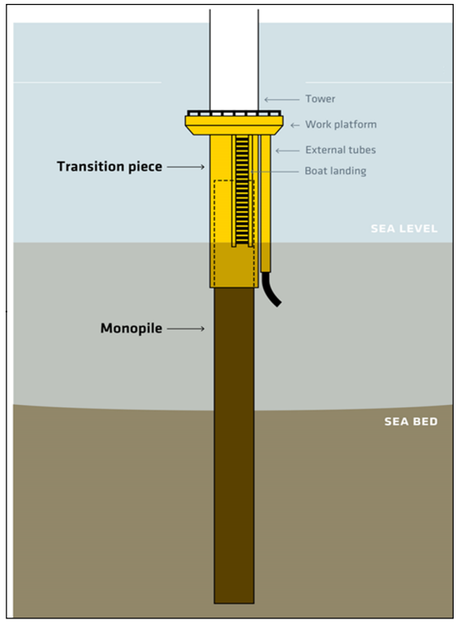
4.
Fixed Jacket
on Pin Piles



5.
Fixed Jacket
on Suction Caissons



6.
Fixed
Monopile



7.
Fixed Monopile
(Fully Restrained Platform)

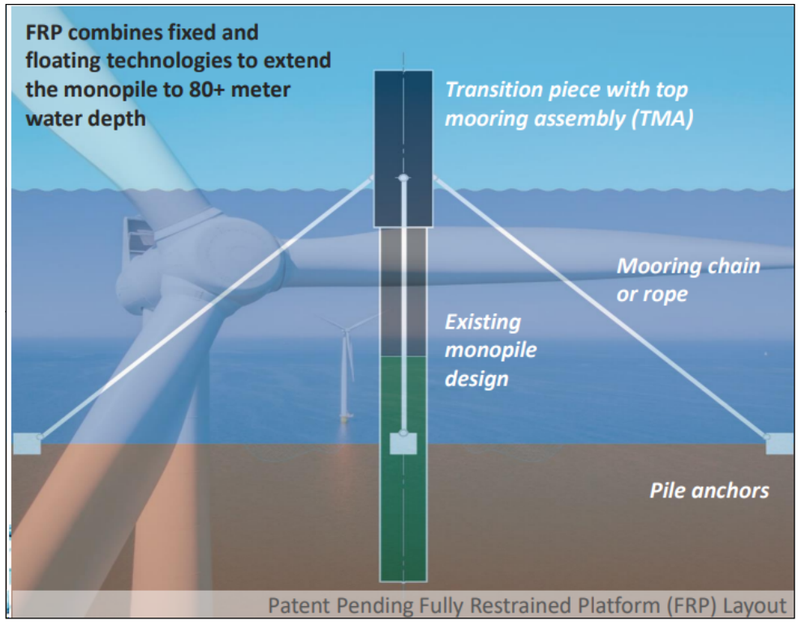


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Figure 3.1

Example foundation options

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

3.3.6 Inter-array and Interconnector Cables

3.3.6.1 The inter-array cables connect the WTGs to each other, and to the OSP, typically in branched strings allowing the collection of electricity generated from the WTGs. If multiple OSPs are required (up to six anticipated in the design envelope; Table 3.1), then interconnector cables may be necessary to connect these to each other as well (up to five based on the maximum number of OSPs), in order to improve the reliability of the electrical system.

3.3.6.2 The inter-array cables, with an estimated total length of up to 720 km, cable outer diameter of up to 230 millimetres (mm) and voltage of up to 132 kilovolts (kV), will be buried below the seabed to a target depth of 1 m where possible to ensure they are protected and avoid interaction with other sea users. Interconnector cables, with an estimated total length of up to 135 km, will be buried to a target depth of 1 m. Burial methods include jet trenching, mechanical trenching and cable ploughing. The maximum width of the cable trench will be 2 m, with a maximum width of seabed affected by installation per cable up to 15 m.

3.3.6.3 If burial is not possible, either due to seabed conditions, crossings or hydrological conditions, then further external cable protection may be required. The type of cable protection will be dependent on factors such as seabed and sediment conditions and the physical processes present. Cable protection may include concrete mattresses, rock placement, cast iron shells or grout bags.

3.3.6.4 Where floating foundations are used, dynamic inter-array cables may be required. These are cables with floating components to enable them to move with the foundation. As such, it is anticipated that floating inter-array cables will likely be surface laid. Small deadweight gravity anchors may be required to stabilise the cable on the seabed.

3.3.6.5 The cable installation and protection methodology will be defined within the final design envelope presented as part of the EIAR.

3.3.7 Offshore Export Cables

3.3.7.1 Offshore export cables will be laid between the OSP and the landfall (up to six anticipated in the design envelope; Table 3.1), connecting to the onshore transmission infrastructure and finally into the NETS. The offshore export cables allow the transfer of electricity from the OWF to the onshore transmission infrastructure.

3.3.7.2 The offshore export cables will be HVAC (based on National Grid's HND study, the connection offer at New Deer and the distance being within the typical threshold for HVAC), with a maximum (indicative) cable length of 610 km included within the design envelope.

3.3.7.3 As with the inter-array and interconnector cables (see Section 3.3.7), the offshore export cables will be buried below the seabed where possible to ensure they are protected and minimise interaction with other sea users. Offshore export cables will be buried to a target depth of 1 m. Burial methods include jet trenching, mechanical trenching and cable ploughing. The maximum width of the cable trench will be 2 m, with a maximum width of seabed affected by installation per cable up to 15 m. Considering the anticipated length of the offshore export cables, a combination of burial and external protection methods (e.g., concrete mattresses, rock placement, cast iron shells or grout bags) may be required.

3.3.7.4 The cable installation and protection methodology will be defined within the final design envelope presented as part of the EIAR.

3.4 Landfall Infrastructure

3.4.1.1 Offshore export cables arriving onshore at the landfall location will cross the intertidal area and land between MHWS and a transition joint bay (TJB) – the interface between offshore export cables and onshore cable circuits. Depending upon the final location of the landfall point, burial of the offshore export cables within the intertidal area and onshore between MHWS and the TJB will either be via an open cut trenching method, via a trenchless technique such as Horizontal Directional Drill (HDD), rockpinned or via a combination of each method.

3.4.1.2 All infrastructure located above MHWS falls outside the scope of this Offshore Scoping Report. This infrastructure design will be detailed within the Onshore Scoping Report and assessed within the EIAR.

3.5 Proposed Development Phases

3.5.1 Overview

3.5.1.1 The key milestones of the Proposed Development are:

- Commencement of onshore construction – 2027 (duration of 2.5 years);
- Commencement of offshore construction – 2028 (duration of 3 years); and
- First power – 2029.

3.5.1.2 It is noted that, at this scoping stage, the above timescales/durations are indicative only and there could be an element of phasing of the Proposed Development considered as part of the EIA.

3.5.2 Construction

3.5.2.1 Assuming the Proposed Development is awarded the necessary consents, it is anticipated that construction of the offshore elements will take approximately three years (subject to change) between 2028 to 2030. Offshore construction works would be undertaken 24 hours a day, 7 days a week, dependent upon weather conditions.

3.5.2.2 Precise information on the construction process will become available once the final design of the Proposed Development has been defined. A general construction series is outlined below showing the key stages associated with the installation of the Proposed Development:

- Pre-construction surveys (e.g., detailed geophysical surveys, UXO surveys) and site investigations (e.g., Cone Penetration Test (CPT)/boreholes);
- Site preparation and foundation installation;
- OSPs installation;
- Offshore export cable – landfall and offshore installation;
- Inter-array and interconnector cable installation;
- Commissioning of OfTI electrical system; and
- WTG installation (tower, nacelle, hub and blades)/commissioning.

3.5.2.3 It is noted that the sequencing for floating submersible foundations would differ slightly, as follows:

- Pre-construction surveys and site investigations (as above);
- Mooring pre-lay;
- Onshore WTG installation;
- Tow to site and mooring hook-up; and
- Inter-array/interconnector cable installation/commissioning.

3.5.2.4 During construction activities, appropriate safety zones will be required to be in place around WTGs, construction vessels and work areas. Caledonia OWF intends to apply for standard safety zones (distances to be confirmed) during construction and major maintenance activities, and around any structure where construction is not ongoing up until the point of commissioning of the OWF. Caledonia OWF will confirm as part of the EIAR whether the Proposed Development will look to utilise operational safety zones during normal operations of the OWF around certain offshore structures (i.e., floating WTGs and OSPs).

3.5.3 Operations and Maintenance (O&M)

3.5.3.1 The overall O&M strategy will be finalised once the onshore base location and technical specifications are known. It is anticipated that the Proposed Development will be managed from a local onshore facility for the lifecycle of the proposed development.

3.5.3.2 During the operation period the following classifications of maintenance may be required:

- Periodic overhauls: These will be carried out in accordance with the WTG manufacturer's warranty. They are planned for execution in periods of the year with the best weather conditions, preferably in the summer.
- Scheduled monitoring and maintenance: The inspection, testing, investigation and rectification of any minor faults. This primarily applies to inspection and work on parts susceptible to failure or deterioration in between periodic overhauls. Scheduled maintenance is likely to occur every 6 to 12 months.
- Unscheduled maintenance: Works required outside of the planned maintenance strategy, in response to unforeseen defects. Scope of maintenance can range from small defects to the replacement of main components.

3.5.3.3 All offshore infrastructure, including WTGs, foundations, cables and offshore platforms will be included in monitoring and maintenance programmes. The EIA will assess the LSEs of expected maintenance activities based on experience and good practice; however, further consents or licences will be applied for if required.

3.5.4 Decommissioning

3.5.4.1 Under Section 105 of the Energy Act 2004 (as amended), developers of offshore renewable energy projects are required to prepare a Decommissioning Programme (DP) for approval by Scottish Ministers. A Section 105 notice is issued to developers by the regulator after consent or a Marine Licence has been issued for the given development. Developers are then required to submit a detailed plan for the decommissioning works, including anticipated costs and financial securities.

3.5.4.2 The DP will consider good industry practice, guidance and legislation relating to decommissioning at that time. The plan will be consulted on by an approved set of stakeholders and will be publicly available. MS-LOT will further consult on the plan, the costs and financial securities prior to seeking ministerial approval.

3.5.4.3 The EIAR will provide an overview of the estimated decommissioning events and an assessment of the anticipated significant effects of this phase on relevant receptors.

4 EIA Methodology

4.1 EIA Process

4.1.1.1 EIA is the process of systematically identifying the potential impacts that the Proposed Development could have on the environment. The process involves developing a detailed understanding of both the Proposed Development (e.g., proposed construction and installation, O&M and decommissioning activities) and the environment within which the Proposed Development will be located. The potential impacts of the Proposed Development are then evaluated to determine the resulting potential effects of the Proposed Development upon the receiving environment/receptors and the significance of those effects. The assessment considers the anticipated significant effects of the Proposed Development on the environment, both individually and cumulatively with other proposed projects.

4.1.1.2 Where potential impacts are likely to result in significant effects, specific measures will need to be taken to reduce or remove such impacts (mitigation measures). Mitigation measures can either take the form of changes to the design of the Proposed Development (embedded or design mitigation), or implementation of additional mitigation to avoid or reduce significant effects through the application of industry standard measures, specific controls implemented by environmental management or through additional survey or study programmes. The EIA process also regularly requires the identification of measures to monitor (and validate or otherwise) the predicted effects of the Proposed Development in the long term.

4.1.1.3 The overall EIA process is delivered through several clearly defined stages, namely screening, scoping, environmental assessment, determination and post-consent monitoring. The core guidance documents that will be applied during the EIA include the following:

- Chartered Institute for Ecology and Environmental Management (CIEEM, 2018). Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine;
- Institute of Environmental Management and Assessment (Institute of Environmental Management and Assessment (IEMA), 2017). Delivering Proportionate EIA. A Collaborative Strategy for Enhancing UK EIA Practice;
- Centre for Environment, Fisheries and Aquaculture (Cefas) (2004a). Offshore Wind Farms: Guidance Note for EIA in Respect of Food and Environmental Protection Act (FEPA) and Coast Protection Act (CPA) Requirements: V2;
- RenewableUK (2013). Guiding Principles for Cumulative Impacts Assessment in Offshore Wind Farms;
- OSPAR (2009). Assessment of the Environmental Impacts of Cables;
- European Commission (2017). EIA of Projects – Guidance on the preparation of the EIAR. (Office for Official Publications of the European Communities 2017); and
- European Commission (1999). Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interactions.

4.2 Assessment Process

4.2.1 Baseline Characteristics

4.2.1.1 The characterisation of the existing environment will be undertaken in order to determine the baseline conditions (and the future baseline assuming that the Proposed Development is not progressed) in the area covered by the Array Area, the Offshore ECC and the relevant surrounding technical study areas for those issues scoped into the EIAR. This will involve the following steps:

- Study area definition for each receptor based on the relevant characteristics of the receptor (e.g., mobility/range);
- Review of all publicly available information;
- Review of available data from other OWF projects within the baseline study area;
- Review of likely or potential impacts that might be expected to arise from the Proposed Development based on a maximum design scenario following assessment of that scenario;
- Determination of whether there is sufficient data to make the EIA judgements with sufficient confidence;
- If further data is required, ensure that data gathered is targeted and directed at answering the key question and filling key data and knowledge gaps; and
- Review of information gathered to ensure the environmental baseline can be sufficiently characterised in appropriate detail.

4.2.2 Assessment of Potential Impacts

4.2.2.1 This Offshore Scoping Report sets out the potential environmental impacts associated with the Proposed Development and identifies those proposed to be scoped into or out of the EIA process. The EIA scoping assessment considers embedded mitigation measures that are built into the Proposed Development concept either through design or implementation of industry good practice.

4.2.2.2 For those potential impacts scoped into the EIA, the EIAR will describe the level of significance of effect expected to result from the Proposed Development using standard EIA methodology. The assessment process will consider the potential magnitude of the change to the baseline conditions arising from the Proposed Development and the sensitivity of the particular receptor under consideration, as well as any embedded mitigation measures (see Figure 4.1).

4.2.2.3 There is the potential for the Proposed Development to result in both adverse and beneficial effects on the environment. The impact identification will consider whether a potential impact is considered to be adverse or positive. The assessment process will then consider the significance of resulting effect on the environment, either adverse or positive, using the process outlined in Figure 4.1.

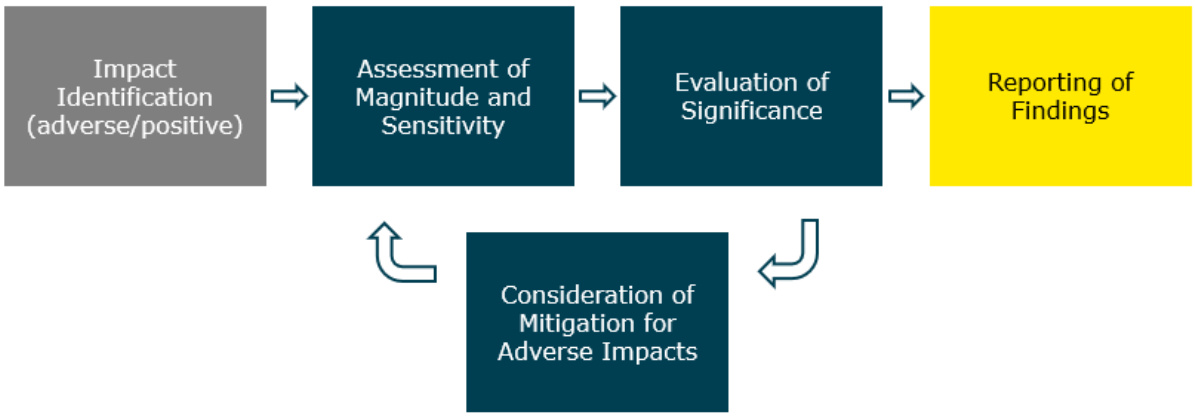


Figure 4.1. Assessment of effects process.

4.2.3 Magnitude

4.2.3.1 The categorisation of magnitude of impact will vary for specific pathways, receptors and technical assessments, but will broadly follow:

- High: total change or major alteration to key elements/features of the baseline conditions;
- Medium: Partial change or alteration to one or more key elements/features of the baseline conditions;
- Low: Minor shift away from the baseline conditions; or
- Negligible: Very slight change from baseline conditions.

4.2.3.2 For topics where there is the potential for adverse and positive impacts, magnitude definitions will be defined for both.

4.2.4 Sensitivity

4.2.4.1 The specific scale of sensitivity for a receptor is dependent on the EIA topic/receptor in question, but in general it may be defined in terms of quality, value, rarity or importance of the receptor being assessed. The ability of a receptor to adapt to change, tolerate and/or recover from potential impacts will be key in assessing its sensitivity to the impact under consideration. The scale of sensitivity will be classed as: negligible, low, medium, or high.

4.2.4.2 In carrying out topic specific assessments, a more specific scale of increasing sensitivity will be defined where this is appropriate. Guidance will also be taken from the value attributed to elements through designation or protection under law. Expert judgement is particularly important when determining the sensitivity of receptors.

4.2.5 Evaluation of Significance

4.2.5.1 The consideration of magnitude of a potential impact and sensitivity of the receptor will determine an expression, which may be quantitative or qualitative and often informed by expert judgement, for the significance of the adverse and positive effects. Table 4.1 sets out how the magnitude of impact and the sensitivity of the receptor are combined to provide an assessment of effect significance.

Table 4.1. Significance of effect.

Significance of Effect		Sensitivity of Receptor			
		Negligible	Low	Medium	High
Magnitude of Effect	Negligible	Negligible	Negligible	Negligible	Negligible
	Low	Negligible	Negligible	Minor	Minor
	Medium	Negligible	Minor	Moderate	Moderate
	High	Negligible	Minor	Moderate	Major

4.2.5.2 The significance categories provide a threshold to determine whether or not significant effects may result from the Proposed Development, with Moderate and Major effects being defined as 'significant' in EIA terms (highlighted in grey in Table 4.1). A typical definition of the various categorisations is presented in Table 4.2, noting that when applying these definitions, impacts can be both adverse or positive in nature.

Table 4.2. Definitions of significance of effect categories.

Category	Definition
Negligible	No detectable change to the environment or receptor resulting in no significant effect.
Minor	A detectable but non-material change to the environment or receptor resulting in no significant effect or small-scale temporary changes.
Moderate	A material but non-fundamental change to the environment or receptor, resulting in a possible significant effect.
Major	A fundamental change to the environment or receptor, resulting in significant effect.

4.2.5.3 The EIA will provide topic-specific definitions of magnitude, sensitivity and significance of effect as required. The topic specific definitions will consider guidance and specialist knowledge specific to the topic in question.

4.2.5.4 Where the impact assessment identifies that an aspect of the Proposed Development is likely to give rise to significant environmental effects, mitigation measures, above and beyond any embedded mitigation or design changes, will be incorporated into the assessment process to avoid or reduce significant effects to acceptable (non-significant) levels. At this point the predicted significance of effect will be reassessed, taking into consideration the additional mitigation, in order to determine the residual effect. The assessments will describe and take account of the degree of uncertainty inherent in the baseline data, identification of activities and receptor sensitivity.

4.3 Approach to Cumulative Impact Assessment (CIA)

4.3.1.1 As well as considering the impacts from the Proposed Development alone, the EIA Regulations require consideration of the potential impacts that could occur cumulatively with other relevant plans, projects and activities. Each technical chapter of the EIAR will provide a CIA with regards to their respective receptors. Each technical chapter of this Offshore Scoping Report has provided a high-level overview of the cumulative impacts relevant to that topic and an indication as to whether cumulative impacts will be relevant at EIA.

4.3.1.2 A list of plans, projects and activities that may act cumulatively with the Proposed Development will be identified as part of the EIAR preparation and this will be consulted upon to ensure inclusion of all necessary plans, projects and activities within the assessment. For each of these relevant plans, projects or activities, the most up-to-date publicly available project parameters will be used to inform the CIA. Where information is not publicly available, Caledonia OWF will seek to consult and collaborate in order to obtain project parameters for assessment. The assessment will consider the temporal and spatial extent of impacts associated with each phase of the Proposed Development to present an understanding of how these overlap with relevant plans, projects and activities.

4.3.1.3 The Moray Firth contains several other offshore renewable projects, both operational and under construction, that may contribute towards cumulative impacts on a range of receptors and pathways. These include:

- Beatrice OWF, an operational wind farm located approximately 25 km south-east of Wick, Caithness, with the site boundary located 13.5 km from the coast at its closest point. The Array Area sits at the north-western most point of Smith Bank and consists of 84 fixed-bottom WTGs with the export cable running south to make landfall at Portgordon.
- Moray East OWF, located approximately 22 km from the Caithness coast on the eastern flank of Smith Bank, immediately to the west of the Proposed Development. Comprising of 100 fixed-bottom WTGs with the ECR running south to Inverboyndie.
- Moray West OWF, located on the south-western flank of Smith Bank, with construction underway for up to 60 fixed-bottom WTGs and a planned ECR running southwards to make landfall in Sandend.

4.3.1.4 In addition, there are several proposed floating offshore wind developments further offshore, such as Stromar (located to the northeast of the Proposed Development) and Broadshore (located to the west) (also see Chapter 19: Other Human Activities).

4.3.1.5 The CIA for each technical chapter will take projects such as these, as well as projects from other industries, into consideration when assessing the potential cumulative impacts of the Proposed Development on the surrounding environment.

4.3.1.6 When completing the CIA, it is important to consider that some proposed projects may not be taken forward and built out as currently described. Therefore, there is a level of uncertainty with respect to the potential impacts which may arise. The 'phase' of a project, in relation to the certainty or uncertainty over whether the proposed development will be brought forward as described, will be considered when drawing conclusions on cumulative effects. It will be assumed that projects that are built and already operational, along with active licensed activities, at the time that baseline data is collected will constitute part of the existing baseline conditions as receptors would already be adapted to them. Any effect they might have had will be reflected in the baseline characterisation undertaken to inform the impact assessment, although it is noted that some built/operational projects will have ongoing effects which will need to be incorporated within the CIA (e.g., collision risk).

4.3.1.7 The potential in-combination effects on European sites will be considered through a separate HRA process. A list of in-combination projects will be determined from those of which are in planning, consented or in construction.

4.4 Inter-related Effects and Transboundary Effects

4.4.1.1 The Offshore EIA will consider inter-related effects, the potential effects of multiple impacts from the construction, O&M and decommissioning of the Proposed Development, affecting one receptor. Inter-related effects are assessed through consideration of all effects on a receptor by the Proposed Development.

4.4.1.2 Transboundary effects arise when impacts from a development within one European Economic Area (EEA) state's territory significantly affects the environment or interests of another EEA state(s). The EIA Directive, and thus the relevant EIA Regulations, requires the assessment of transboundary effects. This Offshore Scoping Report will therefore identify any relevant transboundary impacts that will need to be considered within the EIA.

4.5 Approach to Proportionate EIA

4.5.1.1 This Offshore Scoping Report aims to deliver a robust, yet proportionate EIA. The importance of proportionate and accessible EIAs is recognised by regulators, stakeholders and practitioners and IEMA has developed specific guidelines regarding this (IEMA, 2017).

4.5.1.2 The aim of ensuring a proportionate EIA has been considered from the offset of project planning and our approach includes:

- A robust EIA Scoping process: Scoping based on significant industry experience and local area knowledge of what the key impacts are likely be;
- Consideration of embedded and industry good practice mitigation from the offset: mitigation measures that are built into the proposed development concept rather than in response to a significant effect identified as part of the EIA process. A range of mitigation measures have been applied to the proposed development concept and, therefore, considered within this Offshore Scoping Report;
- Mitigation commitments register: A register of all the mitigation measures that have been committed to as part of the Proposed Development and how these will be secured in the Proposed Development consents/licences. This is kept as a 'live' document and will be developed through the Scoping and EIA process. The relevance of each mitigation measure to both project phase and environmental topic is presented;
- Impacts register: A register of all the impacts considered from the offshore EIA scoping stage (and separate onshore EIA scoping) through to EIAR submission. This is also a 'live' document that will be continually updated throughout the pre-application period. The register contains:
  - List of all impacts considered;
  - Relevance of impacts to both aspect and phase of the Proposed Development;
  - Embedded mitigation relevant to each impact;
  - Scoping result;
  - Approach to baseline characterisation; and
  - Approach to EIA.

4.6 Additional EIA Matters and Scoped Out Topics

4.6.1.1 Under the EIA Regulations, an EIA must provide a description of the LSEs of the Proposed Development. The EIA Regulations broadened the scope of EIAs with the requirement to consider the following aspects:

- The risk to human health (for example due to accidents or disasters);
- The vulnerability of the works to risks of major accidents and/or disasters; and
- Climate and the vulnerability of the Proposed Development to climate change and potential for GHG.

4.6.1.2 It is proposed to scope out human health and major accidents and/or disasters as part of this Offshore Scoping Report, with justification provided in Table 4.3.

4.6.1.3 As a renewable energy project, it is not anticipated that the Proposed Development will have a significant adverse effect on climate or GHG, but there may be likely benefits. A separate chapter of this Offshore Scoping Report has been provided to consider Climate (Chapter 18). The topic will be scoped in for the EIA, with the assessment based on the design envelope and construction approach/details that are taken forward for assessment. As well as assessing potential adverse effects from the Proposed Development arising from emissions, the EIAR will outline the benefits that the Proposed Development will deliver in reducing GHG and meeting renewable energy targets.

Table 4.3. Offshore topics to be scoped out of the EIA.

Scoped Out Topic	Justification
Human Health	A stand-alone chapter for human health has not been provided within this Offshore Scoping Report as potential effects on human health will be considered within technical topics such as airborne noise and air quality (forming part of the Onshore Scoping Report). It is therefore proposed to scope out human health with regards to the offshore elements of the Proposed Development.
Offshore Airborne Noise and Vibration	A number of potential airborne noise and vibration effects on human receptors have been identified, which may occur during the construction, O&M and decommissioning phases of the Proposed Development. This includes piling and auxiliary construction activities (vessels, use of other machinery and generators) generating airborne noise/vibration that may impact other marine users, cable installation activities (including in the intertidal area) generating noise/vibration that may impact marine users and onshore human receptors and operation of WTGs producing airborne noise/vibration. However, all effects are proposed to be scoped out of the assessment for offshore airborne noise and vibration. Commercial vessels will maintain a minimum distance to pass construction activities. Vessels are transient in nature and therefore will only be in the vicinity of construction activities for a short period of time. Considering existing sources of anthropogenic and natural airborne noise, the effect of airborne noise from piling on receptors onboard other marine vessels, will be negligible. Auxiliary construction noise is expected to be localised around the vessels being used and unlikely to result in the significant propagation of airborne noise considering the existing vessel traffic within the area, other anthropogenic noise and natural noise sources. Airborne noise associated with the installation of the inter-array/ interconnector cables and offshore export cables will occur from the cable laying vessels. Noise emissions from vessels is generally low and localised around the vessels being used, will be of short duration, transient (as the vessel moves along the offshore cable route) and unlikely to result in significantly elevated noise levels beyond the baseline considering the existing vessel movements across the wider region, other anthropogenic noise and natural noise sources. Cable installation at the landfall will either be undertaken using HDD, through the burial of the cable in the intertidal area or rockpinned. Any works undertaken above water in the intertidal area will be subject to the strict procedures and mitigation measures implemented for onshore construction noise (captured as part of the Onshore Scoping Report). Noise from intertidal cable burial equipment will be localised, temporary, transient and of short duration. It will also be in the context of existing anthropogenic noise sources including vessels, road traffic, residential and industrial noise and natural noise sources including precipitation, wave and wind action. As such, it is considered that works within the intertidal area (up to MHWS) are unlikely to result in a significant impact to onshore human receptors. The movement of WTG blades is expected to result in low levels of airborne noise, which considering the distance and existing anthropogenic and natural sources of noise along the coastline (wind, wave and precipitation), is not

Scoped Out Topic	Justification
	considered audible by onshore receptors or transient marine users (vessels in the vicinity of the Array Area). It is therefore proposed to scope out offshore airborne noise and vibration with regards to the offshore elements of the Proposed Development, noting the proposed embedded mitigation for the development of and adherence to a Construction Method Statement (CMS), Environmental Management Plan (EMP) and Piling Strategy (PS).
Offshore Air Quality	Engine emissions from construction vessels active during construction, O&M and decommissioning will contribute to atmospheric emissions at a small, localised scale. The Vessel Management Plan (VMP) will outline the final vessel construction, O&M and decommissioning strategies for the Proposed Development, ensuring the most efficient use of vessels where possible. It will also ensure compliance with relevant national and international air quality standards and legislation. The number of project-related vessels active on site would be limited in comparison with the number of vessels active regionally and would contribute a small amount of emissions to air relative to the current baseline. It is recognised that there might be a negligible increase in background emission levels within the immediate vicinity of vessels supporting the Proposed Development while they are operating; however, there are limited receptors nearby that are likely to be impacted by the increase, with the marine nature of the works limiting proximity to any onshore receptors. Overall, the Proposed Development will be a source of clean, renewable energy and therefore as a whole will contribute positively to a reduction in emissions at a national and global level by facilitating a reduced reliance on fossil fuels and help move Scotland towards its 2045 goal of net zero emissions of all GHG. Therefore, it is proposed that offshore air quality is scoped out of any further assessment as there is expected to be only a negligible impact upon the identified receptors, noting the proposed embedded mitigation for the development of and adherence to a CMS, EMP and VMP.
Major Accidents and/or Disasters	The potential for major accidents and/or disasters is inherently related to the nature of the activity (i.e., the Proposed Development) and proximity to high-risk infrastructure. The construction and O&M of OWFs is a well-established practice and, therefore, through careful site-selection, design and planning, as well as the implementation of proposed embedded mitigation such as the development of and adherence to a CMS, EMP and VMP, the potential for major accidents and/or disasters is considered highly unlikely. The Shipping and Navigation risk assessment undertaken to support the Shipping and Navigation EIA (see Chapter 13) underpins the categorisation of the risk of collision and allision in terms of vessel activity. Furthermore, the inclusion of Other Human Activities (see Chapter 19) as part of the EIA will assess the potential for interactions with other infrastructure in the Moray Firth of relevance to such scenarios (e.g., oil and gas pipelines or existing OWFs). It is therefore proposed to scope out major accidents and/or disasters with regards to the offshore elements of the Proposed Development.

5 Consultation Process

5.1 Introduction

5.1.1.1 Stakeholder engagement and consultation is a key aspect and EIA process for the successful delivery of a consent application for any OWF development. Without statutory stakeholder input and collaboration to address concerns, the achievement of UK and Scottish renewable energy targets and the provision of clean energy would not be possible. It is equally important to consult other non-statutory bodies, interested parties and the general public in order to take into consideration aspects that can affect specialist interests (such as recreational activities or other marine users), livelihoods, employment and daily life activities. This approach to stakeholder consultation will ensure a robust application is made that takes into consideration all potential environmental and socio-economic receptors that might be impacted by the Proposed Development.

5.1.1.2 This chapter of the Offshore Scoping Report sets out the planned consultation process, including the anticipated timings for when Caledonia OWF and the wider project team intend to carry out engagement with relevant stakeholders, other interested parties and the public.

5.1.1.3 Stakeholder engagement comprises of two main elements: communication and consultation. The former is the provision of information to enable stakeholders to understand the progress of the Proposed Development, while the latter provides the opportunity for stakeholders to provide information and express views which influence the Proposed Development.

5.1.1.4 This leads to four basic objectives for the engagement strategy:

- Identify – identification of those stakeholders with an interest in the Proposed Development;
- Communicate – provide appropriate information on the Proposed Development to stakeholders including any potential positive (beneficial) or negative (adverse) impacts that the Proposed Development may have;
- Consult – seek and record views and potential concerns of stakeholders;
- Communicate again – provide information to stakeholders detailing the results of consultation and provide reassurance to any concerns raised.

5.2 Consenting Procedure and Relevant Legislation

5.2.1.1 As highlighted in Chapter 2 (Legislation and Policy), Caledonia OWF will undertake the EIA process in line with legislative requirements, including the following:

- The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017;
- The Marine Works (Environmental Impact Assessment) Regulations 2007; and
- The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017.

5.2.1.2 These Regulations are collectively referred to as "the EIA Regulations" and they take into account the requirement for public participation in offshore project planning and development. As part of the EIA, a full public consultation will be undertaken.

5.2.1.3 The Aarhus Convention is 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 the individuals and civil society organisations with regard to the environment. Caledonia OWF will undertake an EIA in line with the Aarhus Convention which establishes the rights of the general public to environmental information. This includes the public's right to receive environmental information held by public authorities, the right to participation 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.

5.2.1.4 Caledonia OWF will also provide, as part of their consent application, a Report to Inform Appropriate Assessment (RIAA) under the HRA process, which is required under the Habitats Regulations which implement the EU Habitats Directive (see Chapter 2: Legislation and Policy). The content of this RIAA will follow and adhere to the guidance provided within the Offshore Scoping Opinion.

5.2.1.5 The Regulations listed above set out the statutory consultation requirements relevant to the pre-application stage, covering requirements such as advertising of consent applications. Additional PAC requirements are set out in the Marine (Scotland) Act 2010, Marine and Coastal Access Act 2009 and Marine Licensing (Pre-application Consultation) (Scotland) Regulations 2013.

5.3 Stakeholder Engagement and Management

5.3.1 Background

5.3.1.1 Caledonia OWF will follow best practice guidelines set out by the British Wind Energy Association with the aims of inclusiveness and equality. Stakeholders will be given the opportunity to determine how they wish to be consulted with regards to the Proposed Development. Caledonia OWF will also follow consenting guidance and advice given by statutory stakeholders, such as MS-LOT and NatureScot, on matters regarding engagement and stakeholders.

5.3.1.2 Development and consent of the proposed development will rely on engagement with relevant stakeholders from the pre-EIA phases through to consent application, and beyond.

5.3.2 Initial Engagement

5.3.2.1 Caledonia OWF understands the value of building and maintaining strong professional relationships with statutory stakeholders and communities from early project stages through to the consent application. Caledonia OWF has already actively begun the process of engaging with key statutory stakeholders during this scoping stage of development. An introductory meeting was held between MS-LOT and Caledonia OWF in May 2022. Caledonia OWF has also participated in Quarterly Project Update Meetings with MS-LOT, Marine Scotland Science (MSS) and NatureScot to meet with the expectations of these stakeholders and their request for regular (and purposeful) meetings.

5.3.2.2 In recognition of the potential complex issues associated with ornithological interests with the northeast Plan Options and wider region, Caledonia OWF has also been engaging and collaborating with the other developers that were awarded

projects within the northeast region via the North East Ornithology Group. In addition, Caledonia OWF has introduced the Proposed Development to MCA and NLB, while also having monthly meetings with the Scottish Fishermen's Federation (SFF) where the Proposed Development has been discussed at a high level.

5.3.2.3 Caledonia OWF is committed to building on this initial engagement in preparation for the EIA. Relevant stakeholders being consulted/to be consulted across all stages of the Proposed Development (such as pre-application, application submission and review, pre-construction, construction, commissioning, O&M and decommissioning) include:

- National and local authorities;
- Local communities/councils;
- A long list of local and international interest organisations;
- Suppliers/industry;
- National/regional grid providers;
- Onshore landowners;
- Other users of the sea;
- The owner of the seabed; and
- Other seabed leaseholders.

5.3.2.4 It is acknowledged that stakeholders will hold different information needs and will have different levels of involvement in the Proposed Development.

5.3.3 Planned Statutory Engagement

5.3.3.1 Caledonia OWF has initiated early consultation with MS-LOT/MSS and NatureScot in order to understand their preferred method of scheduling engagement and consultation throughout the EIA (which involves regular project update meetings throughout the proposed development consenting timeline). Previously, applicants have used MS-LOT's Protocol Agreement to specify meeting dates and agendas to be covered. MS-LOT have updated this approach and are now using quarterly project meetings instead in order to liaise with developers regarding projects and provide updates on progress.

5.3.3.2 The Proposed Development will adhere to all statutory consultation requirements that are required as part of the consenting process. Engagement with stakeholders will be ongoing and iterative during the EIA process, but it is also expected to be focused around the following key stages:

- Formal submission and publication of this Offshore Scoping Report and request for a Scoping Opinion;
- If required, consultation on the survey scopes of work for key survey campaigns, and liaison regarding Marine Licence and EPS risk assessment requirements to allow surveys to proceed;
- Provision of key technical reports and data, used to inform the assessments, to relevant stakeholders for information and feedback;
- Completion of statutory PAC;

- Formal submission and publication of consent applications and the accompanying EIAR to seek views on the proposal; and
- Additional public/stakeholder-specific engagement events that will take place at intervals during the consenting process, together with the issue of project communications and documentation to the Proposed Development's website.

5.3.3.3 To inform the offshore elements of the EIA, Caledonia OWF is planning to hold two rounds of in-person (i.e., physical as opposed to virtual) consultation events to inform and gain feedback from local communities. The first round will be undertaken at three representative locations during the scoping consultation period, while the second round will involve three events (at the same locations) prior to submission of the application. The second event will include feedback to the public on engagement during the first event.

5.4 Stakeholder Identification

5.4.1.1 This chapter of the Offshore Scoping Report has been informed by the Caledonia OWF Project Team's experience of previous stakeholder engagement in relation to the consenting of OWF projects in Scotland. Ocean Winds has built positive stakeholder relationships over the last 12+ years through the development of Moray East and Moray West OWFs, and the subsequent construction of the Moray East OWF. Caledonia OWF will ensure these relationships are maintained in order to deliver the Proposed Development.

5.4.1.2 Caledonia OWF is already aware of, and has anticipated, those key stakeholders expected to have an interest in the Proposed Development. These stakeholders are identified within Table 5.1; however, it is recognised that this list is not exhaustive and other relevant stakeholders are likely to be consulted as the Proposed Development progresses through the EIA and further details are confirmed.

Table 5.1. Identification of key statutory and non-statutory stakeholders.

Type/Receptor	Stakeholder
Governmental	▪ The Cabinet ▪ CES ▪ MS-LOT ▪ MSS ▪ Scottish Government (Marine Scotland) Policy Team ▪ NatureScot ▪ JNCC ▪ Scottish Environment Protection Agency (SEPA) ▪ Historic Environment Scotland (HES) ▪ Planning Authorities and other Departments within the Scottish Government ▪ NLB ▪ MCA ▪ Ministry of Defence (MoD) ▪ Office of Gas and Electricity Market (Ofgem)
Politically Established	▪ Scottish Enterprise ▪ Scottish Development International ▪ Committee on Climate Change (CCC)
Local Authorities and Organisations	▪ Community Councils and representatives ▪ Community and Local Religious/Faith Organisations ▪ Local Educational Institutions ▪ Local Communities and representatives
Grid Operators	▪ National Grid ESO ▪ SSEN Transmission
Environmental Organisations	▪ Royal Society for Protection of Birds (RSPB) ▪ Scottish Wildlife Trust (SWT) ▪ National Trust for Scotland ▪ Whale and Dolphin Conservation (WDC) ▪ Association of District Salmon Fisheries Boards (ADSFB) ▪ Fisheries Management Scotland ▪ National Nature Reserves (NNR) ▪ Scottish/Local Wildlife Sites
Aviation	▪ National Air Traffic Safeguarding (NATS) ▪ Civil Aviation Authority (CAA) ▪ Aberdeen International Airport and Wick Airport
Navigation	▪ Port and Harbour Authorities inclusive of the Harbour Master ▪ Chamber of Shipping ▪ UK Hydrographic Office (UKHO) ▪ Royal National Lifeboat Institution (RNLI) ▪ Royal Yachting Association (RYA) ▪ Commercial Shipping/Ferry Companies
Tourists and Recreation	▪ Local Tourists Board ▪ Local Water Sports Groups ▪ Visit Scotland ▪ Sub Aqua and Scuba Diving Clubs ▪ Mountaineering Scotland ▪ Surfers Against Sewage

Type/Receptor	Stakeholder
Fisheries	▪ Marine and Fisheries Agency ▪ SFF ▪ The Scottish White Fish Producers Association (SWFPA) ▪ Moray Firth Inshore Fishermen's Association ▪ North and East Coast Regional Inshore Fisheries Group ▪ Scotland's Scallop Sector Working Group ▪ District Salmon Fishery Board (DSFB) – Spey and Deveron ▪ Fisheries Trusts – Spey Foundation and Deveron, Bogie and Isla Rivers Charitable Trust ▪ Local fishing organisations ▪ Individual fishermen as identified by the Company Fisheries Liaison Officer/other means
Wind Energy Interest	▪ Scottish Renewables ▪ Renewable UK (RUK) ▪ Scottish Renewable Forum ▪ Offshore Wind Industry Council (OWIC) and Offshore Wind Growth Partnership – funded by OWIC ▪ ORE Catapult ▪ Deep Wind Cluster ▪ Scottish Offshore Wind Energy Council (SOWEC) ▪ Other Regional Advisory Groups ▪ British Wind Energy Association (BWEA)
Supply/Industry	▪ WTG, foundation and substation manufacturing ▪ Ship building and steel industry ▪ Yards ▪ Cable suppliers ▪ Suppliers of local services
Other	▪ Oil and Gas operators ▪ Scottish gas distributors ▪ Landowners ▪ Other ScotWind Developers (including North, Northeast and East Plan Option developers) ▪ Media, Public Relation ▪ Onshore utilities companies/Scottish Water ▪ Transport Scotland

6 Marine and Coastal Processes

6.1 Introduction

6.1.1.1 This chapter of the Offshore Scoping Report identifies the Marine and Coastal Processes receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

6.1.1.2 For the purposes of both this Offshore Scoping Report and the subsequent EIAR, Marine and Coastal Processes includes the following elements:

- Morphology, including bathymetry, geology, surficial sediments and seabed form;
- Hydrodynamics, including tidal and non-tidal influences, and waves; and
- Sediment transport, including suspended sediment.

6.1.1.3 Marine and Coastal Processes pathways are closely linked to seabed, coastal and water quality receptors. This chapter covers the Marine and Coastal Processes pathways and receptors present within the study area.

6.2 Study Area

6.2.1.1 As presented in Figure 6.1, the Marine and Coastal Processes study area is defined as:

- Near-field:
  - Array Area;
  - Offshore ECC;
  - Proposed export cable landfall areas; and
- Far-field:
  - Coastal and seabed zones outside those previously defined areas, but within the vicinity of the Proposed Development that may be influenced by Marine and Coastal Processes.

6.2.1.2 The Marine and Coastal Processes study area will be further refined during EIA with consideration to the tidal excursions and specifically sediment plume pathways to allow a definition of the Zone of Influence (ZoI).

6.3 Baseline Environment

6.3.1 Data Sources

6.3.1.1 The data sources that have been used to inform this Marine and Coastal Processes chapter of the Offshore Scoping Report are presented within Table 6.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

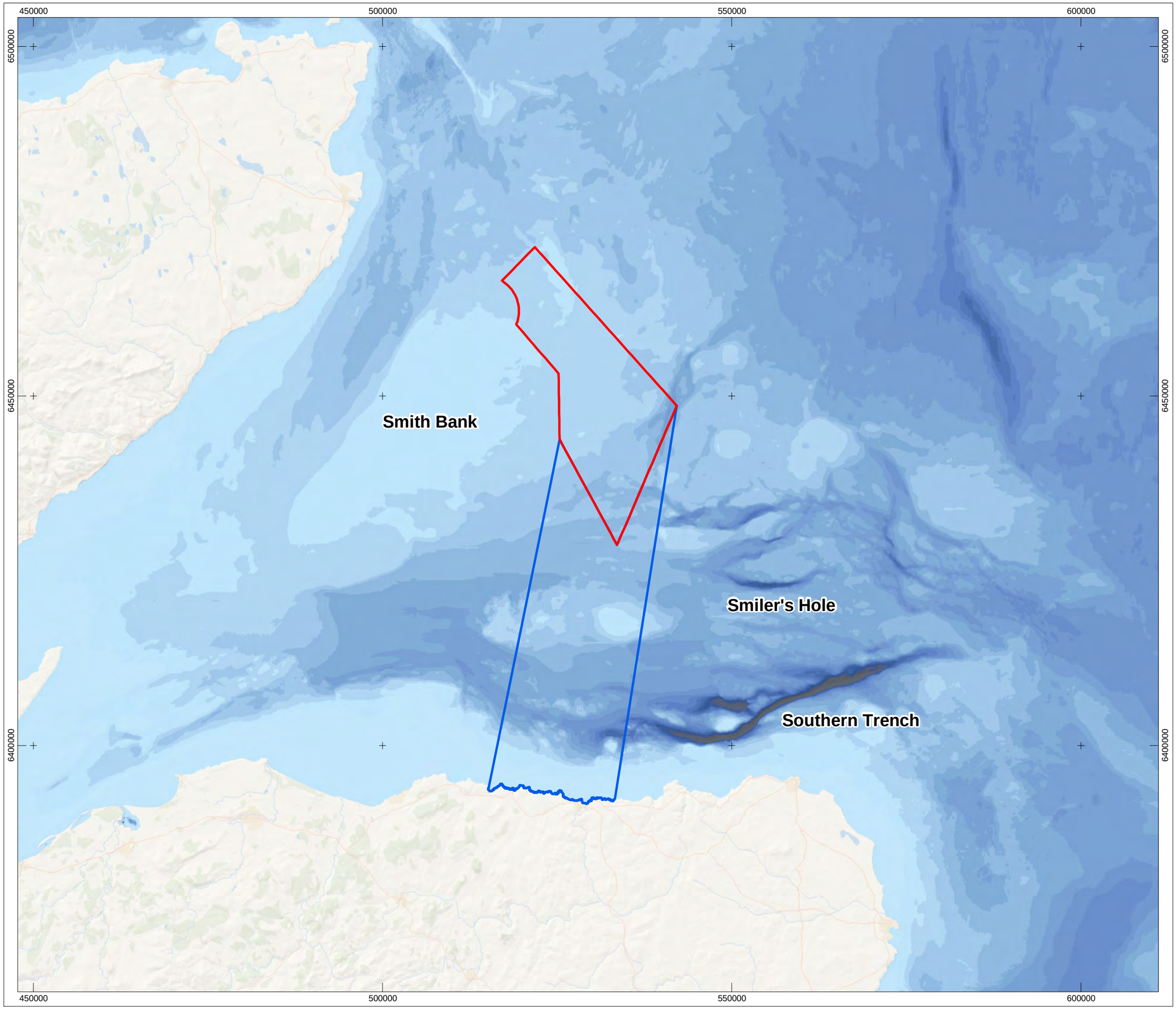
Table 6.1. Summary of key publicly available datasets for Marine and Coastal Processes.

Title	Source	Year	Author
Metocean Data (waves, tides, winds)			
Atlas of UK Marine Renewable Energy Resources	UK Renewables Atlas – ABPmer (https://www.renewables-atlas.info)	2017	ABPmer
Cefas Wavenet data	www.cefas.co.uk/cefas-data-hub/wavenet	2022	Cefas
National Tide and Sea Level Facility (NTSLF)	www.ntslf.org	2020	NTSLF
SEASTATES Metocean Data and Statistics Interactive Map	www.seastates.net	2018	ABPmer
United Kingdom Hydrographic Office (UKHO) Admiralty Tide Tables	https://www.admiralty.co.uk/publications/publications-and-reference-guides/admiralty-tide-tables	2022	UKHO
Morphology (bathymetry, geology, coastal, seabed and suspended sediments) and Sediment Transport			
Seabed and Subsurface Geological Features (GS2_NE4 – Geology Chart)	Project data archive	2020	Lloyd's Register
New Leasing Geological Consultancy Support: OWF Ground Conditions Feasibility Assessment – NE4 Soil Thickness Study	Project data archive	2021	Vysus Group
British Geological Society (BGS) Offshore GeoIndex Map	www.bgs.ac.uk/GeoIndex/offshore/htm	2020	BGS
Caledonia OWF Project specific surveys (geotechnical, geophysical, and benthic)	Not currently available	2022	Ocean Winds

Title	Source	Year	Author
Cefas Suspended Sediment Climatologies around the UK	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf	2016	Cefas
European Marine Observation and Data Network (EMODnet) Bathymetry data	https://portal.emodnet-bathymetry.eu	2020	EMODnet
JNCC Coastal Directory Series: Regional Report 3 North East Scotland: Cape Wrath to St. Cyrus	https://data.jncc.gov.uk/data/6473ed35-d1cb-428e-ad69-eb81d6c52045/pubs-csuk-region-03.pdf	1996	Barne *et al*. (1996)
Strategic Environmental Assessment – SEA5 Seabed and Superficial Geology and Sediments Survey Report	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/197385/SEA5_TR_Geology_BGS.pdf	2004	Holmes *et al*. (2004)
UKHO Admiralty Chart data	https://seabed.admiralty.co.uk	2022	UKHO
Future Changes			
Coastal Futures Interactive Map	https://coastal-futures.org	2021	IHE Delft
Dynamic Coast: Scotland's Coastal Change Assessment	https://www.dynamiccoast.com	2021	Centre of Expertise for Waters
UK FUTURECOAST Project	https://coastalmonitoring.org/ccoresources/futurecoast	2002	Department for the Environment Food and Rural Affairs (DEFRA)
Intergovernmental Panel on Climate Change (IPCC) Sixth Assessment Report: Impacts, Adaption and Vulnerability	https://www.ipcc.ch/report/ar6/wg2	2022	IPCC

Title	Source	Year	Author
Sea Level Projection Tool – NASA Sea Level Change Portal	https://sealevel.nasa.gov/ipcc-ar6-sea-level-projection-tool	2021	NASA
UK Climate Projections Science Report (UKCP18) Marine Report	https://www.metoffice.gov.uk/pub/data/weather/uk/ukcp18/science-reports/UKCP18-Marine-report.pdf	2018	Palmer *et al*. (2018)
General			
Beatrice OWF associated survey results and reports	https://marine.gov.scot/search/content /beatrice%20offshore%20windfarm	Assorted	Beatrice OWF Limited (BOWL)
Beatrice OWF Environmental Statement	https://marine.gov.scot/data/environmental-statement-construction-operation-generating-station-and-transmission-works-0	2012	BOWL
Beatrice OWF Scoping Report	https://marine.gov.scot/sites/default/files/00446498.pdf	2010	BOWL
Marine Scotland National Marine Plan Interactive Mapping Tool (NMPi)	https://marinescotland.atkinsgeospatial.com/nmpi	2022	Marine Scotland
Marine Scotland Regional Assessments	https://marine.gov.scot/sma/assessment-theme/regional-assessments	2020; 2021	Marine Scotland
Moray East OWF associated survey results and reports (bathymetry, geotechnical, geophysical, and pre-construction)	https://www.morayeast.com/document-library	2010; 2014; 2017; 2018; 2019	Moray OWF (East) Limited
Moray East OWF Environmental Statement	http://marine.gov.scot/data/environmental-statement-maccoll-telford-and-stevenson-offshore-wind-farms-moray-east-offshore	2012	Moray OWF (East) Limited
Moray East OWF Scoping Report	https://marine.gov.scot/sites/default/files/00515190.pdf	2017	Moray OWF (East) Limited
Moray West OWF associated survey results and reports (geophysical and geotechnical)	https://www.moraywest.com/document-library	2010; 2018; 2019; 2021	Moray OWF (West) Limited

Title	Source	Year	Author
Moray West OWF EIAR	https://marine.gov.scot/data/moray-west-offshore-windfarm-environmental-impact-assessment-report	2018	Moray OWF (West) Limited
Moray West OWF Scoping Report	https://marine.gov.scot/sites/default/files/00500887.pdf	2016	Moray Offshore Renewables Limited (MORL)
Offshore Energy Strategic Assessment 4 (OESEA4)	https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4	2022b	Department for Business, Energy and Industrial Strategy (BEIS)
Offshore Oil and Gas Licensing 28th Seaward Round Moray Firth – Habitats Regulations Assessment Stage 2 – Appropriate Assessment	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/444922/28th_Round_Moray_Firth_Blocks_AA.pdf	2015	Department for Energy and Climate Change (DECC)
Strategic Environmental Assessment – SEA5	https://www.gov.uk/government/publications/strategic-environmental-assessment-5-environmental-report	2004	DECC
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited



Legend

- Array Area
- Offshore Export Cable Corridor

Depth (m)

0 - 50	130 - 140
50 - 60	140 - 150
60 - 70	150 - 160
70 - 80	160 - 170
80 - 90	170 - 180
90 - 100	180 - 190
100 - 110	190 - 200
110 - 120	>200
120 - 130	

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.1

Marine and Coastal Processes study area

CALEDONIA Offshore Wind Farm

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6.3.2 Overview of the Baseline Environment

6.3.2.1 An understanding of the baseline marine and coastal processes which control the features, pathways and receptors within the study area has been derived from the available data sources and literature (Table 6.1). Regional context is provided where appropriate and dependent upon the scale of the processes discussed. This baseline understanding, as presented below, will be further developed following completion of project-specific surveys and updated in following phases of the EIA process.

Morphology

6.3.2.2 This section provides an overview of the bathymetry, geology, surficial sediments and seabed features of relevance to the Proposed Development.

Bathymetry

6.3.2.3 Across the Array Area, water depths range between approximately 40 and 100 m (LAT), with the majority between 50 and 60 m LAT, as shown in Figure 6.1. The shallowest depths are found in the north-western part of the Array Area, on the outer edges of Smith Bank. Water depths increase towards the south and east of the Array Area, with the deepest areas corresponding with the presence of enclosed basins, for which further information is provided in a subsequent section (Holmes *et al*., 2004).

6.3.2.4 Water depths within the Offshore ECC range between 60 and 150 m LAT, with depths ranging between 70 and 150 m within the Southern Trench feature to the south. An isolated plateau is present to the north of the Southern Trench and approximately in the middle of the Offshore ECC, with shallower depths of 40 and 60 m LAT. South of the Southern Trench, water depths typically shallow uniformly towards the coast.

Geology

6.3.2.5 The geology of the Moray Firth is characterised predominantly of Lower Cretaceous clay, with both Jurassic and Permo-Triassic rocks along the southern and inner margins of the Firth and a belt of chalk across the outer Firth. The presence of the chalk belt has been shown to correlate with the thinning of the surficial sediment layer towards the east, such that the chalk starts where the sediment is, approximately, 10 m or less (Vysus Group, 2021). The belt is overlain by an extensive layer of glacial till (clay, sand and gravel debris deposited from ice sheets), which is commonly observed to be over 100 m thick, underneath a veneer of marine sand (Holmes *et al*., 2004; Moray OWF (East) Limited, 2012). This layer of marine sand was found to range from, approximately, 1 to 30 m across the Moray East and West Development Areas, with thicker deposits within bathymetric deeps (Moray OWF (West) Limited, 2018).

Surficial Sediments

6.3.2.6 Within the Array Area the surficial seabed sediments are typically comprised of sands and gravelly sands, with a small proportion of fines (<5 to 10%) (Figure 6.2). The thickness of the surficial layer has been shown to increase with decreasing water depth, such that it is less than 10 m thick in the eastern extents of the Array Area (Vysus Group, 2021). Towards the shore, along the Offshore ECC, the mud content of sediments increases, with seabed sediments becoming progressively finer as water depth increases. Enclosed basins within the area act as sinks for fine-grained sediments settling out of suspension, with relatively high mud content (30 to 65% fines) within the deepest parts. The exception to this

pattern is within the Southern Trench, where high current speeds along the axis lead to well-sorted fine sands with little silt content (Holmes *et al*., 2004). Within 10 km of the coastline, the seabed is characterised by increased gravel and coarse sediment as the water depth decreases.

Seabed Features

6.3.2.7 The Array Area is bound to the west by Smith Bank and to the east by Bosies Bank, a moraine complex related to the activity of the last British Ice Sheet in the outer Moray Firth (Graham *et al*., 2009). The area is characterised by isolated and irregular shallow banks, which divide a series of tunnel valleys formed sub glacially by the flow of pressurised water, which act as sinks for fine-grained sediments (Holmes *et al*., 2004; Graham *et al*., 2009). Notable offshore seabed features located within the Array Area and Offshore ECC (Figure 6.1), are summarised below:

- Array Area:
  - Smith Bank: a morphological high point measuring approximately 35 km long and 20 km wide, oriented from southwest to northeast and located in the northwest outer Moray Firth. Geologically constrained, Smith Bank is associated with the underlying Smith Bank Fault block and is defined as a raised hard rock features overlain by a relatively thin veneer of more recently deposited marine sediments (Holmes *et al*., 2004; Moray OWF (West) Limited, 2018). Water depths range from between 25 and 55 m (LAT), with surficial sediments of relatively coarse sand and shelly gravel with occasional rock outcrops. Smith Bank is separated from the Caithness coast to the north by a relatively deep channel up to 75 m deep (Moray OWF (West) Limited, 2018).
- Offshore ECC:
  - Southern Trench: located in the southeastern part of the outer Moray Firth, approximately 10 km north of the Fraserburgh – Banff coastline, the Southern Trench is an enclosed seabed basin 58 km long and up to 250 m deep. It was formed predominantly as a result of glacial processes, including subglacial hydrology and potentially catastrophic meltwater flooding (Brooks *et al*., 2013; BEIS, 2022a). There is evidence that gravity-driven down-slope failure has locally affected modern seabed variability within the Southern Trench. Like other enclosed seabed basins in the Moray Firth, the Southern Trench acts as a sink for fine-grained sediments, although this has been mainly found to occur on the trench flanks, not the axes. The trench axes are characterised by well-sorted fine-grained sands, thought to be distributed where tidal flow has accelerated through constricted trench passages below approximately 190 m water depth (Holmes *et al*., 2004).
  - To the north of the Southern Trench is an isolated plateau, the top of which ranges from approximately 40 to 50 m depth (LAT). Seabed photography carried out by the DTI 2003 survey identified a seabed 'armour' in this region characterised by well-rounded pebbles, cobbles and boulders. This is in contrast to the blanket of muddy sands mapped on the plateau

otherwise by the BGS, and may be related to storm processes prior to the survey (Holmes *et al*., 2004).

- Smiler's Hole: an arcuate enclosed basin located to the east of the Offshore ECC, with the convex side facing north. Formed at the margin of a former ice sheet, it is 25 km long and more than 175 m deep. Sediment samples taken from within the basin are classed as muddy sands, with polymodal distribution patterns consistent with an environment allowing both sedimentation of the finest-grained muds and a process of re-suspension under conditions of stronger near-bed currents. The overall trend of increasing mud content with water depth on the basin flanks is consistent with the Smiler's Hole acting as a sink for fine-grained sediments (Holmes *et al*., 2004).

Coastal Form

6.3.2.8 The outer Moray Firth and Caithness coast is characterised by Devonian sedimentary rocks of the Old Red Sandstone Supergroup, which are exposed to winter storms and, therefore, have few accretionary habitats such as sand dunes, except in sheltered bays. These rocks also underlay the coastland on the southern coastline to the west of Spey Bay, which is characterised by sand and shingly spits and barriers, extensive sandy forelands and marshes.

6.3.2.9 The mouth of the River Spey is marked by a complex series of gravel ridges and bars that exhibit frequent changes in response to high river discharge events and wave processes, dominated by a strong, wave-driven longshore current. The eastern part of Spey Bay experiences net erosion, releasing sediment to feed gravel ridge accretion farther west. A strong, wave-driven, longshore current transports sediment westwards towards Lossiemouth, and gravel deposition has progressively replaced the sand beach in the west of the bay (Hansom, 2021).

6.3.2.10 East of Spey Bay, the coastline consists of Dalradian metamorphic rocks, of predominantly rocky character with a series of small bays and coves. The coastal area is generally plateau-like with 30 to 90 m high cliffs, generally fronted by a rocky platform and cut in places by deep ravines. Just west of Rosehearty the cliff level falls, giving way to a low shore extending to Peterhead, comprising first of a rocky platform and then to sandy beach with rocky outcrops east of Fraserburgh (Barne *et al*., 1996).

6.3.2.11 Individual bay-head units on this area of the southern coast are small and isolated from each other by headlands and relatively deep water, preventing longshore movement of sediment other than that within the single beach cells and resulting in a low rate of erosion, little accretion and little evidence of significant longshore drift. Beaches are therefore characterised by extremely high lateral stability and no major dune systems. The most dynamic stretch of coast in terms of change is the centre of Banff Bay, where a small sand spit at the inner margin of the intertidal Deveron delta is subjected to alternating marine and fluvial energies and frequently changes its form (Smith, 1986).

Sediment Transport

6.3.2.12 Regional scale assessments suggest bedload sediment is transported into the Moray Firth from the north, passing along the Caithness coast and towards the Inner Moray Firth (Kenyon and Cooper, 2005) (Figure 6.3). Linear sand patches suggest that sediment transport along the Buchan coast is directed in both east and west directions, possibly reflecting specific tidal patterns within this area (Holmes *et al*., 2004).

6.3.2.13 Sediment transport within the Moray Firth is wave-dominated, as tidal current energy is low and largely incapable of bedload sediment transport beyond fine sand-sized material and smaller (Holmes *et al*., 2004; Moray OWF (East) Limited, 2012). This is supported by the general lack of contemporary large scale bedform features in the Outer Moray Firth, indicating low sediment transport energy, as well as the observed trend of decreasing sediment grain size with increasing water depth within the Firth, reflecting the relative importance of wave energy to sediment transport processes (Moray OWF (East) Limited, 2012).

6.3.2.14 Observations suggest that sediment transport is limited in frequency and related to low-frequency, high-energy storm events – where the combination of tidal and non-tidal currents and wave induced currents during storm events results in considerably higher current speeds at the bed, resulting in medium-grained sand being mobilised across the area. This is likely to be enhanced in areas of greater depth and corresponding higher current speeds, such as in the north of the Array Area and across the Offshore ECC, where tidal current speeds are particularly enhanced.

6.3.2.15 Suspended Sediment Concentrations (SSCs) are typically low in the Array Area, approximately <5 mg/l (Figure 6.4), although near the seabed SSC levels may be significantly elevated during storm events. Fine sand, which is widespread across the study area, is likely to be regularly mobilised in this area during storms.

450000
500000
550000
600000
6500000
6450000
6400000

Legend

- Array Area
- Offshore Export Cable Corridor

Seabed Sediments (Folk, 1954)

- 1.1.1 Mud
- 1.1.2 (gravelly) Mud
- 1.2.1 sandy Mud
- 1.2.2 (gravelly) sandy Mud
- 1.3.1 muddy Sand
- 1.3.2 (gravelly) muddy Sand
- 2.1.1 Sand
- 2.1.2 (gravelly) Sand
- 3.1.1 gravelly Sand
- 3.2.1 sandy Gravel
- 3.3.1 Gravel
- 4.1.1 gravelly Mud
- 4.2.1 muddy Gravel
- 4.3.1 gravelly muddy Sand
- 4.4.1 muddy sandy Gravel
- 5. Rock and Boulders

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.2

Surficial seabed sediments within the Proposed Development (Folk, 1954)

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450000
500000
550000
600000
6500000
6450000
6400000

Smith Bank

Smiler's Hole

Southern Trench

Legend

- Array Area
- Offshore Export Cable Corridor

Sediment Transport

- Bedload Convergence
- Net Longshore Drift
- Sediment Transportation Path
- Sediment Transportation Path (Probable)
- Semi-Independent Beach Unit
- Shelly Carbonate Path
- Tidal Current General Orientation
- Offshore Sediment Sink

Depth (m)

0 - 50	130 - 140
50 - 60	140 - 150
60 - 70	150 - 160
70 - 80	160 - 170
80 - 90	170 - 180
90 - 100	180 - 190
100 - 110	190 - 200
110 - 120	>200
120 - 130	

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.3

Regional sediment transport pathways

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January

April

July

October

450000 500000 550000 600000

6500000 6450000 6400000

Legend

Array Area

Offshore Export Cable Corridor

SPM Concentrations (mg/l) (CEFAS, 1998-2015)

High : 5

Low : 0

Scale at A3: 1:1,000,000

0 25 50 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.4

Suspended particulate matter concentrations (Cefas, 1998 - 2015)

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Hydrodynamics

6.3.2.16 This section provides an overview on the influences of tidal, non-tidal, and wave processes on the Proposed Development.

Tides

6.3.2.17 Modelled mean spring and neap tidal ranges across the Array Area are, approximately, 2.9 m and 1.4 m respectively, with slightly higher values along the Offshore ECC as the tidal range increases into the Moray Firth and closer to the coast (Figure 6.5; ABPmer, 2017). The mean spring range measured at Fraserburgh, located approximately 25 km to the east of the Offshore ECC, is 3.7 m (Moray OWF (East) Limited, 2012). Tidal currents are generally to the south or south-east during the flood tide and to the north during the ebb tide; however, regional tidal ellipses indicate variation between the Array Area and Offshore ECC (ABPmer, 2017).

6.3.2.18 Tidal streams present in the Moray Firth are complex and variable in direction, with stronger tidal currents in the outer Firth due to the passage of tidal wave currents, particularly through the Pentland Firth and off Rattray Head, where mean spring peak flow can reach up to 1.5 m/s. Further inshore, local gyral patterns occur, resulting in benign current speeds of generally less than 0.5 m/s (mean spring peak flow) (Adams and Martin, 1986; ABPmer, 2017). Within the Array Area, tidal current speeds range from approximately 0.25 to 0.5 m/s, with speeds increasing from south to north (Figure 6.6).

6.3.2.19 A notable feature along the southern shore of the Firth is a flood lasting approximately nine hours of the tidal cycle, with insignificant ebb flow for the remaining three hours. This feature occurs up to 8 km offshore and is due to the southern Moray coastline sheltering the area from the north flowing ebb current, resulting in an eastward flow along the southern shore of the outer Firth (Adams and Martin, 1986; DTI, 2004). This is reflected in regional tidal ellipses in this area, which are oriented east to west, parallel to the coastline (ABPmer, 2017). Variations in current speeds within the Array Area and further afield occur in response to the presence of notable seabed and coastal features. Near bed peak spring tidal currents in the Southern Trench are estimated to exceed 0.7 m/s in some parts, oriented west to east, although tidal currents outside of the trench generally range from around 0.35 to 0.65 m/s (DTI, 2004).

6.3.2.20 Residual tidal currents (over a period of days to weeks) are generally directed into the Moray Firth, to the south-southwest (Moray OWF (East) Limited, 2012).

450000
500000
550000
600000
6500000
6450000
6400000

Legend

- Array Area
- Offshore Export Cable Corridor

Mean Spring Tidal Range (m)

- <1
- 1.01 - 1.5
- 1.51 - 2
- 2.01 - 2.5
- 2.51 - 3
- 3.01 - 3.5
- 3.51 - 4

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.5

Mean spring tidal range (ABPmer, 2017)

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450000
500000
550000
600000
6500000
6450000
6400000

Legend

Array Area

Offshore Export Cable Corridor

Peak Flow for a Mean Spring Tide (m/s)

- <0.1
- 0.11 - 0.15
- 0.16 - 0.2
- 0.21 - 0.25
- 0.26 - 0.3
- 0.31 - 0.35
- 0.36 - 0.4
- 0.41 - 0.45
- 0.46 - 0.5
- 0.51 - 0.55
- 0.56 - 0.6
- 0.61 - 0.65
- 0.66 - 0.7
- 0.71 - 0.75
- 0.76 - 0.8
- 0.81 - 0.85
- 0.86 - 0.9
- 0.91 - 0.95
- 0.96 - 1
- 1.01 - 1.05
- 1.06 - 1.1
- 1.11 - 1.15

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 6.6

Peak spring tidal current speed (ABPmer, 2017)

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Non-tidal Influences

6.3.2.21 Superimposed upon regular tidal behaviours are various non-tidal influences, which mainly originate from meteorological effects. An example is surges, formed by rapid changes in atmospheric pressure causing the water levels to fluctuate considerably above or below the tidal level. This effect can be further impacted by the wind strength and direction. Moving low pressure systems and associated strong and persistent wind fields may generate strong positive surges, often referred to as a 'storm surge'. The height of a 1 in 50-year return period storm surge has been defined as 1.25 m (Moray OWF (East) Limited, 2012).

6.3.2.22 Storm surges may cause short-term modification of astronomically driven tidal currents. Under an extreme (1 in 50-year return period) storm surge, current speeds may be more than twice that encountered under normal peak spring tide conditions.

6.3.2.23 The Moray Firth is also influenced by non-tidal residual circulation patterns, most notably the Fair Isle Current, which transports Atlantic water into the North Sea through the Fair Isle Channel before flowing southward down the Scottish east coast (Turrell *et al.*, 1992; BEIS, 2022b). Shoreward of the Fair Isle Current, which approximately follows the 100 m depth contour into the North Sea, local currents transport water into the Moray Firth through the Pentland Firth, where they circulate in an anticyclonic residual circulation cell around Smith Bank (McManus, 1992). Coastal waters within the Firth further subdivide into eastward- or westward-directed lobes off the southern shore and northbound residual stream off the Caithness coast, although the central cell of motion remains largely separated from the marginal waters (McManus, 1992).

Waves

6.3.2.24 Annual significant wave heights[5] within the Array Area are within the range of 1.25 to 1.75 m, reaching up to 2.5 m in the winter, with the largest waves coming from the more exposed offshore sectors (ABPmer, 2017) (Figure 6.7). The most frequent wave direction is from the south-east and north, with a smaller proportion from the south-west and north-east (ABPmer, 2018). Along the Offshore ECC, the waves originate mainly from the west, with the northern component becoming increasingly significant with decreasing distance to shore (ABPmer, 2018).

6.3.2.25 During extreme events, wave heights coming from the more exposed offshore sectors may be between 6 and 7 m during relatively frequent (annual) events or up to 9 m for a 1 in 50-year return period. Waves coming from other directions within the Moray Firth are generally smaller during extreme events (4 and 5 m or up to 7 m) due to the relatively shorter distances available for wave growth (Moray OWF (East) Limited, 2012).

6.3.2.26 The Moray Firth is generally characterised by low tidal current energy; therefore, waves and winds constitute the main energy inputs to the coastal system.

[5] Defined as the mean of the highest one-third (33%) of waves (measured from trough to crest) occurring within a year.

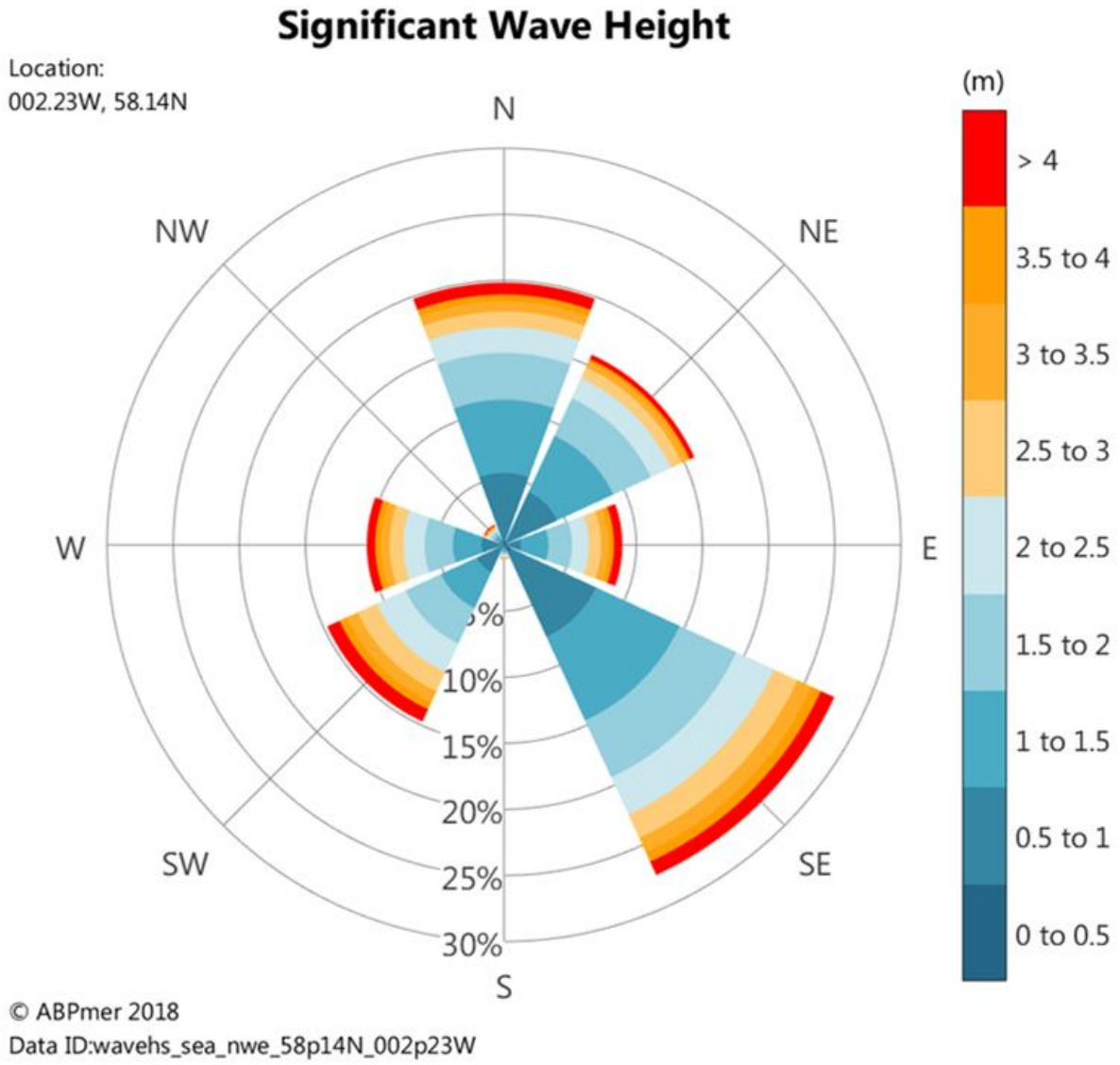


Figure 6.7. Significant wave height in the centre of the Array Area (Source: ABPmer, 2018).

Frontal Zones and Stratification

6.3.2.27 Frontal zones mark boundaries between water masses, including tidally mixed and stratified areas, and are numerous on the European continental shelf (BEIS, 2022b). Fronts play an important role is enabling the circulation and transport of nutrients and heat, and frequently reoccurring fronts (e.g., spatially and/or seasonally) are widely recognised as supporting enhanced biological activity (NatureScot, 2019).

6.3.2.28 Stratification is a naturally occurring seasonal hydrodynamic feature related to the distribution of sea water temperature and salinity. Naturally occurring stratification occurs across the study area due to seasonal heating of the upper water column and vertical fronts area also observed between regions of slight freshwater influence coming from the Moray Firth (Adams and Martin, 1986; Connor *et al.*, 2006) (Figure 6.8).

6.3.2.29 A thermal front is present year-round along the southeast coast of the Firth, over the Southern Trench. In autumn and winter the front, which is maintained by tidal currents, is located close to the coast, whereas in spring and summer the additional stratification generated by summer warming generates additional surface thermal fronts that extend further offshore (NatureScot, 2014). The position of the front corresponds to a relatively narrow, shallow, inner shelf associated with enhanced tidal mixing (Miller *et al*., 2014; NatureScot, 2019).

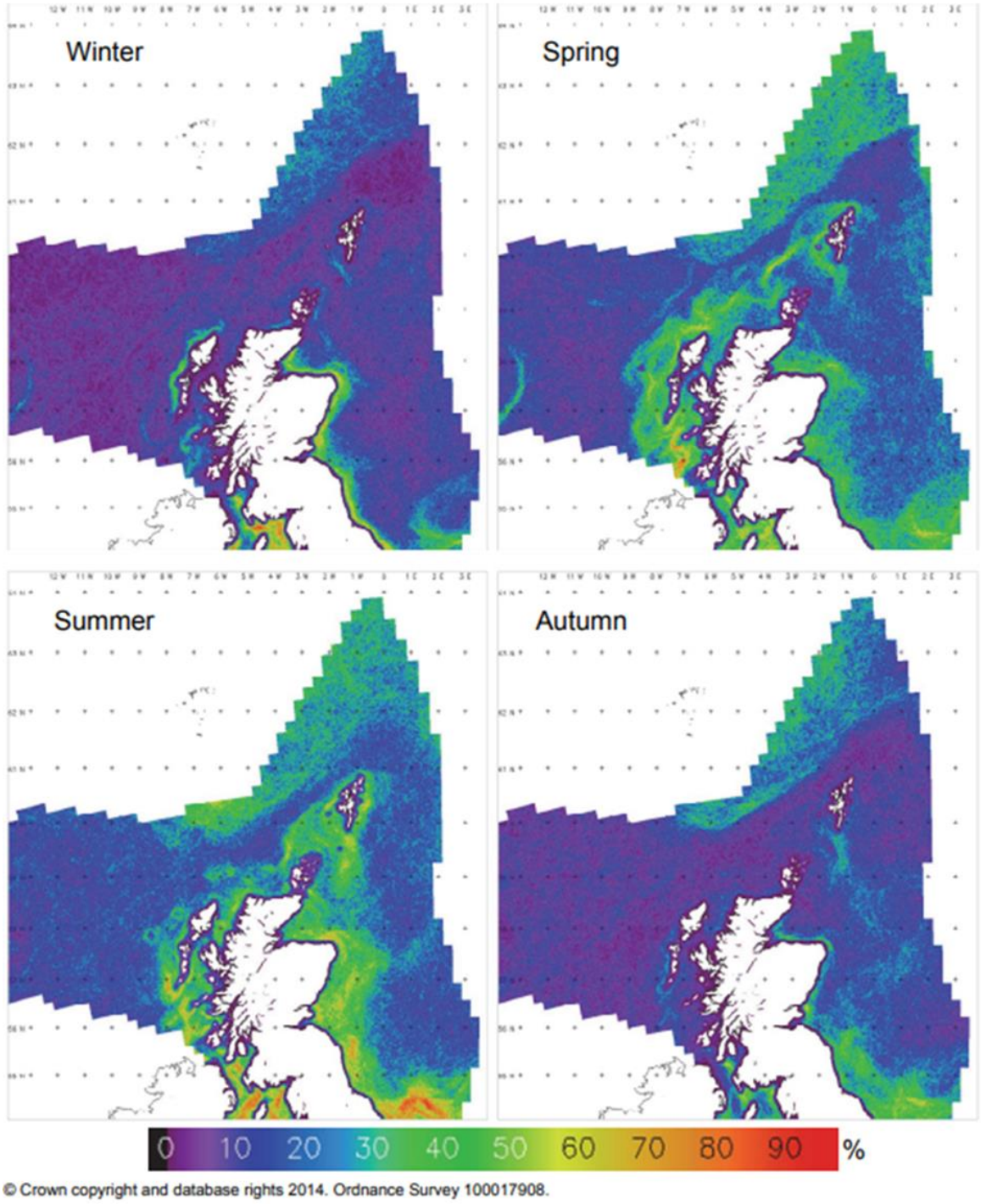


Figure 6.8. Comparison of ocean thermal front frequency for all seasons, derived from Sea Surface Temperature (SST) data from November 1998 – December 2008 (Source: Miller et al., 2014).

Future Changes

6.3.2.30 A consideration of the future baseline, including the associated variation, is provided in the context of the operating lifetime of the Proposed Development. For the current purposes of this Offshore Scoping Report, the Representative Concentration Pathway (RCP) 8.5 (high emissions) scenario (Palmer *et al*., 2018) has been presented.

6.3.2.31 UKCP18 suggests that an increase in mean sea level (MSL) of 0.5 to 0.6 m at 2100 along the coast of the Moray Firth (Palmer *et al*., 2018). Future changes in storm surges have been predicted to be indistinguishable from background variation (Lowe *et al*., 2009), although extreme surge level event frequency is likely to increase (IPCC, 2021).

6.3.2.32 Wave energy is predicted to decrease, such that by 2100 a decrease larger than 10% have been modelled in the North Sea (RCP8.5 scenario; Bonaduce *et al*., 2019; Meucci *et al*., 2020). Inter-decadal variability may be largely due to the influence of local weather in the North Sea (EDF Energy, 2020).

6.3.2.33 In addition, the United Kingdom is affected by isostatic readjustment – a regional change in land surface elevation following the removal of the weight of the British-Irish Ice Sheet. Due to this post-glacial uplift the sea level in the Moray Firth region is estimated to change by approximately -0.6 to -0.8 mm/year (Palmer *et al*., 2018), although this is outpaced by rates of global sea level rise (BEIS, 2022a).

Designated Sites and Protected Species

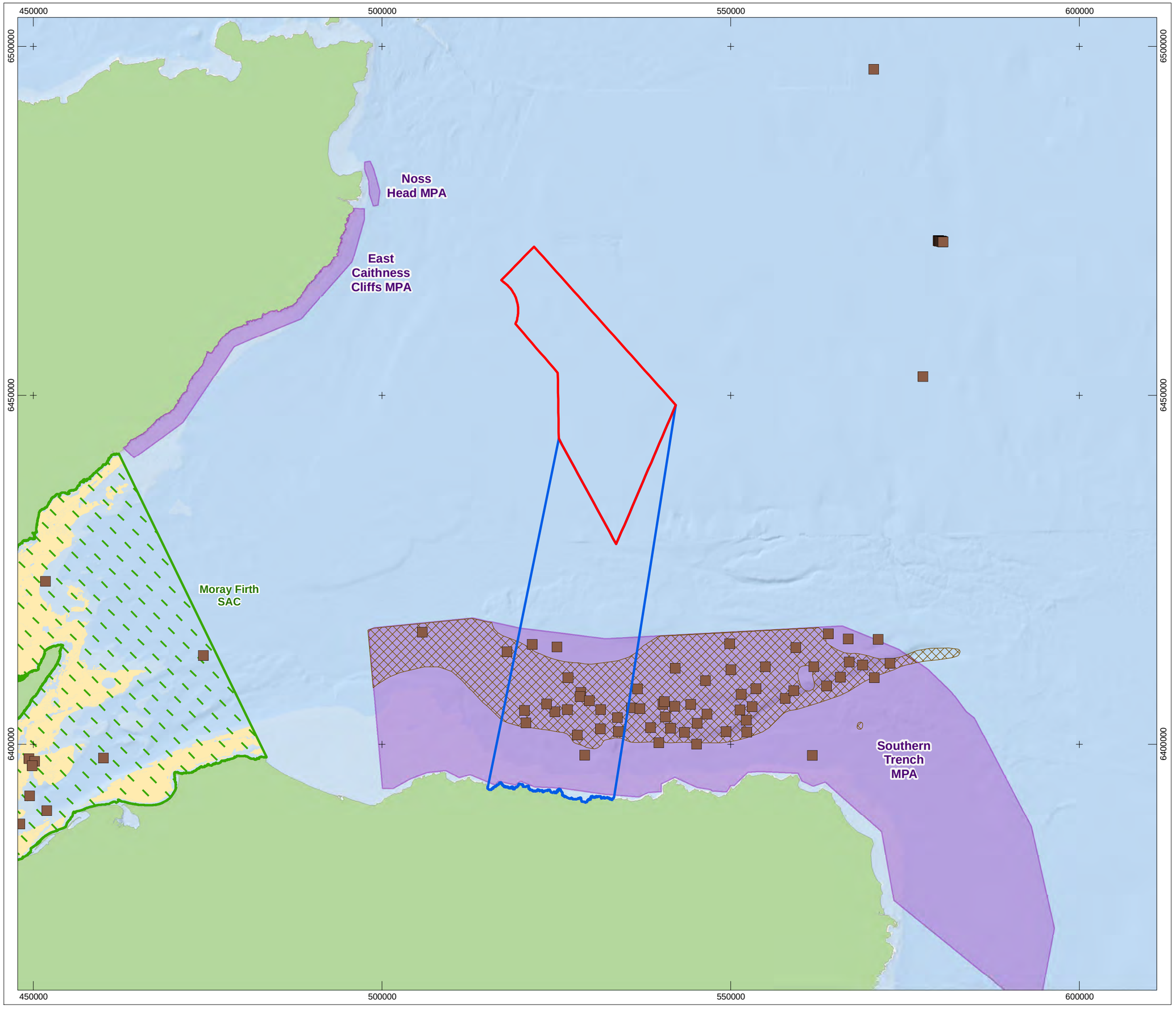
6.3.2.34 Designated sites in the vicinity of the study area, which are designated for the protection and conservation of marine habitats of relevance to marine and coastal processes are shown in Figure 6.9. A comprehensive list, with detail of the relevant (marine process) protected features, is provided below:

- Southern Trench NCMPA: Burrowed mud, fronts, quaternary of Scotland, shelf deeps, submarine mass movement;
- Moray Firth SAC: Subtidal sandbanks;
- East Caithness Cliffs SAC: Vegetated sea cliffs; and
- Noss Head MPA: Horse mussel beds.

6.3.2.35 A number of coastal Sites of Special Scientific Interest (SSSI) are also present:

- Cullen to Stake Ness Coast SSSI: designated for habitats and notable geology;
- Whitehills to Melrose Coast SSSI: designated for geology; and
- Gamrie and Pennan Coast SSSI: designated for geology.

6.3.2.36 Whilst relevant to this scoping stage of the EIA, project refinement including that of the Offshore ECC and associated landfall will inherently result in a refinement of the designated sites considered within the EIA stage of the Proposed Development.



Legend

- Array Area
- Offshore Export Cable Corridor
- Special Areas of Conservation (SAC)
- Marine Protected Areas (MPA)
- Annex I Sandbanks
- Burrowed Mud
- Burrowed Mud (Area)

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AK	DH
Date: 08/08/2022		Revision: 01
REF: UKCAL1_GO_WNF_MPR_MAP_00024		

Figure 6.9
Designated sites of relevance to Marine and Coastal Processes within the study area (Scottish Government, 2022)

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

6.4 Embedded Mitigation Considered Within the EIA

6.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

6.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Marine and Coastal Processes are noted within Table 6.2 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Marine and Coastal Processes receptors:

- M-1: Development of and adherence to a Cable Plan (CaP). The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring;
- M-2: Development of and adherence to a Development Specification and Layout Plan (DSLP). The DSLP will confirm the layout and design parameters of the Proposed Development;
- M-3: Development of and adherence to a CMS. The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures;
- M-4: Scour protection where there is the potential for scour to develop around infrastructure (foundations and cables);
- M-5: Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP;
- M-6: Wind farm infrastructure will be micro-sited, where possible, around any sensitive seabed habitats including Annex 1 habitat (if present) to avoid any development impacts on these conservation features; and
- M-7: Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate cable burial depth as identified via risk assessment is not feasible), as detailed within the CaP.

6.4.1.3 The requirement and feasibility of any mitigation measures will be dependent on the significance of the effects upon physical processes and will be consulted upon with statutory consultees throughout the EIA process.

6.5 Scoping of Impacts

6.5.1.1 Potential impacts on Marine and Coastal Processes have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 6.2. It is considered that the impacts potentially introduced by floating offshore structures will be greatly reduced relative to any resulting from the presence of fixed offshore structures; for example, scour resulting from anchors installed with little change in seabed relief will be considerably less than scour introduced by larger, seabed protruding foundations (which would be installed for a fixed development). This would be confirmed through subsequent phases of the EIA.

6.5.1.2 Marine and Coastal Processes are typically best described as pathways in most cases, rather than receptors. Accordingly, although outputs from the Marine and Coastal Process assessments will be reported in a stand-alone EIAR chapter, for the most part they will not be accompanied by statements of effect significance. Instead, the information on changes to the Marine and Coastal Processes pathways will be used to inform other EIA topic assessments, such as:

- Marine Water and Sediment Quality (Chapter 7)
- Benthic Subtidal and Intertidal Ecology (Chapter 8);
- Fish and Shellfish Ecology (Chapter 9);
- Marine Mammals and Other Megafauna (Chapter 11); and
- Commercial Fisheries (Chapter 12).

6.5.1.3 The scoping of indirect impacts from the identified Marine and Coastal Processes pathways will be assessed within the relevant topics.

6.5.1.4 The Marine and Coastal Processes features that are considered as potential receptors will be guided by tidal excursion, as to be further quantified using project-specific numerical modelling, and will include the following features:

- The adjacent coastline;
- Nearby offshore, designated, sub-tidal sandbanks and sandwave areas; and
- Nationally or internationally designated sites with interest features below MHWS (seabed/sedimentary/geological interest features).

Table 6.2. EIA scoping assessment for Marine and Coastal Processes.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Increases in SSCs and changes to seabed levels	M-1, M-2, M-3, M-4, M-5	Scoped in	Temporary elevations in SSCs due to construction (i.e., cable installation) activities. This could in turn result in changes to the underlying seabed/coastal bed levels, through deposition of the suspended material and changes to the surficial sediment type. Increases in SSC and associated deposition may have indirect, adverse impacts upon other receptor groups including, Benthic Subtidal Ecology and Intertidal Ecology (Chapter 8), Fish and Shellfish Ecology (Chapter 9), Marine Mammals and other Megafauna (Chapter 11) and Commercial Fisheries (Chapter 12). Decommissioning activities, such as foundation and cable removal (if required) can cause increases in SSC as a result of seabed disturbance. The transport of the disturbed material and the eventual deposition could in turn result in variations in bed levels and changes to the sediment type.	✓	✓	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Potential impacts to seabed morphology (sandbanks and notable bathymetric depressions)	M-1, M-2, M-3, M-5, M-6	Scoped in	Activities such as seabed preparation, sandwave levelling and cable trenching have the potential to directly disturb the seabed morphology. This disturbance may have adverse impacts on other receptor groups including Benthic Subtidal Ecology and Intertidal Ecology (Chapter 8), Fish and Shellfish Ecology (Chapter 9) and Commercial Fisheries (Chapter 12). Decommissioning activities relating to the removal of infrastructure (if required) have the potential to directly disturb the local seabed morphology.	✓	✓	✓	✓	✗
Modifications to littoral transport, coastal behaviour (erosion), including at landfall	M-1, M-3, M-5	Scoped in	Where the offshore export cable makes landfall, it must transition through the intertidal and coastal zones. The methods available for installing cables in such environments may physically disturb or disrupt the coastal morphology to differing degrees depending on the construction methods employed and any structures installed. At the time of construction, any disturbance is likely to be localised to the landfall site. This disturbance may have adverse impacts on other receptor groups including Benthic, Subtidal, and Intertidal Ecology (Chapter 8). The methods identified for removing or decommissioning the cable and/or cable protection aspects may physically disturb the local morphology.	✗	✗	✗	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Operation and Maintenance								
Potential impacts to seabed morphology	M-1, M-4, M-5, M-7	Scoped in	The Offshore ECC crosses the Southern Trench NCMPA. The presence of the cable and any cable protection in this offshore area has the potential to change the form and function of the seabed locally, potentially impacting on designated features of the NCMPA.	✗	✗	✗	✓	✗
Modifications to the wave and tidal regime, and associated impacts M-to morphological features	M-2	Scoped out	The interaction between the planned infrastructure, for example the WTG and OSP foundations, cable protection or cable crossings, and the baseline metocean regime (waves; tides) may result in localised changes to tidal current speeds, wave energy and turbulence. These changes may, in turn, impacts upon adjacent physical features, both offshore and along the coast. Due to generally low tidal currents within the area, as well as distance offshore, these impacts are unlikely to significantly impact adjacent morphological features.	✗	✗	✗	✗	✗
Seabed scouring	M-1, M-5, M-7	Scoped in	The wind farm infrastructure has the potential to cause localized seabed scouring, resulting in bathymetric changes and localized alterations to sediment transport patterns. This is likely to occur both around foundations for fixed WTGs as well as around anchors and clump weights that may be part of floating WTG infrastructure.	✓	✓	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Cumulative modifications to the wave and tidal regime and associated potential impacts to the sediment transport regime	M-2	Scoped out	Available assessments suggest that modifications to the wave and tidal regime remain within small distances from the foundations. Consequently, it is anticipated that there is no likelihood of local or regional changes in the sediment transport regime.	X	X	X	X	X
Modifications to stratification and frontal features	M-2	Scoped out	Available evidence suggests that modifications to turbulent mixing from WTG foundations would not be sufficient to cause significant changes to stratification.	X	X	X	X	X

6.6 Potential Cumulative Impacts

6.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Marine and Coastal Processes, cumulative interactions may occur with other planned OWFs as well as other activities in the study area.

6.6.1.2 Impacts that are scoped into the assessment for the Proposed Development alone, are generally spatially restricted to being within close proximity to the Array Area and Offshore ECC. However, certain potential impacts, such as an increase in SSC, have the potential to be observed over a wider area. Potential cumulative impacts on Marine and Coastal Processes receptors will be guided by tidal excursions, to be further quantified using project specific numerical modelling.

6.6.1.3 The CIA for Marine and Coastal Processes will consider the maximum adverse design scenario for each of the project, plan or activity in question in line with the methodology outlined in Chapter 4 (EIA Methodology).

6.7 Potential Transboundary Effects

6.7.1.1 No transboundary impacts on marine physical process pathways are anticipated to occur as a result of the Proposed Development activities during construction, O&M or decommissioning. Any predicted impacts on these pathways will largely be localised to within the study area and will not give rise to effects on the marine environment beyond UK waters. Therefore, it is proposed to scope out transboundary impacts with regards to Marine and Coastal Processes.

6.8 Proposed Approach to EIA

6.8.1 Relevant Data Sources

6.8.1.1 A more detailed literature review will be developed for the EIA, building upon the high-level outline provided within this Offshore Scoping Report. Project-specific survey outputs will be used to enhance the understanding of the baseline conditions. These may include the following across the Array Area and Offshore ECC:

- Geophysical surveys – planned to commence in September 2022 for the Array Area and March 2023 for the Offshore ECC;
- Geotechnical surveys – planned to commence in May 2023 for both the Array Area and Offshore ECC; and
- Benthic surveys – planned to commence in March 2023 for both the Array Area and Offshore ECC.

6.8.1.2 The deployment of a wave buoy within the Array Area is planned to commence in November 2022, aiming to collected metocean data throughout the winter period. It is anticipated that floating light detection and ranging (FLiDAR) will replace the wave buoy in 2023, but data collection will continue.

6.8.1.3 A numerical model will be developed to factor in the project-specific surveys, metocean data collection and a range of representative baseline conditions. The model will be applied to investigate the source-pathway-receptor relationship for those issues scoped in (Table 6.2) and based upon the realistic maximum design scenario, as provided in Chapter 3 (Proposed Development Description). Numerical model outputs will be supplemented with the Evidence Base, using existing studies from comparable projects.

6.8.2 Guidance

6.8.2.1 The assessment of Marine and Coastal Processes will also follow the guidance documents presented below and where they are specific to this topic:

- EIA for offshore renewable energy projects (BSI, 2015);
- Coastal Process Modelling for Offshore Wind Farm EIA; Best Practice Guide (Lambkin *et al*., 2009);
- Guidelines in the use of metocean data through the lifecycle of a marine renewable development (Cooper *et al*., 2008);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Cefas, 2011);
- Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (MS-LOT, 2018)
- National Resources Wales (NRW) Monitoring Evidence Report No: 243 Guidance on Best Practice for Marine and Coastal Physical Processes Baseline Survey and Monitoring Requirements to inform EIA of Major Development Projects (Brooks *et al*., 2018);
- Review of Cabling Techniques and Environmental Effects applicable to the Offshore Wind farm Industry. Department for Business Enterprise and Regulatory Reform in association with Defra (BERR, 2008a);
- General advice on assessing potential impacts of and mitigation for human activities on Marine Conservation Zone (MCZ) features, using existing regulation and legislation (JNCC and Natural England, 2011);
- Offshore Windfarms: Guidance note for EIA in Respect of FEPA and CPA requirements (Cefas, 2004a);
- Review of environmental data associated with post-consent monitoring of licence conditions of offshore wind farms. MMO Project No: 1031 (Fugro-Emu, 2014).
- Best Practice Advice for Evidence and Data Standards for offshore renewables projects (Natural England, 2022);
- Further review of sediment monitoring data (COWRIE ScourSed-09) (ABPmer *et al*., 2010);
- Review of Round 1 Sediment process monitoring data – lessons learnt (Sed01) (ABPmer *et al*., 2007);
- Dynamics of scour pits and scour protection – Synthesis report and recommendations (Sed02) (HR Wallingford *et al*., 2007); and
- Potential effects of offshore wind developments on coastal processes (ABPmer and METOC, 2002).

6.8.3 Assessment Methodology

6.8.3.1 The EIA will follow the general approach outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report.

6.8.3.2 The study area for Marine and Coastal Processes baseline within the EIA will be as currently outlined but will be further refined to focus on the final Offshore ECR. The scope of the Marine and Coastal Processes assessment is to characterise and understand the Marine and Coastal Processes present within the Proposed Development area, particularly with respect to the metocean regime and associated sediment transport pathways. These will be used to inform other topic specific assessments, for example Benthic, Subtidal and Intertidal Ecology.

6.8.3.3 The Marine and Coastal Processes assessment will consider the magnitude and duration of the impact, the reversibility of the impact and the timing and frequency of the activity. An assessment of the potential impacts of the Proposed Development will be undertaken through application of the Evidence Base, alongside outputs from numerical modelling activities. The significance of any changes will be evaluated against the likely naturally occurring variability in, or long-term changes to, the marine physical environment within the Proposed Development lifetime due to natural cycles, for example storm events, and/or climate change.

6.8.3.4 Consultation will be undertaken at pivotal points throughout the EIA process to ensure that the approach, including the application of the Evidence Base alongside numerical modelling, satisfies the requirements of both stakeholders and regulators.

6.9 Scoping Questions

6.9.1.1 The questions in Table 6.3 are posed to consultees to frame and focus responses to the Marine and Coastal Processes scoping exercise, which will in turn inform the Scoping Opinion

Table 6.3. EIA scoping questions for Marine and Coastal Processes.

Scoping Questions – Marine and Coastal Processes
Do you agree with the data sources, including project specific surveys, to be used to characterise the Marine and Coastal Processes baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Marine and Coastal Processes?
Do you agree with the project impacts which have been scoped out of the EIA for Marine and Coastal Processes?
Do you agree that transboundary impacts for Marine and Coastal Processes may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Marine and Coastal Processes that have been identified for the Proposed Development?

7 Marine Water and Sediment Quality

7.1 Introduction

7.1.1.1 This chapter of the Offshore Scoping Report identifies the Marine Water and Sediment Quality (MW&SQ) receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS. It is noted that MW&SQ is considered a receptor in its own right, whilst also providing an impact pathway for other receptors.

7.2 Study Area

7.2.1.1 The MW&SQ study area for the Proposed Development is defined as:

- Near-field:
  - Array Area;
  - Offshore ECC;
  - Proposed export cable landfall areas; and
- Far-field:
  - Coastal and seabed zones outside those previously defined areas, but within the vicinity of the Proposed Development that may be influenced by changes to MW&SQ – informed through further analysis of the Marine and Coastal Processes (Chapter 6) pathways.

7.2.1.2 The MW&SQ study area is consistent with that presented in Chapter 6 (Marine and Coastal Processes) and may be further refined following detailed assessments of tidal excursions and specifically sediment transport pathways to allow a definition of the ZoI.

7.3 Baseline Environment

7.3.1 Data Sources

7.3.1.1 The data sources that have been used to inform this MW&SQ chapter of the Offshore Scoping Report, which will also be used to inform the EIA, are presented within Table 7.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

Table 7.1. Summary of key publicly available datasets for Marine Water and Sediment Quality.

Title	Source	Year	Author
Bathing Water Profiles	https://www2.sepa.org.uk/bathingwaters/Locations.aspx	2021/2022	SEPA
Water Classification Hub	https://www.sepa.org.uk/data-visualisation/water-classification-hub/	2020	SEPA
Shellfish Water Protected Areas: Maps	https://www.gov.scot/publications/shellfish-water-protected-areas-maps/	2019b	Scottish Government
Urban Waste Water Treatment Directive Sensitive Areas 2019	https://www.gov.scot/binaries/content/documents/govscot/publications/map/2016/01/urban-waste-water-treatment-sensitive-areas-map/documents/urban-waste-water-treatment-sensitive-areas-map-2019/urban-waste-water-treatment-sensitive-areas-map-2019/govscot%3Adocument/UWWTD%2BDesignations%2B2019.pdf	2019	SEPA
Waste water treatment in the United Kingdom – 2012. Implementation of the European Union Urban Waste Water Treatment Directive – 91/271/EEC	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/69592/pb13811-waste-water-2012.pdf	2012	Department for Environment, Food and Rural Affairs (Defra)
The River Basin Management Plan for Scotland 2021 – 2027	https://www.sepa.org.uk/media/594088/211222-final-rbmp3-scotland.pdf	2021	Scottish Government and SEPA
Moray West OWF EIAR	https://marine.gov.scot/data/moray-west-offshore-windfarm-environmental-impact-assessment-report	2018	Moray Offshore Windfarm (West) Limited
Mean monthly sea surface temperature and salinity (NMPi)	https://marine.gov.scot/maps/72 https://marine.gov.scot/maps/74	2017	Marine Scotland

Title	Source	Year	Author
Charting Progress 2	https://tethys.pnnl.gov/sites/default/files/publications/UKMMAS_2010_Charting_Progress_2.pdf	2010	United Kingdom Marine and Monitoring Assessment Strategy (UKMMAS)
Hazardous substances – UK Marine Environment Monitoring and Assessment National (MERMAN)	https://marine.gov.scot/node/12618	2017	MERMAN
Intermediate Assessment 2017 – Contaminants	https://oap.ospar.org/en/ospar-assessments/intermediate-assessment-2017/pressures-human-activities/contaminants	2017	OSPAR
Contaminant and biological effect data 1999-2017 for the 2018 CSEMP assessment	https://data.marine.gov.scot/dataset/contaminant-and-biological-effect-data-1999-2017-2018-csemp-assessment	2019	Marine Scotland
Suspended Sediment Climatologies around the UK	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/584621/CEFAS_2016_Suspended_Sediment_Climatologies_around_the_UK.pdf	2016	Cefas
Shellfish safety and sanitation	https://www.foodstandards.gov.scot/business-and-industry/industry-specific-advice/shellfish	2022	Food Standards Scotland
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited

7.3.2 Overview of Baseline Environment

7.3.2.1 An understanding of the MW&SQ baseline within the study area has been derived from the available data sources and literature (Table 7.1). Alongside physical parameters associated with MW&SQ, this also includes consideration of relevant designations, such as the status/classification of Water Framework Directive (WFD) water bodies, Bathing Water, Shellfish Water Protected Areas and nutrient sensitive areas. This baseline understanding, as presented below, will be further developed following completion of project-specific surveys (e.g., sediment sampling) and updated in following phases of the EIA process.

Water Quality

7.3.2.2 Annual mean surface temperature (°C) and salinity (‰) within the Moray Firth, specifically five cells with central points within the Array Area (8475, 8625, 8626, 8776 and 8926) and seven cells within the Offshore ECC (8925, 9075, 9076, 9225, 9226, 9375 and 9376) of the Proposed Development, have been collated from climatology data presented via Scotland's National Marine Plan Interactive Map[6] (see Table 7.2). The available data layers present a 30-year (1971-2000) temperature/salinity climatology for surface regions of the Northwest European shelf seas. The data have been extracted from the International Council for the Exploration of the Sea (ICES) data centre and supplemented by additional records from the World Ocean Data Centre (WODC). From the original data, which are irregularly distributed in space and time, the mean monthly surface temperature and salinity are calculated, as well as the climatic mean annual cycle.

7.3.2.3 As shown in Table 7.2 and Figure 7.1, mean monthly water temperatures (surface) within the Array Area and Offshore ECC of the Proposed Development range from 5.6 °C in March to 12.8 °C in August. Mean monthly salinity values are less variable across the Proposed Development, remaining fully marine throughout the year with minimal freshwater influence.

7.3.2.4 Within the Array Area of the Moray West OWF, located to the southwest of the Proposed Development, SSCs are typically very low (approximately <5 mg/l). However, during storm events, near seabed SSCs can be significantly increased in the short-term due to the influence of waves stirring the seabed and raising sediments into suspension. Coarser sediments may be transported a short distance in the direction of ambient flow or down-slope under gravity before being redeposited. Finer material that persists in suspension will eventually be transported in the direction of net tidal residual flow (i.e., to the south-west, into the Firth) (Moray Offshore Windfarm (West) Limited, 2018). Refer to Chapter 6 (Marine and Coastal Processes) for further details on sediment transport as well as seabed sediment characterisation and SSCs.

7.3.2.5 The main pressures on water quality within the Moray Firth are associated with human activities that take place within the riverine, tidal and coastal waters as opposed to offshore waters (Moray Firth Partnership, 2007; Moray Offshore Windfarm (West) Limited, 2018). Sources of potential impacts relate to sewage, industrial discharges and diffuse discharges (Moray Offshore Windfarm (West) Limited, 2018).

[6] https://marinescotland.atkinsgeospatial.com/nmpi

Table 7.2. Mean monthly water temperature (surface) and salinity (surface) pooled for cells within the Array Area and Offshore ECC of the Proposed Development based on climatology data between 1971 and 2000. Source: Scotland's National Marine Plan Interactive Map.

Month	Mean Water Temperature (Surface; °C)		Mean Salinity (Surface; ‰)	
	Array Area	Offshore ECC	Array Area	Offshore ECC
January	7.5	7.3	34.7	34.7
February	6.6	6.4	34.7	34.7
March	5.8	5.6	34.7	34.7
April	7.2	6.2	34.7	34.6
May	8.3	8.3	34.7	34.7
June	10.5	10.6	34.8	34.7
July	11.3	11.4	34.8	34.8
August	12.6	12.8	34.8	34.8
September	12.2	12.3	34.9	34.8
October	11.8	11.8	34.9	34.9
November	10.0	9.8	34.8	34.8
December	8.6	8.5	34.9	34.8

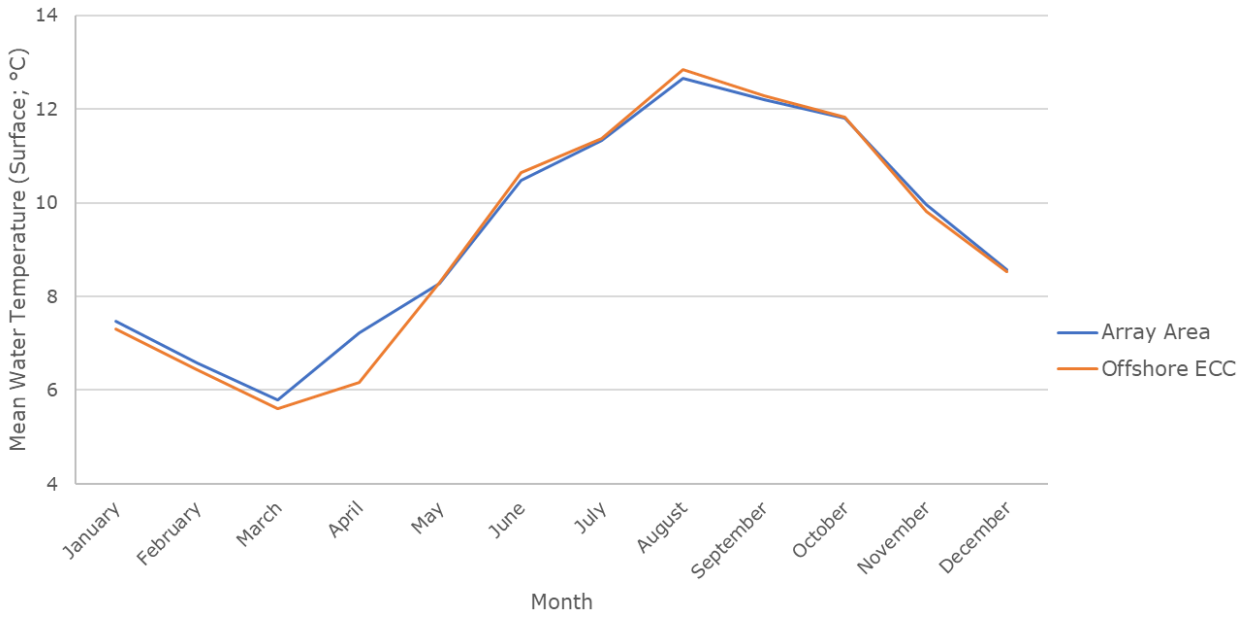


Figure 7.1. Mean monthly water temperature (surface; °C) from combining cells within the Array Area and Offshore ECC of the Proposed Development based on climatology data between 1971 and 2000. Source: Scotland's National Marine Plan Interactive Map.

Water Framework Directive

7.3.2.6 The WFD (2000/60/EC) establishes a framework for the management and protection of Europe's water resources. It is implemented in Scotland through the Water Environment and Water Services (Scotland) Act 2003 and the Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended), more commonly known as the Controlled Activity Regulations (CAR).

7.3.2.7 The WFD divides rivers, lakes, lagoons, estuaries, coastal waters (out to one nautical mile from the low water mark), man-made docks and canals into a series of discrete surface water bodies. It sets ecological as well as chemical targets (objectives) for each surface water body. For a surface water body to be at overall good status, the water body must be achieving good ecological status (GES) and good chemical status (GCS). Ecological status is measured on a scale of high, good, moderate, poor or bad, while chemical status is measured as good (pass) or fail (i.e., failing to achieve good).

7.3.2.8 Each surface water body has a hydromorphological designation that describes how modified a water body is from its natural state. Water bodies are either undesignated (i.e., natural, unchanged), designated as a heavily modified water body (HMWB) or designated as an artificial water body (AWB). HMWBs are defined as bodies of water which, as a result of physical alteration by sustainable human use activities (such as flood protection and navigation) are substantially changed in character and cannot therefore meet GES. AWBs are artificially created through human activity. The default target for HMWBs and AWBs under the WFD is to achieve good ecological potential (GEP), a status recognising the importance of their human use while ensuring ecology is protected as far as possible.

7.3.2.9 The ecological status of surface waters is classified using information on the biological (e.g., fish, benthic invertebrates, phytoplankton, angiosperms and macroalgae), physico-chemical (e.g., dissolved oxygen and salinity) and hydromorphological (e.g., hydrological regime) quality of the body of water, as well as several specific pollutants (e.g., copper and zinc). Compliance with chemical status objectives is assessed in relation to Environmental Quality Standards (EQS) for a specified list of 'priority' and 'priority hazardous' substances. Two subsequent amendments to the WFD through the development of the Priority Substances Directive (2008/105/EC and 2013/39/EU) have outlined EQS for these substances. The Scotland River Basin District (Standards) Directions 2014 direct SEPA, Scotland's principal environmental regulator, regarding the application of environmental standards for the water environment.

7.3.2.10 The overall objective of the WFD is to achieve GES/GEP and GCS in all inland and coastal waters. There is also a general "no deterioration" provision to prevent decline in water body status.

7.3.2.11 River Basin Management Plans (RBMPs) are a requirement of the WFD, setting out measures for each River Basin District to maintain and improve quality in surface and groundwater water bodies where necessary. RBMPs are to be updated and published on a six-yearly cycle. In 2009, the Scottish Government published the first cycle (2009 to 2015) of RBMPs for the two River Basin Districts in Scotland (Solway Tweed and Scotland), reporting the status and objectives of each individual water body. In 2015, the Scottish Government subsequently published updated RBMPs as part of the second cycle (2015 to 2021) and, most recently, the Scottish Government and SEPA published the third cycle (2021 to 2027) RBMPs in December 2021.

7.3.2.12 The Proposed Development, specifically the Offshore ECC, wholly or partially overlaps with the Findochty to Knock Head (ID: 200497), Banff and Macduff (ID: 200498) and Macduff to Rosehearty (ID: 200499) coastal water bodies and Deveron Estuary transitional water body (ID: 200138), as shown in Figure 7.2. These water bodies are located within the Scotland River Basin District which is reported in the Scotland RBMP (Scottish Government and SEPA, 2021). Table 7.3 presents a summary of the latest classification status of these four coastal and transitional water bodies, all of which are currently (2020 interim classification) achieving at least good overall status.

Table 7.3. Summary of latest classification status (2020) for WFD coastal water bodies in the vicinity of the Proposed Development

Parameter	Coastal Water Body			
	Findochty to Knock Head	Banff and Macduff	Macduff to Rosehearty	Deveron Estuary
Water body ID	200497	200498	200499	0.1
Water body type	Coastal	Coastal	Coastal	Transitional
Water body size (surface area)	135.3 km^2	41.3 km^2	130.9 km^2	0.1 km^2
Overall status	Good	Good	Good	High
Overall ecology	Good	Good	Good	High
Physico-chemical	High	High	High	-
Dissolved oxygen	High	High	High	-
Dissolved inorganic nitrogen	High	High	High	-
Biological elements	Good	Good	Good	-
Invertebrate animals	Good	Good	Good	-
Imposex assessment	-	Good	-	-
Benthic invertebrates (IQI)	Good	Good	Good	-
Macroalgae	High	High	High	-
Macroalgae (FSL)	High	High	High	-
Macroalgae (RSL)	High	High	High	-
Phytoplankton	High	High	High	-
Specific pollutants	Pass	Pass	Pass	-
Copper	-	-	-	-
Zinc	-	-	-	-
Unionised ammonia	Pass	Pass	Pass	-
Hydromorphology	High	High	High	High
Morphology	High	High	High	High
Water quality	Good	Good	Good	-
Chemical status	Pass	Pass	Pass	Pass

Bathing Waters

7.3.2.13 The EU's revised Bathing Water Directive (rBWD; 2006/7/EC) came into force in March 2006. The rBWD has been implemented in Scotland via the Bathing Waters (Scotland) Regulations 2008 (as amended), with Bathing Waters classified against the standards set by the rBWD since 2015. The rBWD provides more stringent standards than the previous (original) Bathing Water Directive (BWD; 76/160/EEC) and places an emphasis on providing information to the public.

7.3.2.14 The rBWD focuses on fewer microbiological indicators, whilst setting higher standards, compared to those of the BWD. Bathing Waters under the rBWD are classified according to the levels of certain types of bacteria (intestinal enterococci and *Escherichia coli*) in samples obtained during the bathing season (May to September). Monitoring of bathing water quality has been reported against rBWD indicators since 2015. The new classification system considers all samples obtained during the previous four years and, therefore, data has been collected for rBWD indicators since 2012. The rBWD has four different Bathing Waters classifications of performance, as follows:

- Excellent – the highest, cleanest class;
- Good – generally good water quality;
- Sufficient – water quality meets minimum required standards; and
- Poor – water quality does not meet the minimum required standards.

7.3.2.15 Inverboyndie is located within the Offshore ECC, while Cullen Bay is approximately 5 km to the west and Rosehearty is approximately 19 km to the east (Figure 7.2). All designated bathing waters within the Moray Firth are reported to have achieved at least sufficient in 2021/22 bathing season (see Table 7.4).

Table 7.4. Bathing water classifications in the vicinity of the Proposed Development.

Bathing Water	Classification				
	2017/18	2018/19	2019/20	2020/21*	2021/22
Dornoch	Excellent	Excellent	Excellent	-	Excellent
Rosemarkie	Good	Good	Good	-	Good
Nairn (Central)	Sufficient	Good	Good	-	Good
Nairn (East)	Sufficient	Sufficient	Sufficient	-	Good
Findhorn	Good	Good	Excellent	-	Excellent
Lossiemouth (East)	Sufficient	Sufficient	Sufficient	-	Sufficient
Cullen Bay	Sufficient	Sufficient	Good	-	Good
Inverboyndie	Sufficient	Sufficient	Sufficient	-	Good
Rosehearty	Good	Good	Excellent	-	Excellent
Fraserburgh (Tiger Hill)	Sufficient	Sufficient	Good	-	Good
Fraserburgh (Philorth)	Excellent	Excellent	Excellent	-	Excellent
* Note: There were no classifications calculated for 2020/21 due to the shortened season and reduced sampling during the COVID-19 pandemic.					

Shellfish Water Protected Areas

7.3.2.16 The Shellfish Waters Directive (2006/113/EC) was repealed in 2013 and subsumed within the WFD. In Scotland, it has been replaced by the Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 (as amended). The Order identifies 85 coastal areas as shellfish waters, which are identified on a series of maps[7].

7.3.2.17 The Water Environment (Shellfish Water Protected Areas: Environmental Objectives etc.) (Scotland) Regulations 2013 set environmental objectives for Shellfish Water Protected Areas, while The Scotland River Basin District (Quality of Shellfish Water Protected Areas) (Scotland) Directions 2021 direct SEPA on how to assess and classify the quality of Shellfish Water Protected Areas for the Scotland River Basin District. The Directions enable SEPA to assess and classify Shellfish Water Protected Areas as Excellent, Good or Insufficient based on thresholds for the 'most probable number of *Escherichia coli* per 100 g sample of shellfish flesh and intra-valvular liquid as a 90-percentile standard'.

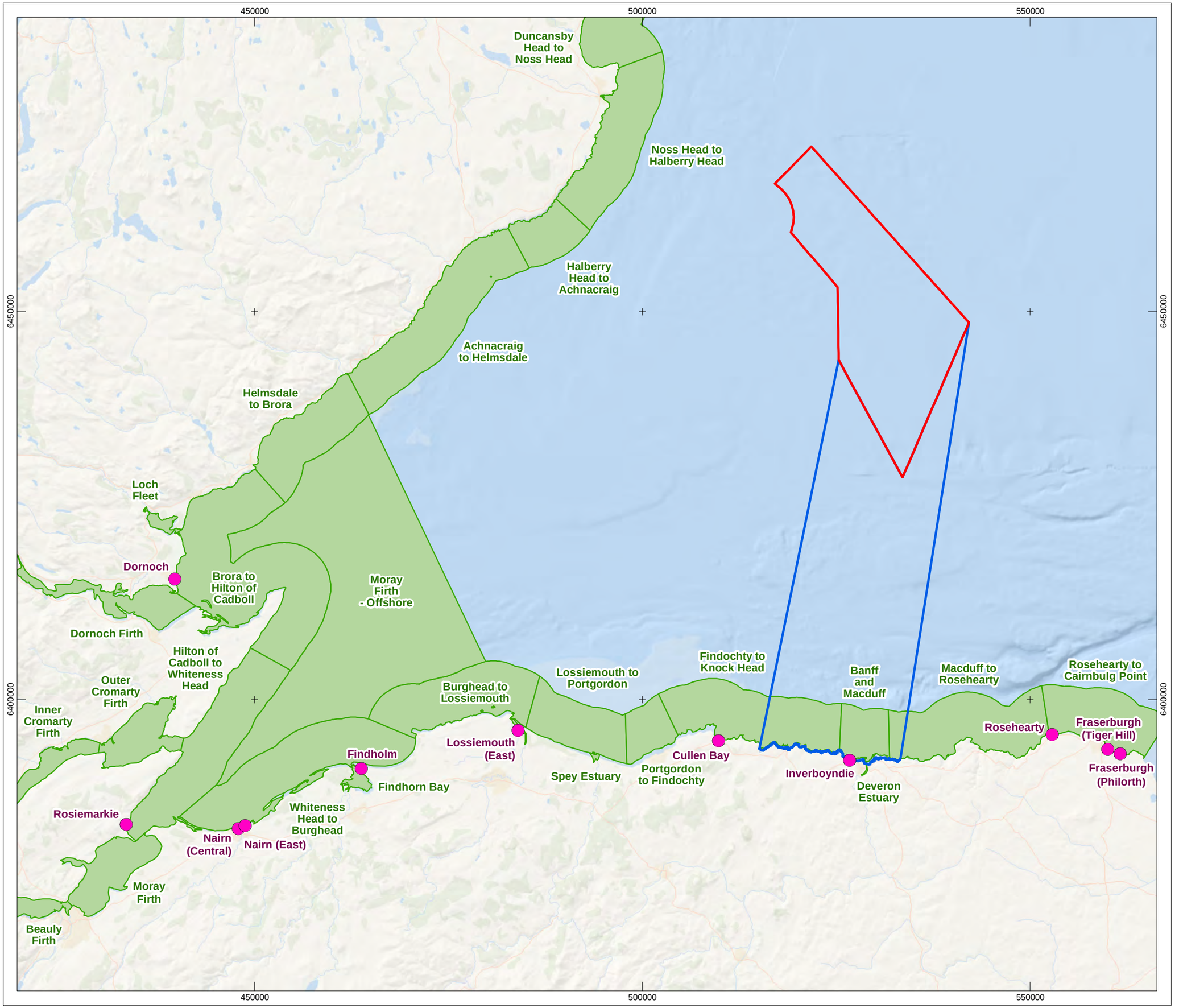
7.3.2.18 There are two Shellfish Water Protected Areas in the Moray Firth, namely Cromarty Bay and Dornoch Firth. However, both areas are located within the Inner Moray Firth, greater than 70 km to the west of the Proposed Development. Furthermore, Production Areas for Cromarty Bay (Pacific oyster)[8] and Dornoch Firth (common mussels)[9] were declassified as part of the 2017/18 season and have not been classified since.

Sensitive Areas

7.3.2.19 The Urban Waste Water Treatment Directive (91/271/EEC), implemented in Scotland via the Urban Waste Water Treatment (Scotland) Regulations 1994 (as amended), aims to protect the environment from the adverse effects of the collection, treatment and discharge of urban waste water. It sets treatment levels on the basis of sizes of sewage discharges and the sensitivity of waters receiving the discharges. In general, the Directive requires that collected waste water is treated to at least secondary treatment standards for significant discharges. Secondary treatment is a biological treatment process where bacteria are used to break down the biodegradable matter (already much reduced by primary treatment) in waste water. Sensitive areas under the Urban Waste Water Treatment Directive are water bodies affected by eutrophication or elevated nitrate concentrations and act as an indication that action is required to prevent further pollution caused by nutrients.

7.3.2.20 There are three 'Sensitive Areas (Eutrophic and Freshwater Fish) Rivers' which drain into the Moray Firth within the Offshore ECC, namely River Deveron – Turriff to tidal limit, Boyne Burn (including Burn of Corncairn) and Fordyce Burn. In addition, Inverboyndie is designated as a Sensitive Area (Bathing Waters) which is located within the Offshore ECC (Defra, 2012).

[7] https://www.gov.scot/publications/shellfish-water-protected-areas-maps
[8] https://www.sepa.org.uk/media/593904/swpa-11_cromarty-bay.pdf
[9] https://www.sepa.org.uk/media/593906/swpa-13_dornoch-firth.pdf



Legend

- Array Area
- Offshore Export Cable Corridor
- Bathing Water Locations
- Surface Water Bodies

Scale at A3: 1:450,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	DL	DH
Date: 10/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MWS_MAP_00042		

Figure 7.2

WFD surface water bodies and bathing water locations

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Sediment Quality

7.3.2.21 Unlike water quality, there are no formal quantitative EQS for sediments. Therefore, in the absence of any quantified UK standards, common practice for characterising baseline sediment quality conditions is to compare against Action Levels for the disposal of dredged material as defined by Marine Scotland (2017). These Action Levels, as shown in Table 7.5 are used as part of a 'weight of evidence' approach to assessing material suitability for disposal at sea. In general, contaminant levels below Action Level 1 (AL1) are of no concern and are unlikely to influence the licensing decision. However, material with contaminant levels above Action Level 2 (AL2) is generally considered unsuitable for disposal at sea. Dredged material with contaminant levels between AL1 and AL2 requires further consideration and testing before a decision can be made. However, the Action Levels should not be viewed as pass/fail threshold, instead providing an appropriate context for consideration of contaminant levels in sediments for dredging/disposal works and other activities which disturb the seabed.

Table 7.5. Action Levels (Marine Scotland, 2017).

Contaminant	Actions Levels	
	AL1 (mg/kg)	AL2 (mg/kg)
Arsenic	20	70
Cadmium	0.4	4
Chromium	50	370
Copper	30	300
Lead	50	400
Mercury	0.25	1.5
Nickel	30	150
Zinc	130	600
Tributyltin (TBT)	0.1	0.5
Polychlorinated Biphenyls (PCBs)	0.02	0.18
Polyaromatic Hydrocarbons (PAHs)*	0.1*	-
Total Hydrocarbons	100	-
* AL1 for PAHs set for all United States Environmental Protection Agency (USEPA) Suite of 16 compounds, except for Dibenzo(a,h)anthracene (set at 0.01 mg/kg).		

7.3.2.22 The 2018 assessment of the UK's Clean Seas Environment Monitoring Programme (CSEMP)[10] described the status and trends of contaminant concentrations and biological effects measurements in biota and sediment at monitoring stations in waters around the UK. The results of the individual time series at coastal and offshore stations were synthesised to assess status and trends at the biogeographic regional level. Four monitoring stations were located within the Moray Firth, with one station (Southern Moray Firth) within the Offshore ECC of the Proposed Development.

7.3.2.23 Table 7.6 presents a summary of metal concentrations reported at the four CSEMP monitoring stations in the Moray Firth using data collected between 1999 to 2017.

[10] https://data.marine.gov.scot/dataset/contaminant-and-biological-effect-data-1999-2017-2018-csemp-assessment

Overall, contaminant concentrations in sediments were consistently low, with only minor exceedances of AL1 for cadmium (Whiteness Head only), chromium (Southern Moray Firth only), copper (Southern Moray Firth only) and mercury (Outer Moray Firth and Whiteness Head). There were no samples reported at any of the monitoring stations within the Moray Firth where concentrations exceeded the respective AL2.

Table 7.6. Summary of contaminant concentrations in sediments analysed from monitoring stations in the Moray Firth as part of the CSEMP assessment (1999-2017).

Metal	Sediment Concentration (mg/kg)			
	Southern Moray Firth (Offshore ECC; 2006 – 2017)	Outer Moray Firth (1999 – 2017)	Inner Moray Firth (2006 – 2017)	Whiteness Head (1999 – 2017)
Arsenic	$\bar{x}$ = 4.04 (0.4 - 7.64) *n* = 120	$\bar{x}$ = 3.96 (0.40 – 15.0), *n* = 54	$\bar{x}$ = 5.24 (1.00 - 11.8), *n* = 60	$\bar{x}$ = 7.51 (2.16 - 10.3), *n* = 45
Cadmium	$\bar{x}$ = 0.099 (0.031 - 0.24), *n* = 120	$\bar{x}$ = 0.140 (0.062 - 0.36), *n* = 54	$\bar{x}$ = 0.094 (<0.062 - 0.187), *n* =60	$\bar{x}$ = 0.181 (<0.07 - 1.460), *n* = 45
Chromium	$\bar{x}$ = 30.7 (9.60 - 53.9), *n* = 120	$\bar{x}$ = 18.5 (6.01 - 53.0), *n* = 54	$\bar{x}$ = 32.1 (11.1 - 66.2), *n* = 60	$\bar{x}$ = 49.9 (21.2 - 69.8), *n* = 45
Copper	$\bar{x}$ = 5.66 (1.35 - 56.4), *n* = 120	$\bar{x}$ = 2.78 (1.27 - 8.73), *n* = 54	$\bar{x}$ = 4.54 (0.15 - 12.5), *n* = 60	$\bar{x}$ = 9.25 (2.27 - 12.4), *n* = 45
Lead	$\bar{x}$ = 12.0 (5.90 - 32.2), *n* = 120	$\bar{x}$ = 9.47 (5.86 - 28.7), *n* =54	$\bar{x}$ = 14.0 (7.01 - 31.4), *n* = 60	$\bar{x}$ = 27.0 (12.1 - 38.3), *n* = 45
Mercury	$\bar{x}$ = 0.020 (<0.007 - 0.096), *n* = 110	$\bar{x}$ = 0.056 (<0.007 - 0.290), *n* = 53	$\bar{x}$ = 0.022 (<0.007 - 0.092), *n* = 55	$\bar{x}$ = 0.088 (0.026 - 0.290), *n* = 44
Nickel	$\bar{x}$ = 9.74 (3.20 - 18.8), *n* = 120	$\bar{x}$ = 5.39 (0.94 - 19.6), *n* = 54	$\bar{x}$ = 10.2 (3.16 - 24.8), *n* = 60	$\bar{x}$ = 17.4 (8.28 - 22.3), *n* = 45
Zinc	$\bar{x}$ = 25.0 (10.0 - 68.6), *n* = 120	$\bar{x}$ = 19.3 (4.56 - 73.0), *n* = 54	$\bar{x}$ = 29.9 (9.92 - 71.0), *n* = 60	$\bar{x}$ = 57.7 (14.4 - 71.5), *n* = 45
$\bar{x}$ = mean concentration (range in brackets); *n* = number of samples.				

7.3.2.24 The Intermediate Assessment 2017 prepared by OSPAR (2017) reviewed and compared mercury, cadmium, lead, organotin (limited data), PCB, PAH and polybrominated diphenyl ether (PBDE) concentrations in sediments between OSPAR contaminant assessment areas (including data collated as part of the CSEMP assessment). The four monitoring stations in the Moray Firth form part of the Northern North Sea region.

7.3.2.25 Mercury and lead concentrations in sediment are at or above the Background Assessment Concentrations (BAC) in the Northern North Sea, while lead concentrations are also at or above the Effects Range-Low (ERL) value as proxy for Environmental Assessment Criteria (EAC). Mean concentrations of cadmium are below the BAC. PCB concentrations are decreasing in the Northern North Sea, although while concentrations of PCB congener 118 in sediments are below the EAC, they are still above the BAC. Mean PAH concentrations in sediment monitored within the Northern North Sea were statistically significantly below the ERL but not below the BAC. The majority of measured concentrations of PBDEs in sediment are low and often below detection levels. There were enough years of data from some of the monitoring sites in the Northern North Sea to carry out temporal trend analyses, which indicated PBDE concentrations are currently showing no statistically significant change in the region.

7.4 Embedded Mitigation Considered within the EIA

7.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

7.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for MW&SQ are noted within Table 7.7 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to MW&SQ receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring;
- M-4: Scour protection where there is the potential for scour to develop around infrastructure (foundations and cables).
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management;
- M-9: Development of and adherence to a Marine Pollution Contingency Plan (MPCP). The MPCP will identify potential sources of pollution and associated spill response and reporting procedures; and
- M-10: Development of and adherence to a DP. The DP will outline measures for the decommissioning of the Proposed Development.

7.5 Scoping of Impacts

7.5.1.1 Potential impacts on MW&SQ have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are based on the assessment of the baseline environment detailed in Section 7.3 and are outlined in Table 7.7.

7.5.1.2 It is noted that MW&SQ also provides impact pathways for other receptors. Information on changes to the MW&SQ pathways will be used to inform other EIA topic assessments, such as:

- Benthic Subtidal and Intertidal Ecology (Chapter 8);
- Fish and Shellfish Ecology (Chapter 9);
- Marine Mammals and Other Megafauna (Chapter 11); and
- Commercial Fisheries (Chapter 12).

Table 7.7. EIA Scoping assessment for Marine Water and Sediment Quality.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Deterioration in water quality due to suspension of sediments	M-1, M-4, M-8, M-10	Scoped in	Sediment disturbance and resuspension arising from construction activities, such as cable laying and foundation installation may result in adverse effects on marine water quality such as increased nutrients, decreased dissolved oxygen, a reduction in water clarity or an increase and/or reduction in primary production.	✓	✓	✓	✓	✓
Release of sediment-bound contaminants from disturbed sediments	M-1, M-8	Scoped in	Sediment disturbance arising from construction activities, such as cable laying and foundation installation, may result in adverse effects on marine water quality. This can be a result of temporary re-suspension and redistribution of existing contaminants within the seabed sediments.	✓	✓	✓	✓	✓
Deterioration in water clarity due to the release of drilling mud	M-1, M-8, M-9, M-10	Scoped in	There is a requirement to use drilling mud, such as bentonite (or another inert mud), in order to undertake horizontal directional drilling (HDD) at landfall, if required. This in turn may result in the release of drilling mud at the punch out point. The principal issue, for MW&SQ receptors, relating to bentonite release to the water column comprise the potential for an increase in SSC (and so turbidity) within the water column and potential reduction in bacterial mortality, as opposed to contamination.	✗	✗	✗	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Accidental releases or spills of materials or chemicals	M-8, M-9, M-10	Scoped out	Substances such as grease, oil, fuel, anti-fouling paints and grouting materials may be accidentally released or spilt into the marine environment. No discharges (continuous or intermittent) of chemicals or construction materials are proposed during the construction phase of the Proposed Development which may be toxic or persistent within the marine environment. Nevertheless, the impacts are likely to be short-lived and localised. In the event of an accidental chemical or oil spill, hydrocarbons would rapidly be dispersed or diluted. As well as this, all vessels on the Proposed Development will be required to comply with strict environmental controls set out in the Project Environmental Monitoring Programme (PEMP) and MPCP which will minimise the risk and set out provisions for responding to spills during construction or decommissioning. Due to the implementation of control measures and small quantities of hydrocarbons and chemicals, it is proposed to scope this impact out of further consideration within the EIA.	X	X	X	X	X

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Deterioration in status of WFD transitional and/or coastal water body	M-1, M-8, M-9, M-10	Scoped in	Construction and decommissioning activities could result in a deterioration in status of transitional and coastal water bodies, such as through seabed disturbance during cable installation. However, given the boundaries of WFD coastal water bodies extend to 1 nm from the low water mark only, it is anticipated that potential impacts would be limited to works associated with the export cables and landfall. A WFD compliance assessment will be produced as part of the EIA.	✗	✗	✗	✓	✓
Deterioration in Bathing Water quality	M-1, M-8, M-9, M-10	Scoped in	Construction and decommissioning activities could result in a deterioration to Bathing Water classifications. For example, the increased turbidity associated with sediment plumes could result in reduced bacterial mortality, influencing Bathing Water classifications during the bathing season. It is anticipated that potential impacts would be limited to works associated with the export cables and landfall.	✗	✗	✗	✓	✓
Operation and Maintenance								
Deterioration in water quality due to suspension of sediments from O&M activities	M-1, M-4, M-8, M-10	Scoped in	If a section of the cable became exposed or damaged it would require reburial and/or replacement. Reburial (and/or replacement) would be undertaken using similar techniques to those used to install the cables.	✗	✗	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Accidental releases or spills of materials or chemicals	M-8, M-9, M-10	Scoped out	There is a potential risk of the accidental spillage or release of materials such as grease and oils during maintenance work and from vessels associated with the Proposed Development during the O&M phase. Nevertheless, the impacts are likely to be short-lived and localised. In the event of an accidental chemical or oil spill, hydrocarbons would rapidly be dispersed or diluted. As well as this, all vessels on the Proposed Development will be required to comply with strict environmental controls set out in the PEMP and MPCP which will minimise the risk and set out provisions for responding to spills during O&M. Due to the implementation of control measures and small quantities of hydrocarbons and chemicals, it is proposed to scope this impact out of further consideration within the EIA.	X	X	X	X	X
Deterioration in water quality due to re-suspension and deposit of sediments from scour	M-1, M-4, M-8	Scoped out	There is the potential that sediment could be re-suspended as a result of scour around infrastructure (including foundations and cable protection). Given that the volume of suspended sediment released during operation via scour would be much lower than during construction or repair works, it is proposed that this impact will be scoped out from further consideration within the EIA. Furthermore, the effect will be highly localised and associated volumes of mobilised sediment (and associated contaminants) are considered to be within the range of natural variability.	X	X	X	X	X

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Changes in water and sediment quality associated with cleaning of infrastructure	M-8, M-9	Scoped out	Routine maintenance activities (e.g., removal/cleaning of biofouling) on infrastructure may potentially result in reduced water and sediment quality in the immediate vicinity of the activity. Such operational cleaning may also release paints used on the infrastructure. Any impacts are likely to be small scale, temporary, short-lived and highly localised. Risks will also be adequately managed through the embedded mitigation measures, including using anti-biofouling paints suitable for the marine environment and fauna.	✗	✗	✗	✗	✗
Deterioration in status of WFD transitional and/or coastal water body	M-1, M-8, M-9, M-10	Scoped in	O&M activities could result in a deterioration in status of transitional and coastal water bodies, such as through seabed disturbance during cable repairs/replacement. Given the boundaries of WFD coastal water bodies extend to 1 nm from the low water mark only, it is anticipated that potential impacts would be limited to works associated with the export cables. A WFD compliance assessment will be produced as part of the EIA.	✗	✗	✗	✓	✗
Deterioration in Bathing Water quality	M-1, M-8, M-9, M-10	Scoped in	O&M activities could result in a deterioration to Bathing Water classifications. For example, the increased turbidity associated with sediment plumes could result in reduced bacterial mortality, potentially influencing Bathing Water classifications during the bathing season. It is anticipated that potential impacts would be limited to works associated with the export cables.	✗	✗	✗	✓	✗

7.6 Potential Cumulative Impacts

7.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For MW&SQ, cumulative interactions may occur with other planned OWFs as well as other activities in the study area.

7.6.1.2 As noted in Section 7.2, the MW&SQ study area is consistent with that presented in Chapter 6 (Marine and Coastal Processes) and may be further refined following detailed assessments of tidal excursions and specifically sediment transport pathways to allow a definition of the ZoI. While the predicted effects of the Proposed Development are anticipated to be largely localised within the footprint of the Proposed Development, there is the possibility that certain impacts could interact with other projects, plans and activity, resulting in a cumulative effect on MW&SQ receptors. There is potential for cumulative effects during the construction, O&M and decommissioning stages of the Proposed Development with other offshore infrastructure in the Moray Firth.

7.6.1.3 The CIA for MW&SQ will consider the maximum adverse design scenario for each of the project, plan or activity in question in line with the methodology outlined in Chapter 4 (EIA Methodology).

7.7 Potential Transboundary Impacts

7.7.1.1 No transboundary impacts on MW&SQ pathways are anticipated to occur as a result of the Proposed Development activities during construction, O&M or decommissioning. Any predicted impacts on these pathways will largely be localised to within the study area and will not give rise to effects on the marine environment beyond UK waters. Therefore, it is proposed to scope out transboundary impacts with regards to MW&SQ.

7.8 Proposed Approach to EIA

7.8.1 Relevant Data Sources

7.8.1.1 A detailed desk-based collation and review of available data will be undertaken to inform the EIA, including updated classifications for WFD water bodies and Bathing Waters. The Applicant will request any MW&SQ data held by SEPA for areas of the Moray Firth of relevance to the Proposed Development. This will be supplemented by site-specific sediment sampling, with laboratory analysis providing details of particle size distribution and contaminant concentrations in sediment within the Array Area and Offshore ECC. It is anticipated that sediment sampling will be undertaken alongside the benthic survey works planned for March 2023. The survey specification will be agreed with Marine Scotland in advance of the surveys being undertaken. It is noted that survey works will not involve the collection of water samples for subsequent laboratory analysis.

7.8.2 Guidance

7.8.2.1 The assessment of MW&SQ will also follow the guidance documents presented below and where they are specific to this topic:

- EIA for offshore renewable energy projects (BSI, 2015);
- Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (MS-LOT, 2018);
- Coastal Process Modelling for Offshore Wind Farm Environmental Impact Assessment: Best Practice Guidance (Lambkin *et al*., 2009);
- OSPAR Assessment of the Environmental Impacts of Cables (OSPAR, 2009);
- Review of Cabling Techniques and Environmental Effects Applicable to the Offshore Wind Farm Industry (BERR, 2008a);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Cefas, 2011);
- Guidance for Pollution Prevention (GPP) Note 5 (GPP5) – Works and maintenance in or near water produced by Natural Resources Wales (NRW), the Northern Ireland Environment Agency (NIEA) and SEPA (2018); and
- Pre-disposal Sampling Guidance. Version 2 – November 2017 (Marine Scotland, 2017).

7.8.2.2 In the absence of formal guidance for the preparation of WFD compliance assessments in Scotland, the Environment Agency's "Clearing the Waters for All" process will be used as a template for the assessment[11], as well as Advice Note Eighteen: The Water Framework Directive (Planning Inspectorate, 2017) (unless an alternative is suggested during consultation). This guidance outlines how to assess the impact(s) of activities in transitional and coastal waters in relation to WFD objectives, setting out the following three stages:

- Screening: exclude any activities that do not need to go through the scoping or impact assessment stages;
- Scoping: identify the receptors and quality elements that are potentially at risk from an activity and need further detailed assessment; and
- Assessment: consider the potential impacts of an activity, identify ways to avoid or minimise impacts, and indicate if an activity may cause deterioration or jeopardise the water body achieving GS.

7.8.3 Assessment Methodology

7.8.3.1 The EIA will follow the general approach outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report.

7.8.3.2 The study area for the MW&SQ baseline within the EIA will be as currently outlined but will be further refined to focus on the final Offshore ECR. The scope of the MW&SQ assessment is to characterise and understand the physical (e.g., SSCs, dissolved oxygen) and chemical (contaminants) conditions present within the study area, and how these could be impacted by the Proposed Development. While this will be used to assess potential impacts to MW&SQ as a receptor in its own

[11] https://www.gov.uk/guidance/water-framework-directive-assessment-estuarine-and-coastal-waters

right, it will also inform other topic specific assessments, for example Benthic Subtidal and Intertidal Ecology (see Chapter 8), Fish and Shellfish Ecology (see Chapter 9), Marine Mammals and Other Megafauna (see Chapter 11) and Commercial Fisheries (see Chapter 12).

7.8.3.3 The MW&SQ assessment will consider the magnitude and duration of the impact, the reversibility of the impact and the timing and frequency of the activity (e.g., this will be an important factor in assessing impacts to Bathing Waters during the bathing season). An assessment of potential impacts of the Proposed Development will be undertaken through application of the Evidence Base (including site specific sediment contamination data), alongside outputs from numerical modelling activities described in Chapter 6 (Marine and Coastal Processes). The significance of any changes will be evaluated against the likely naturally occurring variability in, or long-term changes to, the marine physical environment within the lifetime of the Proposed Development due to natural cycles, for example storm events.

7.8.3.4 Consultation will be undertaken at pivotal points throughout the EIA process to ensure that the approach, including the application of the Evidence Base, satisfies the requirements of both stakeholders and regulators.

7.9 Scoping Questions

7.9.1.1 The questions in Table 7.8 are posed to consultees to frame and focus responses to the MW&SQ scoping exercise, which will in turn inform the Scoping Opinion.

Table 7.8. EIA scoping questions for Marine Water and Sediment Quality.

Scoping Questions – Marine Water and Sediment Quality
Do you agree with the data sources, including project specific surveys, to be used to characterise the MW&SQ baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for MW&SQ?
Do you agree with the project impacts which have been scoped out of the EIA for MW&SQ?
Do you agree that transboundary impacts for MW&SQ may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to MW&SQ that have been identified for the Proposed Development?

8 Benthic Subtidal and Intertidal Ecology

8.1 Introduction

8.1.1.1 This chapter of the Offshore Scoping Report identifies the Benthic Subtidal and Intertidal Ecology receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

8.1.1.2 This offshore scoping chapter should be read alongside the following:

- Marine and Coastal Processes (Chapter 6);
- Marine Water and Sediment Quality (Chapter 7); and,
- Fish and Shellfish Ecology (Chapter 9).

8.2 Study Area

8.2.1.1 The benthic subtidal and intertidal ecology study area is defined by the Proposed Development footprint, presented in Figure 8.1, plus an appropriate buffer. This includes the Array Area and the Offshore ECC, the proposed intertidal landfall, as well as a wider ZoI associated with secondary impacts.

8.2.1.2 The ZoI buffer for the assessment of benthic subtidal and intertidal ecology therefore encompasses the area over which suspended sediment might travel following disturbance as a result of the Proposed Development. For the purposes of scoping it is assumed this distance encompasses the spring tidal excursion distance, which has been defined as 2 to 6 km (ABPmer *et al.*, 2008), so a maximum precautionary buffer distance has been defined as 6 km. This buffer has been defined based on previous project experience at the neighbouring Moray West OWF, as well as expert judgement of the range over which indirect effects of Proposed Development may have an impact on benthic ecology receptors (for example, increased suspended sediment concentrations and deposition).

8.2.1.3 The intertidal ecology study area is defined by the intertidal zone extending up to the MHWS mark within the Offshore ECC (Figure 8.1).

8.2.1.4 This study area may be refined as required at post-scoping stages to reflect any site-specific sediment plume modelling work that may be undertaken as part of the Marine and Coastal Processes assessment (see Chapter 6), as well as stakeholder consultation and refinements to the Proposed Development design. This will result in an adapted and refined study area for the EIAR which will be based on all activities carried out throughout the Proposed Development stages.

8.3 Baseline Environment

8.3.1 Data Sources

8.3.1.1 The data sources that have been used to inform this Benthic Subtidal and Intertidal Ecology chapter of the Offshore Scoping Report are presented within Table 8.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

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Legend

- Array Area
- Offshore Export Cable Corridor
- Benthic Ecology Study Area

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AdB	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_BEN_MAP_00005		

Figure 8.1

Benthic Subtidal and Intertidal Ecology study area

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Table 8.1. Summary of key publicly available datasets for Benthic Subtidal and Intertidal Ecology.

Title	Source	Year	Author
Existing OWF Data			
Beatrice OWF Post-Construction Monitoring Year 2 (2021): Benthic Grab Survey Report	https://marine.gov.scot/sites/default/files/p6764_beatrice_owf_-_benthic_grab_survey_monitoring_report_year_2_post-construction_-_12.01.2022_final.pdf	2022	Beatrice Offshore Wind Farm Ltd (BOWL)
Moray West OWF Intertidal Survey Report	https://marine.gov.scot/sites/default/files/00538036_3.pdf	2018	Moray OWF (West) Ltd
Moray West OWF Benthic Survey Report	https://marine.gov.scot/sites/default/files/00538036_3.pdf	2018	Moray OWF (West) Ltd
Moray East Environmental Statement Technical Appendices - Benthic Subtidal and Intertidal Ecology Characterisation Reports	https://www.morayeast.com/application/files/1315/8014/0645/Appendix-4-2-A-Benthic-Ecology-Wind-Farm-Sites.pdf https://www.morayeast.com/application/files/7515/8014/3988/Technical-Appendices-Biological-Environment.pdf	2011; 2014	Moray Offshore Renewables Ltd
Publicly Available Datasets/Reports			
EMODnet broad scale seabed habitat map for Europe (EUSeaMap) (2021) EUNIS 2019 habitat types (EMODnet, 2021)	https://www.emodnet-seabedhabitats.eu	2021	EMODnet
EMODnet Seabed Habitats collated habitat point data (in EUNIS system)	http://gis.ices.dk/geonetwork/srv/eng/catalog.search#/metadata/ef3966c9-187b-416a-8a74-e0a853f6fcfa	2019	EMODnet
Marine Protected Area (MPA) network (SPAs, site of special scientific interests (SSSIs), MPAs, SACs)	http://marine.gov.scot/node/12790	2018b	Scottish Government
Kelp bed habitat information	http://marine.gov.scot/node/14689	2018b	Scottish Government

Title	Source	Year	Author
Burrowed mud habitat information	http://marine.gov.scot/node/14626	2018b	Scottish Government
Ocean Quahog habitat information	http://marine.gov.scot/node/12704	2018b	Scottish Government
Cefas OneBenthic Baseline Tool	https://openscience.cefas.co.uk/ob_baseline	2017	Cefas
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited
Literature			
Towards Quantitative Spatial Models of Seabed Sediment Composition	https://journals.plos.org/plosone/article?id=10.1371/journal.pone.0142502	2015	Stephens and Diesing (2015)
A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploitation of the seabed	https://www.nature.com/articles/s41598-017-11377-9	2017	Cooper and Barry (2017)

8.3.2 Overview of Baseline Environment

Array Area

8.3.2.1 Figure 8.2 shows Cefas seabed sediment modelling data across the Array Area (Cefas, 2015). These data indicate the presence of sand and muddy sand with a band of coarse sediments running through the centre of the Array Area.

8.3.2.2 A total of three broadscale sediment habitats have been identified within the Array Area through a review of the EUSeaMap data (2021) presented in Figure 8.3. The Array Area is primarily characterised by deep circalittoral sand with smaller areas of deep circalittoral coarse sediment to the east and west and a limited area of deep circalittoral mud in the eastern most region of the Array Area. Within the wider benthic ecology study area outwith the Array Area, the broadscale sediment habitats are similar, but with a small patch of deep circalittoral mixed sediments in the east and no deep circalittoral mud recorded.

8.3.2.3 The Cefas seabed sediment modelling data provides a low-level characterisation compared to the EUSeaMap data; however, the datasets do correspond to one another as the coarse sediment band recorded in Cefas data is in the same region as the circalittoral coarse sediment in EUSeaMap data.

8.3.2.4 Across the Array Area, there are no recorded PMFs or sites designated for nature conservation (Figure 8.4).

8.3.2.5 Benthic characterisation surveys carried out in the neighbouring (west) Moray West OWF site (which included infaunal grab sampling, drop down video (DDV) surveillance and contaminant analysis) indicated that seabed habitats were characterised by extensive areas of rippled sublittoral sands and muddy sands, with occasional stones and cobbles sporadically recorded. In some areas of the Moray West site, primarily in the eastern half of the survey area, a habitat comprising of mixed gravelly sediment was recorded at a number of stations. Coarser sediments were also located across Moray West, with variable coarse/mixed sediments with sand or sandy gravel and patchy stones/cobble recorded at the eastern fringe. Occasional areas of more consolidated surface cobble were recorded, particularly which included a small area likely to be considered stony reef (Moray Offshore Windfarm (West) Limited, 2018).

8.3.2.6 The following biotopes (or slight variants of) were recorded across the Moray West OWF Array Area:

- *Fabulina fabula* and *Magelona mirabilis* with venerid bivalves and amphipods in infralittoral compacted fine muddy sand (EUNIS biotope code: A5.242);
- *Mediomastus fragilis*, *Lumbrineris* spp. and venerid bivalves in circalittoral coarse sand or gravel (EUNIS biotope code: A5.142);
- *Moerella* spp. with venerid bivalves in infralittoral gravelly sand (which is a PMF) (EUNIS biotope code: A5.133);
- *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (EUNIS biotope code: A5.251); and
- Sparse sponges, *Nemertesia* spp. and *Alcyonidium diaphanum* on circalittoral mixed substrata (EUNIS biotope code: A4.135).

8.3.2.7 Details of the benthic environment from the Moray West survey report correspond to those details of the Beatrice OWF post-construction monitoring benthic survey report from 2021 (BOWL, 2022). The Beatrice OWF is located west of the Caledonia OWF Array Area and the report indicates that the sediment type across the entire survey area was predominantly made up of sandy sediments with mud and gravel representing a very small proportion of the total sediment composition. The most dominant biotope recorded during the post-construction survey was *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand' (EUNIS biotope code: A5.251).

8.3.2.8 Site-specific surveys conducted for the Moray East OWF (Moray Offshore Windfarm (East) Limited, 2018) identified the presence of five habitat biotopes across the respective Array Area which is located adjacent to the Caledonia OWF Array Area. These biotopes included sublittoral sand and muddy sediments with patches of circalittoral coarse sediment, seapens and megafauna in circalittoral fine mud, seapens and megafauna in circalittoral fine mud as well as cobbles, boulder and bedrock reef habitat with encrusting algae present.

Offshore ECC

8.3.2.9 According to EUSeaMap data (EMODnet, 2021), the offshore region of the Offshore ECC is dominated by deep circalittoral sand with some limited patches of circalittoral coarse sediment. Moving inshore, there is a band of deep circalittoral mud towards the south of the Offshore ECC. The inshore region of the Offshore ECC is dominated by circalittoral coarse sediment with smaller areas of infralittoral coarse sediment and circalittoral fine sand (Figure 8.3). Within the wider benthic ecology study area outwith the Offshore ECC, the broadscale sediment habitats are similar but with small patches of circalittoral fine sand or circalittoral muddy sand located within areas of circalittoral coarse sediment/deep circalittoral coarse sediment.

8.3.2.10 EUSeaMap (EMODnet, 2021) data corresponds to Cefas (2015) data which shows the offshore region to be dominated by sand and muddy sand, with a band of mud and sandy mud in the south of the Offshore ECC and coarse sediments in the inshore region (Figure 8.2).

8.3.2.11 EUSeaMap (EMODnet, 2019) habitat survey point data exist for the inshore region of the Offshore ECC (Figure 8.3). These habitat points present information from site specific surveys (from a range of sources) and therefore present detail that is not defined in the broadscale habitat mapping data. For example, in the region classified as infralittoral coarse sediment under broadscale mapping data, habitat survey point data describes the presence of Atlantic and Mediterranean high energy infralittoral rock, Atlantic and Mediterranean moderate energy infralittoral rock and features of infralittoral rock.

8.3.2.12 Within the Offshore ECC faunal clusters (Cooper and Barry, 2017) have been identified, predominantly across the deep circalittoral mud sediment. Clusters are fairly homogenous across the sample area with only D2a and D2b being recorded within the inshore region of the Offshore ECC (Figure 8.3). Associated taxa with cluster D2a include Spinnidae, Glyceridae and Nemertea and associated taxa with cluster D2b include Amphyiuridae, Nephtyidae and Lumbrineridae.

8.3.2.13 As part of the Moray West OWF benthic survey (Moray Offshore Windfarm (West) Limited, 2018), site-specific samples taken throughout the Offshore ECC revealed that inshore areas were characterised by relatively clean sublittoral sand with small portions of shell grit or fine gravel. There were also areas of coarse mixed

sediments and some areas of cobbles and boulders, which were often characterised by patchy hydroid and/or bryozoan turf. Brittle star beds were also recorded across the Moray West Offshore ECC.

8.3.2.14 The deeper water regions of the Moray West Offshore ECC were characterised by areas of sandy mud or very muddy sand as well as the sea pen *Pennatula phosphorea*. There was also an abundance of burrows and pits present on the seabed. Taxa that were present included *Virigularia mirabilis*, curled octopus (*Eledone cirrhosa*) sparse hydroids/bryozoa and plaice (*Pleuronectes platessa*). Areas of burrowed mud habitat were recorded, which is a PMF.

8.3.2.15 The following biotopes (or slight variants of) were recorded across the Moray West Offshore ECC:

- *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (EUNIS biotope code: A5.251);
- Seapens and burrowing megafauna in circalittoral fine mud in areas of deeper muddy sediment (EUNIS biotope code: A5.361; PMF);
- *Flustra foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment (EUNIS biotope code: A5.444); and
- Sparse sponges, *Nemertesia* spp. and *Alcyonidium diaphanum* on circalittoral mixed substrata (EUNIS biotope code: A4.135).

8.3.2.16 The Moray East Offshore ECC follows a very similar route to the Offshore ECC of the Proposed Development. Site-specific surveys of the Moray East Offshore ECC (Moray Offshore Renewables Limited, 2011) indicate that the region was predominantly made up of homogenous sedimentary habitat with areas of muddy sand, fine sandy mud, mixed sandy gravels. The fauna that were recorded from infaunal grab samples included seapens, *Pennatula phosphorea* and *Virgularia mirabilis*. The offshore region of the Moray East Offshore ECC was largely made up of fine, sandy mud with some patches of more mixed coarse sand, gravel and shell material. Further inshore the sediment type was more varied with mixed sediment types being recorded including cobbles, boulders and exposed bedrock.

8.3.2.17 As with the Array Area for Beatrice OWF, the post-construction monitoring benthic survey revealed that the most dominant biotope recorded during across the Offshore ECC was *Echinocyamus pusillus*, *Ophelia borealis* and *Abra prismatica* in circalittoral fine sand (EUNIS biotope code: A5.251) (BOWL, 2021).

8.3.2.18 Contaminant analysis of sediment grab samples across the Moray West OWF site (Moray Offshore Windfarm (West) Limited, 2018) revealed that all metals were at concentrations below respective guidelines (where available) with no samples above UK limits or Dutch/Canadian standards. PAH concentrations were also low and generally below the limit of detection (LOD) for the analytical tests although LODs for Acenaphthene, Acenaphthylene, Dibenzo(ah)anthracene were slightly higher than the Canadian threshold effect levels values. The environmental assessment at Moray East concluded that sediment contaminants were below guideline values so that no deleterious effects on marine life are expected as a result of the proposed scheme (Moray OWF (East) Limited, 2012). Also see Chapter 7: Marine Water and Sediment Quality.

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Legend

- Array Area
- Offshore Export Cable Corridor
- Benthic Ecology Study Area

Cefas Sediment Model (Cefas, 2015)

- Sand and Muddy Sand
- Mud and Sandy Mud
- Mixed Sediments
- Coarse Sediments

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AdB	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_BEN_MAP_00006		

Figure 8.2

Sediment modelling data across the Array Area and Offshore ECC (Cefas, 2015)

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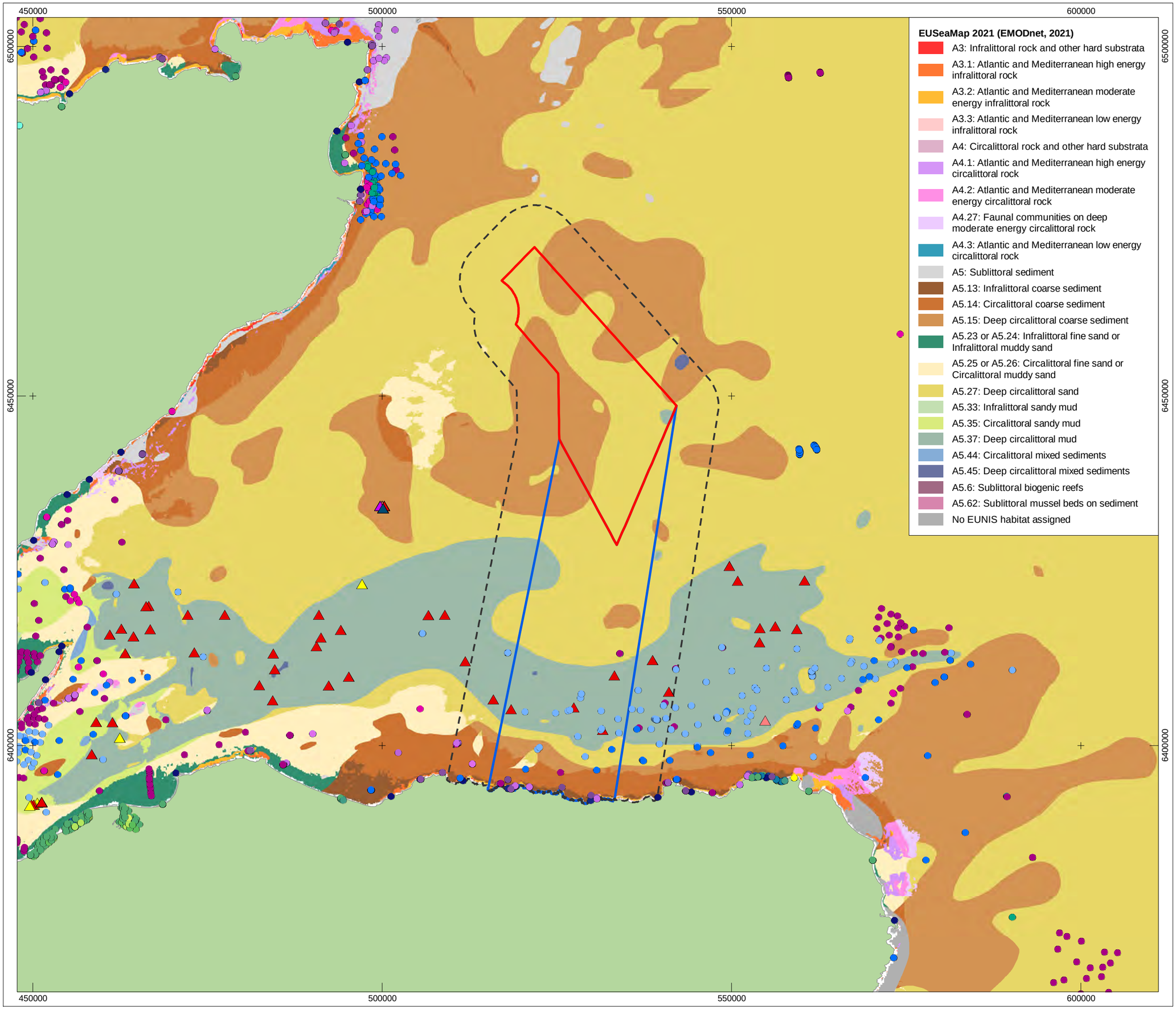

Legend

- Array Area
- Offshore Export Cable Corridor
- Benthic Ecology Study Area

OneBenthic Faunal Data Points (Cefas, 2019)

B1b, D1, D2b, C1b, D2a, D2c

Habitat Survey Point Data (EUNIS) (EMODnet, 2021)

A1, A1.1, A1.2, A1.3, A1.4, A2.1, A2.2, A2.3, A2.4, A2.5, A2.6, A2.7, A3.1, A3.2, A3.3, A3.7, A4.1, A4.2, A4.7, A5, A5.1, A5.2, A5.3, A5.4, A5.5, A5.6, B3.1

Scale at A3: 1:500,000

0 10 20 km

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CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AdB	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_BEN_MAP_00007		

Figure 8.3
Seabed substrate data, overlayed habitat survey point data (EUNIS) and faunal point data (Cefas, 2019; EMODnet, 2019; 2021)

CALEDONIA Offshore Wind Farm

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North Caithness Cliffs SPA
North Caithness Cliffs SPA
Noss Head MPA
East Caithness Cliffs MPA
East Caithness Cliffs SPA
Moray Firth SAC
Moray Firth SPA
Moray and Nairn Coast SPA
Moray and Nairn Coast SPA
Troup, Pennan and Lion's Heads SPA
Southern Trench MPA
Buchan Ness to Collieston Coast SPA

Legend

- Array Area
- Offshore Export Cable Corridor
- Benthic Ecology Study Area
- Special Protection Areas (SPA)
- Special Areas of Conservation (SAC)
- Marine Protected Areas (MPA)

Priority Marine Features (Scottish Gov., 2018)

- Kelp Beds
- Ocean Quahog (Arctica islandica)
- Burrowed Mud
- Burrowed Mud (Area)

Scale at A3: 1:500,000
0 10 20 km
N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AdB	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_BEN_MAP_00008		

Figure 8.4
Sites designated for nature conservation and Priority Marine Features (PMFs; Scottish Government, 2018; 2022)

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Features of Conservation Interest

8.3.2.19 As part of the Benthic Subtidal and Intertidal Ecology scoping exercise, a review has been undertaken to identify sites designated for nature conservation as well as protected species found within the study area.

8.3.2.20 A number of designated sites and PMFs have been identified within the study area, some of which directly overlap with the Offshore ECC (Figure 8.4). Scottish Ministers identified a list of 81 PMFs in 2014 that were named due to their significant role within Scottish marine ecosystems. There are three known PMFs present within the benthic ecology study area enclosing the Proposed Development, namely burrowed mud habitat, ocean quahog (*Arctica islandica*) and kelp beds (predominantly made up of *Laminaria hyperboria*).

8.3.2.21 Burrowed mud is mainly found in deep water or sheltered conditions where there is very little water movement and provides habitat for burrowing marine animals, like Norway lobster (*Nephrops norvegicus*), fireworks anemone (*Pachycerianthus multiplicatus*) and sea pens including *Virgularia mirabilis*, *Pennatula phosphorea* and *Funiculina quadrangularis*. Burrowed mud is also an OSPAR threatened and/or declining habitat and a BAP priority habitat.

8.3.2.22 Ocean quahog (*A. islandica*) are a large, slow growing and long-lived species. They are found in the subtidal benthic environment around the UK, with 70% of records being from Scottish seas including within the Offshore ECC and the wider study area. It is also an OSPAR threatened and/or declining species.

8.3.2.23 Kelp beds form a key part of marine ecosystems throughout Scottish seas, providing food and shelter for fish, invertebrates, and marine mammal species. Coralline algae often forms on the rocks below the kelp canopy and this supports fauna such as sponges, sea squirts and sea anemones. Crustaceans and worms will often live on the holdfasts and sea urchins and snails will graze on the kelp itself, whilst fish species will use the kelp to hide from predators. Kelp beds are a BAP priority habitat and activities that alter wave exposure or tidal flow can impact kelp beds and the associated ecosystem they create.

Designated Sites

8.3.2.24 Sites designated for nature conservation within or in close proximity to the Proposed Development and wider benthic ecology study area have been detailed in Table 8.2 and presented spatially in Figure 8.4. Sites within proximity include NCMPAs, SACs and SPAs. Sites that have a qualifying feature related to benthic subtidal or intertidal ecology, or a qualifying feature that is dependent on benthic subtidal or intertidal ecology have been listed within this table.

8.3.2.25 The Southern Trench NCMPA intersects with the Offshore ECC along the inshore region and has been designated for the protection of burrowed mud habitat. Conservation advice for the NCMPA includes minimising the potential impact of renewable energy development on burrowed mud habitats via the existing licensing process. Early pre-application discussion is recommended and will assist with the identification of the need for any surveys to map habitats to inform siting and design[12].

[12] https://sitelink.nature.scot/site/10477

8.3.2.26 The southwestern edge of the Offshore ECC intersects with the Moray Firth SPA, which has been designated for the protection of birds such as red-throated diver, shag and great northern diver (Figure 8.4). No other sites designated for nature conservation overlap with the scoping boundary.

Table 8.2. Sites designated for nature conservation within the Benthic Subtidal and Intertidal Ecology study area.

Site	Location (Relative to the Proposed Development)	Benthic Qualifying Feature
Southern Trench NCMPA	Intersects with the entire inshore region of the Offshore ECC	Burrowed mud
Noss Head NCMPA	Northwest of the northern edge of the Array Area (approximately 20 km from Array Area)	Horse mussel beds (annex I habitat, OSPAR threatened and/or declining habitat and a BAP priority habitat)
Moray Firth SAC	East of the Array Area and Offshore ECC (approximately 32 km from the Offshore ECC, 57 km from Array Area)	Subtidal sandbanks
Moray Firth SPA	Intersects with an inshore region of the Offshore ECC	Waterfoul assemblage with a dependency on the benthic environment for foraging purposes
Moray and Nairn Coast SPA	Southwest of the Offshore ECC (approximately 20 km from Offshore ECC)	Waterfoul assemblage with a dependency on the benthic environment for foraging purposes

Landfall Site

8.3.2.27 A landfall site has not yet been confirmed, but a number of landfall scoping sites have been proposed along the southern Moray Firth coastline between Cullen and Macduff (Figure 8.1). The intertidal zone along this stretch is characterised by a mixture of sandy and gravelly sediments where there are bays with a backdrop of cliffs over 10m in height (Hansom, 2021). MagicMap also highlights that there are rock platforms between the sands and gravel inlets and bays across this stretch of coastline (MagicMap, 2022).

8.3.2.28 Site-specific surveys carried out for the Moray West OWF included intertidal surveys of the landfall site at Sandend Bay, which lies to the west of the Proposed Development landfall scoping boundary. The Moray West Phase I and II intertidal surveys characterised the landfall as being predominantly made up of well-sorted medium sands with low gravel and silt content. It was described as a dynamic habitat with sparse benthic communities, represented by low numbers of amphipods, crustaceans, isopods and polychaetes.

8.4 Embedded Mitigation Considered within the EIA

8.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

8.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation

measures for Benthic Subtidal and Intertidal Ecology are noted within Table 8.3 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Benthic Subtidal and Intertidal Ecology receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring as secured by Section 36 and Marine Licence consent conditions;
- M-5: Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP. This commitment will be secured by Section 36 and Marine Licence consent conditions;
- M-6: Wind farm infrastructure will be micro-sited, where possible, around any sensitive seabed habitats including Annex 1 habitat (if present) to avoid any developmental impacts on these conservation features. This commitment will be secured by Section 36 and Marine Licence consent conditions;
- M-7: Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified via risk assessment is not feasible), as detailed within the CaP;
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management. This commitment is secured by Section 36 consent and Marine Licence conditions;
- M-9: Development of and adherence to a MPCP. The MPCP will identify potential sources of pollution and associated spill response and reporting procedures as secured by Section 36 and Marine Licence consent conditions; and
- M-10: Development of and adherence to a DP. The DP will outline measures for the decommissioning of the Proposed Development as secured by Section 36 and Marine Licence consent conditions and Section 105 of the Energy Act 2004 (as amended).

8.5 Scoping of Impacts

8.5.1.1 Potential impacts on Benthic Subtidal and Intertidal Ecology have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development. These impacts are based on the assessment of the baseline environment detailed in Section 8.3 and are outlined in Table 8.3.

8.5.1.2 These impacts are based on the design envelope and the anticipated worst-case scenario at this stage of the Proposed Development. As it stands, the Proposed Development will be split between fixed foundations such as monopiles (potentially with moorings), jackets on either pin piles or suction caissons and GBS in the shallower regions of the Array Area, and floating WTGs in the deeper (southern) sections of the site which might include semi-submersible and/or tension leg platforms.

Table 8.3. EIA scoping assessment for Benthic Subtidal and Intertidal Ecology.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Temporary habitat disturbance	M-1, M-6, M-10	Scoped in	There is potential for temporary, direct habitat disturbance during construction activities in the Array Area and along the Offshore ECC due to seabed preparation, cable laying, foundation installation and the use of jack up vessels or vessel anchoring.	✓	✓	✓	✓	✓
Temporary increases in SSCs and changes to seabed levels	M-1, M-5	Scoped in	Temporary elevations in SSCs due to construction (i.e., cable installation) or decommissioning (i.e., scour protection removal) activities. These temporary elevations can result in changes to the underlying seabed levels, through deposition of the suspended material and changes to the surficial sediment type. Increases in SSC and associated deposition may have indirect, adverse impacts upon benthic receptors.	✓	✓	✓	✓	✓
Direct and indirect seabed disturbance leading to release of sediment contaminants	M-8, M-10	Scoped in	Seabed disturbance during construction could lead to the mobilisation of existing sediment contaminants that could have an impact on the benthos. Effects on benthic subtidal and intertidal ecology as a result of changes in water quality will be informed by the conclusions of the marine and sediment quality assessments.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Long-term habitat loss/alteration due to the removal of infrastructure	M-10	Scoped in	Following the decommissioning of Proposed Development, there is potential for long-term habitat loss or alteration directly associated with the removal of infrastructure	✓	✓	✓	✓	✓
Accidental pollution event during construction or decommissioning activity	M-9, M-10	Scoped out	Chemical and oil inventories on vessels working during construction and decommissioning stages will be small in size. In the event of an accidental chemical or oil spill, hydrocarbons would rapidly be dispersed or diluted. As well as this, all vessels on the Proposed Development will be required to comply with strict environmental controls set out in the PEMP and MPCP which will minimise the risk and set out provisions for responding to spills during construction or decommissioning. Due to the implementation of control measures and small quantities of hydrocarbons and chemicals it is proposed to scope this impact out of further consideration within the EIA.	✗	✗	✗	✗	✗
Operation and Maintenance								
Long-term habitat loss/alteration due to the addition of infrastructure to the area	M-1, M-6, M-8	Scoped in	Following the construction of the Proposed Development, there is potential for long-term habitat loss or alteration directly associated with the presence of, for example, WTG and OSP foundations, scour and cable protection.	✓	✓	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Temporary habitat disturbance	M-1, M-6, M-8	Scoped in	There is the potential for direct habitat disturbance of the seabed during planned and unplanned maintenance through (e.g., the use of jack up vessels or cable repair or replacement).	✓	✓	✓	✓	✓
Colonisation of hard substrates	M-5, M-8	Scoped in	Man-made structures such as WTG and OSP foundations and any associated scour/cable protection on the seabed are expected to be colonised by marine organisms. This colonisation is expected to then result in an increase in local biodiversity and alterations to the near field benthic ecology of the area.	✓	✓	✓	✓	✗
Accidental pollution events during O&M activity	M-8, M-9	Scoped out	See justification described for accidental pollution events during construction and decommissioning activity above.	✗	✗	✗	✗	✗
Increased risk of introduction and/or spread of Invasive Non-Native Species (INNS)	M-8	Scoped out	This impact is proposed to be scoped out in consideration of the mitigation and control of invasive species measures in line with International Maritime Organization (IMO, 2019). These standards and procedures will be incorporated into the PEMP and are embedded in the project design and as such ensure that no significant effects arise from INNS.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Changes in physical processes resulting from the presence of the OWF subsea infrastructure (e.g., scour effects, changes in wave/ tidal current regimes and resulting effects on sediment transport)	M-8	Scoped out	With embedded mitigation measures implemented it is unlikely there will be significant impacts to benthic ecology features from changes in physical processes as impact will be spatially and temporally minimal. Physical processes modelling of other OWF projects has predicted small, local impacts on benthic communities from disturbances of this nature. For these reasons this impact is being proposed to be scoped out of further EIA assessment.	X	X	X	X	X
Electromagnetic fields (EMF) effects generated by inter-array, interconnector and export cables. This may have indirect effects on benthic ecology	M-8	Scoped out	EMFs are likely to be generated by subsea cables and detectable above background levels in close proximity to the cables. Although burial does not mask EMFs it increases the distance between species that may be affected by EMFs and the source. As the cable will be buried or protected any behavioural responses would be mitigated. The magnitude is therefore considered to be negligible. Monitoring to date has not recorded any significant changes in invertebrate behaviour resulting from EMF exposure at existing offshore wind farms. It is considered unlikely that EMFs will result in a significant behavioural response that would cause a change in benthic communities.	X	X	X	X	X

8.6 Potential Cumulative Impacts

8.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Benthic Subtidal and Intertidal Ecology, cumulative interactions may occur with other planned OWFs as well as other activities in the benthic ecology study area. The Benthic Subtidal and Intertidal Ecology CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

8.6.1.2 Impacts that are scoped into the assessment for the Proposed Development alone, are generally spatially restricted to being within close proximity to the Array Area and Offshore ECC. However, certain potential impacts, such as an increase in SSC, have the potential to affect the benthic subtidal communities over a more significant area. It is proposed that impacts with limited spatial extent, that do not have an effect on a designated species, site or feature, are scoped out of any further assessment within the EIA.

8.6.1.3 For this reason, only the following impact on Benthic Subtidal and Intertidal Ecology receptors is being proposed for further consideration within the CIA, subject to route refinement:

- Temporary increase in suspended sediment and sediment deposition.

8.7 Potential Transboundary Impacts

8.7.1.1 Transboundary impacts related to benthic subtidal and intertidal ecology are not anticipated to arise from construction, O&M or decommissioning stages of the Proposed Development. Any impacts on Benthic Subtidal or Intertidal Ecology receptors will be localised in nature and any indirect effects will likely be limited to one tidal excursion from the impact source. The Proposed Development is a significant distance from the nearest adjacent EEZ of another state and, therefore, it is considered that transboundary impacts will not occur and will therefore be scoped out from further consideration within the EIA.

8.8 Proposed Approach to EIA

8.8.1 Relevant Data Sources

8.8.1.1 In addition to those readily available data sources outlined in Table 8.1, site-specific survey data is planned to inform the EIA, as well as further review of survey data from the Moray East and Moray West OWFs, such as those detailed in Table 8.4.

8.8.1.2 As noted in Section 6.8, geophysical survey works are planned for the Array Area in September 2022 and Offshore ECC in March 2023. The objectives of these geophysical survey campaigns are to achieve 100% seabed coverage in determining the bathymetry, seabed infrastructure, classification and morphology, as well as the presence of any geohazards across the Array Area and Offshore ECC.

8.8.1.3 Geophysical survey outputs will be used to inform the location of the benthic ground-truthing survey campaign (currently planned for March 2023) in order to get a representative spread of samples across the seabed features identified, as well as targeting any potential conservation features to understand location and extent. The layout of the benthic survey campaign will also be informed by pre-existing broadscale habitat mapping. Grab samples and drop-down video (DDV)

surveillance will be used to characterise the Array Area and Offshore ECC. Samples will be used to classify the sediment type present across the study area, as well as monitor contaminants and the fauna that are present. Data from these surveys will be used to confirm or dispute existing data from across the survey area.

Table 8.4. Relevant data sources to inform EIA for Benthic Subtidal and Intertidal Ecology.

Title	Detail/Source	Year	Author
Caledonia OWF Geophysical Data Collection	Site-specific geophysical data and corresponding survey report to inform benthic survey planning and the EIA	2022 – 2023	Ocean Winds
Caledonia OWF Site-Specific Benthic Subtidal Ecology Baseline Characterisation Survey	Site-specific surveys will be carried out in order to characterise the benthic ecology of the study area and inform the EIA. Subtidal benthic habitats will be sampled via a combination of targeted benthic infaunal grab sampling and DDV surveys, with particular focus on any habitats of conservation interest. Sediment samples will also be collected for contaminants and particle size analysis	2022 – 2023	Ocean Winds
Caledonia OWF Site-Specific Benthic Intertidal Ecology Baseline Characterisation Survey	Intertidal benthic habitats will be characterised via a Phase I and Phase II habitat survey	2022 – 2023	Ocean Winds
Moray East OWF – Benthic Surveys - seabed sampling, video surveillance and scientific trawling (October 2010, July 2011, May 2014)	Project data archive; https://www.morayeast.com/application/files/1315/8014/0645/Appendix-4-2-A-Benthic-Ecology-Wind-Farm-Sites.pdf	2010 – 2014	EMU Ltd.
Moray West OWF – site-specific characterisation surveys between May and June 2017 – DDV, benthic grabs, beam trawls	Project data archive; https://www.moraywest.com/download_file/force/650/219	2017	PMSL
Moray West OWF – site-specific extended Phase 1 intertidal survey in July 2017 in selected sections of the landfall area	Project data archive; https://www.moraywest.com/download_file/force/650/219	2017	PMSL

8.8.2 Guidance

8.8.2.1 The approach to EIA will follow the general approach outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report. The assessment of Benthic Subtidal and Intertidal Ecology will also give due regard to the following guidance documents where they are specific to this topic and methodology:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial Freshwater, Coastal and Marine (CIEEM, 2018);
- Guidelines for Ecological Impact Assessment in Britain and Ireland. Marine and Coastal. Final Document, August 2010 (CIEEM, 2010);
- Guidance document on wind energy developments and AU nature legislation (2021);
- Strategic Review of Offshore Windfarm Monitoring Data Associated with FEPA Licence Conditions (Cefas, 2010);
- Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in offshore wind farm (RenewableUK, 2013);
- Guidance note for EIA in respect of FEPA and CPA requirements (Centre for Environment, Fisheries and Aquaculture (Cefas, 2004b);
- Marine Scotland HRA of Draft Plan for Offshore Wind Energy in Scottish Territorial Waters: Information for Appropriate Assessment (Marine Scotland, 2011b);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects (Judd, 2012);
- NatureScot HRA: Help and advice (NatureScot, 2020b);
- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008); and
- Sensitivity of features based upon the Marine Evidence-based Sensitivity Assessment (MarESA) framework where possible (MarLIN, 2022).

8.9 Assessment Methodology

8.9.1.1 To enable the potential impact of the Proposed Development to be assessed, a description of the existing benthic communities, focusing particularly on any areas of conservation interest, will be produced. Potential impacts that may occur on the subtidal and intertidal physical, chemical and biological environment as a result of the planned construction, O&M and decommissioning will then be identified. The sensitivities of the communities present to the types of impact expected from wind farm construction, O&M and decommissioning activities will be assessed. Where necessary, measures will be proposed to mitigate the impacts.

8.9.1.2 In the event that the Proposed Development has a direct impact on any sites that are designated for conservation at the European (SAC or SPA; now forming part of the UK's National Site Network) or international level (NCMPA or Ramsar), as a result of qualifying habitats or species that they support, then the requisite information will be provided alongside the EIAR to assist the competent authority to carry out an appropriate assessment. A separate Offshore HRA Screening Report has been produced and submitted alongside this Offshore Scoping Report

which considers/evaluates the potential connectivity of European Sites (including SACs with benthic habitat features) within the assessment, and apportions the impacts identified back to the European Sites impacted.

8.9.1.3 Cumulative impacts will be assessed by taking into consideration any similar developments, proposed or existing, that are in the vicinity of the development zone.

8.10 Scoping Questions

8.10.1.1 The questions in Table 8.5 are posed to consultees to frame and focus responses to the benthic subtidal and intertidal ecology scoping exercise, which will in turn inform the Scoping Opinion.

Table 8.5. EIA scoping questions for Benthic Subtidal and Intertidal Ecology.

Scoping Questions – Benthic Subtidal and Intertidal Ecology
Do you agree with the data sources, including project specific surveys, to be used to characterise the Benthic Subtidal and Intertidal Ecology baseline within the EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Benthic Subtidal and Intertidal Ecology?
Do you agree with the project impacts which have been scoped out of the EIA for Benthic Subtidal and Intertidal Ecology?
Do you agree that transboundary impacts for Benthic Subtidal and Intertidal Ecology may be scoped out of the EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Benthic Subtidal and Intertidal Ecology that have been identified for the Proposed Development?

9 Fish and Shellfish Ecology

9.1 Introduction

9.1.1.1 This chapter of the Offshore Scoping Report identifies the Fish and Shellfish receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, alone and cumulatively on Fish and Shellfish Ecology.

9.1.1.2 The methodology to be used within the EIA, an overview of the baseline conditions across the study area, the datasets to be used to inform the EIA, the anticipated significant effects to be considered within the EIA, and how these anticipated significant effects will be assessed for the purpose of an EIA are described.

9.1.1.3 This chapter of the Offshore Scoping Report should be read alongside the following:

- Marine and Coastal Processes (Chapter 6);
- Marine Water and Sediment Quality (Chapter 7);
- Benthic Subtidal and Intertidal Ecology (Chapter 8); and
- Commercial Fisheries (Chapter 12).

9.2 Study Area

9.2.1.1 The Fish and Shellfish Ecology study area is defined by the Proposed Development footprint, presented in Figure 9.1, plus an appropriate buffer. This includes the Array Area and the Offshore ECC, as well as a wider ZoI associated with secondary impacts.

9.2.1.2 The ZoI buffer for the assessment of fish and shellfish ecology, therefore, encompasses the area over which suspended sediment might travel following disturbance as a result of Proposed Development activities. Therefore, for the purposes of scoping this has assumed this distance encompasses the spring tidal excursion distance, which has been defined as 2 to 6 km (ABPmer *et al.*, 2008), so a maximum precautionary buffer distance has been defined as 6 km. This buffer has been defined based on previous project experience at the neighbouring Moray West OWF, as well as expert judgement of the range over which indirect effects of development may have an impact on Fish and Shellfish Ecology receptors (for example, increased suspended sediment concentrations and deposition).

9.2.1.3 This study area may be refined as required at post-scoping stages to reflect any site-specific sediment plume modelling work that may be undertaken as part of the Marine and Coastal Processes assessment (see Chapter 6), as well as stakeholder consultation and refinements to the Proposed Development's design. The study area for the EIAR will also be defined based on site-specific underwater noise modelling to account for potential impacts from noise, which will be considered in relation to the species and habitats found throughout the Moray Firth and wider northern North Sea biogeographic region and data available on the spawning and nursery grounds within this area.

9.2.1.4 The current study area overlaps with the International Council for the Exploration of the Sea (ICES) rectangles 44E7 and 45E7 (see Chapter 12: Commercial Fisheries) and provides a regional context on fish and shellfish ecology and is sufficient to cover potential effects outside of the Array Area and Offshore ECC.

9.3 Baseline Environment

9.3.1 Data Sources

9.3.1.1 The data sources that have been used to inform this Fish and Shellfish Ecology chapter of the Offshore Scoping Report are presented within Table 9.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

9.3.2 Overview of the Baseline Environment

Species Present

9.3.2.1 This characterisation of the species found within the Fish and Shellfish Ecology study area has been completed by drawing upon work that was undertaken in support of various wind farm projects in the vicinity of the Proposed Development as well as wider information from publicly available sources (Table 9.2).

9.3.2.2 The distribution of fish in the Moray Firth region is seasonal, with many species using the Moray Firth for overwintering, feeding, breeding, and nursery purposes.

9.3.2.3 Epibenthic beam trawl surveys conducted in the neighbouring (west) Moray West OWF site between May and June 2017 (Moray Offshore Windfarm (West) Limited, 2018) revealed a species assemblage typical of this area of the North Sea. The fish community was largely characterised by demersal species recorded in abundance during surveys, including dragonet (*Callionymus lyra*), dab (*Limanda limanda*) and plaice (*Pleuronectes platessa*). Less abundant species included lemon sole (*Microstomus kitt*), pogge (*Agonus cataphractus*) and grey gurnard (*Eutrigla gurnardus*). Typically, areas with higher diversity tended to be recorded in more heterogenous seabed habitats often present in these areas which included patches of coarser mixed sediment, gravels and stones/cobble and a similar trend was evident at both the Moray East and Beatrice OWF surveys (Moray Offshore Renewables Limited, 2011; BOWL, 2011). Other fish species recorded included monkfish (*Lophius* spp.), Norwegian topknot (*Phrynorhombus norvegicus*), sandeel (Ammodytidae, principally *Ammodytes* spp.) and elasmobranchs such as the cuckoo ray (*Leucoraja naevus*) and lesser spotted dogfish (*Scyliorhinus canicular*), but generally at low abundances (Moray Offshore Windfarm (West) Limited, 2018).

9.3.2.4 Between January and March 2012, dredge tow surveys were conducted across the Moray East OWF and Western Moray Firth area to identify sandeel distributions (Moray Offshore Renewables Limited, 2011). Raitt's sandeel (*Ammodytes marinus*), smooth sandeel (*Gymnammodytes semisquamatus*) and greater sandeel (*Hyperoplus lanceolatus*) were identified with Raitt's sandeel being the most abundant. Overall, the distribution of sandeels was patchy and abundance was low, with the majority captured in areas characterised with sandy substrate (sand, sandy gravel, gravelly sand, sandy gravel).

9.3.2.5 Similarly, results from sandeel surveys across the Beatrice OWF site in December 2020, indicated patchy distribution with low abundance, with Raitt's sandeel being the most prevalent (BOWL, 2021). The Beatrice OWF post-construction survey findings indicate an increase over the pre-construction survey, and there is no indication that the construction of the Beatrice OWF resulted in negative impacts on the local sandeel population (BOWL, 2014; 2021).

9.3.2.6 Otter trawl surveys conducted in March 2021 to identify cod (*Gadhus morhua*) distributions across the Beatrice OWF site revealed haddock (*Melangrammus aeglefinus*) was the most abundant species accounting for the majority of the total

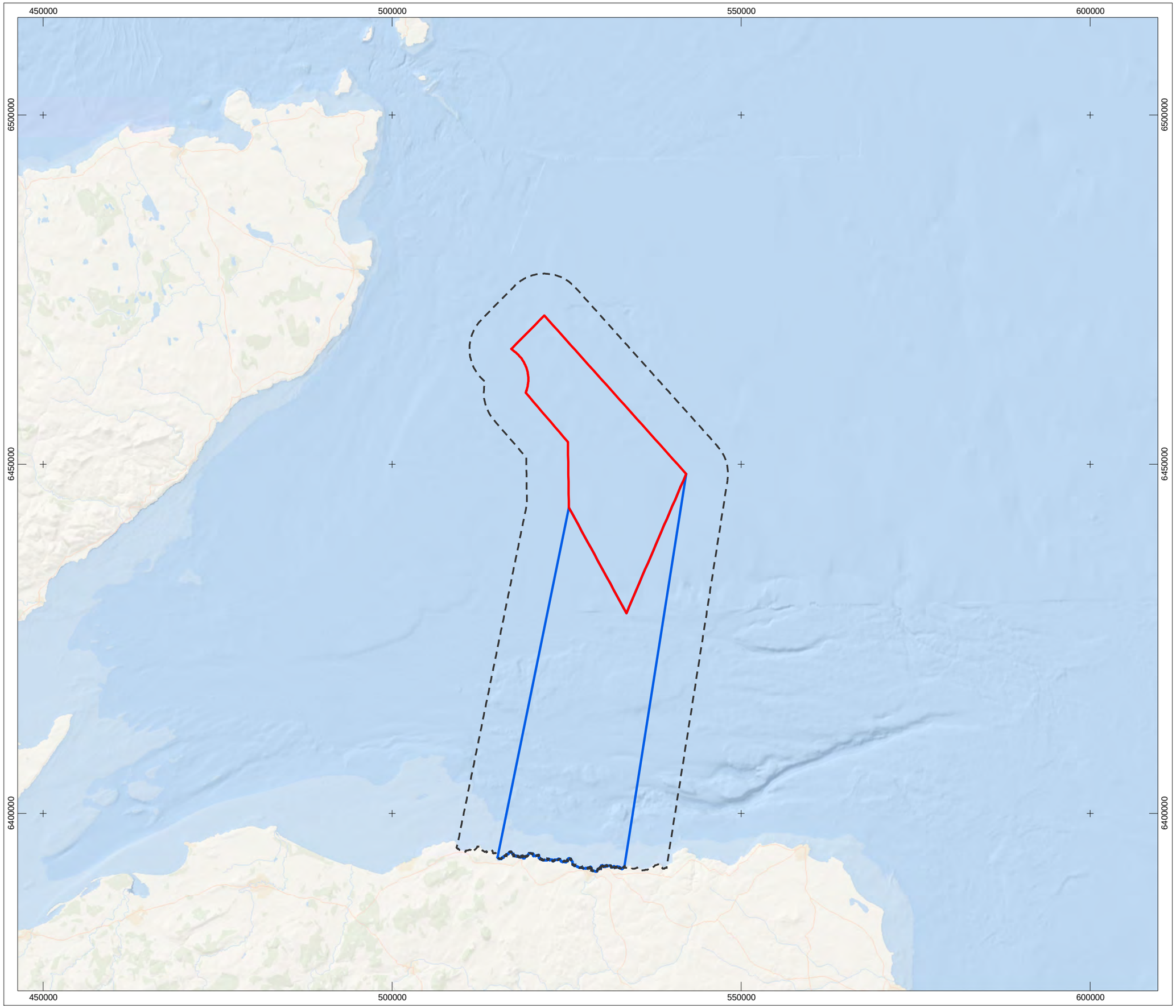
by-catch, followed by whiting (*Merlangius merlangus*) and squid, whilst cod abundance was relatively low (BOWL, 2021).

9.3.2.7 Several shellfish species are known to be abundant within the study area, including Nephrops (*Nephrops norvegicus*) (particularly significant for commercial fisheries within the study area) squid *Loligo* spp., and king scallop (*Pecten maximus*) (Scottish Government, 2020c; ICES, 2022). Moray West OWF site epibenthic trawls recorded hermit crabs (*Pagurus prideaux* and *Pagurus bernhardus*), contracted crab (*Hyas coarctatus*), long legged crab (*Macropodia rostrata*), squat lobster (*Galathea intermedia*) and saddle oyster (*Anomia ephippium*). Prawn (*Pandalina brevirostris*) and pink shrimp (*Pandalus montagui*) were present but generally at low abundances (Moray Offshore Windfarm (West) Limited, 2018).

9.3.2.8 Elasmobranch species are also known to be present in the Moray Firth area although with low percentage of total landings in the study area and regional area. Elasmobranch species identified include spurdog (*Squalus acanthias*), lesser spotted dogfish, starry ray (*Amblyraja radiata*), cuckoo ray, thornback ray (*Raja clavata*) and spotted ray (*Raja montagui*) (Ellis *et al*., 2004; Scottish Government, 2020c; ICES, 2022).

9.3.2.9 In addition to the species mentioned above, basking shark (*Cetorhinus maximus*) migrate from the western English Channel in spring to west Scottish waters, where they spend the summer and early autumn before moving offshore in winter. Basking shark sightings have occurred infrequently in the study area and across the Moray Firth (Scottish Government, 2022).

9.3.2.10 Details of those species recorded and other species that are known to be present in the study area are detailed in Table 9.2.



Legend

- Array Area
- Offshore Export Cable Corridor
- Fish and Shellfish Ecology Study Area

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	AL	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_FAS_MAP_00001		

Figure 9.1

Scoping boundaries of the Caledonia OWF assessment area

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Table 9.1. Summary of key publicly available datasets for Fish and Shellfish Ecology.

Title	Source	Year	Author
Existing OWF Data			
Moray East OWF Environmental Statement Technical Appendices - Fish and Shellfish Technical Report	http://marine.gov.scot/datafiles/lot/morl/Environmental_statement/Volumes%208%20to%2011%20-20Technical%20Appendices/Volume%2010%20Part%201%20-%20Biological%20Environment%20Technical%20Appendices/Appendix%204.3%20A%20-%20Fish%20&%20Shellfish%20Ecology.pdf	2011	Moray Offshore Renewables Limited
Moray East OWF Environmental Statement Technical Appendices – Sandeel Survey Report	http://marine.gov.scot/datafiles/lot/morl/Environmental_statement/Volumes%208%20to%2011%20-%20Technical%20Appendices/Volume%2010%20Part%201%20-%20Biological%20Environment%20Technical%20Appendices/Appendix%204.3%20C%20-%20Sandeel%20Survey.pdf	2012	Moray Offshore Renewables Limited
Moray East OWF Environmental Statement – Environmental Baseline	https://www.morayeast.com/application/files/6915/8013/6681/Chapter-4-Biological-Environment-Baseline.pdf	2011	Moray Offshore Renewables Limited
Moray East OWF Environmental Statement – Impact Assessment	https://www.morayeast.com/application/files/7315/8013/6709/Chapter-7-Biological-Environment-OGS-IA.pdf https://www.morayeast.com/application/files/3815/8013/6732/Chapter-10-Biological-Environment-TI-IA.pdf https://www.morayeast.com/application/files/2915/8013/6755/Chapter-14-Biological-Environment-CIA.pdf https://www.morayeast.com/application/files/1315/8013/7730/4-2-and-14-1-Benthic-Ecology-Vol-6a.pdf https://www.morayeast.com/application/files/9615/8013/7820/4-3-7-2-and-10-2-Fish-and-Shellfish-Ecology-Vol-6a.pdf	2011	Moray Offshore Renewables Limited

Title	Source	Year	Author
Moray East OWF Herring Larval Annual Review – January 2018	https://marine.gov.scot/sites/default/files/herring_larvae_annual_review_report_-_january_2018.pdf	2018	Moray Offshore Renewables Limited
Moray West OWF Draft EMP	https://marine.gov.scot/sites/default/files/00538036_3.pdf	2018	Moray OWF (West) Limited
Moray West ES Technical Appendix 4.3 A – Fish and Shellfish Technical Report	https://marine.gov.scot/datafiles/lot/morl/Environmental_statement/Volumes%208%20to%2011%20-%20Technical%20Appendices/Volume%2010%20Part%201%20-%20Biological%20Environment%20Technical%20Appendices/Appendix%204.3%20A%20-%20Fish%20&%20Shellfish%20Ecology.pdf	2011	Moray OWF (West) Limited
Moray West OWF EIAR - Chapter 8: Fish and Shellfish Ecology	https://www.moraywest.com/document-library/navigate/358/720	2018	Moray OWF (West) Limited
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited
Beatrice OWF Environmental Statement: Fish and Shellfish Ecology Technical Report	http://marine.gov.scot/datafiles/lot/bowl/ES/ES%20Volume%204%20-%20Annexs/11A%20Fish%20and%20Shellfish/Annex%2011A%20Fish%20and%20Shellfish%20Ecology%20Technical%20Report.pdf	2011	BOWL
Beatrice OWF Farm - Diadromous Fish Monitoring	https://marine.gov.scot/sites/default/files/bowl_salmon.pdf	2017	BOWL
Beatrice OWF Farm Pre-Construction Baseline Sandeel Survey – Technical Report	https://marine.gov.scot/sites/default/files/sandeel_survey_results_-_technical_report_.pdf	2014	BOWL
Beatrice OWF Farm Post-construction Sandeel Survey – Technical Report	https://marine.gov.scot/sites/default/files/bowl_-_post-construction_sandeel_survey_technical_report_redacted.pdf	2021	BOWL

Title	Source	Year	Author
Beatrice OWF - Pre-construction Cod Spawning Survey – Technical Report	https://marine.gov.scot/sites/default/files/pre-construction_cod_spawning_survey_results_-_technicla_report.pdf	2015	BOWL
Beatrice OWF - Post-construction Cod Spawning Survey – Technical Report	https://marine.gov.scot/sites/default/files/bowl_-_post-construction_cod_spawning_survey_-_technical_report_redacted.pdf	2021	BOWL
Beatrice OWF Herring Larval Survey Results – Technical Reports	https://marine.gov.scot/sites/default/files/00499196.pdf https://marine.gov.scot/sites/default/files/00499197.pdf	2014; 2016	BOWL
Beatrice OWF Pre-Construction Baseline Herring Larval Surveys Summary Technical Report	https://marine.gov.scot/sites/default/files/00499204.pdf	2016	BOWL
Moray Firth Tracking Project Internal Report & Proposal For Trustees October 2018	https://atlanticsalmontrust.org/our-work/morayfirthtrackingproject/	2018	Atlantic Salmon Trust (AST)
Publicly Available Datasets			
Information on species of conservation interest	https://sac.jncc.gov.uk/species	2007	JNCC
ICES Scottish Rockall Survey	https://datras.ices.dk/Data_products/Download/Download_Data_public.aspx	2011-2021	ICES
ICES North Sea International Bottom Trawl Survey	https://datras.ices.dk/Data_products/Download/Download_Data_public.aspx	2012 – 2022	ICES
ICES Beam Trawl Surveys	https://datras.ices.dk/Data_products/Download/Download_Data_public.aspx	2012 – 2022	ICES

Title	Source	Year	Author
Fisheries datasets available from the Marine Scotland MAPS National Marine Plan Interactive (NMPi), including ScotMap data	https://marinescotland.atkinsgeospatial.com/nmpi/default.aspx?layers=46	Various	Marine Scotland
MPA network (SPAs, SSSIs, NCMPAs, SACs)	http://marine.gov.scot/node/12790	2018	Scottish Government
UK sea fisheries annual statistics report	https://www.gov.uk/government/statistics/uk-sea-fisheries-annual-statistics-report-2020	2021	MMO
Scottish Sea Fisheries Statistics, Data from 2016-2020	https://data.marine.gov.scot/dataset/2020-scottish-sea-fisheries-statistics-fishing-effort-and-quantity-and-value-landings-ices-1	2020	Scottish Government
Literature			
Fisheries Sensitivity Maps in British Waters	https://www.cefas.co.uk/media/o0fgfobd/sensi_maps.pdf	1998	Coull *et al*. (1998)
Spawning and Nursery Grounds of Selected Fish Species in UK	https://www.cefas.co.uk/publications/techrep/techrep147.pdf	2012	Ellis *et al*. (2012)
Impacts from Piling on Fish at Offshore Wind Sites: Collating Population Information, Gap Analysis and Appraisal of Mitigation Options	https://prod-drupal-files.storage.googleapis.com/documents/resource/public/ORJIP%20Piling%20Study%20Final%20Report%20Aug%202018%20%28PDF%29.pdf	2018	Boyle and New, ORJIP

Table 9.2. Fish and shellfish potentially present within the study area and wider geographic region.

Group/Species	
Pelagic	
Allis shad *Alosa alosa* Atlantic salmon *Salmo salar* European eel *Anguilla anguilla* Greater argentine *Argentina silus* Herring *Clupea harengus* Horse mackerel *Trachurus trachurus*	Mackerel *Scomber scombrus* Sea lamprey *Petromyzon marinus* Sea trout *Salmo trutta* Sprat *Sprattus sprattus* Twaite shad *Alosa fallax*
Inshore/Coastal Species	
Ballan wrasse *Labrus bergylta* Catfish *Anarhichas lupus* Gobies *Pomatoschistus* spp.	Long-spined sea scorpion *Taurulus bubalis* Scaldfish *Arnoglossus laterna*
Demersal	
Bib *Trisopterus luscus* Bull trout *Myoxocephalus Scorpius* Cod Dab Dragonet European flounder *Platichthys flesus* Greater sandeel Grey gurnard Haddock Hake *Merluccius merluccius* Halibut *Hippoglossus hippoglossus* John Dory *Zeus faber* Ling *Molva molva* Lemon sole Long rough dab *Hippoglossoides platessoides* Megrim *Lepidorhombus whiffiagonis*	Norway pout *Trisopterus esmarkii* Norwegian topknot Plaice Pogge Poor cod *Trisopterus minutus* Red gurnard *Chelidonichthys cuculus* Raitt's sandeel Saithe *Pollachius virens* Sandeels Smooth sandeel Solenette *Buglossidium luteum* Spotted dragonet *Calionymus maculata* Monkfish Thickback sole *Microchirus variegatus* Whiting Witch flounder *Glyptocephalus cynoglossus*
Shellfish	
Brown shrimp *Crangon crangon* Brown crab *Cancer pagurus* Contracted crab European lobster *Homarus gammarus* Green crab *Carcinus maenas* Hermit crab King scallops Long legged crab Norway lobster (Nephrops)	Prawn Pink shrimp *Pandulus montagui* Queen scallop *Aequipecten opercularis* Red whelk *Neptunea antiqua* Saddle oyster Squat lobster Long-finned squid *Loligo forbesi* Velvet crab *Necora puber* Whelk *Buccinum undatum*
Elasmobranchs	
Basking shark Lesser spotted dogfish Spurdog Thornback ray	Cuckoo ray Spotted ray Starry ray

Species of Commercial Importance

9.3.2.11 The study area used for the assessment of the Fish and Shellfish Ecology receptors is shown in Figure 9.1 and is located in area is located in ICES rectangles 44E7 and 45E7. As detailed in Chapter 12 (Commercial Fisheries), landings from these areas from 2016 to 2020 (MMO, 2020) were dominated by long-finned squid, Nephrops, haddock, king scallop and brown crab. Peaks in landings of mackerel were observed in 2019; such patterns in landings by ICES rectangles are typical for pelagic species that swim in fast moving shoals and may not be specifically linked to areas or habitats when caught in the water column (MMO, 2020).

9.3.2.12 ICES rectangles 44E7 and 45E7 support local fishing fleets, targeting brown crab, lobster, scallop, mackerel, haddock, Nephrops, squid and whitefish (MMO, 2020).

Spawning and Nursery Grounds

9.3.2.13 The spawning and nursery grounds of several fish species are known to be located within or in close proximity to the study area based on available information on spawning and nursery areas for fish species (Coull *et al*., 1998; supported by data sources from Ellis *et al*., 2010; 2012).

9.3.2.14 Spawning grounds for cod, herring, plaice, sprat, whiting, sandeel and Nephrops overlap with the study area as well as extending over much of the Moray Firth and northern North Sea (see Figure 9.2) (Coull *et al*., 1998; Ellis *et al*., 2010; 2012).

9.3.2.15 The study area and inshore area of the Moray Firth is identified as a high intensity spawning ground for sandeel with low intensity spawning grounds to the west and in the northern North Sea (Coull *et al*., 1998; Ellis *et al*., 2010; 2012). Sandeel are of relevance when considering impacts to spawning areas as they are demersal spawners that lay their eggs onto or into seabed sediments; they also exhibit substrate dependency, preferring sandy substrates on which to spawn. Sandeel surveys were undertaken by both Moray East OWF and Beatrice OWF, in 2012 and 2014 respectively. Both surveys reported similar findings, indicating patchy sandeel distribution across the sites, with sandeel recorded in relatively low numbers (Moray Offshore Renewables Limited, 2012; BOWL, 2014). Post construction monitoring at Beatrice OWF undertaken in 2021 reported significant increases in sandeel numbers, when compared to the 2014 pre-construction surveys (BOWL, 2014; 2021).

9.3.2.16 The study area overlaps with a low intensity cod spawning area (with spawning occurring in winter) and a high intensity nursery ground (Coull *et al*., 1998; Ellis *et al*., 2010; 2012). Cod are of particular importance due to their sensitivity to noise (cod possess a swim bladder which is involved in hearing). In addition, cod exhibit substrate dependency during spawning, with a preference for coarse sands. Within areas of suitable substrates, males identify small territories (known as leks) that they subsequently defend from other males (González-Irusta and Wright, 2016; Grabowski *et al*., 2009; Nordeide and Folstad, 2000). Cod spawning surveys were conducted across the Moray East OWF in 2013 (Brown and May Marine, 2013) and more recently otter trawl surveys were conducted for pre- and post-construction monitoring of the Beatrice OWF (BOWL, 2015; 2021). Results from these surveys found spawning cod densities to be very low across the sites, indicating that the Moray Firth is not a spawning ground of key importance to cod.

9.3.2.17 Key herring spawning grounds are located to the north and south of the Fish and Shellfish Ecology study area (spawning grounds for the Shetland stock to the north, and spawning grounds for the Buchan herring stock to the south). Herring are demersal spawners that lay their eggs onto or into seabed sediments, they

also exhibit substrate dependency, with a preference for gravelly substrates on which to spawn. Furthermore, herring are particularly sensitive to noise impacts as they have swim bladders involved in hearing. Pre-construction herring larvae surveys were undertaken by BOWL in 2014 and 2015 (BOWL, 2014; 2016). Data collected across Beatrice OWF identified larvae in the north of the Array Area with the larvae originating from well-established spawning grounds located around Orkney and Shetland and being transported south with the tides and currents. Larval spatial distributions reported in the Moray East OWF identified lower larval densities in the vicinity of the OWF Array Area and Offshore ECC compared to areas around Shetland and Orkney. The spatial distribution of herring larvae indicated the highest distributions were found north-east of the Moray East Array Area. Generally, however, the smallest larvae were found to the south of the array and the largest were found to the north.

9.3.2.18 Spawning grounds for Nephrops and scallops are also present within the Moray Firth. The distribution of Nephrops is largely dependent on the presence of seabed habitats comprising muddy substrates. Scallop spawning grounds have been identified in the northern area of the Moray Firth and prefer fine or sandy gravel substrates (Keltz and Bailey, 2010).

9.3.2.19 The Fish and Shellfish Ecology study area also coincides with high intensity herring, cod and anglerfish *Lophius piscatorius* nursery grounds, and many low intensity nursery grounds including lemon sole, haddock, sprat, whiting, Nephrops, hake, ling, mackerel, plaice, sandeel, spotted ray, spurdog and thornback ray (Figure 9.3).

9.3.2.20 In a broader context, the study area has a spatially limited interaction with a small portion of the overall spawning sites and nursery grounds for these species. The spawning and nursery grounds of these species in the study area form part of far greater spawning and nursery grounds within the North Sea system and are therefore impact from the Proposed Development are expected to be smaller significance.

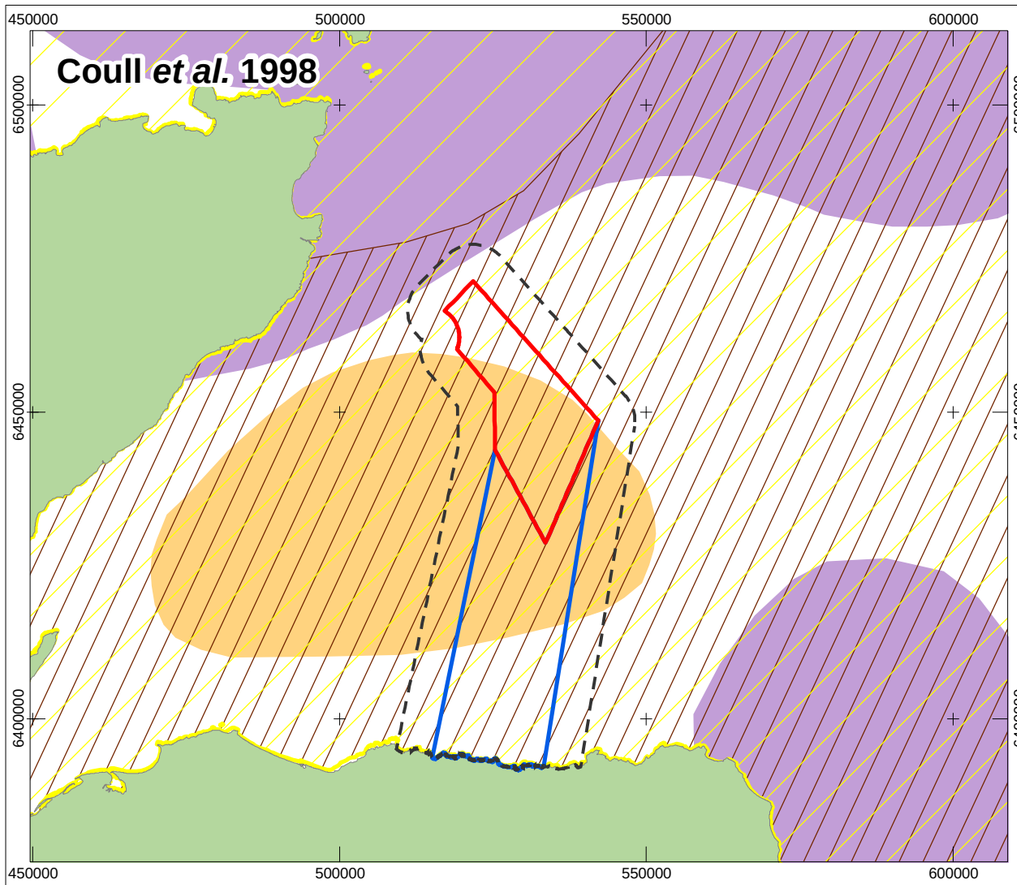
Designated Sites and Protected Species

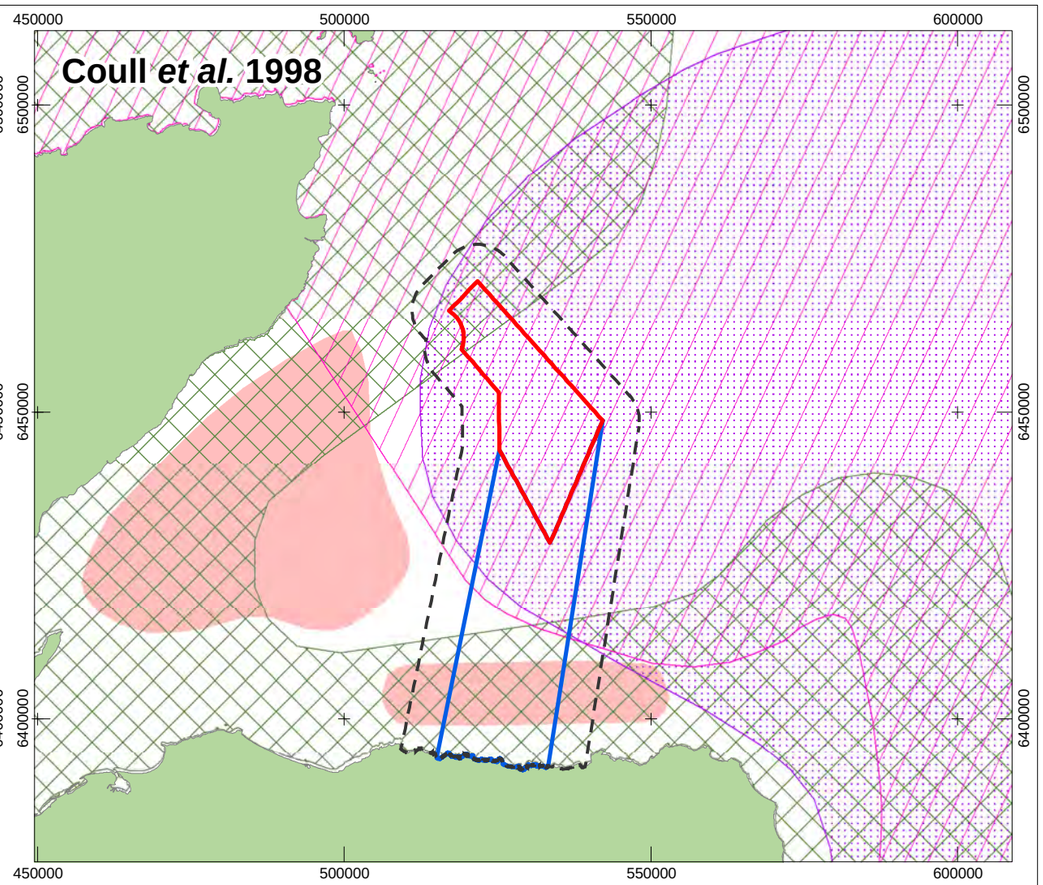
Species of Conservation Importance

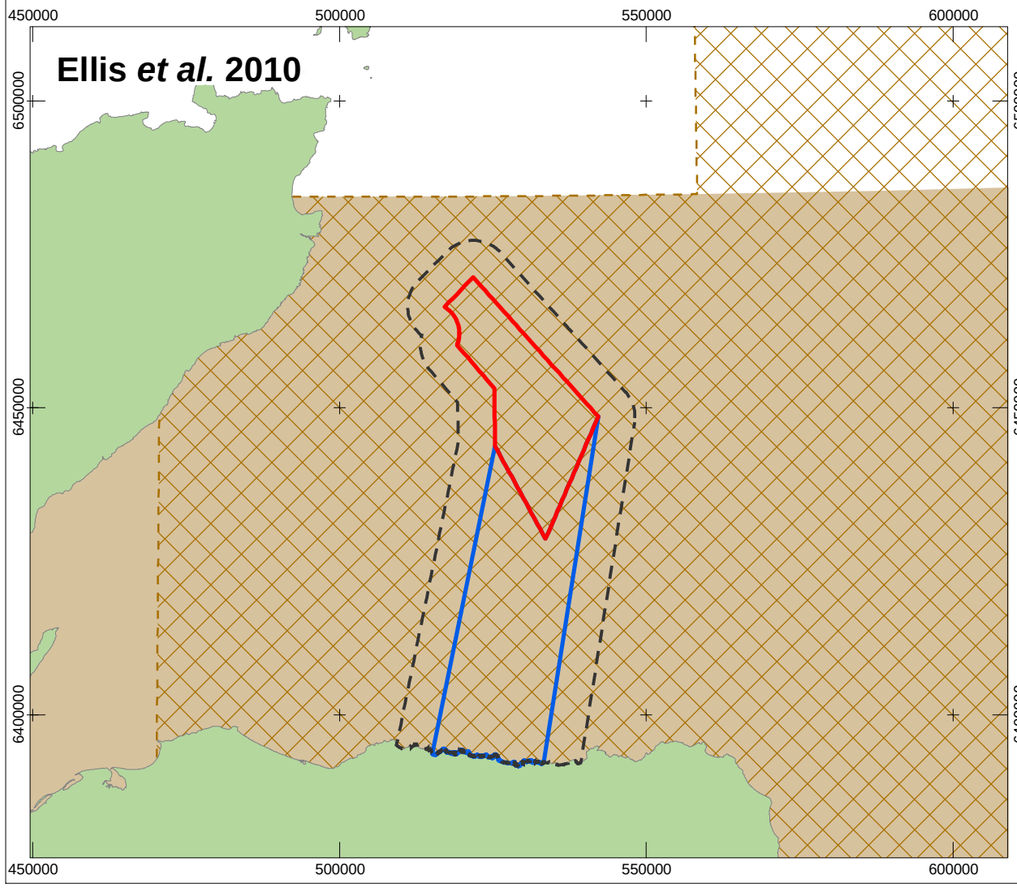
9.3.2.21 Within the northern North Sea region, there are records of several marine and estuarine species protected under national, European and international legislation.

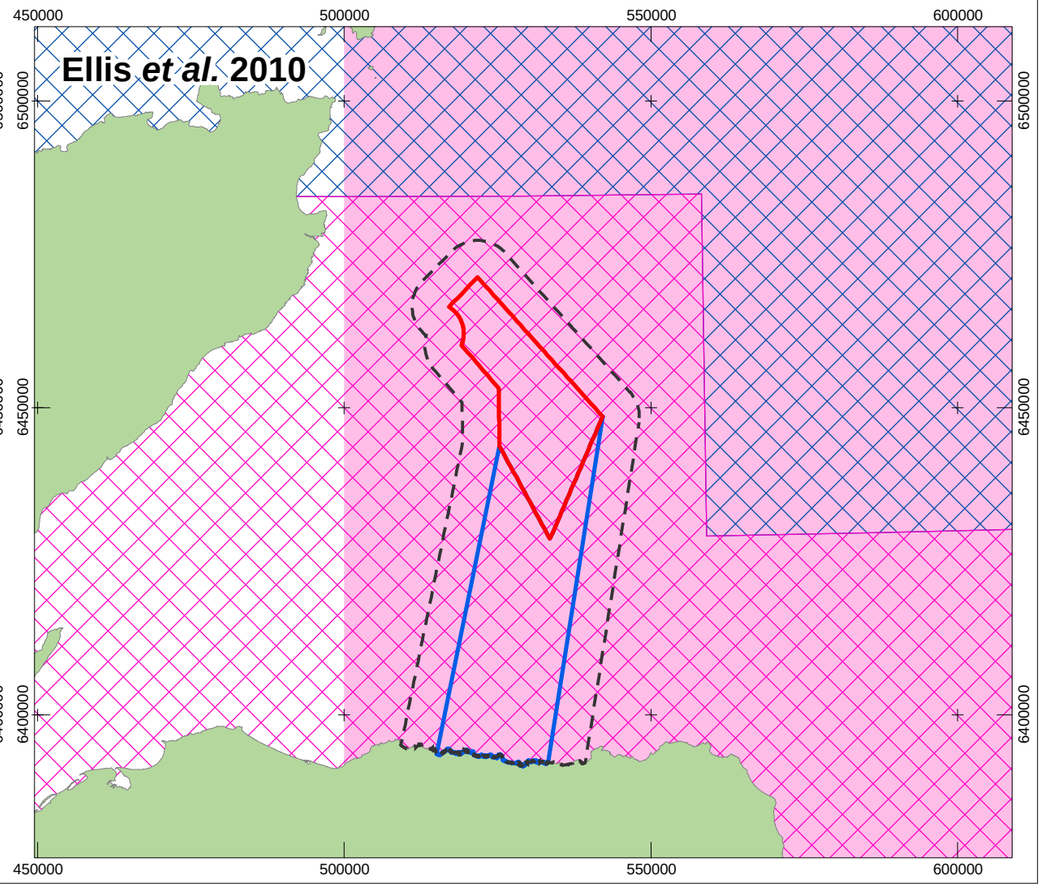
9.3.2.22 Species of conservation importance that have the potential to be present within the Fish and Shellfish Ecology study area are listed below in Table 9.3 alongside their associated designations.

9.3.2.23 On account of the conservation importance of these species to the region, all species are considered sensitive receptors to the Proposed Development and, therefore, potential impacts on these species from the Proposed Development will be taken into consideration in the Fish and Shellfish Ecology assessment.









Legend

- Array Area
- Offshore Export Cable Corridor
- Fish and Shellfish Ecology Study Area

Spawning Grounds (Coull *et al.* 1998)

Species

- Cod
- Herring
- Lemon Sole
- Nephrops
- Plaice
- Sandeel
- Sprat
- Whiting

Spawning Grounds (Ellis *et al.* 2010)

Species (Intensity)

- Cod (Low)
- Plaice (Low)
- Sandeel (High)
- Sandeel (Low)
- Whiting (Low)

Scale at A3: 1:1,000,000

0 25 50 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Figure 9.2
Spawning grounds for fish species in relation to the proposed development (Coull et al., 1998; Ellis et al., 2010; 2012)

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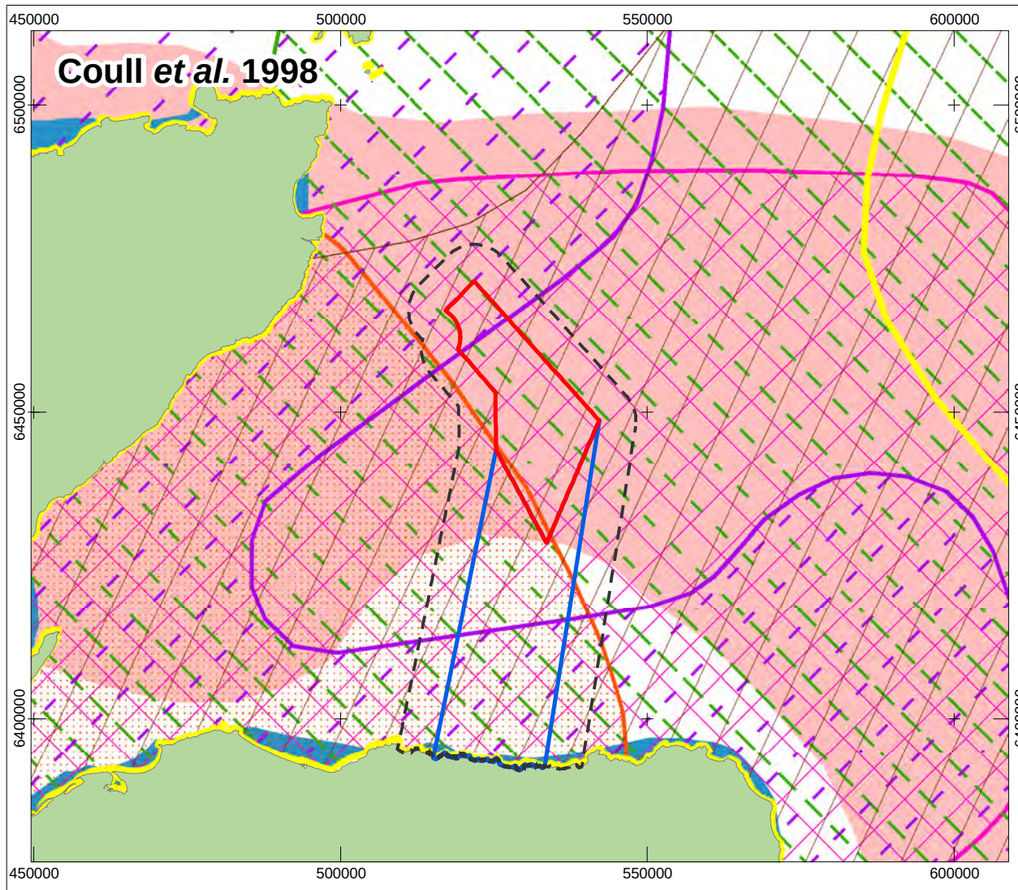

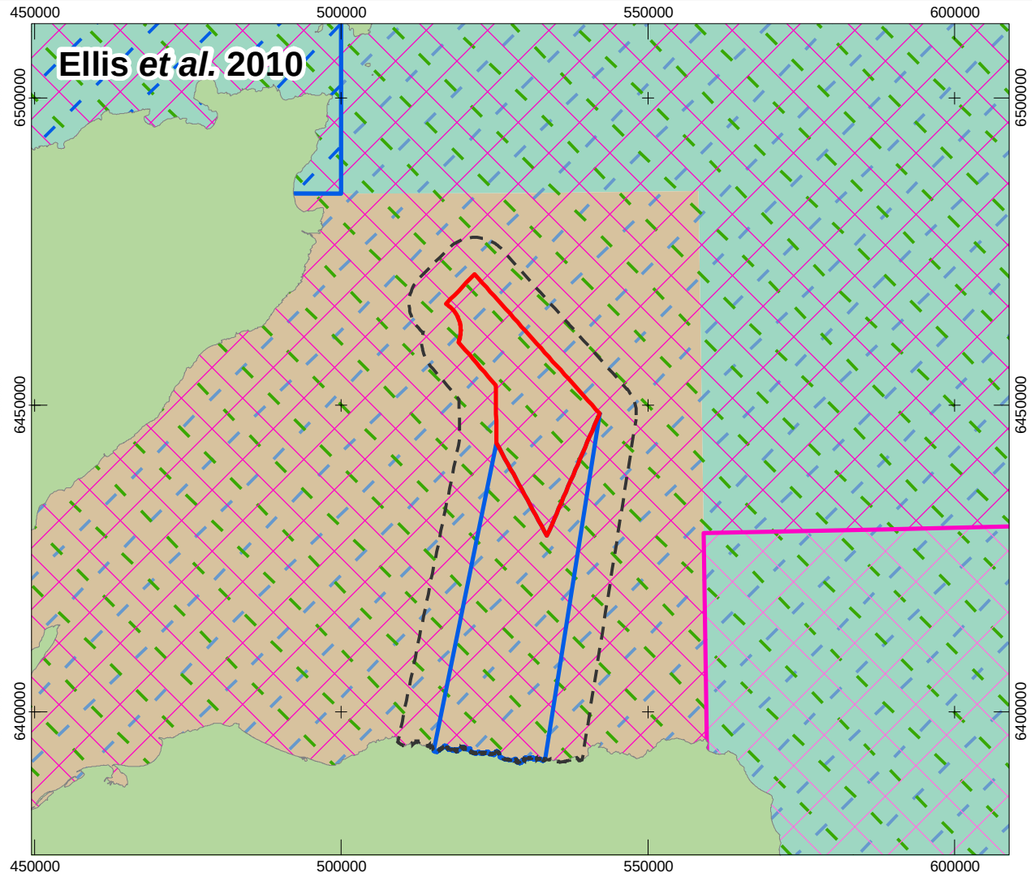

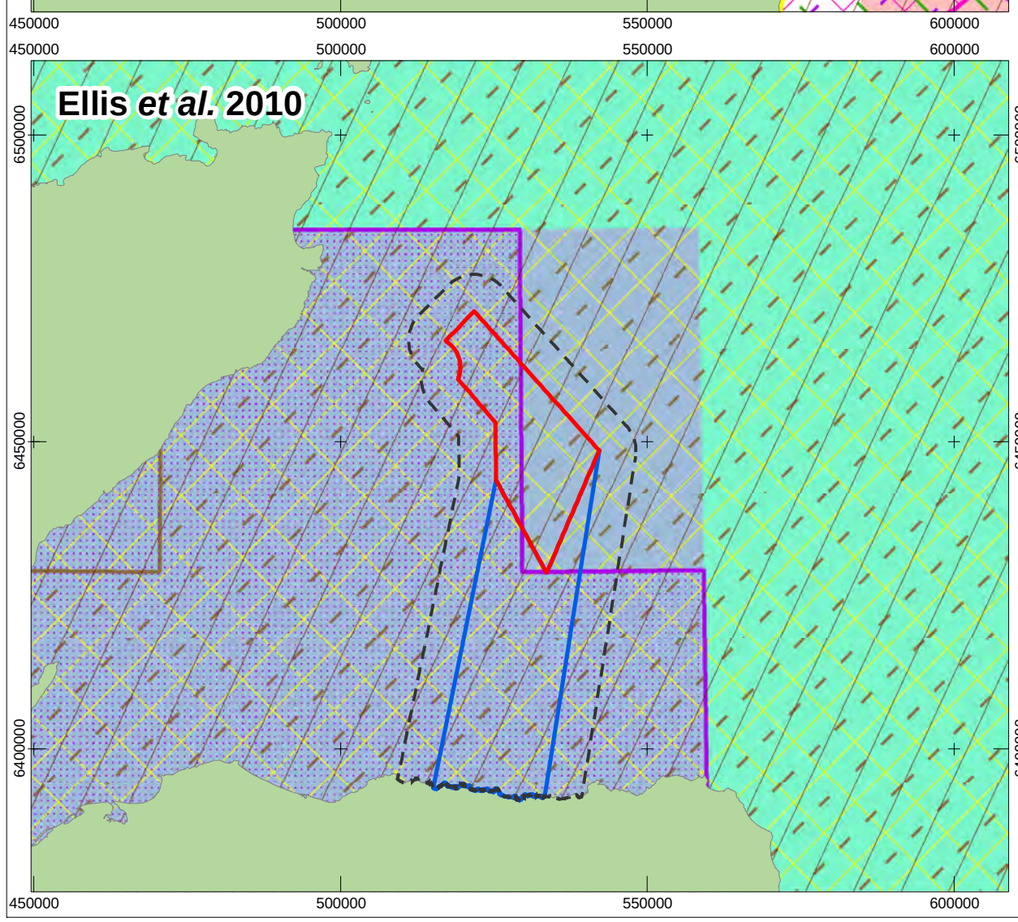

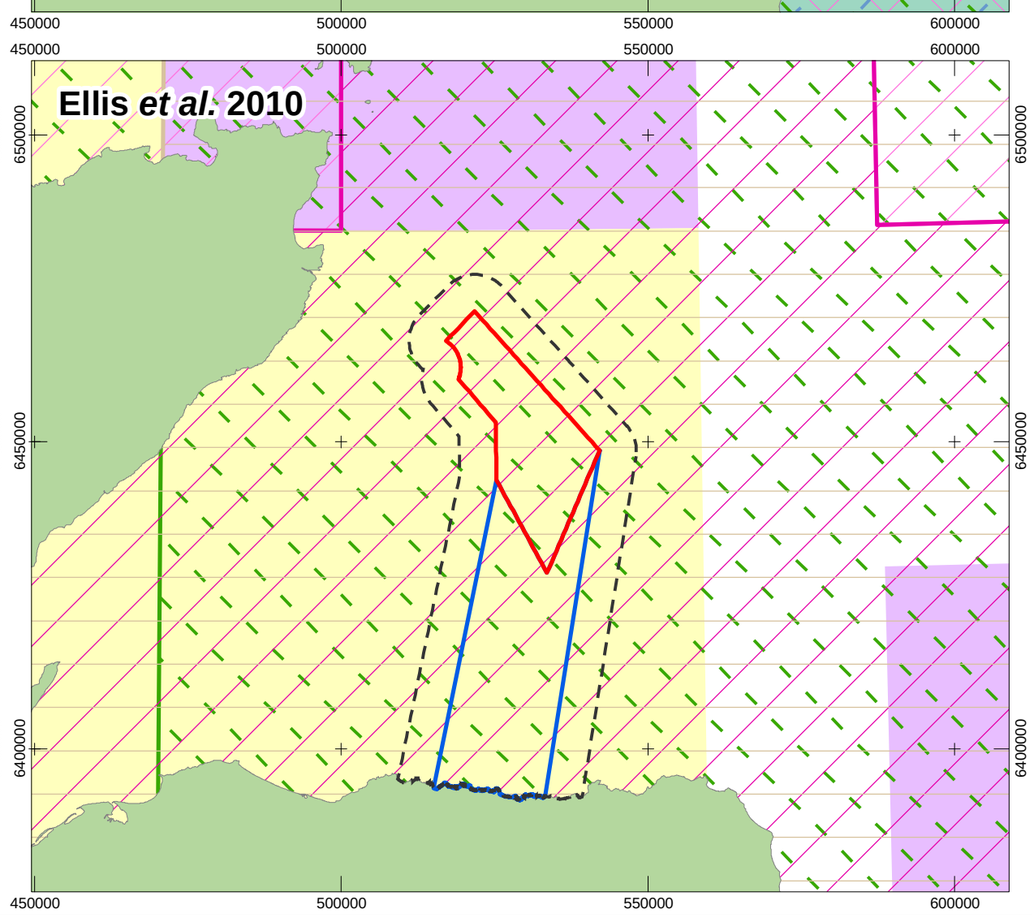

Legend

- Array Area
- Offshore Export Cable Corridor
- Fish and Shellfish Ecology Study Area

Nursery Grounds - Species (Coull *et al.* 1998)

- Haddock
- Herring
- Lemon Sole
- Nephrops
- Plaice
- Sand Eel
- Sprat
- Whiting

Nursery Grounds (Ellis *et al.* 2010)

Species (Intensity)

- Anglerfish (High)
- Anglerfish (Low)
- Blue whiting (High)
- Blue whiting (Low)
- Cod (High)
- Cod (Low)
- European hake (Low)
- Herring (High)
- Herring (Low)
- Ling (Low)
- Mackerel (Low)
- Plaice (Low)
- Sandeel (Low)
- Spotted ray (Low)
- Spurdog (Low)
- Thornback ray (Low)
- Tope shark (Low)
- Whiting (High)
- Whiting (Low)

Scale at A3: 1:1,000,000

0 25 50 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Figure 9.3
Nursery grounds for fish species in relation to the proposed development (Coull et al., 1998; Ellis et al., 2010; 2012)

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Table 9.3. Fish and shellfish species that are protected or considered threatened/declining, which are potentially present within the Caledonia study area and wider geographic region.

Fish and Shellfish Species	
OSPAR List of threatened and/or declining species[13]	
Allis shad; Atlantic salmon; Cod; European eel; Basking shark; Spurdog; Spotted ray; Thornback ray;	Greenland hablibut *Reinhardtius hippoglossoides*; Sea lamprey *Petromyzon marinus*; Gulper Shark *Centrophorus granulosus*; Leafscale gulper shark *Centrophorus squamosus*; Porbeagle *Lamna nasus*; Portuguese dogfish *Centroscymnus coelolepi*; Common skate *Dipturus batis*; and White skate *Dipturus alba*.
UK Post-2010 Biodiversity Framework[14] *Priority Species*	
Allis shad; Anglerfish; Atlantic halibut; Basking shark; Blue ling *Molva dipterygia*; Blue shark *Prionace glauca*; Cod; Common skate; European eel Greenland halibut; Gulper Shark; Hake; Horse mackerel; Leafscale gulper shark; Lesser sandeel *Ammodytes tobianus*;	Ling; Mackerel; Plaice; Porbeagle; Portuguese dogfish; Raitt's sandeel; Sandy ray *Leucoraja circularis*; Sea trout; Smelt; Spurdog; Tope *Galeorhinus galeus*; Twaite shad; White skate; and Whiting.
Scottish Priority Marine Features[15]	
Anglerfish; Blue ling; Ling; Norway pout; Lesser sandeel; Whiting (juveniles); Common skate;	Mackerel; Cod; Herring; Saithe (juveniles); Raitt's sandeel; Basking shark; and Spurdog.
Nature Conservation (Scotland) Act 2004	
Basking shark.	
ICUN Red List[16]	
Atlantic salmon (Vulnerable); Cod (Vulnerable); European eel (Critically Endangered); Basking shark (Endangered); Blue shark (Near Threatened) Spurdog (Vulnerable);	Atlantic Halibut (Endangered); Greenland Halibut (Near threatened); Gulper Shark (Vulnerable); Leafscale gulper shark (Vulnerable); Porbeagle (Vulnerable); Portuguese dogfish (Near Threatened);

[13] https://www.ospar.org/work-areas/bdc/species-habitats/list-of-threatened-declining-species-habitats/fish
[14] https://www.wildlifetrusts.org/wildlife-explorer/marine/fish-sharks-skates-and-rays?page=0
[15] https://marine.gov.scot/sma/assessment/case-study-priority-marine-features
[16] https://www.iucnredlist.org/

Fish and Shellfish Species	
Tope (Vulnerable); Sandy ray (Vulnerable); Thornback ray (Near Threatened);	Common skate (Critically Endangered); Long-nosed skate (Near Threatened); and While skate (Endangered).
Annex II Fish Species EU Habitats Directive (92/43/EEC)	
Allis shad; Atlantic salmon; European eel;	River lamprey; Sea lamprey; and Twaite shad.

Designated Sites

9.3.2.24 Sites designated for nature conservation within or in proximity to the Fish and Shellfish Ecology study area have been detailed in Table 9.4 and presented spatially in Figure 9.4. Sites within proximity include NCMPAs, SACs and SPAs. Sites that have a qualifying feature related to Fish and Shellfish Ecology, or a qualifying feature that is dependent on Fish and Shellfish Ecology have been listed within this table.

9.3.2.25 The Southern Trench NCMPA intersects with the Offshore ECC and has been designated for the Minke whale (*Balaenoptera acutorostrata*). The NCMPA has a conservation objective to maintain productivity and feeding conditions for local mobile species and the minke whale as both juveniles and adults are regularly observed feeding (non-spiny fish such as sandeel, herring, whiting and cod, squid and sprat) in the NCMPA.

9.3.2.26 The Moray Firth SAC is designated for the Annex II species bottlenose dolphin (*Tursiops truncatus*). The SAC has a conservation objective to maintain the availability of prey for the species.

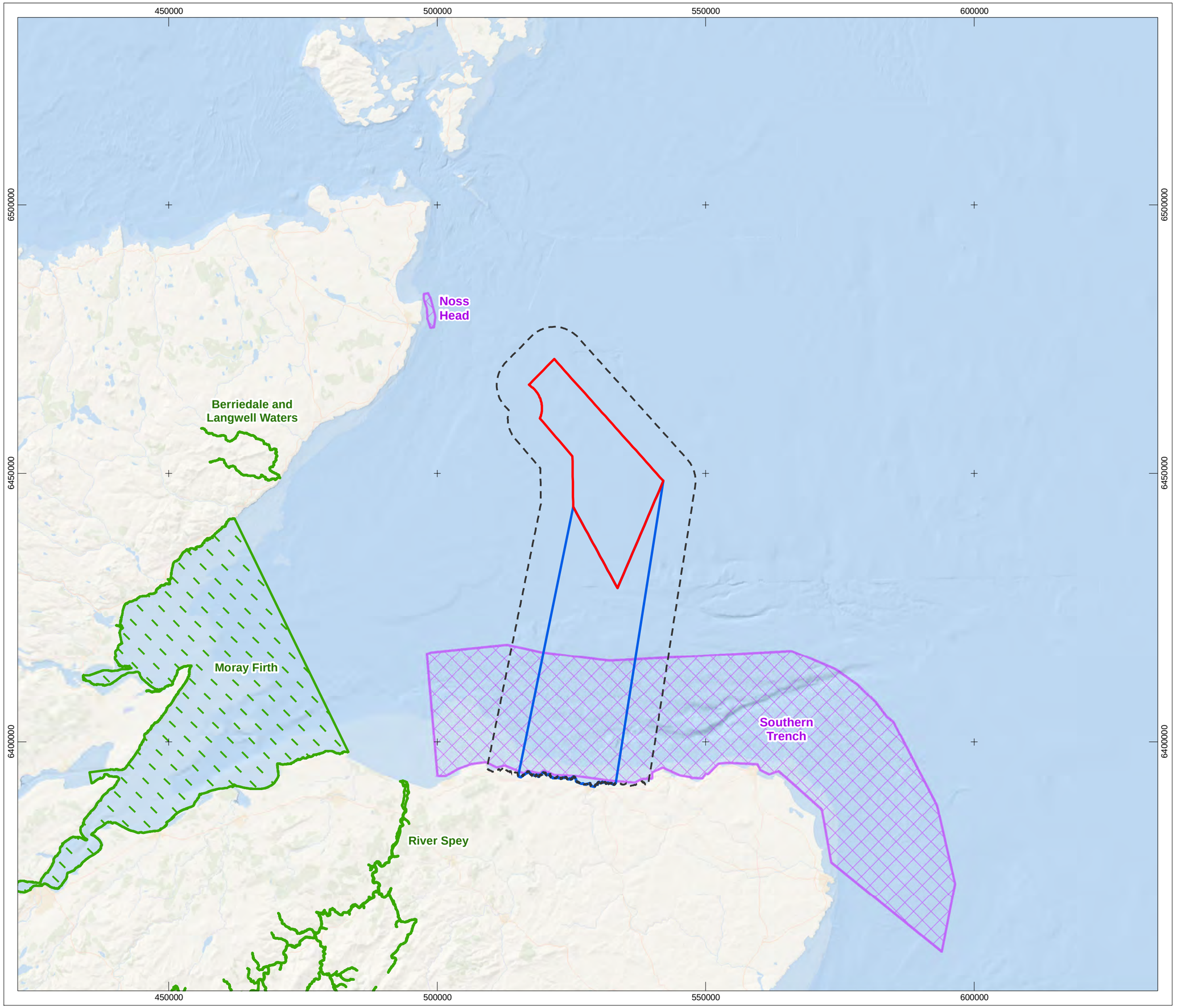
Table 9.4. Sites designated for nature conservation in the vicinity of the Fish and Shellfish Ecology study area.

Site	Location (Relative to the Proposed Development)	Qualifying Feature
Southern Trench NCMPA	Intersects with the entire inshore region of the Offshore ECC	Minke whale
Noss Head NCMPA	Northwest of the northern edge of the Array Area (approximately 20 km from Array Area)	Horse mussel beds (annex I habitat, OSPAR threatened and/or declining habitat and a BAP priority habitat)
Moray Firth SAC	West of the Array Area and Offshore ECC	Bottlenose dolphin (Annex II species)
River Spey SAC	Southwest of the Offshore ECC	Freshwater pearl mussel (Annex II species), sea lamprey and Atlantic salmon.
Berriedale and Langwell Waters SAC	West of the Array Area	Atlantic salmon (Annex II species)

Migratory Species

9.3.2.27 Migratory fish are species that spend part of their life cycle in freshwater and part in seawater; such species are termed diadromous (migrate between freshwater and saltwater) and anadromous (migrating up rivers from the sea to spawn). A number of migratory fish species have the potential to occur in the Fish and Shellfish Ecology study area, migrating to and from rivers and other freshwater bodies in the area.

9.3.2.28 Migratory fish species including Atlantic salmon, sea trout, European eel, smelt, Twaite Shad, and Allis shad are likely to occur in the Moray Firth, nearby rivers and estuaries.



Legend

- Array Area
- Offshore Export Cable Corridor
- Fish and Shellfish Ecology Study Area
- Special Areas of Conservation
- Marine Protected Areas

Scale at A3: 1:650,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Date: 02/09/2022	Revision: 01	
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Figure 9.4
Designated protected areas in relation to the Fish and Shellfish Ecology study area (Scottish Government, 2022)

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9.4 Embedded Mitigation Considered within the EIA

9.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

9.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Fish and Shellfish Ecology are noted within Table 9.5 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Fish and Shellfish Ecology receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring as secured by Section 36 and Marine Licence consent conditions;
- M-5: Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP. This commitment will be secured by Section 36 and Marine Licence consent conditions;
- M-7: Suitable implementation and monitoring of cable protection (via burial, or external protection where adequate burial depth as identified via risk assessment is not feasible), as detailed within the CaP;
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management. This commitment is secured by Section 36 and Marine Licence consent conditions;
- M-9: Development of and adherence to a MPCP. The MPCP will identify potential sources of pollution and associated spill response and reporting procedures as secured by Section 36 and Marine Licence consent conditions;
- M-10: Development of and adherence to a DP. The DP will outline measures for the decommissioning of the Proposed Development as secured by Section 36 and Marine Licence consent conditions and Section 105 of the Energy Act 2004 (as amended);
- M-11: Development of and adherence to a PS (applicable where piling is undertaken). The PS will detail the method of pile installation and associated noise levels. It will describe any mitigation measures to be put in place (e.g., soft starts and ramp ups, use of Acoustic Deterrent Devices) during piling to manage the effects of underwater noise on sensitive receptors; and
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction Proposed Development phases.

9.5 Scoping of Impacts

9.5.1.1 Potential impacts on Fish and Shellfish Ecology have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are based on the assessment of the baseline environment detailed in Section 9.3 and are outlined in Table 9.5.

9.5.1.2 These impacts are based on the design envelope and the anticipated worst-case scenario at this stage of the Proposed Development. As it stands, the Proposed Development will be split between fixed monopiles (potentially with moorings), fixed jackets on pin piles or suction caissons or GBS in the shallower regions of the Array Area, and floating WTGs in the deeper regions of the site which might include semi-submersible and/or tension leg platforms.

Table 9.5. EIA scoping assessment for Fish and Shellfish Ecology.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Temporary habitat disturbance	M-1, M-6, M-8	Scoped in	There is potential for temporary, direct habitat loss and disturbance due to seabed preparation works for foundations and cable laying operations (including anchor placements and jack-up operations).	✓	✓	✓	✓	✓
Temporary increases in SSCs and changes to seabed levels	M-1, M-5	Scoped in	Sediment disturbance may arise from a range of construction activities within the Array Area, such as foundation installation and cable installation. Sediment disturbance from foundation installation may comprise the disposal of drill arisings following WTG installation or seabed.	✓	✓	✓	✓	✓
Direct and indirect seabed disturbance leading to release of sediment contaminants	M-8, M-10	Scoped in	Potential effects from construction may arise from sediment resuspension; while in suspension, there is the potential for sediment bound contaminants, such as metals, hydrocarbons and organic pollutants, to be released into the water column and lead to an effect on fish and shellfish receptors.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Direct damage (e.g., crushing) and disturbance to mobile demersal and pelagic fish and shellfish species	M-1, M-6, M-10	Scoped out	Affected species are likely to be mobile and can move away from disturbance. The habitats that will be disturbed represent a very small area of the total	✗	✗	✗	✗	✗
Mortality, injury, behavioural impacts and auditory masking arising from noise and vibration	M-11	Scoped in	Potential effects from construction activities may arise from noise and vibrations from pile-driving for the installation of foundations for offshore structures (i.e., WTGs and OSP). Cable laying, dredging and vessel movements also have the potential to result in underwater noise. Noise from piling has the potential to cause significant impacts to fish and shellfish species ranging from lethal trauma to behavioural changes in susceptible fish species.	✓	✓	✗	✗	✗
Accidental pollution events during the construction phase resulting in potential effects on fish and shellfish receptors	M-8, M-9	Scoped out	The magnitude of an accidental spill will be limited by the size of chemical or oil inventory on construction vessels. In addition, released hydrocarbons would be subject to rapid dilution, weathering and dispersion and would be unlikely to persist in the marine environment. The likelihood of an incident will be reduced by implementation of a PEMP. It is proposed that this impact is therefore scoped out of the EIA.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Increased risk of introduction and/or spread of INNS	M-8	Scoped out	This impact is being proposed to be scoped out in consideration of the mitigation and control of invasive species measures in line with International Maritime Organization (IMO, 2019). These standards and procedures will be incorporated into the PEMP and are embedded in the project design and as such ensure that no significant effects arise from INNS.	✗	✗	✗	✗	✗
Operation and Maintenance								
Long-term loss of habitat due to the presence of WTG foundations, scour protection and cable protection	M-10	Scoped in	Potential effects during the operational phase will mostly result from the physical presence of infrastructure (i.e., foundations and any cable protection above the seabed) which will result in long-term habitat loss. This has the potential for impacts on substrate dependent fish and shellfish, in particular those that have substrate specific spawning behaviours (e.g., sandeel), or those with designated conservation status.	✓	✓	✓	✓	✗
Entanglement of fish within discarded fishing gear/debris that becomes caught within the dynamic cabling/ mooring lines	M-8, M-12	Scoped in	Potential for discarded fishing gear and other debris to become caught up in dynamic cabling/mooring lines for floating foundations. This could result in entanglement of fish (ghost fishing).	✗	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Direct disturbance resulting from maintenance during operational phase	M-1, M-6, M-8	Scoped out	Affected species are likely to be mobile and can move away from disturbance. The habitats that will be disturbed represent a small area of the total distribution of that habitat type in the Moray Firth.	X	X	X	X	X
Increased hard substrate and structural complexity as a result of the introduction of WTG foundations, scour protection and cable protection	M-5, M-8	Scoped out	The introduction of infrastructure such as foundations and scour protection will result in the introduction of hard substrate. The increased structural complexity from the introduced infrastructure may provide a habitat or refuge for fish and shellfish species (Hoffman *et al*., 2000). A commercial species, edible crab, is likely to be an early coloniser of operational OWFs (Linley *et al*., 2007). The area provided by the infrastructure for fish aggregation is relatively small and of minor significance.	X	X	X	X	X
Increased risk of introduction and/or spread of INNS	M-8	Scoped out	This impact is being proposed to be scoped out in consideration of the mitigation and control of invasive species measures in line with International Maritime Organization (IMO, 2019). These standards and procedures will be incorporated into the PEMP and are embedded in the project design and as such ensure that no significant effects arise from INNS.	X	X	X	X	X

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
EMF effects arising from cables during operational phase	M-8	Scoped out	The inter-array and interconnector cables can produce EMF which has the potential to affect the behaviour of sensitive species. EMF effects on sensitive species are usually limited to the immediate cable area and the resulting impacts are considered minor (Normandeu *et al*., 2011). Monitoring of previous OWF projects has revealed no behavioural changes of invertebrate species as a result of EMF. The EMFs produced by cables will be of a small magnitude. As well as this, embedded mitigation measures (e.g., cable burial being the preference for all cables) that will be implemented and this will increase the distance between sensitive species and the source of EMF, reducing the likelihood of behavioural responses from species. For this reason, it is considered that the risk of impact from EMF is not significant and will be scoped out.	X	X	X	X	X
Underwater noise as a result of operational WTGs	M-11	Scoped out	Underwater noise as a result of operational WTGs, has a relatively low frequency and pressure level (Andersson *et al*., 2011). Operational noise generated from maintenance vessel traffic is likely to be low and would only have an impact on fish species if they remained in close proximity to the vessel for hours.	X	X	X	X	X

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Accidental pollution events during O&M activity	M-8, M-9	Scoped out	See justification listed for accidental pollution events during construction and decommissioning activity.	X	X	X	X	X

9.6 Potential Cumulative Impacts

9.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Fish and Shellfish Ecology, cumulative interactions may occur with other planned OWF as well as other activities in the study area. The Fish and Shellfish CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

9.6.1.2 Impacts that are scoped into the assessment for the Proposed Development alone, are generally spatially restricted to being within close proximity to the Array Area and Offshore ECC. However, certain potential impacts, such as an increase in SSC, and underwater noise have the potential to affect the fish and shellfish communities over a more significant area. It is proposed that impacts with limited spatial extent, that do not have an effect on a designated species, site or feature, are scoped out of any further assessment within the EIA.

9.6.1.3 For this reason, the following impacts on Fish and Shellfish Ecology receptors are being proposed for further consideration within the CIA, subject to route refinement:

- Temporary increase in suspended sediment and sediment deposition; and
- Mortality, injury and behavioural changes resulting from underwater noise arising from construction activity.

9.7 Potential Transboundary Impacts

9.7.1.1 Transboundary impacts related to Fish and Shellfish Ecology are not anticipated to arise from construction, O&M or decommissioning stages of the Proposed Development. Any impacts on fish and shellfish receptors will be localised in nature (including those giving rise to the greatest footprint of effect such as underwater noise from piling), and any indirect effects will likely be limited to one tidal excursion from the impact source. The Proposed Development is a significant distance from the nearest adjacent EEZ of another state and, therefore, it is considered that transboundary impacts will not occur and will be scoped out from further consideration within the EIA.

9.8 Proposed Approach to EIA

9.8.1.1 This section outlines the proposed EIA approach to Fish and Shellfish Ecology for the Proposed Development. This includes the proposed assessment methodology, relevant embedded mitigation measures, as well as those measures scoped into and out of the assessment.

9.8.1 Relevant Data Sources

9.8.1.1 In addition to those readily available data sources outlined in Table 9.1, site-specific survey data is planned to inform the EIA, as well as further review of survey data from the Moray East and Moray West OWFs, such as those detailed in Table 8.4 (as part of Benthic Subtidal and Intertidal Ecology) and Table 9.6.

9.8.1.2 Site-specific fish ecology surveys are not planned for the Proposed Development due to the volume of pre-existing survey data that cover the region. These data are considered significantly robust for the purposes of conducting an EIA and site-specific surveys of the area will likely not add any meaningful information to the EIA baseline. It is considered unlikely that site-specific Fish and Shellfish Ecology surveys of the Proposed Development would record additional species to those captured within the pre-existing datasets listed within Table 9.1.

Table 9.6. Relevant data sources to inform EIA for Fish and Shellfish Ecology.

Title	Detail/Source	Year	Author
Moray East OWF - Pre-construction herring larvae monitoring survey undertaken in the August and September 2018	Project data archive	2018	Brown and May Marine
Moray East OWF – Moray Firth Tracking Project	The project will aim to tag up to 350 salmon smolts from between four and six rivers in the Moray Firth area with acoustic transmitters	-	AST and the Centre for Ecology & the Natural Environment at the University of Glasgow
Moray East OWF – Cod Survey Report 2019	Project data archive	2019	Moray Offshore Renewables Limited
Moray East OWF – Cod Survey Final Report 2013	Project data archive	2013	Moray Offshore Renewables Limited
Moray East OWF – Sandeel Survey Report	Project data archive	2019	Moray Offshore Renewables Limited
Salmon and Sea Trout Technical Report	Project data archive	2014	Brown and May Marine

9.8.2 Guidance

9.8.2.1 The approach to EIA will follow the general approach outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report. In addition, the assessment of Fish and Shellfish Ecology will also give due regard to the following guidance documents where they are specific to this topic:

- Guidelines for Ecological Impact Assessment in the UK and Ireland. Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2018);
- Guidance note for EIA in respect of FEPA and CPA requirements (Cefas *et al.*, 2004);
- Strategic Review of Offshore Windfarm Monitoring Data Associated with FEPA Licence Conditions (Cefas 2010);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy projects (Judd, 2012); and

- Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008).
- Sensitivity of features based upon the MarESA framework where possible (MarLIN, 2022).
- Sound Exposure Guidelines for Fishes and Sea Turtles: A Technical Report (Popper *et al*., 2014).
- Information gaps in understanding the effects of noise on fishes and invertebrates (Hawkins *et al*., 2014).
- A sound approach to assessing the impact of underwater noise on marine fishes and invertebrates (Hawkins and Popper, 2016).
- Monitoring Guidance for Underwater Noise in European Seas, Part II Monitoring Guidance Specifications (Dekeling *et al*., 2014);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase I (Natural England, 2021a);
- Offshore Wind Marine Environmental Assessments: Best Practice Advice for Evidence and Data Standards – Phase III (Natural England, 2021b); and
- Overarching National Planning Statement (NPS) for Energy (EN-1) (Biodiversity and Geological Conservation) (DECC, 2011a), NPS for Renewable Energy (EN-3) (Offshore Wind Farm Impacts – Fish) (DECC, 2011b), Draft Overarching NPS for Energy (EN-1) (DECC, 2021a), Draft NPS for Renewable Energy Infrastructure (EN-3) (DECC, 2021b), The UK Marine Policy Statement (HM Government, 2011) along with local planning policies.

9.8.3 Assessment Methodology

9.8.3.1 To enable the potential impact of the Proposed Development to be assessed, a description of the existing fish and shellfish populations, focusing particularly on any areas of conservation interest, will be produced. Potential impacts that may occur on Fish and Shellfish Ecology as a result of the planned construction, O&M and decommissioning will then be identified. The sensitivities of the populations present to the types of impact expected from wind farm construction, O&M and decommissioning will be assessed. Where necessary, measures will be proposed to mitigate the impacts.

9.8.3.2 In the event that the Proposed Development has a direct impact on any sites that are designated for conservation at the European (SAC or SPA; now forming part of the UK's National Site Network) or international level (NCMPA or Ramsar), as a result of qualifying habitats or species that they support, then the requisite information will be provided alongside the EIAR to assist the competent authority to carry out an appropriate assessment. A separate Offshore HRA Screening Report has been produced and submitted alongside this Offshore Scoping Report which considers/evaluates the potential connectivity of European Sites (including SACs with migratory fish features) within the assessment, and apportions the impacts identified back to the European Sites impacted.

9.8.3.3 Cumulative impacts will be assessed by taking into consideration any similar developments, proposed or existing, that are in the vicinity of the development zone.

9.9 Scoping Questions

9.9.1.1 The questions in Table 9.7 are posed to consultees to frame and focus responses to the Fish and Shellfish Ecology scoping exercise, which will in turn inform the Scoping Opinion.

Table 9.7. EIA scoping questions for Fish and Shellfish Ecology.

Scoping Questions – Fish and Shellfish Ecology
Do you agree with the data sources, including project specific surveys, to be used to characterise the Fish and Shellfish Ecology baseline within the EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Fish and Shellfish Ecology?
Do you agree with the project impacts which have been scoped out of the EIA for Fish and Shellfish Ecology?
Do you agree that transboundary impacts for Fish and Shellfish Ecology may be scoped out of the EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Fish and Shellfish Ecology that have been identified for the Proposed Development?
Do you agree that no site-specific surveys for Fish and Shellfish Ecology will be required to inform the Proposed Development?

10 Offshore Ornithology

10.1 Introduction

10.1.1.1 This chapter of the Offshore Scoping Report identifies the Offshore Ornithology receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS and thus captures both intertidal and marine/offshore ornithological receptors.

10.2 Study Area

10.2.1.1 The Offshore Ornithology study area is defined by the Proposed Development footprint plus an appropriate buffer. This includes the Array Area with a 4 km buffer, the Offshore ECC and the export cable landfall search area, thereby encapsulating both the offshore and intertidal ornithological receptors. Account also has to be taken of the mobility of birds, noting that, for instance, birds that nest outside the study area might fly in to or across the study area to feed during the breeding season, might fly into the study area outside of the breeding season to spend the winter or might fly across the study area on migration.

10.3 Baseline Environment

10.3.1 Data Sources

10.3.1.1 An initial desk-based review of literature and data sources has been undertaken to support this Scoping Report. The data sources listed below provide coverage of the study area and the wider region of interest for offshore and intertidal bird species.

10.3.1.2 The data sources that have been used to inform this Offshore Ornithology chapter of the Offshore Scoping Report are presented within Table 10.1.

Table 10.1. Summary of key datasets for Offshore Ornithology.

Title	Source	Year	Author
Existing OWF Data			
Moray East OWF Pre-construction Aerial Survey Report 2018	https://marine.gov.scot/data/mfrag-ornithology-moray-east-offshore-windfarm-pre-construction-aerial-survey-report-2018	2018 (May to July)	Moray East OWF
Beatrice OWF Beatrice OWF Pre-Construction Aerial Survey Report	https://marine.gov.scot/data/mfrag-ornithology-beatrice-offshore-windfarm-pre-construction-aerial-survey-report-meeting	2015 (May to August)	Beatrice OWF
Beatrice OWF Year 1 Post-construction Ornithological Monitoring Report 2019	https://marine.gov.scot/data/mfrag-ornithology-post-construction-ornithological-monitoring-report-2019-28042021	2019 (May to July)	Beatrice OWF
Moray East OWF Environmental Statement	https://www.morayeast.com/application/files/6915/8013/6681/Chapter-4-Biological-Environment-Baseline.pdf https://www.morayeast.com/application/files/7315/8013/6709/Chapter-7-Biological-Environment-OGS-IA.pdf https://www.morayeast.com/application/files/3815/8013/6732/Chapter-10-Biological-Environment-TI-IA.pdf https://www.morayeast.com/application/files/2915/8013/6755/Chapter-14-Biological-Environment-CIA.pdf	2011	Moray Offshore Renewables Limited
Moray West OWF EIAR - Chapter 10: Ornithology	https://www.moraywest.com/document-library/navigate/358/720	2018	Moray OWF (West) Limited
Beatrice OWF Environmental Statement	https://marine.gov.scot/ml/section-36-consent-construction-and-operation-offshore-windfarm-and-transmission-works-beatrice	2012	Beatrice OWF
Publicly Available Datasets			
Designated Sites	NatureScot SiteLink: https://sitelink.nature.scot/home	Multiple	NatureScot

Title	Source	Year	Author
Seabirds Count national colony census data	BTO Seabird Monitoring Programme https://app.bto.org/seabirds/public/index.jsp	Multiple	British Trust for Ornithology (BTO)
Seabird Tracking Data	http://seabirdtracking.org/mapper/index.php, plus other published tracking data.	Multiple	Multiple
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited
Literature			
Literature: Potential impacts of offshore windfarms on birds	Peer reviewed scientific literature regarding the potential impacts from OWFs: e.g., Garthe and Hüppop (2004); Drewitt and Langston (2006); Stienen *et al.* (2007); Speakman *et al.* (2009); Langston (2010); Band (2012); Cook *et al.* (2012); Furness and Wade (2012); Wright *et al.* (2012); Furness *et al.* (2013); Johnston *et al.* (2014a; 2014b); Cook *et al.* (2014; 2018); Dierschke *et al.* (2017); Jarrett *et al.* (2018); Leopold and Verdaat (2018); Mendel *et al.* (2019); Goodale and Milman (2020).	Multiple	Multiple
Literature: Bird distribution	Publicly available reports of seabird distribution: e.g., Stone *et al.* (1995); Brown and Grice (2005); Kober *et al.* (2010); Bradbury *et al.* (2014); HiDef Ltd. (2015); Waggitt *et al.* (2019); Cleasby *et al.* (2020); Davies *et al.* (2021).	Multiple	Multiple
Literature: Bird breeding ecology	Publicly available information on the breeding ecology of various bird species: e.g., Cramp and Simmons (1977-94); Del Hoyo *et al.* (1992-2011); Robinson (2005).	Multiple	Multiple
Literature: Bird population estimates and demographic rates	Publicly available reports/data on seabird populations and demographic rates for use in assessments: e.g., Mitchell *et al.* (2004); BirdLife International (2004); Holling *et al.* (2011); Musgrove *et al.* (2013); Furness (2015); Horswill *et al.* (2017); Frost *et al.* (2019); JNCC (2020).	Multiple	Multiple
Literature: Bird migration and foraging movements	Publicly available reports of bird movements during breeding season foraging trips and migration: e.g., Wernham *et al.* (2002); Thaxter *et al.* (2012); Wright *et al.* (2012); Wakefield *et al.* (2013; 2017); Furness *et al.* (2018); Woodward *et al.* (2019).	Multiple	Multiple

10.3.2 Overview of Baseline Data

10.3.2.1 This section provides information on the baseline ornithological environment, gathered from a desk-based assessment of information available to date.

Moray Firth

10.3.2.2 The Moray Firth represents mainland Britain's most northerly large estuary, with numerous firths, inlets and sandy bays providing key sheltered refuges and feeding spots for breeding, nonbreeding and migratory seabirds and waterbirds. Most of the area comprises shallow (<20 m) water over a sandy substrate, supporting a wide variety of pelagic and demersal fish and acting an important fish spawning ground and nursery site (Marine Scotland, 2020a). The area also supports shellfish (e.g., Norway lobster and Blue mussel) and bivalves which are important prey species for visiting waterbirds (Marine Scotland, 2020a).

10.3.2.3 This area is especially important for populations of non-breeding and migratory species, regularly supporting both non-breeding populations of European importance (e.g., divers and grebes), and migratory species of European importance (e.g., ducks and shags), alongside hosting internationally important numbers of wintering birds many of which have migrated thousands of miles from breeding grounds in northern Europe and western Siberia (Marine Scotland, 2020a). It also provides a key feeding area for birds during spring and autumn migration periods, moving between breeding grounds at high latitudes and wintering grounds further south within the UK and beyond. Coastlines of the Moray Firth also provide important nesting habitat for seabirds during the breeding season, with a range of seabirds (e.g., gannet, guillemot, and kittiwake) returning in spring and summer each year (RSPB, 2014). In recognition of these ornithological interests, there are several designated sites situated around the Moray Firth (Figure 10.1).

Array Area

10.3.2.4 Site specific digital aerial surveys are currently being undertaken; however, data is not yet currently available (see Section 10.8.1 for digital aerial survey methodology). In the absence of site-specific digital aerial surveys, alternative surveys/data sources from previous projects have been reviewed as a proxy to identify potential Important Ornithological Features (IOFs). The list of species may therefore be updated following the results from the site-specific digital aerial surveys.

10.3.2.5 Ocean Winds has been involved in developments adjacent to the site for a decade; therefore, there is vast amounts of knowledge on the baseline data surrounding the Proposed Development, including:

- 2010 to 2012 boat-based surveys (Moray East OWF);
- Boat-based and coastal vantage points migration surveys in autumn 2010 and spring 2011 (Moray East OWF);
- Summer 2011 aerial surveys (Moray East OWF);
- April 2016 to March 2017 aerial survey (Moray West OWF);
- Pre-construction monitoring has been undertaken at Moray East OWF (adjacent to the Proposed Development, plus a 10 km buffer which overlaps with the Array Area for the Proposed Development); and

- Pre-/post-construction monitoring has been undertaken at Beatrice OWF (plus a 2 km buffer).

10.3.2.6 A review of the surveys listed above has identified species that are likely to be present within the Array Area. A description of the key species identified is provided below:

- Fulmar
  - Fulmar are present in surveys throughout the year. The highest densities were recorded to the west of the Array Area, with lower densities in the buffer which overlap with the Proposed Development; therefore, fulmar are likely to be present throughout the year with the Proposed Development.
  - Although fulmar has low vulnerability to both displacement and collision (Bradbury *et al*., 2014), fulmar has been included as an IOF on a precautionary basis due to presence in surveys.
- Kittiwake
  - Kittiwake were one of the most frequently encountered species in the Moray West OWF aerial surveys.
  - Kittiwake were recorded in surveys throughout the year, with densities peaking around June. Within the Moray East OWF pre-construction surveys, the highest densities were within the northwest and southeast of the survey (south-east overlapping with the Proposed Development).
  - Kittiwake have been included as an IOF due to presence in surveys and vulnerability to collision risk.
- Guillemot
  - Guillemot were one of the most frequently encountered species in the Moray West OWF aerial surveys, and the most abundant in the Beatrice OWF pre-and post-construction surveys.
  - Guillemot were recorded throughout the year, with peak abundances recorded in various months in the different surveys (Moray East OWF – May; Moray West OWF – September; Beatrice OWF – July).
  - Guillemot have been included as an IOF due to presence in surveys and vulnerability to displacement.
- Razorbill
  - Razorbill were one of the most frequently encountered species in Moray West OWF aerial surveys.
  - Razorbill were recorded throughout the year, with peak abundances recorded from May to August. Within the Moray East OWF pre-construction survey, razorbill were identified within the overlap with the Array Area during July, therefore likely to be present in the site-specific aerial surveys.
  - Razorbill have been included as an IOF due to presence in surveys and vulnerability to displacement.

- Puffin
  - Puffin were recorded throughout the year, with highest densities recorded in May/August. The highest densities of puffin recorded within the Moray East OWF survey area were recorded in the central and south-eastern parts of the Moray East site, with concentrations in the buffer zone in the southeast (overlap with the Proposed Development).
  - Puffin have therefore been included as an IOF due to presence in surveys and vulnerability to displacement.
- Herring gull
  - Herring gull were recorded throughout the year. Peak densities varied between surveys. Peak densities were recorded in winter during Moray East OWF baseline surveys, whereas peak densities were recorded in June during the Moray East OWF pre-construction and Moray West OWF baseline surveys.
  - Herring gull have been included as an IOF due to presence in surveys and vulnerability to collision risk.
- Lesser black-backed gull
  - Lesser black-backed gull were recorded in small numbers, with records restricted to the spring and summer months.
  - Nevertheless, there is the potential that lesser black-backed gull may be recorded in higher numbers within the Proposed Development site-specific surveys currently being undertaken. Lesser black-backed gull have, therefore, been included as an IOF due to vulnerability to collision risk.
- Great black-backed gull
  - Great black-backed gull were recorded throughout the year. Peak densities were recorded during the breeding season in either June, July or September, with annual variation.
  - Great black-backed gull have therefore been included as an IOF due to presence in surveys and vulnerability to collision risk.
- Gannet
  - Gannet were recorded throughout the year. Peak densities varied between surveys, occurring between April and September. Within the Moray East OWF pre-construction surveys, large aggregations were identified within the northwest and southeast of the survey (southeast overlapping with the Proposed development); however, lower densities in the overlap with the Array Area within the Moray East baseline surveys. Therefore, there may be some interannual variation.
  - Gannet have been included as an IOF due to presence in surveys and vulnerability to collision risk and displacement.

- Great skua
  - Great skua were recorded throughout the year apart from the winter months, with birds absent from November to March. Densities were highest in late spring, peaking in May/June. Great skua were not mentioned within the Beatrice pre-/post-construction reports.
  - Great skua have been included as an IOF due to presence in surveys and moderate vulnerability to collision risk.
- Arctic tern
  - Annual variation was identified with the presence of Arctic terns, with peak densities recorded in May/June/September. Arctic tern were not mentioned within the Beatrice pre-/post-construction reports.
  - Arctic tern have been included as an IOF due to presence in surveys and vulnerability to collision risk.
- Less common recorded seabirds species
  - Sooty shearwater, Manx shearwater, European storm petrel, Leach's storm petrel, pomarine skua; long-tailed skua, black-headed gull, common gull, Iceland gull, Sandwich tern, common tern and black guillemot.
  - Due to being recorded in such low numbers/and or low sensitivity to potential impacts, these species are not considered as IOFs.
  - Although European shag was only recorded in low numbers, the species has been included as an IOF due to the proximity (small overlap) of the Offshore ECC with Moray Firth SPA (for which the species is designated).

10.3.2.7 Overall, from reviewing the currently available dataset, the seabird species most likely to be identified as an IOF are fulmar, kittiwake, guillemot, razorbill, puffin, gannet, herring gull, great black-backed gull, great skua, Arctic tern and European shag.

10.3.2.8 Non-seabird migratory species have also been evaluated previously in surveys for Moray East and Moray West. It is noted that migratory species were not identified within the Moray East or Moray West sites in significant numbers. It is likely that similar findings will arise from the Proposed Development site specific surveys. However, similarly to European shag, there are designated non-seabird species at Moray Firth SPA which is in close proximity (small overlap) to the Offshore ECC and have therefore been included as an IOF. These species are great northern diver, red-throated diver, Slavonian grebe, greater scaup, common eider, long-tailed duck, common scoter, velvet scoter, common goldeneye and red-breasted merganser.

Designated Sites

10.3.2.9 While recognising that EIA focuses assessment at broader scale than individual designated sites, there will be interaction with National Site Network designations. Therefore, for this Offshore Scoping Report, an initial review has been undertaken to identify the key designated sites with ornithology interest features that may be sensitive to the Proposed Development. Sites which may have connectivity to the Proposed Development include those designated for breeding seabirds and those

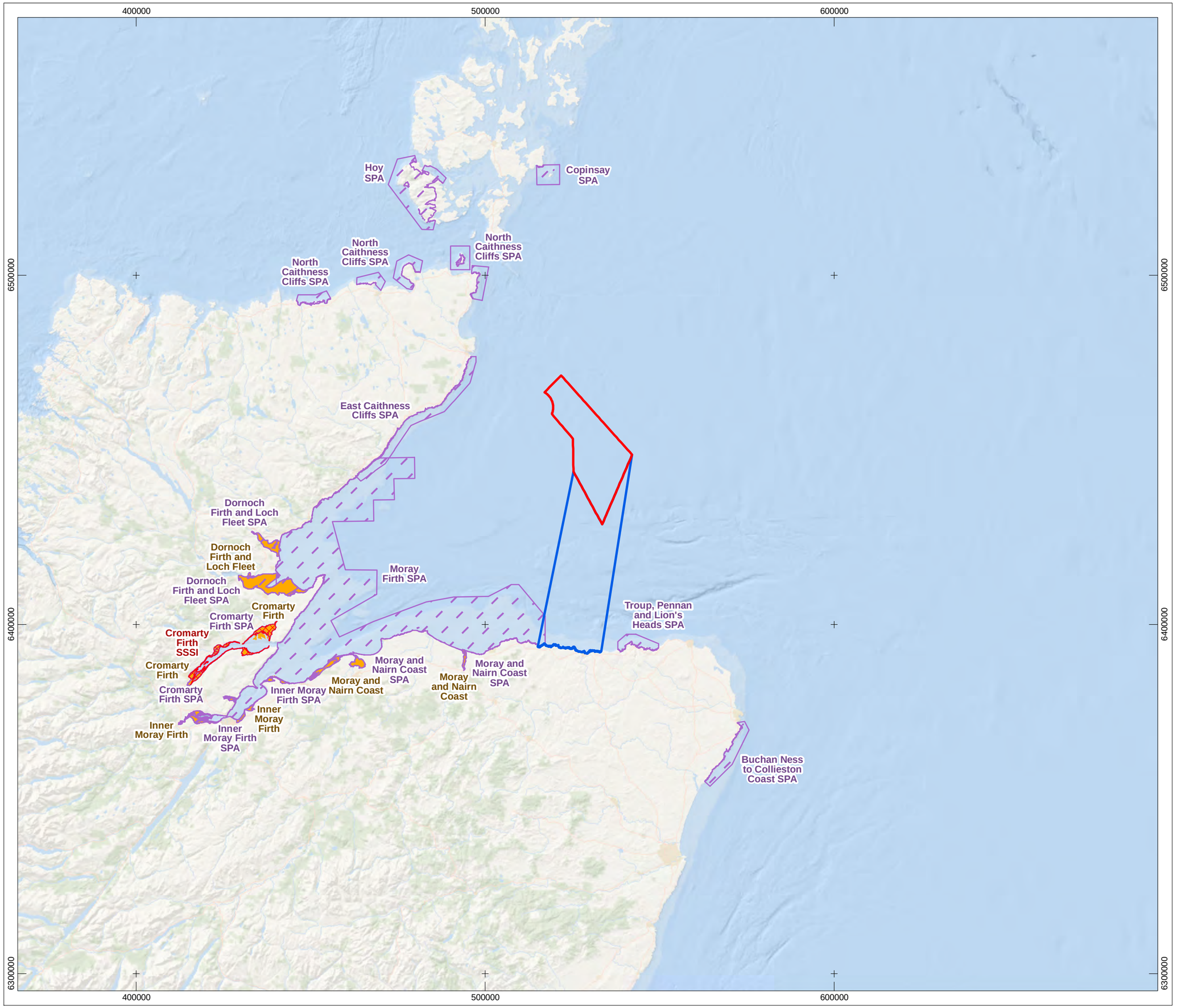
for terrestrial, coastal or marine bird interests (typically overwintering aggregations).

10.3.2.10 For the EIAR, wider, regional reviews of designated sites for offshore ornithology will be undertaken, considering potential connectivity of receptors within the study area. In addition, full consideration of connectivity of European Sites (including sites which form the UK's National Site Network; SPAs and Ramsar sites) are provided in a separate HRA Screening Report which covers matters associated with European designations in more detail. This will also be discussed with Statutory Nature Conservation Bodies (SNCBs) as part of the PAC process.

10.3.2.11 The Array Area does not directly overlap with any ornithological designations (Figure 10.1). Furthermore, the Array Area is over 20 km from the nearest SPA designated for displacement sensitive species. However, as breeding seabirds can travel considerable distances when foraging it is necessary to consider designated sites beyond the Array Area boundary. Additionally, bird species (including seabirds, waterfowl and waders) may have connectivity to the Proposed Development during the non-breeding season and during migration. The key sites identified in relation to ornithological interest are as follows:

- North Caithness Cliffs SPA;
- East Caithness Cliffs SPA;
- Copinsay SPA;
- Fair Isle SPA;
- Forth Islands SPA;
- Hoy SPA;
- North Rona and Sula Sgeir SPA;
- Troup, Pennan and Lions Heads SPA;
- Buchan Ness to Collieston Coast SPA;
- Moray Firth SPA;
- Inner Moray Firth SPA;
- Inner Moray Firth Ramsar;
- Moray and Nairn Coast SPA;
- Moray and Nairn Coast Ramsar;
- Cromarty Firth SPA;
- Cromarty Firth Ramsar;
- Cromarty Firth SSSI;
- Dornoch Firth and Loch Fleet SPA; and
- Dornoch Firth and Loch Fleet Ramsar.

10.3.2.12 The Offshore ECC marginally overlaps with Moray Firth SPA (Figure 10.1). The features of this SPA have been included within Table 10.2 as IOFs.



Legend

- Array Area
- Offshore Export Cable Corridor
- Special Protection Area (SPA)
- Ramsar Site
- Site of Special Scientific Interest (SSSI)

Scale at A3: 1:1,000,000

N

0 25 50 km

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	JG	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ORN_MAP_00009		

Figure 10.1
Ornithological designations (SPAs, Ramsar sites and SSSIs) in the vicinity of the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Important Ornithological Features

10.3.2.13 Species likely to be taken forward to the EIA as IOFs will be features identified through analysing the site-specific surveys and/or features of overlapping SPAs that are considered to be at potential risk either due to their abundance, potential sensitivity to wind farm impacts and/or due to biological characteristics (e.g., commonly fly at rotor heights) which make them potentially susceptible. Prior to the completion of ongoing site-based aerial surveys, a list of species most likely to be considered IOFs is presented in Table 10.2, as determined from available information outlined in Table 10.1. This species list may be subject to change based on the results of ongoing aerial surveys and stakeholder consultation. Additionally, data collected as part of the Moray East OWF and Beatrice OWF monitoring requirements will be used to assess area specific impacts, thereby informing assessment.

Table 10.2. Species conservation value for current key IOFs.

Species	Nature Conservation Value
Kittiwake (*Rissa tridactyla*)	Birds of Conservation Concern (BoCC) (Eaton *et.al*, 2015) Red listed, Birds Directive Migratory Species, International Union for Conservation of Nature (IUCN) Red List 'Vulnerable' status.
Guillemot (*Uria aalge*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Razorbill (*Alca torda*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Puffin (*Fratercula arctica*)	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Vulnerable' status.
Gannet (*Morus bassanus*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Herring gull (*Larus argentatus*)	BoCC Red listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Lesser black-backed gull (*Larus fuscus*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Great black-backed gull (*Larus marinus*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status
Fulmar (*Fulmarus glacialis*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Great skua (*Stercorarius skua*)	BoCC Amber listed, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Arctic tern (*Sterna paradisaea*)	BoCC Amber listed, Birds Directive Annex I, IUCN Red List 'Least Concern' status.
European shag (*Phalacrocorax aristotelis*)	Moray Firth SPA feature. BoCC Red listed, Birds Directive Annex I, IUCN Red List 'Least Concern' status.
Great northern diver (*Gavia immer*)	Moray Firth SPA feature. BoCC Amber listed, Birds Directive Annex I, IUCN Red List 'Least Concern' status.

Species	Nature Conservation Value
Red throated diver (*Gavia stellata*)	Moray Firth SPA feature. BoCC Green listed, Birds Directive Annex I, IUCN Red List 'Least Concern' status.
Slavonian grebe (*Podiceps auritus*)	Moray Firth SPA migratory feature. BoCC Red listed, Birds Directive Annex I, IUCN Red List 'Vulnerable' status.
Greater scaup (*Aythya marila*)	Moray Firth SPA migratory feature. BoCC Red listed, IUCN Red List 'Least Concern' status.
Common eider (*Somateria mollissima*)	Moray Firth SPA migratory feature. BoCC Amber status, IUCN Red List 'Near Threatened' status.
Long-tailed duck (*Clangula hyemalis*)	Moray Firth SPA migratory feature. BoCC Red status, IUCN Red List 'Vulnerable' status.
Common scoter (*Melanitta nigra*)	Moray Firth SPA migratory feature. BoCC Red status, Birds Directive Migratory Species, IUCN Red List 'Least Concern' status.
Velvet scoter (*Melanitta fusca*)	Moray Firth SPA migratory feature. BoCC Red status, IUCN Red List 'Vulnerable' status.
Common goldeneye (*Bucephala clangula*)	Moray Firth SPA migratory feature. BoCC Red status, IUCN Red List 'Least Concern' status.
Red-breasted merganser (*Mergus serrator*)	Moray Firth SPA migratory feature. BoCC Amber status, IUCN Red List 'Least Concern' status.

10.3.2.14 Data analysis for the EIA will consider seasonal variations in site usage by IOFs as well as the importance of the site for each species' different life stages. Table 10.3 provides an overview of relevant seasons for each species based on information from NatureScot guidance[17], where available.

10.3.2.15 Reference populations for each species and population sizes will be based on the best available information at the time of undertaking the assessment and will be agreed with key stakeholders. The conservation status of each species will also be taken into consideration (Table 10.2).

[17] https://www.nature.scot/doc/guidance-note-seasonal-definitions-birds-scottish-marine-environment

Table 10.3. Species specific bio-season as defined in NatureScot guidance[18].

Species	Breeding	Post-Breeding	Non-Breeding	Pre-Breeding
Kittiwake	Mid-April to August	-	September to March	Early April
Guillemot	April to mid-August	Late August; Flightless moult August to mid-October	September to January	February to March
Razorbill	April to mid-August	Late August; Flightless moult late August to November	September to February	March
Puffin	April to mid-August	Late August	September to mid-March	Late March; Flightless moult February to mid-March
Gannet	Mid-March to September	-	October to mid-February	Mid-February to mid-March
Herring gull	April to August	-	September to February	March
Lesser black-backed gull	Mid-March to August	-	September to mid-March (not present in significant numbers)	-
Great black-backed gull	April to August	-	September to February	March
Fulmar	April to mid-September	-	Mid-September to March	-
Great skua	Mid-April to mid-September	-	Mid-September to March (not present in significant numbers)	Early March

[18] https://www.nature.scot/doc/guidance-note-seasonal-definitions-birds-scottish-marine-environment

Species	Breeding	Post-Breeding	Non-Breeding	Pre-Breeding
Arctic tern	May to August	-	September to April (not present in significant numbers)	-
European shag	March to September	-	October to January	February
Great northern diver	-	-	October to mid-May (remainder of year not present in significant numbers); Flightless moult February to mid-April	-
Red throated diver	May to mid-September	-	Mid-September to March; Flightless moult mid-September to December	April
Slavonian grebe	-	-	Mid-September to April (remainder of year not present in significant numbers)	-
Greater scaup	-	-	Mid-September to March (remainder of year not present in significant numbers)	-
Common eider	Mid-April to August	-	September to mid-April; Flightless moult July to mid-September	-
Long-tailed duck	-	-	Mid-September to April (remainder of year not present in significant numbers)	-

Species	Breeding	Post-Breeding	Non-Breeding	Pre-Breeding
Common scoter	-	-	July to April (remainder of year not present in significant numbers); Flightless moult July to mid-October	-
Velvet scoter	-	-	September to mid-April (remainder of year not present in large numbers)	-
Common goldeneye	-	-	September to mid-April (remainder of year not present in large numbers)	-
Red-breasted merganser	Mid-April to mid-August	-	Mid-August to March Flightless moult August to mid-September	Early April

10.4 Embedded Mitigation Considered within the EIA

10.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

10.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Offshore Ornithology are noted within Table 10.4 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Offshore Ornithology receptors:

- M-3: Development of and adherence to a CMS. The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures.
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management;
- M-11: Development of and adherence to a PS (applicable where piling is undertaken). The PS will detail the method of pile installation and associated noise levels. It will describe any mitigation measures to be put in place (e.g., soft starts and ramp ups, use of Acoustic Deterrent Devices) during piling to manage the effects of underwater noise on sensitive receptors. Mitigation of relevance to Offshore Ornithology in relation to prey species;
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction Project phases;
- M-13: Development of and adherence to a VMP. The VMP will confirm the types and numbers of vessels that will be engaged on the Project, and consider vessel coordination including indicative transit route planning;
- M-14: Development of and adherence to a Lighting and Marking Plan (LMP). The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting; and
- M-15: Blade clearance of at least 35 m above MSL (minimum blade clearance of 35 m will be maintained for floating WTGs due to tidal movements)[19].

10.5 Scoping of Impacts

10.5.1.1 Potential impacts on Offshore Ornithology have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 10.4.

[19] A 35 m air gap has been shown to be achievable for fixed foundations. This has not been required to date for floating projects due to their limited scale; however, Caledonia OWF believe it should be achievable.

Table 10.4. EIA Scoping assessment for Offshore Ornithology.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Direct temporary habitat loss/ disturbance	M-13	Scoped in	Construction activities such as increased vessel activity and underwater noise may result in direct disturbance or displacement of birds from important feeding and roosting areas, including due to direct habitat loss.	✓	✓	✓	✓	✓
Indirect impacts on IOFs due to impacts on prey species due to construction and/or decommissioning	M-3, M-11	Scoped in	Impacts include those resulting from underwater noise (e.g., during piling) or the generation of suspended sediments (e.g., during preparation of the seabed for foundations) that may alter the distribution, physiology or behaviour of bird prey species and thereby have an indirect effect. These mechanisms could potentially result in less prey being available in the area adjacent to active construction works to foraging seabirds.	✓	✓	✓	✓	✓
Indirect impacts through effects on prey species and habitats: Accidental pollution during construction	M-8	Scoped out	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 birds or a reduction in prey availability either of which may affect species' survival rates. With implementation of an appropriate Code of Construction Practice (CoCP) it has been agreed with stakeholders on consent applications for other OWFs, that complete mortality 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	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
			population level is considered very unlikely. It has been predicted for other OWFs that any impact would be of local spatial extent, short term duration, and 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 and within the same environment, whilst implementing an appropriate CoCP. Therefore, subject to consultation with the stakeholders and feedback received on this Offshore Scoping Report, it is intended to scope out this impact pathway from further consideration within the EIA.					
Displacement from wet storage for floating WTG	-	Scoped out	Displacement impacts from WTGs in wet storage will be temporary, therefore any displacement impacts would be short-lived. Due the nature of the potential impact pathway, it is proposed that this impact should be scoped out from further consideration within the EIA.	✗	✗	✗	✗	✗
Collision risk from wet storage for floating WTG	-	Scoped out	WTGs in wet storage are stationary, and therefore will not be assessed for collision risk.	✗	✗	✗	✗	✗
Operation and Maintenance								
Operational disturbance and displacement	M-13, M-14	Scoped in	The presence of WTGs has the potential to disturb and displace birds from within and around the Array Area. This would have the potential to reduce the area available to birds for feeding or loafing. Vessel activity and the lighting of WTGs and associated	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
			ancillary structures could also attract (or repel) certain species of birds and affect migrating birds.					
Indirect impacts on IOFs through direct effects on prey species and habitats	-	Scoped in	Impacts include habitat loss due to the presence of turbines that may alter the distribution, physiology or behaviour of bird prey specie. There is also evidence that fish and mobile invertebrates may be attracted to the operational area (Wilhelmsson, 2006; Emu, 2008; Linley *et al*., 2008; Kerckhof *et al*., 2010; Krone *et al*., 2013) and so beneficial impacts may occur.	✓	✓	✓	✓	✓
Collision risk	M-15	Scoped in	There is a risk of birds in flight colliding with rotating WTG blades. The susceptibility of species to collision risk depends upon morphological and behavioural characteristics of the species, in addition to the project design specifications.	✓	✓	✗	✗	✗
Operational disturbance and displacement (Offshore ECR)	-	Scoped out	Given that potential impacts along the Offshore ECR would be highly localised and episodic (i.e., limited to any maintenance or repair of the export cables), it is proposed that this impact should be scoped out from further consideration within the EIA in relation to the Offshore ECC, with the focus of operation disturbance-displacement on the Proposed Development's array only.	✗	✗	✗	✗	✗
Barrier effects during operation	-	Scoped out	For the purposes of assessment of displacement for resident birds, it is usually not possible to distinguish between displacement and barrier effects; for example, to define where individual birds may have intended to travel to, or beyond an offshore wind farm, even when tracking data are available.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
			Therefore, in the EIA, the effects of displacement and barrier effects on resident IOFs are considered together. The small risk of impact to migrating birds resulting from flying around rather than through the Array Area is considered a potential barrier effect but has been scoped out of the assessment. Masden *et al*. (2010; 2012) and Speakman *et al*. (2009) calculated that the costs of one-off avoidances during migration were small, accounting for less than 2% of available fat reserves. Therefore, the impacts on birds that only migrate through the Array Area (including seabirds, waders and waterbirds on passage) are considered negligible and these would be scoped out of detailed assessment.					

10.6 Potential Cumulative Impacts

10.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Offshore Ornithology, cumulative interactions may occur with other planned OWFs as well as other activities in the study area. The Offshore Ornithology CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project (and as built parameters for those already constructed/operational) and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

10.6.1.2 There is a potential for cumulative impacts on birds due to other operational, consented and planned offshore wind farms. As many bird species are highly mobile, there is the potential for the same bird populations to be affected by several wind farms. Of particular relevance to the cumulative assessment will be operational wind farms in the North Sea and any further ScotWind projects which may enter the consenting process during the period of the EIA stage of the Proposed Development.

10.6.1.3 The potential impacts that would be scoped into the cumulative impact assessment are operational disturbance and displacement, and collision risk. Cumulative construction and decommissioning impacts would be scoped out as the likelihood that there would be a cumulative impact is low. The contribution from the Proposed Development is likely to be small and is dependent on a temporal and spatial co-incidence of disturbance/displacement from other plans or projects (significant additive effects associated with simultaneous construction phases are considered unlikely based on spread of projects within the ScotWind consenting round).

10.6.1.4 Overall, the potential for cumulative impacts will be species-specific as the impacts will be dependent upon the individual sensitivities of each species, where the birds have originated from, and their potential to interact with other wind farms (i.e., on migratory or foraging travel).

10.6.1.5 A Cumulative Effects Framework (CEF) tool[20] is currently being developed for Marine Scotland. Much of the approach for the CIA on ornithology receptors will be guided by the outcomes of the CEF project; therefore, it is likely that CIAs on seabirds will evolve with the Proposed Development, so it would be premature to summarise these as part of this Offshore Scoping Report.

10.6.1.6 However, it should be noted that post-construction monitoring studies, including for the Beatrice and Moray East OWFs are being undertaken to monitor ornithology impacts and confirm the assumptions of OWF ornithological assessments. These studies will provide a wealth of information not previously available when undertaking CIAs. It is therefore proposed that the findings of these studies are drawn upon and taken into account when assessing cumulative impacts.

10.7 Potential Transboundary Impacts

10.7.1.1 Based on the location of the Proposed Development and the likely key receptors, it is considered that there will be no significant transboundary effects on birds in the breeding season. A number of transboundary sites were identified as having designated seabird features (fulmar and Manx shearwater) that are within the mean of the maximum foraging range (+1 S.D.) of the Proposed Development;

[20] https://www.ceh.ac.uk/our-science/projects/cumulative-effects-framework-key-ecological-receptors

however, due to the distances associated with these transboundary sites[21] it is highly unlikely any measurable impacts will occur.

10.7.1.2 In the non-breeding season, it is possible that birds from non-UK seabird colonies may occur within the Proposed Development and therefore there may be impacts on birds originating from non-UK colonies. These potential impacts will be addressed in the EIAR.

10.8 Proposed Approach to EIA

10.8.1 Relevant Data Sources

10.8.1.1 Site-specific digital aerial surveys are currently being undertaken (between May 2021 to April 2023) covering the Array Area plus a 4 km buffer (Figure 10.2). Flight lines are spaced approximately 2.6 km apart with approximately 15% coverage, at a flight heigh of 1,350 ft. The images will be captured at a 1.5 cm ground survey distance (GSD) resolution. At this resolution it is possible to identify the large majority of seabirds[22] to species level while delivering high coverage and causing no or minimal disturbance.

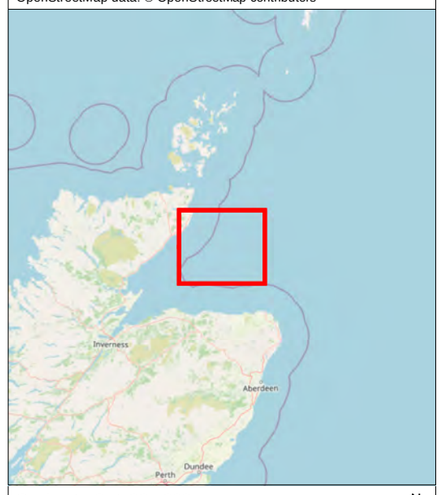
10.8.1.2 Post-construction monitoring surveys were undertaken between May and July 2022 for the Moray East OWF (separate data collection to the Proposed Development), which included the Moray East OWF Array Area plus a 10 km buffer (see Figure 10.3). To compliment this survey work, Caledonia OWF has undertaken additional surveys in April and August 2022 to increase the data collection over the full breeding season in these adjacent areas to the west of the Proposed Development (see 'Caledonia Additional Flight Lines' in Figure 10.2). It is considered that these data, while not processed to inform this Offshore Scoping Report, would likely provide support for a reduced risks from displacement impact assessments for gannet, kittiwake, guillemot, razorbill and puffin and would add further information to the monitoring results from Moray East OWF, providing a complete breeding season data on the effects of Moray East OWF on these species. It is noted that no specific tracking of breeding seabirds is currently planned to be undertaken for the Proposed Development; however, tracking studies have been completed previously for the Moray East OWF which will be used to inform the EIA.

[21] Both fulmar and Manx shearwater have large foraging ranges. It is determined that significant effects would not manifest on distant SPAs as once effects have been apportioned to all SPAs within foraging range, any potential impacts will be trivial.
[22] Suitable for the identification of the key species outlined in this document, particularly storm petrels which are small in size and dark in colour, as well as differentiating between the UK auk species.

500000
525000
550000
6475000
6450000
6425000
Beatrice
Moray East
Moray West

Legend

- Array Area
- Offshore Export Cable Corridor
- Operational Offshore Wind Farm
- Consented Offshore Wind Farm
- Caledonia Flight Lines
- Caledonia Additional Flight Lines



Scale at A3: 1:225,000

0 5 10 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	JG	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ORN_MAP_00041		

Figure 10.2

Transects for aerial site-specific surveys for the Proposed Development

CALEDONIA Offshore Wind Farm

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475000
500000
525000
550000
6475000
6450000
6425000
Beatrice
Moray East
Moray West

Legend

- Array Area
- Offshore Export Cable Corridor
- Operational Offshore Wind Farm
- Consented Offshore Wind Farm
- Moray East 10km Buffer
- Moray East Aerial Survey Transects

Scale at A3: 1:300,000

0 5 10 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	JG	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ORN_MAP_00046		

Figure 10.3

Moray East OWF aerial survey transects and buffer

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

10.8.1.3 The digital aerial surveys will provide information on species (or species-groups if species identification is not possible), abundance, distribution, behaviour, location, numbers, sex and age (where possible), flight height and direction. The EIA will identify the nature of the use of the site by birds recorded – i.e., seasonal differences and activities (foraging, overwintering, migrating or other) in order to determine the importance of the site relative to the wider area for seabirds throughout the year.

10.8.1.4 Detailed analysis will include abundance and density estimates (with associated confidence intervals and levels of precision) using a design-based modelling approach. Flight height estimation methods and data will be reported; however, owing to the technical difficulties in estimating flight height from aerial imagery, it is anticipated that generic flight data (Johnston *et al*., 2014a; 2014b) will be used in the collision risk model (subject to discussion with stakeholders). Collaborative work (e.g., strategic monitoring) will be undertaken with other projects within the Moray Firth as part of the Moray Firth Ornithology Group. Other survey information or data from these existing offshore wind projects in the Moray Firth will therefore be drawn upon (for example, Moray East and Moray West OWFs) to inform the EIAR. This information will be clearly defined within relevant documents, if used.

10.8.1.5 In addition to those readily available data sources outlined in Table 10.1, further review of survey data from the Moray East and Moray West OWFs, such as those detailed in Table 10.5.

10.8.2 Guidance

10.8.2.1 The impact assessment will be undertaken in line with guidance by SNCBs, particularly NatureScot[23], CIEEM EIA guidance (2018; updated 2019) and expert opinion. In addition to these guidance notes the results from past, current and ongoing research projects from ScotMer[24], Offshore Wind Strategic Monitoring and Research Forum (OWSMRF)[25], and Offshore Renewables Joint Industry Programme (ORJIP)[26] will be utilised where appropriate.

[23] https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/marine-renewables/advice-marine-renewables-development
[24] https://www.gov.scot/policies/marine-renewable-energy/science-and-research
[25] https://jncc.gov.uk/our-work/owsmrf
[26] http://www.orjip.org.uk

Table 10.5. Relevant data sources to inform EIA for Offshore Ornithology.

Title	Detail/Source	Year	Author
Moray East OWF – Aerial surveys between May and June 2011	Project data archive	2011	Moray East OWF
Moray East OWF – Project Tag	Aimed to identify the constraints of existing bird tagging, define the functional scope of optimised tags, and to engage the tag manufacturers that are interested in demonstrating their technologies	2017	Moray East OWF
Moray East OWF – Boat-based surveys (28 surveys) in April 2010 and March 2012	Project data archive; https://www.morayeast.com/application/files/9515/8014/0714/Appendix-4-5-A-Ornithology.pdf	2010 - 2012	Moray East OWF
Moray East OWF – Tracking of great black-backed gulls at the East Caithness Cliffs SPA in 2014	Project data archive	2014	Moray East OWF
Moray East OWF – Tracking data for fulmar, kittiwake, guillemot and razorbill from southern part of the East Caithness Cliffs SPA in 2011 breeding season	Project data archive	2011	Moray East OWF
Moray West OWF – Digital aerial site-specific surveys, monthly from April 2016 to March 2017	A transect-based survey design in which strip transects (placed 2.5 km apart) are placed approximately perpendicular to the depth contours along the coast - aircraft equipped with four HiDef Gen II cameras with sensors	2016 - 2017	Moray West OWF
Moray West OWF – Pre-construction Great Black Back Gulls: cliff observations, pellet analysis (East Caithness Cliffs SPA) (April – July 2022)	Project data archive	2022	Moray West OWF

10.8.3 Assessment Methodology

10.8.3.1 The impact assessment methodology will be based on that described in Chapter 4 (EIA Methodology), adapted to make it applicable to ornithology IOFs. The Offshore Ornithology EIA will be supported by a number of technical appendices, described in greater detail below, including:

- Baseline report;
- Collision risk modelling;
- Displacement; and
- Population Viability Analysis.

10.8.3.2 A separate Offshore HRA Screening Report has been produced and submitted alongside this Offshore Scoping Report which considers/evaluates the potential connectivity of European Sites (including sites which form the UK's National Site Network; SPAs and Ramsar sites) into account within the assessment, and apportions the impacts identified back to the European Sites impacted.

10.8.3.3 The EIA assessment approach will use a 'source-pathway-receptor' model, which identifies likely impacts on IOFs resulting from the proposed construction, O&M and decommissioning of the offshore infrastructure of the Proposed Development. The parameters of this model are defined as follows:

- Source – the origin of a potential impact (noting that one source may have several pathways and receptors); e.g., an activity such as cable installation and a resultant effect such as re-suspension of sediments.
- Pathway – the means by which the effect of the activity could impact an IOF; e.g., for the example above, re-suspended sediment could settle and smother the seabed.
- Receptor – the element of the receiving environment that is impacted; e.g., for the above example, bird prey species living on or in the seabed are unavailable to foraging birds.

10.8.3.4 Species identified as IOFs will be assessed against the impact pathways listed in Table 10.4.

10.8.3.5 All data used within the assessment will be based on the best available information at the time of undertaking the assessment, following NatureScot guidance[27] where applicable, and will be agreed with key stakeholders. This includes, but is not limited to, seabird populations, foraging ranges, displacement rates and collision risk model and associated parameters. The sensitivity of each species will be determined based on the size of its population, its conservation status and its known sensitivity to offshore windfarms.

10.8.3.6 The following sections outline the suggested methodology based on current expectations; however, the methodology may evolve with subsequent SNCB input.

[27] https://www.nature.scot/professional-advice/planning-and-development/planning-and-development-advice/renewable-energy/marine-renewables/advice-marine-renewables-development

Baseline Report

10.8.3.7 Characterisation of the existing environment will be undertaken using a combination of site-specific digital aerial survey data (including data from other Moray Firth developments, such as Moray East OWF and Moray West OWF) plus readily available information from the desktop study (data outlined in Section 10.3 and Table 10.1).

Collision Risk

10.8.3.8 It is proposed to use the Marine Science Scotland Stochastic Collision Risk Model Shiny Application ("sCRM App"; Donovan, 2017; MacGregor *et al.,* 2018). This would be run deterministically (i.e., setting error variables to zero within the app for each run), with separate runs for a central estimate, minimum estimate, and maximum estimate. The monthly densities of flying birds derived from the aerial surveys will be used to populate the sCRM. Models will be run using Option 2 (Basic model) and Option 3 (Extended model) (Band, 2012), utilising generic flight height distributions from Johnston *et al.* (2014a; 2014b).

10.8.3.9 Based on the data reviewed above, the following species may be assessed for collision risk (dependent on the findings of the digital aerial surveys):

- Kittiwake;
- Gannet;
- Herring gull;
- Lesser black-backed gull;
- Great black-backed gull;
- Arctic tern; and
- Great skua.

10.8.3.10 To assess potential collision mortality for migratory non-seabird species, species likely to migrate across the Array Area will be identified and will be assessed using the Marine Scotland commissioned strategic level report (Marine Scotland, 2014a).

Disturbance and Displacement

10.8.3.11 It is proposed to use the Joint SNCB recommended matrix approach (JNCC and SNCB, 2022), presenting a complete range of displacement and mortality rates for each species. The most probable ranges for each species will be highlighted and form the basis of the impact assessment. The area over which displacement impacts will occur, will be based on the best available evidence for each species.

10.8.3.12 Joint SNCB guidance (JNCC and SNCB, 2022) recommends using the overall mean seasonal peak numbers of birds (averaged over the years of survey) in the development footprint and appropriate buffer for displacement assessment. The peak monthly average per season will therefore likely be used for the displacement assessment.

10.8.3.13 Sensitivity to displacement differs considerably between seabird species. As stated in the guidance, species will be ranked according to their sensitivity to displacement and the degree of habitat specialisation (e.g., Bradbury *et al.*, 2014; Dierschke *et al.*, 2016). The following species may be included within the displacement analysis (dependent on the findings of the digital aerial surveys):

- Guillemot;
- Razorbill;
- Puffin; and
- Gannet.

10.8.3.14 It is also expected that the SeaBORD displacement assessment tool (Searle *et al.,* 2018) will also be used during the breeding season for species with available tracking data to parameterise the model.

10.8.3.15 Suitable displacement and mortality rates will be discussed and agreed with consultees during the development of the displacement assessment. The findings from the monitoring being undertaken at Moray East OWF and Beatrice OWF will also be incorporated when identifying the relevant displacement and mortality rates.

Population Viability Analysis

10.8.3.16 PVA will be used within the assessment process model the effects of collision and displacement mortality on populations of key species from relevant SPA breeding colonies. Modelling and assessment of potential impacts will be carried out using the Seabird PVA Tool provided by Natural England (Searle *et al*., 2019; Mobbs *et al*., 2020) following the user guide. The Seabird PVA Tool uses a Leslie matrix approach to construct a PVA model (Caswell, 2000), which compares the population trend over two or more scenarios (impacted and unimpacted) based on the parameters provided by the user. All models will be run for a 40-year time span, representing the predicted operational lifespan of the Proposed Development.

10.8.3.17 For seabird populations, it is widely agreed that some form of compensatory density dependence acts on populations (Horswill *et al.*, 2017). However, the mechanisms as to how this operates are largely uncertain, and, if mis-specified in an assessment, the modelled predictions may be unreliable. In addition, density independent models are more precautionary because populations cannot recover once they have been reduced beyond a certain point. Therefore, density independent models will be used. Both the counterfactual of population size and population growth rate will be provided in the results.

10.8.3.18 Initial population sizes inputted into all PVAs for the biogeographic scale will be taken from the review undertaken by Furness (2015). The most up to date productivity values presented within Horswill and Robinson (2015) will be used for all species. The survival rates for gannet, kittiwake, guillemot, razorbill and puffin will be taken from the national values presented in Horswill and Robinson (2015), which are pre-formulated within the Natural England PVA tool.

10.8.3.19 The survival rates for great black-backed gull presented in Horswill and Robinson (2015) are based on an old study by Glutz von Blotzheim and Bauer (1982). Due to the limited amount of data Horswill and Robinson (2015) recommended using the survival rates of other large gull species when conducting population modelling for great black-backed gull. Therefore, the survival rates for great black-backed

gull used for the PVA will be based on adult and juvenile rates for herring gull as presented in Horswill and Robinson (2015).

10.9 Scoping Questions

10.9.1.1 The questions in Table 10.6 are posed to consultees to frame and focus responses to the Offshore Ornithology scoping exercise, which will in turn inform the Scoping Opinion.

Table 10.6. EIA scoping questions for Offshore Ornithology.

Scoping Questions – Offshore Ornithology
Do you agree with the data sources, including project specific surveys, to be used to characterise the Offshore Ornithology baseline within the EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Offshore Ornithology?
Do you agree with the initial list of IOFs?
Do you agree with the project impacts which have been scoped out of the EIA for Offshore Ornithology?
Do you agree that certain transboundary impacts for Offshore Ornithology may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Offshore Ornithology that have been identified for the Proposed Development?

11 Marine Mammals and Other Megafauna

11.1 Introduction

11.1.1.1 This chapter of the Offshore Scoping Report identifies the marine mammal and other megafauna receptors of relevance, considering the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS, and sets out the proposed scope of the EIA.

11.2 Study Area

11.2.1.1 Depending on individual species ecology, behaviour and life history, the full geographical extent of the study area is variable for marine mammals and other megafauna. However, the study area for all species encompasses the Array Area and the Offshore ECC, extending beyond these areas due to the scale of movement and population structure of each species. For each species, the area considered in the assessment is largely defined by the appropriate species Management Unit (MU).

11.3 Baseline Environment

11.3.1 Data Sources

11.3.1.1 A summary of existing data sources has been collated and presented in Hague *et al*. (2020) to inform the marine mammal baseline characterisation for sites in relation to ScotWind. Therefore, many existing marine mammal baseline data sources for the Moray Firth region have already been identified and summarised. There are a number of projects and developments in the Moray Firth region, from which historic and ongoing survey data will be used, where appropriate, to support the marine mammals baseline. These include data collected during surveys undertaken by MSS, DECC (now BEIS) and Oil and Gas UK Ltd surveys, for OWF projects such as Beatrice OWF, Moray West OWF and Moray East OWF, as well as site condition monitoring surveys for the Moray Firth SAC (see Table 11.1). Additionally, there are existing data from regional-scale visual surveys such as Small Cetaceans in European Atlantic waters and the North Sea (SCANS) (Hammond *et al*., 2021) and acoustic monitoring (East Coast Scotland Marine Mammal Acoustic Array (ECOMMAS); e.g., Palmer *et al*., 2019).

11.3.1.2 The data sources that have been used to inform this Marine Mammals and Other Megafauna chapter of the Offshore Scoping Report are presented within Table 11.1. This table is not an exhaustive list of resources that may be used to inform the EIA. Additionally, emerging data sets such as SCANS IV, post-construction monitoring at Moray East and Beatrice OWFs, pre-construction monitoring at Moray West, and the updated analysis for the Moray Firth Marine Mammal Monitoring Programme (MMMP) may be considered at the EIA stage if publicly available.

Table 11.1. Summary of key datasets for Marine Mammals and Other Megafauna.

Title	Source	Year	Author
Existing OWF Data			
Moray East OWF Environmental Statement – Volume 2, Chapter 4: Biological Environment (Section 4.4: Marine Mammals)	Moray East OWF (https://www.morayeast.com/document-library/navigate/229/144)	2012	Moray Offshore Renewables Limited
Moray West OWF Environmental Statement – Chapter 9: Marine Mammal Ecology	Moray West OWF (https://www.moraywest.com/document-library)	2018	Moray Offshore Windfarm (West) Limited
Beatrice OWF Environmental Statement – Chapter 12: Marine Mammals	Beatrice OWF (https://www.beatricewind.com/es)	2012	BOWL
Strategic Marine Mammal Monitoring Programme (completed on behalf of Moray East OWF and Beatrice OWF)	Various pre-construction monitoring reports: e.g., Graham *et al*. (2015; 2016; 2017); Various construction phase monitoring reports: e.g., Graham *et al*. (2020, 2021)	Multiple	Multiple
Various industry-funded visual surveys within the Moray Firth	Beatrice Demonstrator baseline surveys, DECC outer Moray Firth surveys, DECC aerial surveys, Moray East pre-application surveys, BOWL pre-application surveys, Moray West pre-application surveys	Multiple	Multiple
Various industry- and government-funded Passive Acoustic Monitoring (PAM) surveys within the Moray Firth	Beatrice Demonstrator baseline surveys, SNH and SEERAD surveys, DECC surveys, BOWL surveys, ECOMMAS array	Multiple	Multiple
Publicly Available Datasets			
Scientific advice on matters related to the management of seal populations	Sea Mammal Research Unit (SMRU), University of St Andrews	2021	Special Committee on Seals (SCOS, 2021)

Title	Source	Year	Author
Estimates of abundance and distribution of cetaceans in the study area is available from the Small Cetaceans in European Atlantic waters and the North Sea (SCANS) surveys: block 'S' SCANS-III.	SMRU, University of St Andrews	2017 (revised 2021)	Hammond *et al*. (2021)
Revised Phase III Data Analysis of Joint Cetacean Protocol Data Resources	JNCC Report No. 517	2016	Paxton *et al*. (2016)
Statistical approaches to aid the identification of Marine Protected Areas for minke whale, Risso's dolphin, white-beaked dolphin and basking shark	SNH Report No. 594	2014	Paxton *et al*. (2014)
Distribution maps of cetacean and seabird populations in the North-East Atlantic	Journal of Applied Ecology 57: 253-269	2020	Waggitt *et al*. (2020)
Seal telemetry data	SMRU, University of St Andrews	1988 - 2018	Data held by SMRU
Updated abundance estimates for cetacean management units in UK waters (Revised March 2022)	JNCC Report No. 680	2022	Inter-Agency Marine Mammal Working Group (IAMMWG, 2022)
National Biodiversity Network Atlas Species Search	NBN Atlas online interactive maps (https://nbnatlas.org)	2022	NBN
Sympatric seals, satellite tracking and protected areas: habitat-based distribution estimates for conservation and management	SMRU, University of St Andrews	2022	Carter *et al*. (2022)

Title	Source	Year	Author
Regional baselines for marine mammal knowledge across the North Sea and Atlantic areas of Scottish waters	SMRU Consulting, Scottish Marine and Freshwater Science Vol 11 No 12	2020	Hague *et al*. (2020)
Offshore Energy Strategic Environmental Assessment 4: Environmental Baseline: Appendix 1a.8: Marine mammals and otter	https://www.gov.uk/government/consultations/uk-offshore-energy-strategic-environmental-assessment-4-oesea4	2022	BEIS (2022c)
Predicting habitat suitability for basking sharks (*Cetorhinus maximus*) in UK waters using ensemble ecological niche modelling	University of Exeter	2019	Austin *et al*. (2019)
Basking shark satellite tagging project: insights into basking shark (*Cetorhinus maximus*) movement, distribution and behaviour using satellite telemetry	University of Exeter, NatureScot	2012	Witt *et al*. (2012)
Features (marine mammals) of nature conservation designated sites	SiteLink (https://sitelink.nature.scot/home)	2022	NatureScot
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited
Literature			
Literature: Marine mammal occurrence and distribution	Peer-reviewed scientific literature regarding occurrences of marine mammal species: e.g., Robinson *et al.* (2017), Thompson *et al.* (2015), Risch *et al.* (2019) and Williamson *et al.* (2021)	Multiple	Multiple

11.3.2 Overview of Baseline Environment

11.3.2.1 This section provides high-level information on the presence of those marine mammal species proposed to be scoped into assessment in the EIA. Information is derived from an initial desk-based review that has been undertaken to support this Offshore Scoping Report. Detailed information on all data sources examined, assumptions and limitations of the different surveys and resulting density and abundance estimates for each species will be covered in detail in a baseline characterisation report to support the EIA.

Marine Mammals

11.3.2.2 From desk-based analysis of available marine mammal data, six species of marine mammal have been identified as common (seasonally or year-round) in the Array Area, Offshore ECC and surrounding waters of the Proposed Development. This includes the following key marine mammal species:

- Harbour porpoise (*Phocoena phocoena*);
- Minke whale (*Balaenoptera acutorostrata*);
- White-beaked dolphin (*Lagenorhynchus albirostris*);
- Bottlenose dolphin (*Tursiops truncatus*);
- Grey seal (*Halichoerus grypus*); and
- Harbour seal (*Phoca vitulina*).

11.3.2.3 Less commonly-recorded species include common dolphin (*Delphinus delphis*), Risso's dolphin (*Grampus griseus*), white-sided dolphin (*Lagenorhynchus acutus*), killer whale (*Orcinus orca*), pilot whale (*Globicephala melas*), humpback whale (*Megaptera novaengliae*), fin whale, *(Baelaenoptera physalus*), sperm whale (*Physeter macrocephalus*) and northern bottlenose whale (*Hyperoodon ampullatus*).

11.3.2.4 It is currently proposing to scope in harbour porpoise, bottlenose dolphin, white-beaked dolphin, minke whale, grey seal and harbour seal for the Proposed Development based on the known usage of the Moray Firth area. Data from the ongoing site-specific aerial surveys will be used to refine the species considered where appropriate. The baseline characterisation report will review all data sets available and will identify the key marine mammal species to be taken forward for the impact assessment. It is expected that there will be sufficient data on density and abundance estimates to scope in the more common species for a full quantitative impact assessment, whereas less commonly-recorded species may only be able to be scoped into the impact assessment qualitatively if density data are not available. The final list of species included in the impact assessment is not possible to specify at the Scoping stage and will be refined in the baseline characterisation report.

Cetaceans

Harbour Porpoise

11.3.2.5 Harbour porpoise are the smallest and most abundant cetacean species in UK and Scottish waters (Reid *et al*., 2003; Hammond *et al*., 2017). Animals are frequently sighted throughout coastal and offshore shelf habitats with studies suggesting they are highly mobile and cover large distances (Nabe-Nielsen *et al*., 2011). In

the UK, harbour porpoise have been assessed as having an Unknown Overall Conservation Status[28].

11.3.2.6 The Proposed Development is located within the harbour porpoise North Sea MU which has an estimated abundance, based on SCANS-III data, of 346,601 harbour porpoises (95% CI: 289,498 – 419,967) (IAMMWG, 2022). Harbour porpoises are distributed throughout the Moray Firth (Brookes *et al*., 2013; Williamson *et al*., 2022) and there are several density estimates for the species available from various sources. For example, the Proposed Development is within the SCANS III survey block S which provides a block-wide uniform density estimate of 0.152 individuals/km^2 (Hammond *et al*., 2021).

11.3.2.7 Data collected across the Moray Firth supports the widespread occurrence of porpoises throughout the Moray Firth with high detection rates of porpoises using autonomous passive acoustic detectors (Bailey *et al*., 2010; Brookes *et al*., 2013; Williamson *et al*., 2022). Spatial modelling for harbour porpoise using sightings data from various projects by the University of St Andrews, BOWL and MORL, has shown patchy distribution within the Moray Firth, with relatively higher densities near the coastline as well as higher densities in the northeast of the outer Moray Firth.

Bottlenose Dolphin

11.3.2.8 The Array Area for the Proposed Development is located within the Greater North Sea MU for bottlenose dolphins. This MU contains an estimated 2,022 bottlenose dolphins (IAMMWG, 2022), but these are considered to be of the offshore eco-type (which are considered separate to the coastal ecotype of the Coastal East Scotland MU population). There are almost no data available on the offshore ecotype, other than what is presented in the Waggitt *et al*. (2020) maps (using the JCP data) and sightings from the SCANS III surveys (Hammond *et al*., 2021). It is generally assumed that the offshore ecotype bottlenose dolphins are present more than 30 km from the coast (Breen *et al*., 2016; as referenced in Waggitt *et al*., 2020). In the UK, bottlenose dolphins have been assessed as having an Unknown Overall Conservation Status[29]. However, the Coastal East Scotland population is known to be increasing (Arso Civil *et al*., 2021).

11.3.2.9 The Offshore ECC extends into the Coastal East Scotland MU for bottlenose dolphins. This MU contains a resident population of 224 bottlenose dolphins (IAMMWG, 2022) for which the Moray Firth SAC is designated. The population has a range that expands beyond the Moray Firth SAC, along the east coast of Scotland to the Tay Estuary and adjacent waters and the Firth of Forth (with recent photo-ID matches along the east coast of England). Currently, only around 50% of the population use the Moray Firth SAC in the majority of years (Graham *et al*., 2016; Arso Civil *et al*., 2021). In Scottish waters, this population is primarily found within 2 km of the coast and in water depths <20 m (Quick *et al*., 2014). Therefore, it is expected that there will be few, if any, individuals present within the Array Area of the Proposed Development; however, they are anticipated to be present within the nearshore area of the Offshore ECC and the wider regional area. While the Array Area or Offshore ECC does not overlap with the Moray Firth SAC, the Coastal East Scotland bottlenose dolphins are afforded

[28] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1351 - Harbour porpoise (*Phocoena phocoena*).
[29] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1349 – Bottlenose dolphin (*Tursiops truncatus*).

protection beyond the bounds of the SAC and thus there is the potential for impacts to the SAC population. This will be fully considered in the RIAA.

White-beaked Dolphin

11.3.2.10 UK sightings of white-beaked dolphin are predominantly recorded around Scotland and the east coast of England (Northridge *et al*., 1995; Reid *et al*., 2003), although sightings within the Moray Firth are low compared to other areas. They have been recorded in UK waters year-round, with an increase in sighting frequency in coastal waters during the summer months when the animals appear to move inshore (Evans, 1992; Northridge *et al*., 1995; Weir *et al*., 2007). In the UK, white-beaked dolphins have been assessed as having an Unknown Overall Conservation Status[30].

11.3.2.11 The Proposed Development is located within the Celtic and Greater North Seas MU which has an estimated abundance of 43,951 white-beaked dolphins (95% CI: 28,439 – 67,924) (IAMMWG, 2022). Within the SCANS III survey block S, there is an estimated block-wide uniform density estimate of 0.021 individuals/km^2 (Hammond *et al*., 2021). The predicted density surface for white-beaked dolphins using the SCANS III data shows much higher densities of white-beaked dolphins in the more offshore waters of the outer Moray Firth compared to the inner Moray Firth, with density estimates within the Array Area between 0.1 and 0.2 dolphins/km^2 (Hague *et al*., 2020). Other density estimates for white-beaked dolphins in the Moray Firth are somewhat lacking, though it is anticipated that estimates from SCANS IV and potentially the site-specific surveys (depending on the number of sightings) may provide additional density data.

Minke Whale

11.3.2.12 Minke whales are widely distributed around the UK, with higher densities recorded on the West coast of Scotland and the western North Sea (Reid *et al*., 2003). They occur mainly on the continental shelf and are recorded more frequently in the summer months. in Scottish waters, including within the Moray Firth (Risch *et al*., 2019; Hague *et al*., 2020). They have been found to prefer water depths of up to 200 m and are typically solitary or found in pairs, though they occasionally form larger groups (up to 15 individuals) while feeding (Reid *et al*., 2003; Hammond *et al*., 2021). In the UK, minke whales have been assessed as having an Unknown Overall Conservation Status[31].

11.3.2.13 The Proposed Development is located within the Celtic and Greater North Seas MU which has an estimated abundance of 20,118 minke whales (95% CI: 14,061 – 28,786) (IAMMWG, 2022). Within the SCANS III survey block S, there is an estimated block-wide uniform density estimate of 0.0095 whales/km^2 (IAMMWG, 2022). However, studies have shown that minke whale density within the Moray Firth is not uniform (e.g., Paxton *et al*., 2014; 2016) and that higher densities are expected along the southern coast of the Moray Firth around the deeper waters of the Southern Trench. The Offshore ECC of the Proposed Development runs

[30] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S2032 – White beaked dolphin (*Lagenorhynchus albirostris*).
[31] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S2618 – Minke whale (*Balaenoptera acutorostrata*).

through the Southern Trench NCMPA which has been designated to protect minke whale and thus there is the potential for impacts to the MPA feature.

Pinnipeds

11.3.2.14 The Proposed Development is located within the Moray Firth seal Management Unit. However, given the proximity of the Array Area to the boarder of the North Coast and Orkney seal MU, it is expected that the Proposed Development is likely to impact both MUs. Therefore, the two seal MUs will be considered within the impact assessment, both separately and combined.

Grey Seal

11.3.2.15 In the UK, grey seals have been assessed as having a favourable Overall Conservation Status[32]. The UK total grey seal population was estimated to be 149,700 individuals at the start of the 2019 breeding season, and approximately 77% of the 2019 UK grey seal pup production was in Scotland (SCOS, 2021). In general, pup production is increasing in the North Sea (7.5% per annum between 2014-2018), though most of this increase is driven by rapid expansion at breeding sites in east England.

11.3.2.16 There are three grey seal breeding sites in the Moray Firth MU (Helmsdale to Dunbeath, Dunbeath to Wick and Duncansby Head) where pup counts have been increasing over the last 10 years. Additionally, there are 26 breeding sites in Orkney, where pup production is high (accounting for 43% of the Scottish pup production 2016-2018 count period) and is relatively stable, with an increase of <1% per annum between 2012 and 2016 (SCOS, 2021). Outside of the breeding season, grey seals are counted at haul-outs during the August surveys for harbour seals. August grey seal counts in the Moray Firth have varied annually, with a general increase since the 1996-1997 period, with most counts in the Moray Firth being concentrated in the inner Moray Firth. Within the Offshore ECC there are known seal haul-out sites at Port Soy, Boyne Bay and Whitehils. The modelled habitat preference data from Carter *et al*. (2022) (Figure 11.1) estimates higher densities of grey seals in the inner Moray Firth and around the Orkney Islands, with relatively lower densities within the Array Area and Offshore ECC.

Harbour Seal

11.3.2.17 In the UK, harbour seals have been assessed as having an Unfavourable-Inadequate Overall Conservation Status[33]. However, it is important to note that this assessment is UK-wide, and individual seal MUs are known to have different population trajectories. The harbour seal counts for the Moray Firth MU have increased in recent years, while the North Coast and Orkney MU is undergoing significant steady declines. The total harbour seal count for the entire Moray Firth seal MU in the 2016-2019 count period was 1,077 which was significantly higher than the previous count period (745 in the 2011-2015 period) (SCOS, 2021). The majority of these harbour seals (60%) were observed between Culbin and Findhorn in the inner Moray Firth (to the southwest of the Proposed Development) (SCOS, 2021). Within the Offshore ECC there are known seal haul-out sites at Portsoy, Boyne Bay and Whitehills. By contrast the harbour seal haul-out counts for the North Coast and Orkney MU have been in steady decline since 1997, with

[32] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1364 – Grey seal (*Halichoerus grypus*).
[33] European Community Directive on the Conservation of Natural Habitats and of Wild Fauna and Flora (92/43/EEC) Fourth Report by the United Kingdom under Article 17 on the implementation of the Directive from January 2013 to December 2018 Conservation status assessment for the species: S1365 – Common seal (*Phoca vitulina*).

the 2016-2019 count period total (1,405) being just 16% of the total count from the 1996-1997 period (8,787) (SCOS, 2021). Therefore, it will be important for the impact assessment to consider the potential for impacts to each of the two MUs separately, given their vastly differing trajectories and status.

11.3.2.18 The modelled habitat preference data from Carter *et al*. (2022) (Figure 11.2) estimates relatively high densities of harbour seals in the coastal waters of the inner Moray Firth and around the Orkney Islands, with considerably lower densities within the Array Area and Offshore ECC.

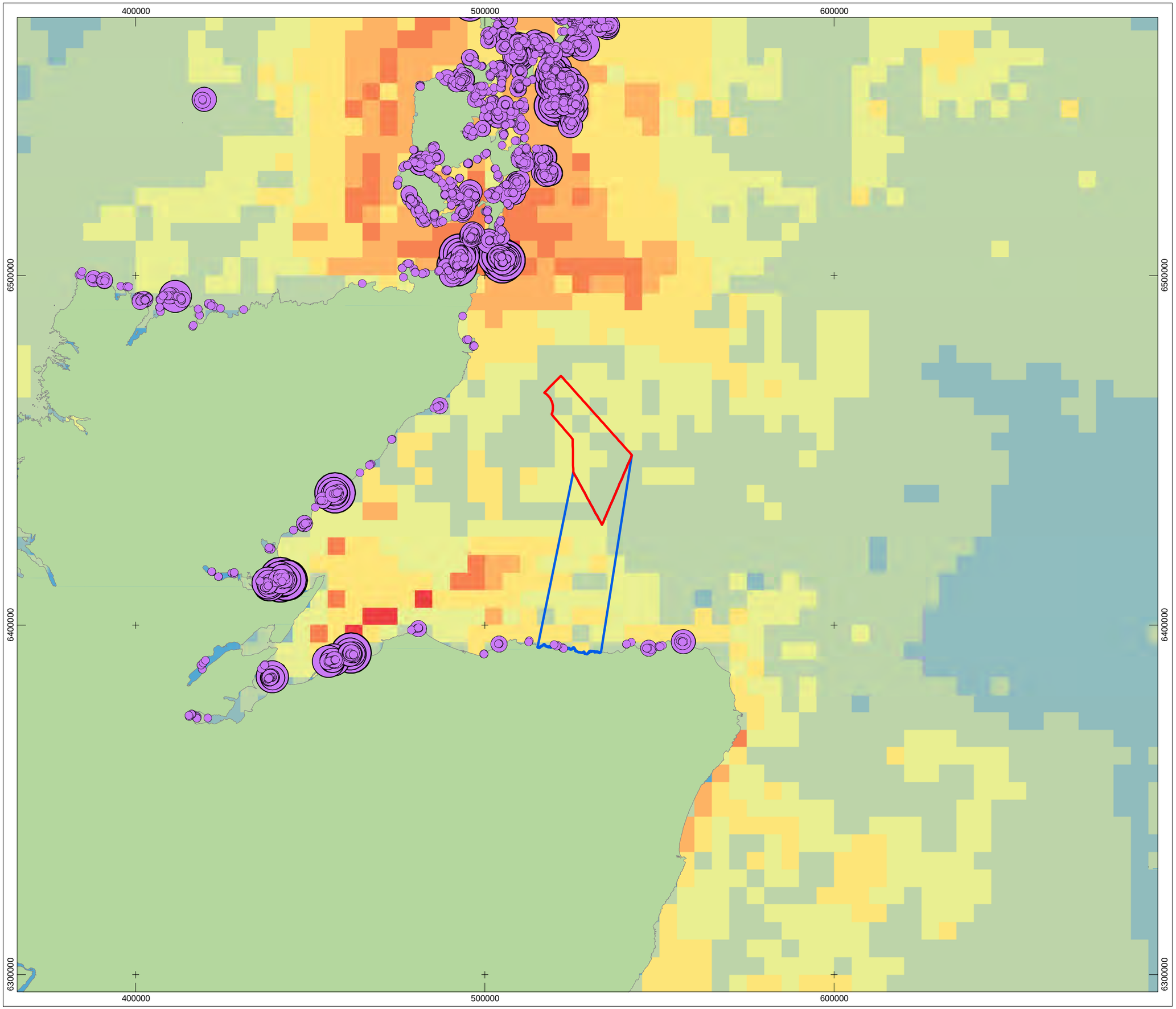
Other Marine Megafauna

11.3.2.19 The marine megafauna considered for this Offshore Scoping Report are the large migratory species that may overlap with the Proposed Development boundaries, in addition to marine mammals. In the context of UK waters, regularly occurring megafauna include basking sharks (*Cetorhinus maximus*) and leatherback turtles (*Dermochelys coriacea*) which have both been recorded in Scottish waters.

11.3.2.20 Although leatherback turtles are the most frequently occurring sea turtle in UK waters, there have been no confirmed sightings of them in the Moray Firth (NBN Atlas, 2022). In Scotland, sightings are limited to the southwest coast as they occupy the Irish Sea as part of their migratory voyages (Baxter *et al*., 2011). As such, leatherback or any other species of sea turtle will not be considered further in this Offshore Scoping Report, or in the subsequent EIA.

11.3.2.21 Basking sharks occupy the cold and temperate waters surrounding Scotland from spring to autumn to feed and breed. Basking sharks migrate from the western English Channel in spring to seas off the west of Scotland, where they spend the summer and early autumn before moving offshore between November and March. They are seasonal visitors to Scottish seas and are recorded consistently around the western isles of Scotland (Witt *et al*., 2012). Sightings have also been recorded in the Moray Firth; however, to a much lesser extent compared the west coast (Witt *et al.,* 2012; Paxton *et al.,* 2014). According to the NBN Atlas (2022), the closest confirmed sightings of basking sharks to the Proposed Development were off the coast of Kington in 2015 and Fraserburgh in 2018, both over 20 km from the boundary of the Offshore ECC. Unlike marine mammals, basking sharks do not currently have distinct MUs established for monitoring and management of populations in the seas surrounding the UK.

11.3.2.22 Increases in sea water temperatures are thought to be related to sightings being observed further north than in previous decades, with occasional records now around Shetland and Orkney north to the Norwegian coast and in the northern North Sea (Bloomfield and Solandt, 2008; Solandt and Ricks, 2009). Despite the sparse records of basking sharks in the Moray Firth, habitat modelling suggests that clusters of the northern North Sea score highly and could be important for the recovery of historically depleted basking shark populations (Austin *et al*., 2019). For this reason, basking sharks will be included in this Offshore Scoping Report and subsequent EIA for the Proposed Development. However, depending on the results from the site-specific aerial surveys, density estimates of basking sharks for the Proposed Development may not be possible.



Legend

- Array Area
- Offshore Export Cable Corridor

Grey Seals % At-Sea Population per 25km² (Carter *et al.* 2022)

- 0
- 0 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- 0.05 - 0.1
- >0.1

Seal Haul Outs (Grey Seal):

- 1 - 30
- 31 - 100
- 101 - 225
- 226 - 450
- 451 - 950

Haul-out data owned by SMRU

Scale at A3: 1:1,000,000

0 25 50 km

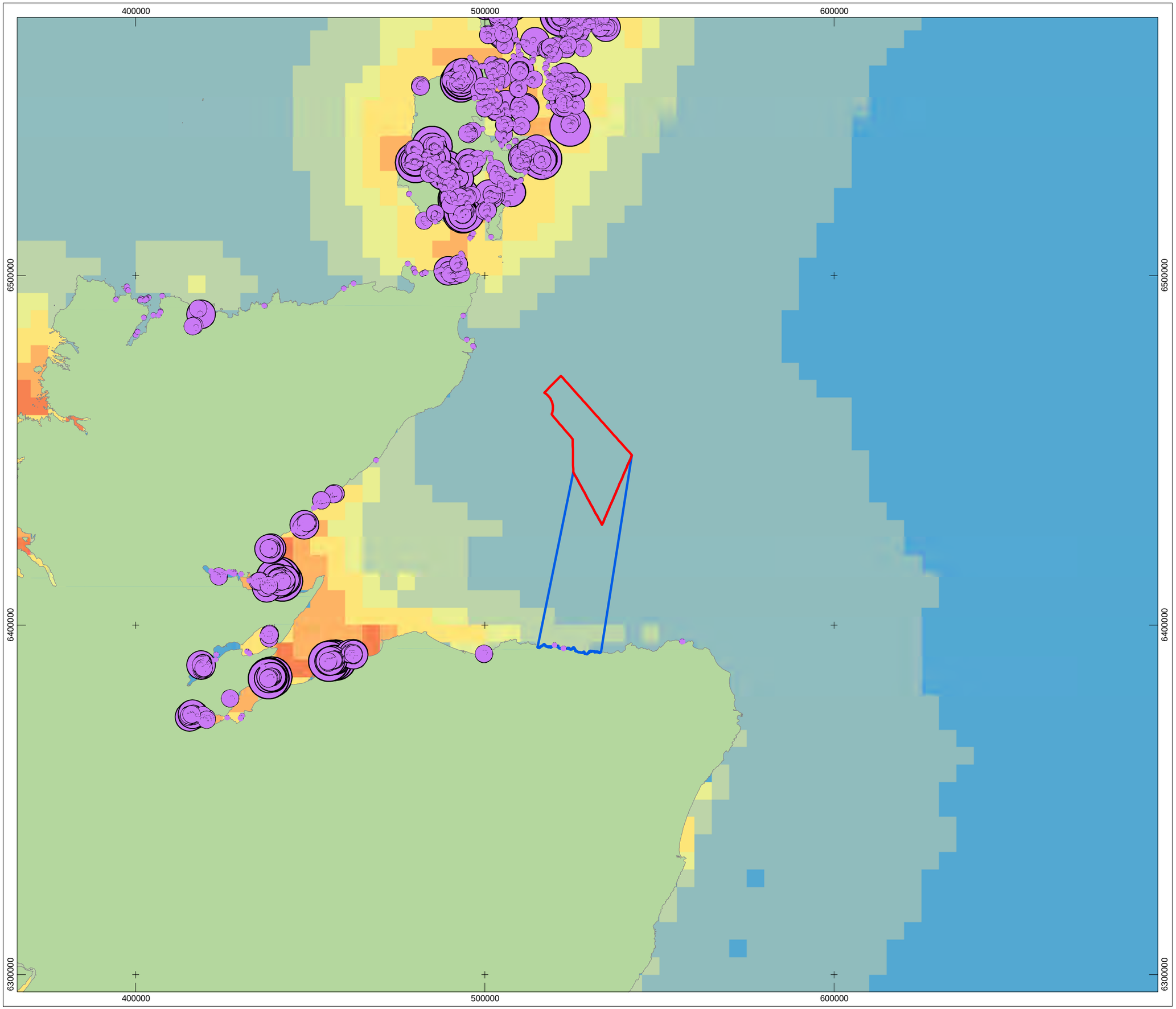
N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	RM	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MMM_MAP_00025		

Figure 11.1
Grey seal at-sea predicted relative density in relation to the Proposed Development (Carter et al., 2020) and August haul out counts 1997-2019 (Haul out data owned by SMRU)

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS



Legend

- Array Area
- Offshore Export Cable Corridor

Harbour Seals % At-Sea Population per 25km² (Carter *et al.* 2022)

- 0
- 0 - 0.001
- 0.001 - 0.005
- 0.005 - 0.01
- 0.01 - 0.025
- 0.025 - 0.05
- 0.05 - 0.1
- >0.1

Seal Haul Outs (Harbour Seals):

- 1 - 20
- 21 - 70
- 71 - 150
- 151 - 360

Haul-out data owned by SMRU

Scale at A3: 1:1,000,000

0 — 25 — 50 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 11.2
Harbour seal at-sea predicted relative density in relation to the Proposed Development (Carter et al., 2020) and August haul out counts 1997-2019 (Haul-out data owned by SMRU)

CALEDONIA Offshore Wind Farm

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Protected Species

11.3.2.23 All cetacean species found in Scottish territorial waters are protected under the Conservation of Offshore Marine Habitats and Species Regulations 2017 and the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended), making it an offence to deliberately or recklessly:

- Kill, injure or capture a cetacean;
- Disturb or harass a cetacean;
- Damage or destroy a breeding site or resting place; and
- Keep, transport, sell or exchange, or offer for sale or exchange of any cetacean (or any part or derivative of one) obtained after 10 June 1994.

11.3.2.24 Both grey and harbour seals are protected in Scottish waters under the Marine (Scotland) Act 2010, Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) and The Protection of Seals (Designation of Haul-Out Sites) (Scotland) Order 2014 (as amended). Under Section 107 of the Marine (Scotland) Act 2010, it is an offence to intentionally or recklessly kill, injure or take a seal except under licence or to alleviate suffering. Under Section 117, harassing a seal (intentionally or recklessly) at a haul-out site is an offence.

11.3.2.25 Basking sharks are protected under Schedule 5 of the Wildlife and Countryside Act 1981 and the Nature Conservation (Scotland) Act 2004. Although they have different levels of protection, all species of cetaceans and basking sharks are classed as European Protected Species (Marine Scotland, 2020b).

Protected Sites

11.3.2.26 There are several protected sites that require consideration in relation to the Proposed Development. Table 11.2 lists all SACs/NCMPAs in the relevant MU for each of the key marine mammal and megafauna species (shown in Figure 11.3). The potential for impacts to these protected sites will be assessed in the HRA, with predicted impacts assessed relative to the site-specific conservation objectives.

Table 11.2. Marine mammal and megafauna protected sites in relation to the Proposed Development.

Site	Approximate Location	Species	Approximate Distance from Proposed Development
Inner Hebrides and Minches SAC	Hebrides	Harbour porpoise	>200 km
Moray Firth SAC	Within the Moray Firth	Bottlenose dolphin	30 km
Southern Trench NCMPA	Within the Moray Firth	Minke whale	0 km (Offshore ECC overlaps)
Dornoch Firth and Morrich More SAC	Within the Moray Firth	Harbour seal	80 km
Firth of Tay and Eden Estuary SAC	Firth of Tay	Harbour seal	130 km
Sanday SAC	Within the Moray Firth	Harbour seal	90 km
Faray and Holm of Faray SAC	Orkney	Grey seal	90 km
Isle of May SAC	Firth of Forth	Grey seal	160 km
Sea of the Hebrides NCMPA	Hebrides	Basking shark; Minke whale	>200 km

11.3.2.27 In addition to these SACs and MPAs, there are designated haul-out sites in Scotland where seals haul-out to rest, moult or breed. It is an offence to harass (intentionally or recklessly) a seal that is hauled-out at a designated site. There are seven designated haul-out sites for harbour seals within the Moray Firth and a further 36 designated haul-out sites for harbour seals in Orkney (Figure 11.3). In addition to these, there are three designated grey seal breeding haul-out sites in the Moray Firth, and a further 18 in Orkney.

11.4 Embedded Mitigation Considered Within the EIA

11.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

11.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Marine Mammals and Other Megafauna are noted within Table 11.3 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Marine Mammals and Other Megafauna receptors:

- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management.
- M-9: Development of and adherence to a MPCP. The MPCP will identify potential sources of pollution and associated spill response and reporting procedures.
- M-11: Development of and adherence to a Piling Strategy (PS) (applicable where piling is undertaken). The PS will detail the method of pile installation and associated noise levels. It will describe any mitigation measures to be put in place (e.g., soft starts and ramp ups, use of Acoustic Deterrent Devices) pre- and during piling to manage the effects of underwater noise on sensitive receptors.
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction Project phases.
- M-13: Development of and adherence to a VMP. The VMP will confirm the types and numbers of vessels that will be engaged on the Project and consider vessel coordination including indicative transit route planning. In the presence of marine mammals and other marine megafauna, vessels will adhere to current guidance such as the Scottish Marine Wildlife Watching Code to minimise the risk of disturbance.

- M-16: Development of and adherence to an MMMP. This will identify appropriate mitigation measures during offshore activities that are likely to produce underwater noise and vibration levels capable of potentially causing injury or disturbance to marine mammals. This will be developed alongside the PS and referred to in the subsequent EPS licence.

11.4.1.3 There is a commitment for the Proposed Development to implement these measures and they have been considered within the scoping assessment. The requirement for additional mitigation measures will be dependent on the significance of the effects on marine mammals and other megafauna and will be consulted upon with consultees throughout the EIA process.

11.5 Scoping of Impacts

11.5.1.1 Potential impacts on marine mammals and other megafauna have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 11.3. For those impacts scoped in, an outline of the proposed approach to assessment is provided in Section 11.8.

400000
500000
600000
6500000
6400000

Faray and Holm of Faray
Sanday
Dornoch Firth and Morrich More
Moray Firth
Southern Trench

Legend

- Array Area
- Offshore Export Cable Corridor
- Special Areas of Conservation
- Marine Protected Areas
- Grey Seal Pupping Sites

Seal Haul Out Sites (Species)

- Grey Seals
- Harbour/Common and Grey Seals
- Harbour/Common Seals

Scale at A3: 1:800,000
0 20 40 km
N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 11.3

Designated seal haul out sites in relation to the Proposed Development

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Table 11.3. EIA scoping assessment for Marine Mammals and Other Megafauna.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Underwater noise from pile-driving	M-11	Scoped in	Underwater noise generated from piling may result in permanent hearing damage (auditory injury) known as Permanent Threshold Shift (PTS), and behavioural disturbance/displacement of marine mammal and other megafauna species.	✓	✓	✗	✗	✗
Underwater noise from UXO clearance[34]	M-12	Scoped in	Underwater noise generated from UXO clearance may result in fatal physical trauma, hearing damage and auditory injury (PTS), behavioural disturbance and displacement of marine mammal and other megafauna species.	✓	✓	✓	✓	✗
Underwater noise from other construction activities	M-8	Scoped in	Underwater noise generated by other construction activities (such as dredging, trenching, cable laying and mooring installation) may result in auditory injury (PTS), and behavioural disturbance/ displacement of marine mammal and other megafauna species.	✓	✓	✓	✓	✓
Vessel collisions	M-13	Scoped in	Increased vessel presence in the area creates a potential for increased collision risk for marine mammal and other megafauna species.	✓	✓	✓	✓	✗

[34] A separate Marine Licence will be applied for to cover this as opposed to inclusion as part of the Section 36 consent.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Vessel disturbance	M-13	Scoped in	Increased vessel presence associated with the development creates a potential for increased behavioural disturbance/ displacement for marine mammal and other megafauna species.	✓	✓	✓	✓	✗
Indirect impacts on prey	-	Scoped in	Indirect impacts on marine mammal and other megafauna species due to changes in prey availability and distribution.	✓	✓	✓	✓	✗
Water quality changes	M-8	Scoped in	Increases in SSCs resulting from construction activities may impact on the ability of marine mammals and other megafauna to forage.	✓	✓	✓	✓	✗
Disturbance at haul-outs	M-13	Scoped in	There are seal haul-outs at Portsoy, Buckie, Cullen, Findochty, Boyne Bay and Port Gordon which are close to the Offshore ECC and landfall. Therefore, there is the potential for disturbance impacts during the construction phase to these seal haul-outs.	✓	✓	✓	✓	✓
Accidental pollution	M-9	Scoped out	Accidental releases of pollutants may arise as a result of accidental spills from vessels or other equipment. Any release is likely to facilitate high dispersal and there will be limited interaction with marine mammals and megafauna. With the implementation of an EMP and MPCP, accidental spillages from machinery (which may have potential to cause mortality in marine mammals or other megafauna) are unlikely to occur. Any impact is predicted to be of local spatial extent, short-term duration, intermittent frequency and reversible, within the context of regional marine mammal and megafauna populations and therefore not significant in terms of the EIA.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Electromagnetic field (EMF)	-	Scoped out	There is currently no evidence to suggest that EMFs from OWF components have any impact on marine mammals (Copping, 2018). Although cetacean species have been found to detect and respond to EMFs, this has only been shown in non-UK species and there is currently no evidence to suggest that seals can detect or respond to EMFs. EMF effects on sensitive fish species (such as basking sharks) are usually limited to the immediate cable area and the resulting impacts are considered minor (Normandeau *et al.*, 2011).	✗	✗	✗	✗	✗
Operation and Maintenance								
Operational noise	-	Scoped in	Operational noise from floating turbines is scoped in due to the uncertainties associated with new technologies (i.e., larger turbines and floating foundations).	✓	✓	✗	✗	✗
Vessel collisions	M-13	Scoped in	Increased vessel presence in the area creates a potential for increased collision risk for marine mammal and other megafauna species.	✓	✓	✓	✓	✗
Vessel disturbance	M-13	Scoped in	Increased vessel presence associated with the development creates a potential for increased behavioural disturbance/ displacement for marine mammal and other megafauna species.	✓	✓	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Entanglement	M-12	Scoped in	Due to the lack of evidence of marine mammal and other megafauna entanglement in floating WTG mooring systems associated with the OWF industry, risk of entanglement between species and in response to different mooring designs is difficult to predict and assess. Furthermore, the design of mooring line, and proportion of floating WTGs for the Proposed Development is unknown, hence a precautionary approach is recommended.	✗	✓	✓	✗	✗
Indirect impacts on prey	-	Scoped in	Indirect impacts on marine mammal and other megafauna species due to changes in prey availability and distribution.	✓	✓	✓	✓	✗
Disturbance at haul-outs	M-13	Scoped in	There are seal haul-outs at Portsoy, Buckie, Cullen, Findochty, Boyne Bay and Port Gordon which are close to the Offshore ECC and landfall. Therefore, there is the potential for disturbance impacts during the O&M phase to these seal haul-outs.	✓	✓	✓	✓	✓
Accidental pollution	M-9	Scoped out	With the implementation of an EMP and MPCP, accidental spillages from machinery (which may have potential to cause mortality in marine mammals and other megafauna) is unlikely to occur. Any impact is predicted to be of local spatial extent, short term duration, intermittent frequency and reversible, within the context of regional marine mammal populations and therefore not significant in terms of the EIA.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Long term displacement/habitat loss/barrier effects	M-12	Scoped in	Fixed WTG: While marine mammal and other megafauna species may be displaced in the short-term during construction activities, studies suggest that they return once the activity has stopped (Russell *et al*., 2016; Brandt *et al*., 2018; Benhemma-Le Gall *et al*., 2021). Floating WTG: Currently unknown. It is possible that marine mammals and other megafauna may perceive the physical presence of mooring lines as a barrier to movement.	✗	✓	✗	✗	✗
Electromagnetic field (EMF)	-	Scoped out	There is currently no evidence to suggest that EMFs from OWF components have any impact on marine mammals (Copping, 2018). Although cetacean species have been found to detect and respond to EMFs, this has only been shown in non-UK species and there is currently no evidence to suggest that seals can detect or respond to EMFs. EMF effects on sensitive fish species (such as basking sharks) are usually limited to the immediate cable area and the resulting impacts are considered minor (Normandeau *et al*., 2011).	✗	✗	✗	✗	✗

11.6 Potential Cumulative Impacts

11.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Marine Mammals and Other Megafauna, cumulative interactions may occur with other planned OWFs as well as other activities in the study area. The Marine Mammals and Other Megafauna CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

11.6.1.2 There is the potential for the potential impacts from the Proposed Development to interact with impacts from other projects, plans and activities, resulting in a cumulative effect on marine mammal and other megafauna receptors. All offshore projects (including renewable, O&G, infrastructure etc) within the relevant marine mammal MUs will be initially screened into the assessment and the approach to the cumulative assessment will be to identify where periods of offshore construction and O&M timelines overlap across projects and developments. The assessment will be holistic, combining various different impacts including, for example, disturbance from underwater noise from piling and UXO clearance with disturbance from vessels, disturbance from seismic surveys and the risk of entanglement.

11.6.1.3 If required, population modelling will be conducted to assess the potential cumulative impacts to marine mammal populations in the long-term. This will be modelled using the iPCoD framework (King *et al*., 2015) and will draw upon the outputs of the Cumulative Effects Framework for Key Ecological Receptors project[35] in order to best approach the cumulative assessment modelling.

11.7 Potential Transboundary Impacts

11.7.1.1 The key transboundary effect will be from underwater noise generated during construction and decommissioning, particularly piling during the installation of foundations. Due to the wide ranging and mobile nature of marine mammals and other megafauna, several species MUs extending beyond the UK EEZ and the proximity of the Proposed Development to the borders of EEA states, there is potential for transboundary impacts to occur. The magnitude of these impacts is not known at this stage of the Proposed Development; however, as with the cumulative impacts, they will be fully assessed in the EIAR.

11.7.1.2 Direct impacts may occur due to underwater noise generated during construction and decommissioning, particularly piling during the installation of foundations. Indirect impacts may cause disturbance to prey (fish) species from loss of fish spawning and nursery habitat and suspended sediments and deposition. The O&M phase is considered less likely to result in significant transboundary impacts.

11.7.1.3 The probability of transboundary impacts to marine mammals occurring during construction, particularly because of underwater noise from piling, is potentially high although the extent cannot be determined at this stage and will be subject to assessment in the EIAR. Behavioural disturbance resulting from underwater noise during construction could occur over large ranges (tens of kilometres) and therefore there is the potential for transboundary effects to occur where subsea noise arising from the Proposed Development could extend into waters of other EEA states or impact individuals which are key components of designated sites in

[35] https://www.ceh.ac.uk/our-science/projects/cumulative-effects-framework-key-ecological-receptors

other states. The relevant scale for assessment of impacts to marine mammals and other megafauna is the Management Unit, which encompasses the waters of adjacent nations, and therefore disturbance will, by default, be assessed at a transboundary scale.

11.7.1.4 In producing a HRA report, the risk of transboundary impacts that have the potential to affect the integrity of transboundary European designated sites will be assessed and presented.

11.8 Proposed Approach to EIA

11.8.1 Relevant Data Sources

11.8.1.1 The key data sources outlined in Table 11.1 will be used to inform the Marine Mammals and Other Megafauna baseline. To enhance the existing data sources, site-specific digital aerial surveys are being conducted by APEM Ltd. for the Proposed Development (see Figure 10.2). These surveys, which commenced in May 2021, cover the Array Area plus a 4 km buffer, and will be conducted monthly for at least 24 months (i.e., up to April 2023). Data from the first year of surveys are still undergoing processing and are therefore not available to include in this Offshore Scoping Chapter. Caledonia OWF has also commissioned additional surveys by APEM Ltd. in April and August 2022 in areas to the west of the Proposed Development (see 'Caledonia Additional Flight Lines' in Figure 10.2). Once the results from these aerial surveys are received and analysed, data from the site-specific surveys will be used to characterise Marine Mammal and Other Megafauna occurrence in the Array Area, as well as provide an estimation of species density in the area (where data allow). See Section 10.8 for further details regarding these surveys which are also being undertaken to support the ornithological baseline.

11.8.1.2 In addition to those readily available data sources outlined in Table 11.1, further review of survey data from the Moray East and Moray West OWFs, such as those detailed in Table 11.4.

11.8.1.3 The approach to EIA will follow the general approach and guidance outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report. Importantly, experienced gained through the consenting and post-consent processes for other wind farm projects in the Moray Firth will be utilised, including the findings of studies within the Moray Firth MMMP.

11.8.1.4 A separate Offshore HRA Screening Report has been produced and submitted alongside this Offshore Scoping Report which considers/evaluates the potential connectivity of European Sites (including sites which form the UK's National Site Network; SACs with marine mammal features) within the assessment, and apportions the impacts identified back to the European Sites impacted.

Table 11.4. Relevant data sources to inform EIA for Marine Mammals and Other Megafauna.

Title	Detail/Source	Year	Author
Moray East OWF – Construction Marine Mammal Monitoring Reports	Project data archive	2019 – 2020	Moray East OWF
Moray East OWF – boat-based surveys (April 2010 to March 2012)	Project data archive; https://www.morayeast.com/application/files/8015/8014/0685/Appendix-4-4-A-Marine-Mammals-Baseline.pdf	2010 – 2012	Moray East OWF
Moray East OWF – Harbour Seal pupping survey – observation and identification (May – July 2014 and 2015)	Project data archive	2014 – 2015	Moray East OWF
Moray East OWF – Harbour Seal tagging – foraging ranges	Project data archive	2014 – 2015	University of St Andrews
Moray East OWF – post-construction surveys (May to July 2022 – Moray East site plus 10 km buffer)	Project data archive	2022 - 2023	Moray East OWF
Moray West OWF – HiDef Moray West surveys – aerial digital video (monthly April 2016 to March 2017)	Project data archive	2016 – 2017	Moray West OWF
Moray West OWF – Annual, unoccupied aerial vehicle surveys will be undertaken in May and September in 2022 and 2023	Survey to extend the long-term monitoring of harbour seals in Loch Fleet; project data archive	2022 – 2023	Moray West OWF
Moray West OWF – boat-based photo-ID surveys will be carried out between May and September of 2022 (pre-construction)	Approximately 20 boat-based photo-ID surveys will be completed	2022 – 2023	Moray West OWF
Moray West OWF – Pre-construction digital aerial survey (March/April to October in 2021 and 2022)	Project data archive	2021 - 2022	Moray West OWF

11.8.2 Guidance

11.8.2.1 The assessment of marine mammals and other megafauna will consider the following guidance documents, advice and position statement where they are specific to this topic:

- Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (Marine Scotland, 2018);
- Marine environment: unexploded ordnance clearance joint interim position statement compiled by DEFRA, BEIS, the Marine Management Organisation (MMO), JNCC, Natural England, the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED), the Department of Agriculture, Environment and Rural Affairs (DAERA), NatureScot and Marine Scotland (2021)[36];
- Marine Mammal Noise Exposure Criteria: Assessing the severity of marine mammal behavioural responses to human noise (Southall *et al*., 2021);
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al*., 2019);
- The protection of Marine European Protected Species from injury and disturbance – Guidance for Scottish Inshore Waters (Marine Scotland, 2020b);
- Guidance on the Offence of Harassment at Seal Haul-out Sites (Marine Scotland, 2014b);
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (CIEEM, 2019);
- Oslo Paris Convention (OSPAR). Guidance on Environmental Considerations for Offshore Wind Farm Development (OSPAR, 2008);
- Environmental Impact Assessment for offshore renewable energy projects – guide (British Standards Institute, 2015);
- Approaches to Marine Mammal Monitoring at Marine Renewable Energy Developments (Macleod *et al*., 2010);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012);
- JNCC guidelines for minimising the risk of injury to marine mammals from pile driving, geophysical surveys and explosives (JNCC, 2010a; 2010b; 2010c; 2017);
- Scottish Marine Wildlife Watching Code (SNH, 2017);
- The Basking Shark Code of Conduct[37].

[36] https://www.gov.uk/government/publications/marine-environment-unexploded-ordnance-clearance-joint-interim-position-statement
[37] https://baskingsharkscotland.co.uk/about-us/our-code-of-conduct

11.8.3 Underwater noise modelling

11.8.3.1 Modelling of underwater noise across the Proposed Development area will be undertaken for all potential noise sources. This will be used to determine the potential risk of physical injury, disturbance/ displacement effects caused by underwater noise.

11.8.3.2 For the assessment of pile-driving noise, the INSPIRE underwater noise model will be used. INSPIRE is a range dependent, semi-empirical broadband noise propagation model developed by Subacoustech, which has been updated and refined over 10 years using empirical data from hundreds of datasets from field studies. The model considers a wide array of input parameters and has the capability to simultaneously model piling from multiple piling events to enable the assessment of events in combination. These methods will be fully described in the underwater noise technical report as part of the EIA.

11.8.3.3 For the assessment of non-impulsive, continuous noise sources, such as vessel noise, dredging, trenching, rock placement etc, the SPEAR model will be used. SPEAR is a simple geometric spreading model that uses measured source level data to predict impact ranges.

11.8.3.4 The outputs of the underwater noise modelling will be overlain on species-specific density surfaces to quantify the number of marine mammals likely to be impacted.

11.8.4 Assessment of PTS

11.8.4.1 For marine mammals, exposure to significant underwater noise can cause auditory injury known as PTS. The PTS-onset thresholds that will be used in this assessment are the dual criteria thresholds presented in Southall *et al*. (2019). This includes the assessment of instantaneous PTS (e.g., from a single pile strike; assessed using the SPL_{peak} metric) and cumulative PTS (e.g., resulting from accumulated exposure over up to 24 hours; assessed using the SEL_{cum} metric). Caledonia OWF is aware of ongoing studies investigating the key conservatisms in cumulative PTS modelling (change in impulsive characteristics with distance and effect on duty cycle on hearing threshold shifts) and, where possible, the results of these studies will be incorporated into the assessment for cumulative PTS (to be discussed further with NatureScot and Marine Scotland).

11.8.4.2 For basking sharks, although they are able to sense underwater noise, it has been documented that their sensitivity to underwater noise is low and appropriate criteria as per Popper *et al*. (2014) will be used for the assessment.

11.8.5 Assessment of Disturbance – UXO

11.8.5.1 If required, the Proposed Development will undertake UXO clearance as part of a separate Marine Licence (and EPS licence) application. At both the scoping and EIAR stage, the number and size of any UXO that may require clearance is unknown. The EIAR will present an indicative worst-case scenario for number of UXO and charge size, based on knowledge gained from previous UXO surveys for other developments in the Moray Firth region. The impact assessment will include an assessment for both high-order detonations and low-order detonations whilst aligning with recent recommendations and position statements on UXO clearance for similar OWF developments in the area.

11.8.5.2 The current guidance (JNCC, 2020) is to assume a 26 km Effective Deterrence Range (EDR) from high-order UXO clearance for harbour porpoise when assessing potential disturbance in harbour porpoise SACs. However, this EDR is not based on any empirical evidence of disturbance responses to UXO clearance (instead,

extrapolated from evidence for pie-driving) and no EDRs have been proposed for other species of marine mammal (and other megafauna); as such, the modelled extent of Temporary Threshold Shift (TTS)-onset threshold noise levels outlined by Southall *et al*. (2019) will be used as a proxy for disturbance. Disturbance from low-order UXO clearance will also be assessed using TTS-onset thresholds for worst-case low-order deflagration donor charge sizes, and also an EDR of 5 km (as used in recent consent applications for offshore wind projects in the Southern North Sea).

11.8.6 Assessment of Disturbance – Piling

11.8.6.1 The assessment of disturbance from piling will be based on the current best practice methodology and most applicable scientific literature from various studies of pile-driving impacts on marine mammals. A dose-response approach will be adopted rather than a fixed behavioural threshold approach, as advised by most recent guidance (Tyack and Thomas, 2019; Southall *et al*., 2021). A dose-response function is used to quantify the probability of a response from an animal to a dose of a certain stimulus or stressor (Dunlop *et al*., 2017) and assumes that not all animals in an impact zone will respond. Noise contours at 5 dB intervals (unweighted SEL, single strike) will be generated by noise modelling, and will be overlain on species density layers to quantify the number of animals at risk of disturbance. Dose-response functions are currently available for harbour porpoise (Graham *et al*., 2017; 2019) and harbour seal (Whyte *et al*., 2020) (though the Caledonia OWF is aware of forthcoming updated dose-response curves based on data from the Moray East OWF and revised modelling for harbour seals). The planned approach is to apply the most up-to-date dose-response functions to all cetacean and seal species, respectively, with appropriate caveats discussed.

11.8.7 Assessment of Entanglement

11.8.7.1 Depending on the mooring methods used (see Chapter 3: Proposed Development Description), there is potential for entanglement in the anchoring mechanisms for floating WTGs. The risk of marine mammal entanglement in the mooring systems of renewable devices is largely unknown, and is expected to vary from species to species (Benjamins *et al*., 2014): it is expected that porpoises and dolphins have a lower risk of entanglement than minke whales, due to their smaller size and increased manoeuvrability. Mooring systems required for floating OWFs are perceived to present a similar risk of entanglement to marine mammals as those used to moor offshore oil and gas infrastructure, and a lesser risk than those used in commercial fishing, such as static fishing gear marker buoys. It is expected that the diameter and the tension of the anchoring lines attached to OWF equipment means that loops will not form, and thus direct entanglement is unlikely (Benjamins *et al*., 2014). There is, however, the potential for indirect entanglement to occur where derelict fishing gear and marine litter may become snagged on the mooring lines and subsequently entangle marine mammals.

11.8.7.2 Assessment of direct and indirect entanglement potential for marine mammals and other megafauna will be assessed in the EIA, considering each marine mammal species and the 'worst-case' characteristics associated with the design of mooring lines (diameter and tension).

11.8.8 Assessment of Vessel Collision and Disturbance

11.8.8.1 Increased vessel presence in the area from the Proposed Development and other projects creates a potential for increased collision risk and disturbance for marine mammals and other megafauna. Expected vessel numbers within and surrounding the Proposed Development (including potential vessel routes to ports) will be compared to baseline levels of vessel activity to quantify the potential increase (also see Chapter 13: Shipping and Navigation). Assessment of impact will be based on the most up-to-date scientific evidence on the effect of construction, O&M and decommissioning vessels on marine mammals and other megafauna; for example, studies of harbour porpoise responses to construction vessel traffic (Benhemma-Le Gall *et al*., 2021).

11.9 Scoping Questions

11.9.1.1 The questions in Table 11.5 are posed to consultees to frame and focus responses to the Marine Mammals and Other Megafauna scoping exercise, which will in turn inform the Scoping Opinion.

Table 11.5. EIA scoping questions for Marine Mammals and Other Megafauna.

Scoping Questions – Marine Mammals and Other Megafauna
Do you agree with the data sources, including project specific surveys, to be used to characterise the Marine Mammals and Other Megafauna baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Marine Mammals and Other Megafauna?
Do you agree with the project impacts which have been scoped out of the EIA for Marine Mammals and Other Megafauna?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Marine Mammals and Other Megafauna that have been identified for the Proposed Development?

12 Commercial Fisheries

12.1 Introduction

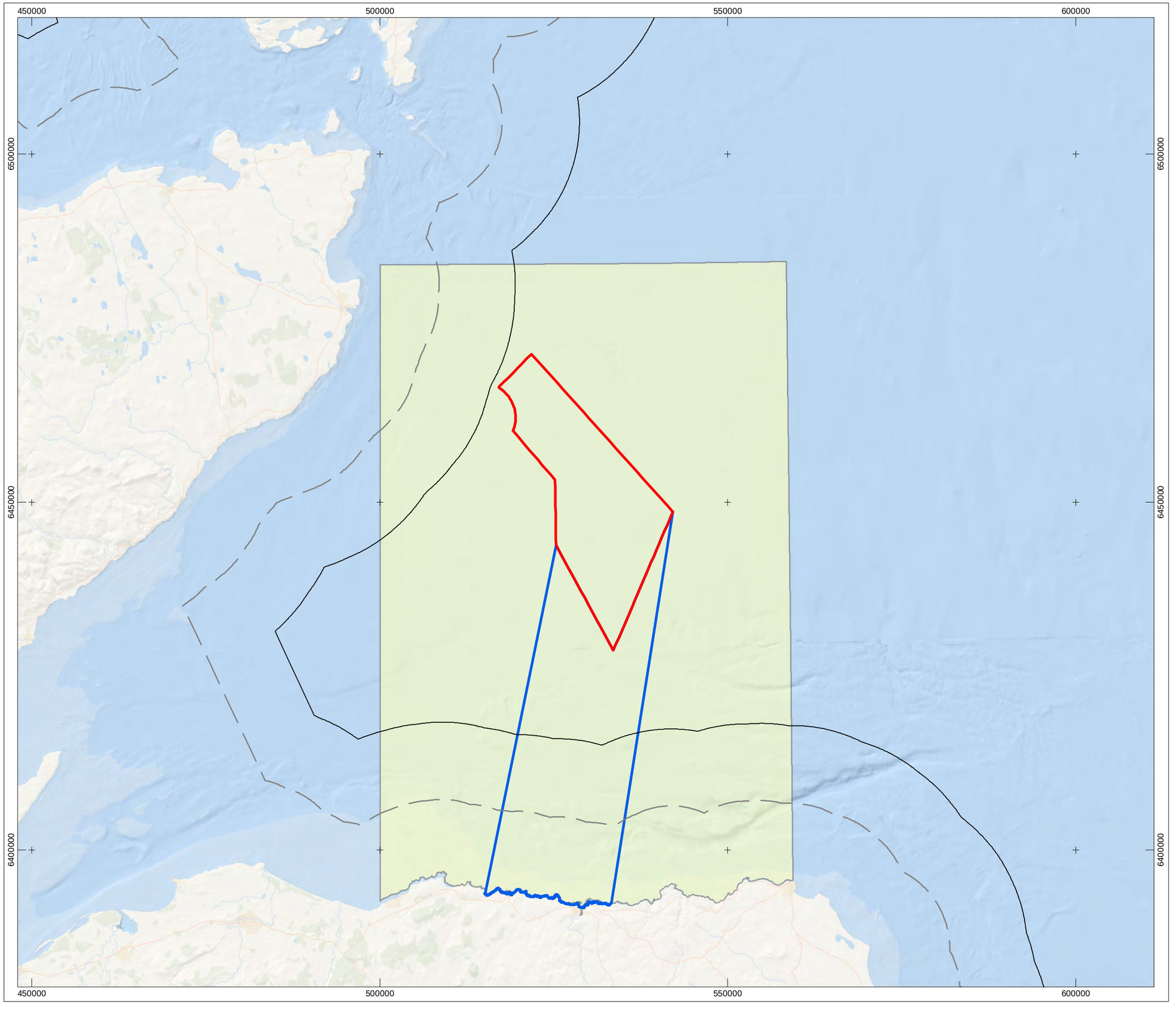
12.1.1.1 This chapter of the Offshore Scoping Report identifies the Commercial Fisheries receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

12.1.1.2 For the purpose of this report, 'commercial fishing' is defined as any form of fishing activity legally undertaken where the catch is sold for taxable profit.

12.2 Study Area

12.2.1.1 The Proposed Development is located within the southwest portion of the ICES Division 4a (northern North Sea) statistical area; within UK EEZ waters. For the purpose of recording Commercial Fisheries landings, ICES Division 4a is divided into statistical rectangles, of which the Proposed Development overlaps with 44E7 and 45E7. For the purposes of this Offshore Scoping Report, the Commercial Fisheries study area comprises ICES rectangles 44E7 and 45E7.

12.2.1.2 While the study area illustrated in Figure 12.1 focuses on the Proposed Development overlap with ICES rectangles, a wider regional area will be considered for displacement impacts within the EIAR. It is proposed that the regional study area will also include those ICES rectangles immediately adjacent to the Commercial Fisheries study area.



Legend

- Array Area
- Offshore Export Cable Corridor
- Commercial fisheries study area
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 12.1

Commercial Fisheries study area
(ICES rectangles 44E7 and 45E7)

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12.3 Baseline Environment

12.3.1 Data Sources

12.3.1.1 The data sources that have been used to inform this Commercial Fisheries chapter of the Offshore Scoping Report are presented within Table 12.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

Table 12.1. Summary of key publicly available datasets for Commercial Fisheries.

Title	Source	Year	Author
UK annual fisheries landings statistics	Marine Management Organisation (MMO)	2016 – 2020	MMO
UK Vessel Monitoring System (VMS) data	MMO	2016 – 2019	MMO
EU annual fisheries landings statistics	Scientific, Technical and Economic Committee for Fisheries (STECF)	2004 – 2016	STECF
EU VMS data	ICES	2016 – 2020	ICES
Fisheries datasets available from the Marine Scotland MAPS NMPi, including ScotMap data	Marine Scotland NMPi (https://marinescotland.atkinsgeospatial.com/nmpi)	Various	Marine Scotland
Key species stock assessments	ICES and Marine Scotland	Various	ICES and Marine Scotland
Description of regional commercial fisheries activity	SMP for Offshore Wind Energy	2020	Scottish Government
Beatrice O&G Field Decommissioning EIA	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/731309/Beatrice_Environmental_Assessment_Report.pdf	2018	Repsol Sinopec Resources UK Limited

12.3.1.2 It should be noted that the quantitative datasets identified in Table 12.1 may not capture all activity in the Commercial Fisheries study area. For instance, the VMS datasets only covers vessels ≥12 m (ICES data) or ≥15 m (MMO data) in length. Note that UK vessels ≥12 m in length have VMS on board, however, to date, the MMO provide amalgamated VMS datasets for ≥15 m vessels only.

12.3.1.3 However, in addition to VMS data, other published data does provide a useful insight into Commercial Fisheries activity undertaken in inshore areas (e.g., ScotMap inshore fisheries mapping) and consultation with fisheries stakeholders and industry is expected to further inform assessment in the EIAR.

12.3.1.4 Consultation with representatives of fishermen's associations and organisations will be undertaken to seek to corroborate the findings of desk-based baseline data analysis and to provide insight into specific fishing grounds and activity of any vessels active in the area. Consultation will also be important to inform gear specifications for vessels active in the area, which will allow a full understanding of how different vessels and different gear configurations may be affected.

12.3.1.5 Variations and trends in Commercial Fisheries activity are an important aspect of the baseline assessment and is the principal reason for considering up to five years of key baseline data. Given the time periods considered in this scoping exercise (i.e., 2016 to 2020), existing baseline data may to some extent capture potential changes in Commercial Fisheries activity resulting from the COVID-19 pandemic, which is understood to have temporarily affected market demand and supply chains. However, changes in fishing patterns resulting from the withdrawal of the UK from the EU would be expected in future data sets, which include data for 2021 onwards. Long term environmental and climatic changes may be expected to be detectable within the five-year time series but may benefit from longer-term analysis dependant on the target species. Inclusion of such longer-term analysis will be informed by stakeholder consultation.

12.3.2 Overview of Baseline Environment

12.3.2.1 Landings by UK-registered vessels from the Commercial Fisheries study area (ICES rectangles 44E7 and 45E7) had an annual average landings value of approximately £8.6 million across the years 2016 to 2020 (MMO, 2021), with landings values increasing from 2017 to 2019, peaking at £11.5 million in 2019, but falling in 2020 to £7 million (likely due to a combination of COVID-19 restrictions and the UK EU-exit). Landings from ICES rectangle 44E7, inshore of the Array Area, accounted for approximately 70% of the total value of landings from the wider study area. Over the same time period, the annual average weight of landings from the study area was approximately 3,400 tonnes, peaking at approximately 4,600 tonnes in 2019.

12.3.2.2 Landings of shellfish dominated, accounting for 77% of the total landings value and 52% of the landed weight (based on data from MMO, 2021). Scottish vessels were responsible for the majority (over 90%) of landings, with landings also being made by vessels registered in England and to a much lesser extent vessels registered in Northern Ireland. The main landing ports local to the Proposed Development include (but are not limited to) Buckie, Fraserburgh, Peterhead and Scrabster.

12.3.2.3 Figure 12.2 and Figure 12.3 show the top 12 species landed from the Commercial Fisheries study area by value and weight respectively, from 2016 to 2020 (MMO, 2020). Figure 12.4 shows the landed value over the same period from the Commercial Fisheries study area by ICES rectangle and gear type. The key species landed are squid (*Loligo forbesi*), nephrops (*Nephrops norvegicus*), haddock (*Melanogrammus aeglefinus*), scallops (*Pecten maximus*) and brown crabs (*Cancer pagurus*). First sales value and weight of squid landings have fluctuated over the 2016 to 2020 period, with an annual landed value of £1.9 million in 2020 and of £3 million in 2019. Landed values and weights of nephrops and scallops have also been variable across the time period, with five-year averages of £1.7 million of nephrops and £850,000 of scallop are landed annually from the study area. Landings of haddock from the study area have generally increased over the time series, peaking in annual landed value in 2020 at £1.5 million. Landings of mackerel (*Scomber scombrus*) peak notably in 2019; such patterns in landings by ICES rectangles are typical for pelagic species that swim in fast moving shoals and may not be specifically linked to areas or habitats when caught in the water column.

12.3.2.4 Landing statistics indicate that landings by under 10 m vessels and over 10 m vessels are made across the Commercial Fisheries study area, with the majority of landings by value being made by vessels over 10 m length. Notably, the majority (90% by value) of the landings by potting vessels and all landings by vessels using gear with hooks are made by vessels ≤10 m in length, indicating the importance of the inshore fleet across the inshore portion of the Commercial Fisheries study area. Almost all of the landings by demersal trawl, dredge and demersal seine are by vessels >10 m in length.

12.3.2.5 Landings of the species detailed above vary seasonally, with inshore vessels often equipped to move from species to species throughout the seasons. Landing trends per month will be analysed within the EIAR for individual species at both an ICES rectangle level, and by port of landing to identify which fleet and fishery operate at specific times of the year.

12.3.2.6 The majority of fishing activity (over 96% based on EU landings data 2012 to 2016) within the Commercial Fisheries study area is by UK vessels, with over 94% of landings attributed to Scottish vessels. EU landings data indicates the potential for occasional activity by German, Dutch and French fishing vessels. Occasional activity by Norwegian pelagic trawlers may also occur in the region.

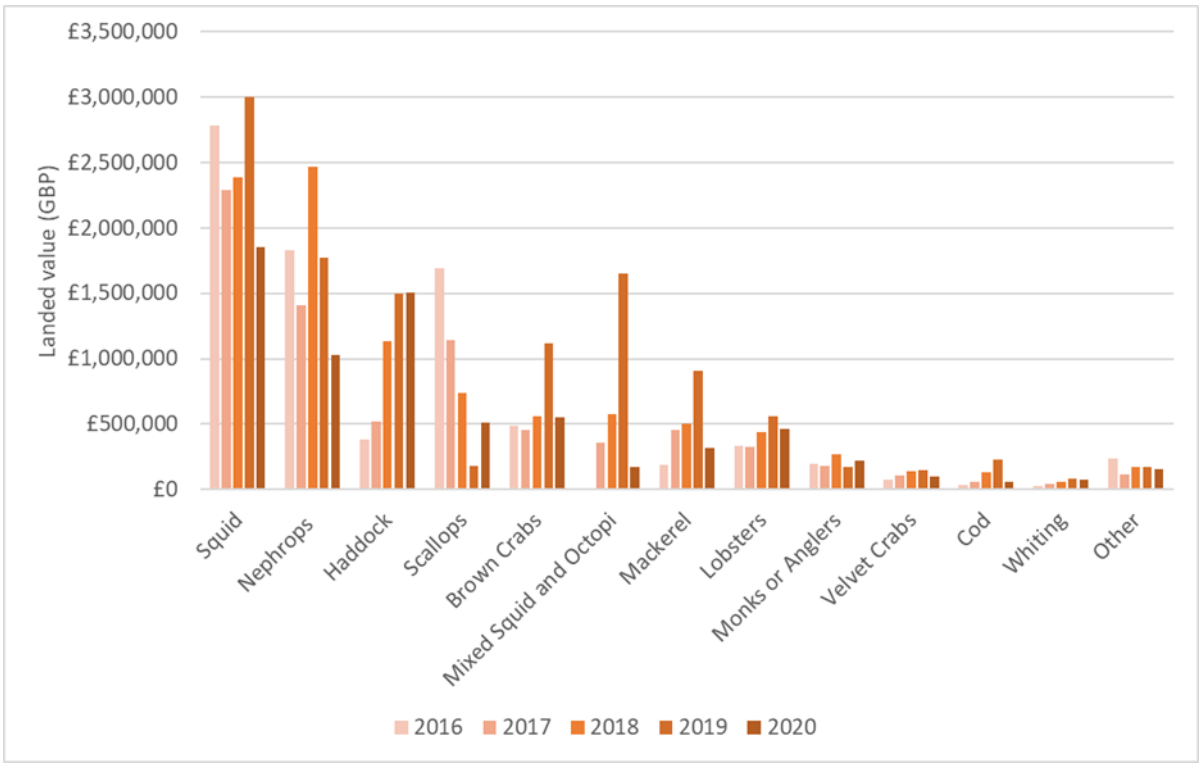


Figure 12.2. Top twelve species by value Great British Pound (GBP) from 2016 to 2020 landed from the Commercial Fisheries study area (data source: MMO, 2021).

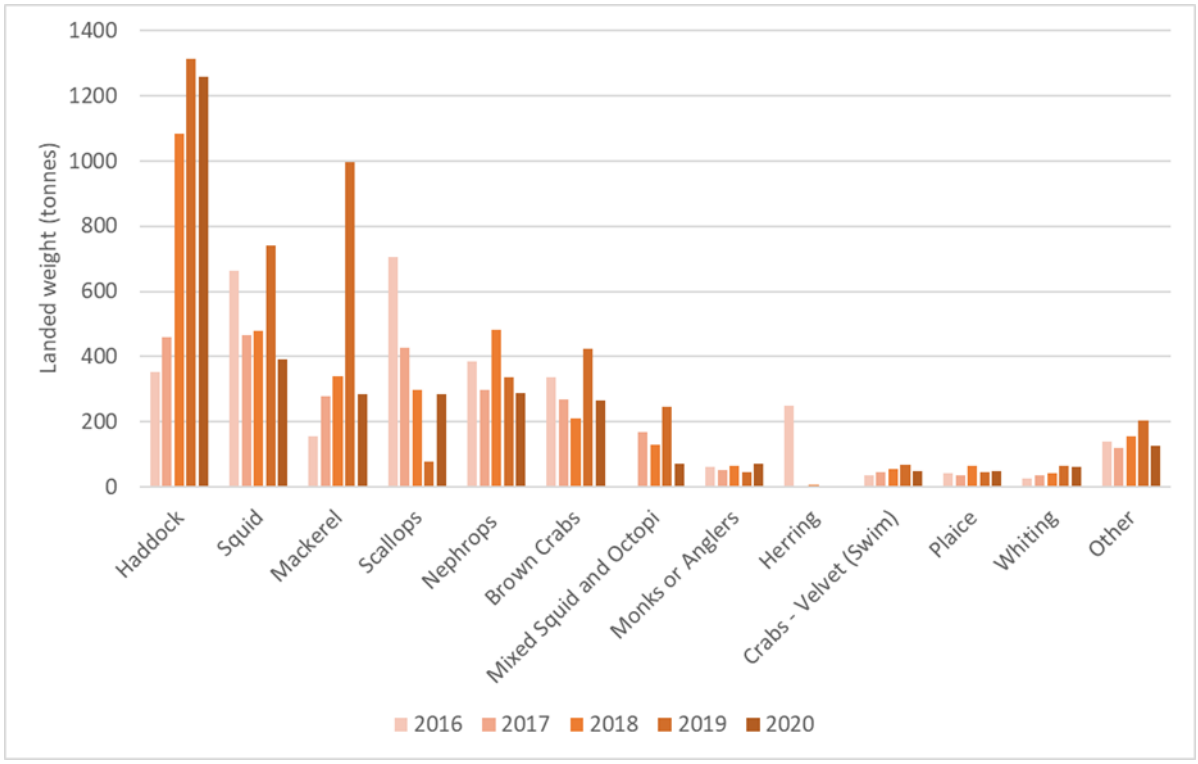


Figure 12.3. Top twelve species by weight (tonnes) from 2016 to 2020 landed from the Commercial Fisheries study area (Source: MMO, 2021).

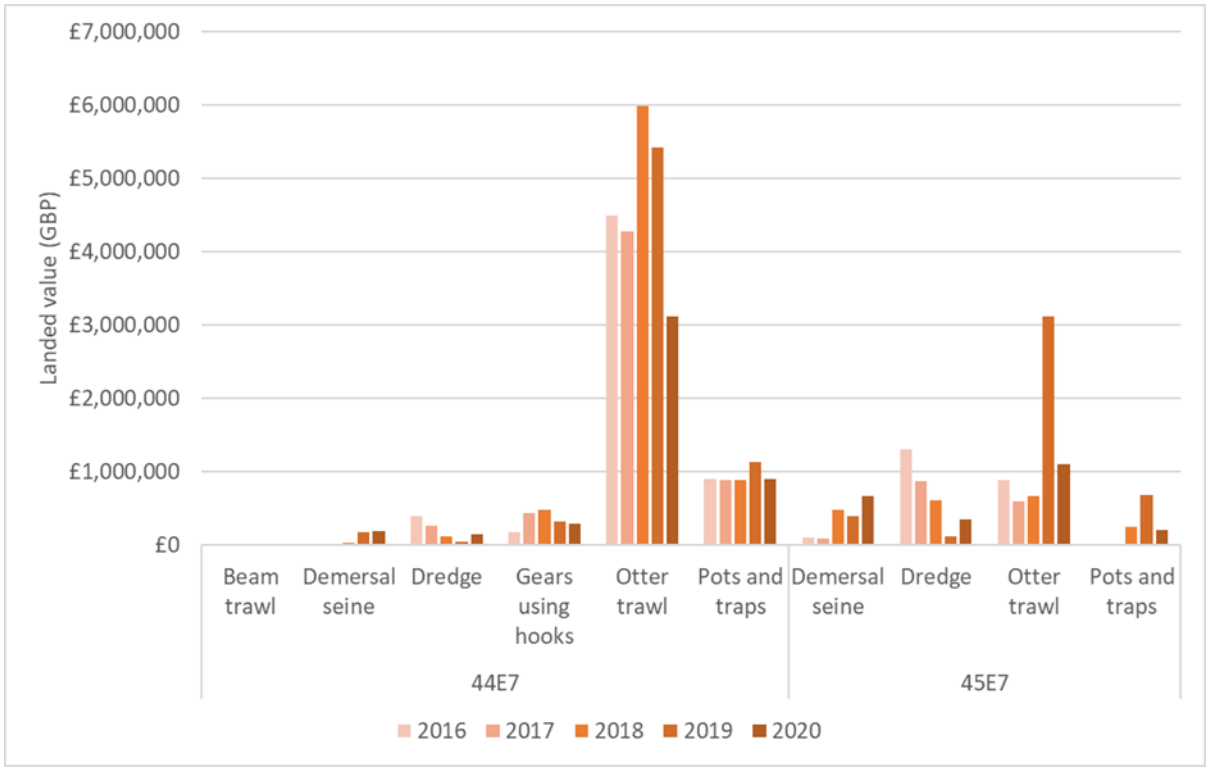


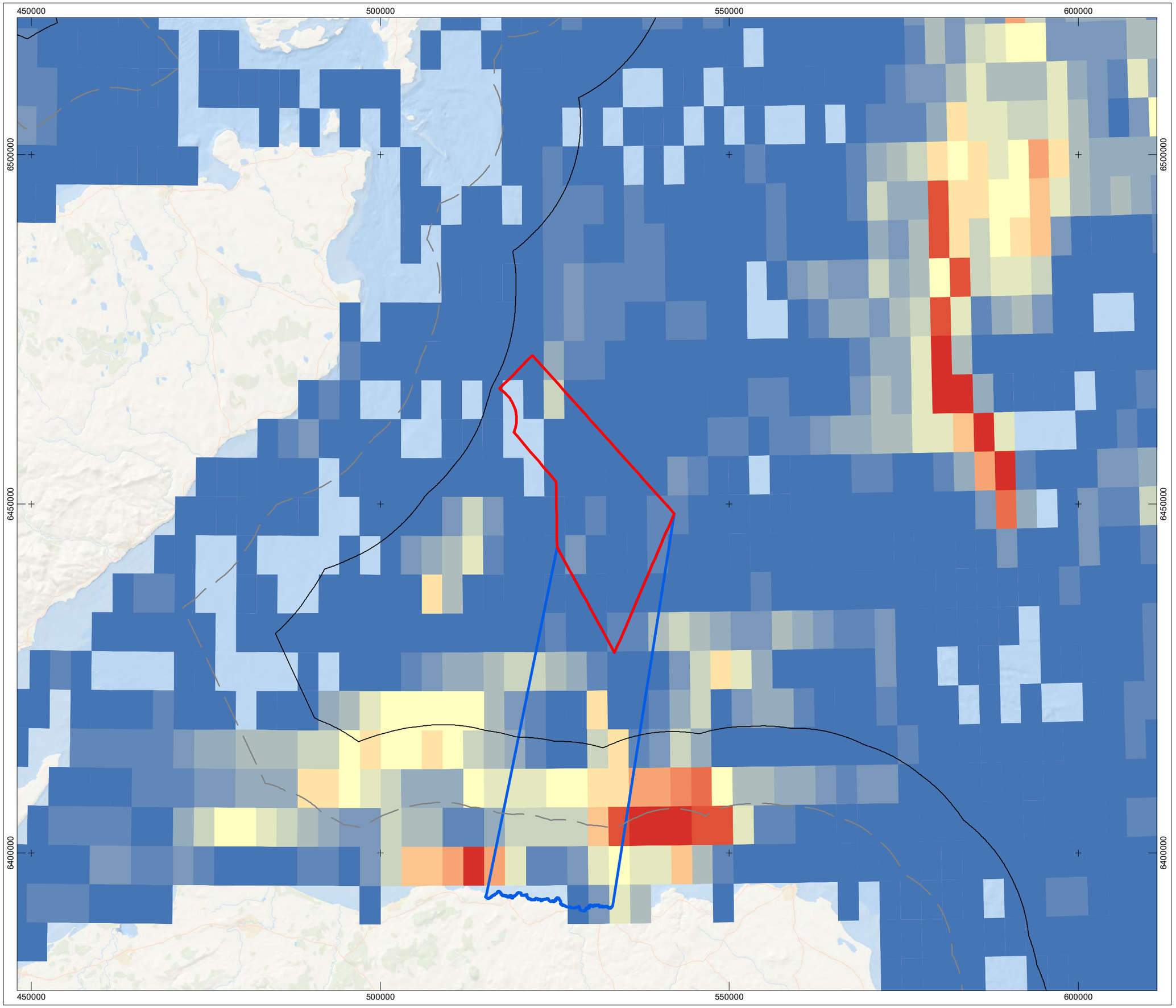
Figure 12.4. Landed value from 2016 to 2020 from the Commercial Fisheries study area by ICES rectangle and gear type (Source: MMO, 2021).

12.3.2.7 In addition to landings data, VMS and spatial data to map fishing activity is available for UK and EU fleets. VMS data sourced from ICES displays the surface Swept Area Ratio (SAR) of catches by different gear types and covers EU (including UK) registered vessels 12 m and over in length. Surface SAR indicates the number of times in an annual period that a demersal fishing gear makes contact with (or sweeps) the seabed surface. Surface SAR provides a proxy for fishing intensity and has been analysed to determine an average annual SAR based on data from 2016-2020 for the following gear types:

- Figure 12.5: demersal otter trawl: indicating high levels of activity within the Offshore ECC, particularly on the east and west boundaries of this area and within the 12 nm boundary; small levels of activity are also noted within the Array Area.
- Figure 12.6: demersal seine: indicating small levels of activity across the Array Area and Offshore ECC.
- Figure 12.7: dredge: indicating activity within the Array Area and within the 6 nm portion of the Offshore ECC.

12.3.2.8 VMS data sourced from MMO displays the first sales value (£) of catches and covers UK registered vessels 15m and over in length from 2016 to 2019 for the following gear types:

- Figure 12.8: pots or traps: indicating some activity by vessel 15 m and over within the Array Area - VMS data for potting is not expected to be representative of the level of activity as under 15 m vessels, which form the majority of the fleet, are not included in the data source.
- Figure 12.9: pelagic trawl: indicating a hotspot of activity within ICES rectangle 45E7, but predominately outside the Array Area.



Legend

- Array Area
- Export Cable Corridor
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

Otter trawl Swept Area Ratio

- 0.0 - 0.6
- 0.7 - 1.3
- 1.4 - 1.9
- 2.0 - 2.6
- 2.7 - 3.2
- 3.3 - 3.9
- 4.0 - 4.5
- 4.6 - 5.1
- 5.2 - 5.8
- 5.9 - 6.4
- 6.5 - 7.1
- 7.2 - 7.7
- 7.8 - 8.4
- 8.5 - 9.0
- 9.1 - 23.2

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
FN	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_PO_WNF_COF_MAP_00002_DemOtterTrawl		

Figure 12-5

EU (including UK) vessels ≥ 12m length actively fishing using demersal otter trawl (Data source: ICES, 2021, based on a five year annual average data set from 2016-2020)

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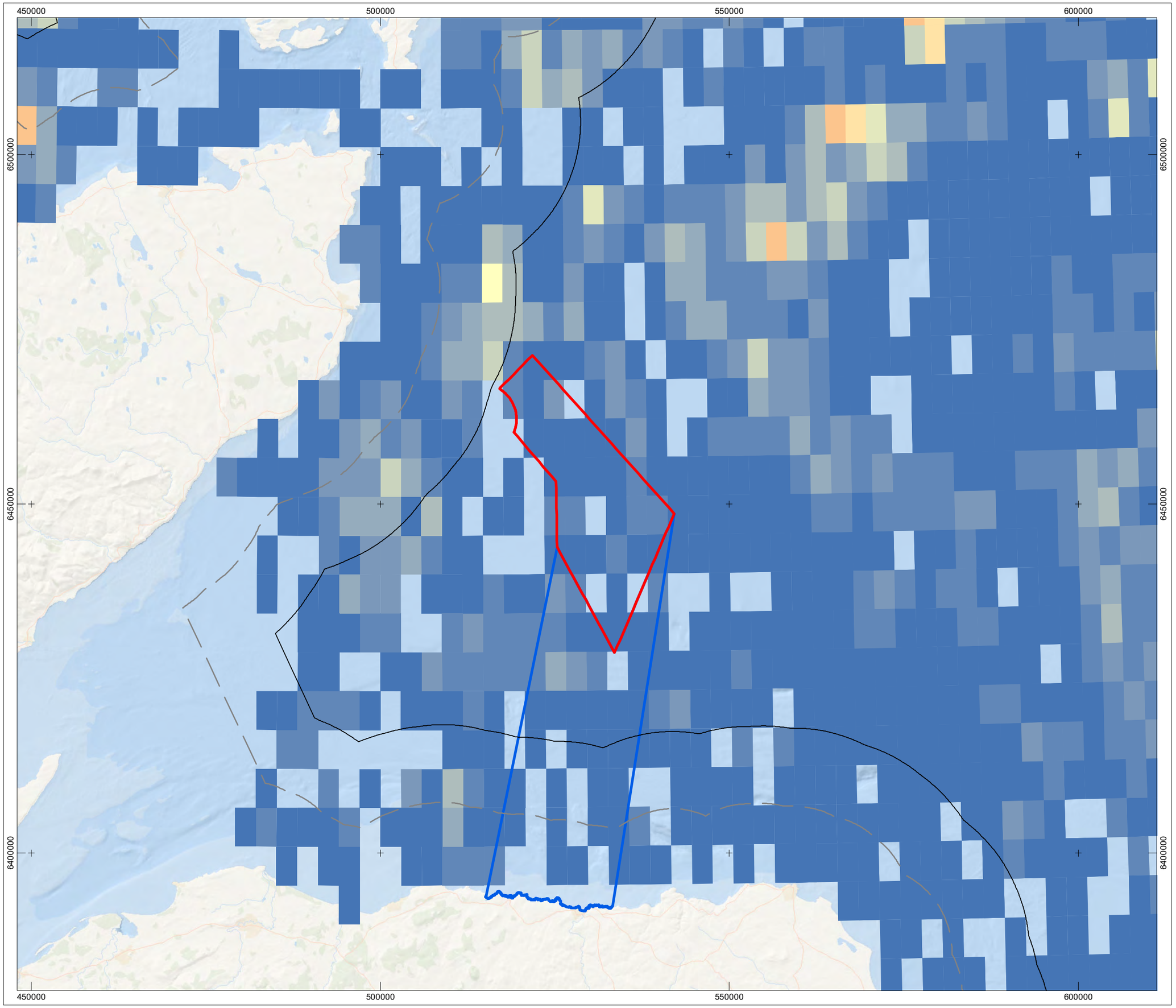

Legend

- Array Area
- Export Cable Corridor
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

Demersal seine Swept Area Ratio

- 0.0 - 0.6
- 0.7 - 1.3
- 1.4 - 1.9
- 2.0 - 2.6
- 2.7 - 3.2
- 3.3 - 3.9
- 4.0 - 4.5
- 4.6 - 5.1
- 5.2 - 5.8
- 5.9 - 6.4
- 6.5 - 7.1
- 7.2 - 7.7
- 7.8 - 8.4
- 8.5 - 9.0
- 9.1 - 46.8

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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FN	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_PO_WNF_COF_MAP_00003_DemSeine		

Figure 12-6

EU (including UK) vessels ≥ 12m length actively fishing using demersal seine (Data source: ICES, 2021, based on a five-year annual average data set from 2016-2020)

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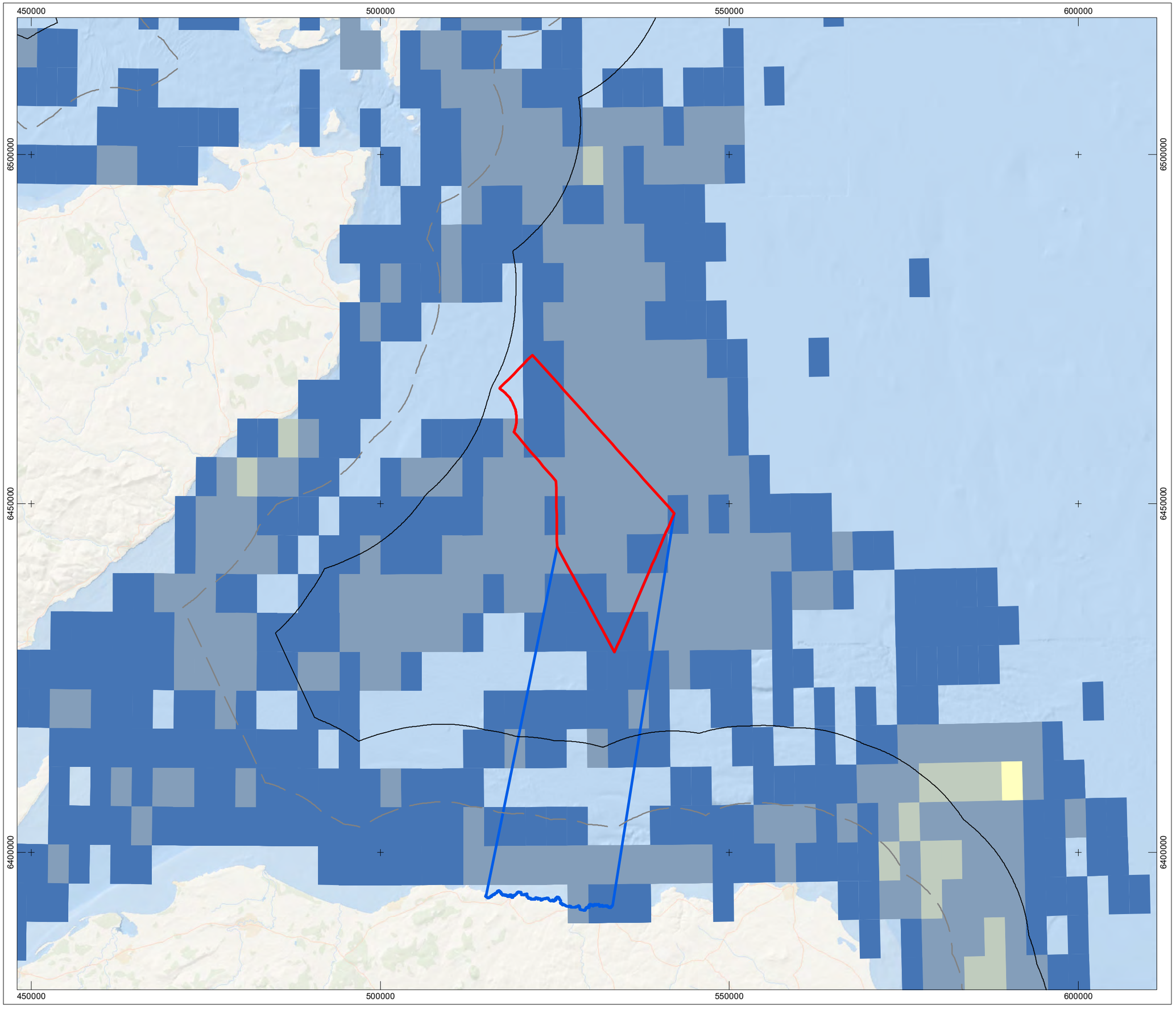

Legend

- Array Area
- Export Cable Corridor
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

Dredge Swept Area Ratio

- 0.0 - 0.1
- 0.2 - 0.5
- 0.6 - 0.8
- 0.8 - 1.0
- 1.1 - 2.0
- 2.1 - 2.5
- 2.6 - 3.8

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
FN	SM	DH
Date: 09/08/2022		Revision: 01
REF: UKCAL1_PO_WNF_COF_MAP_00004_Dredge		

Figure 12-7

EU (including UK) vessels ≥ 12m length actively fishing using dredge (Data source: ICES, 2021, based on a five year annual average data set from 2016-2020)

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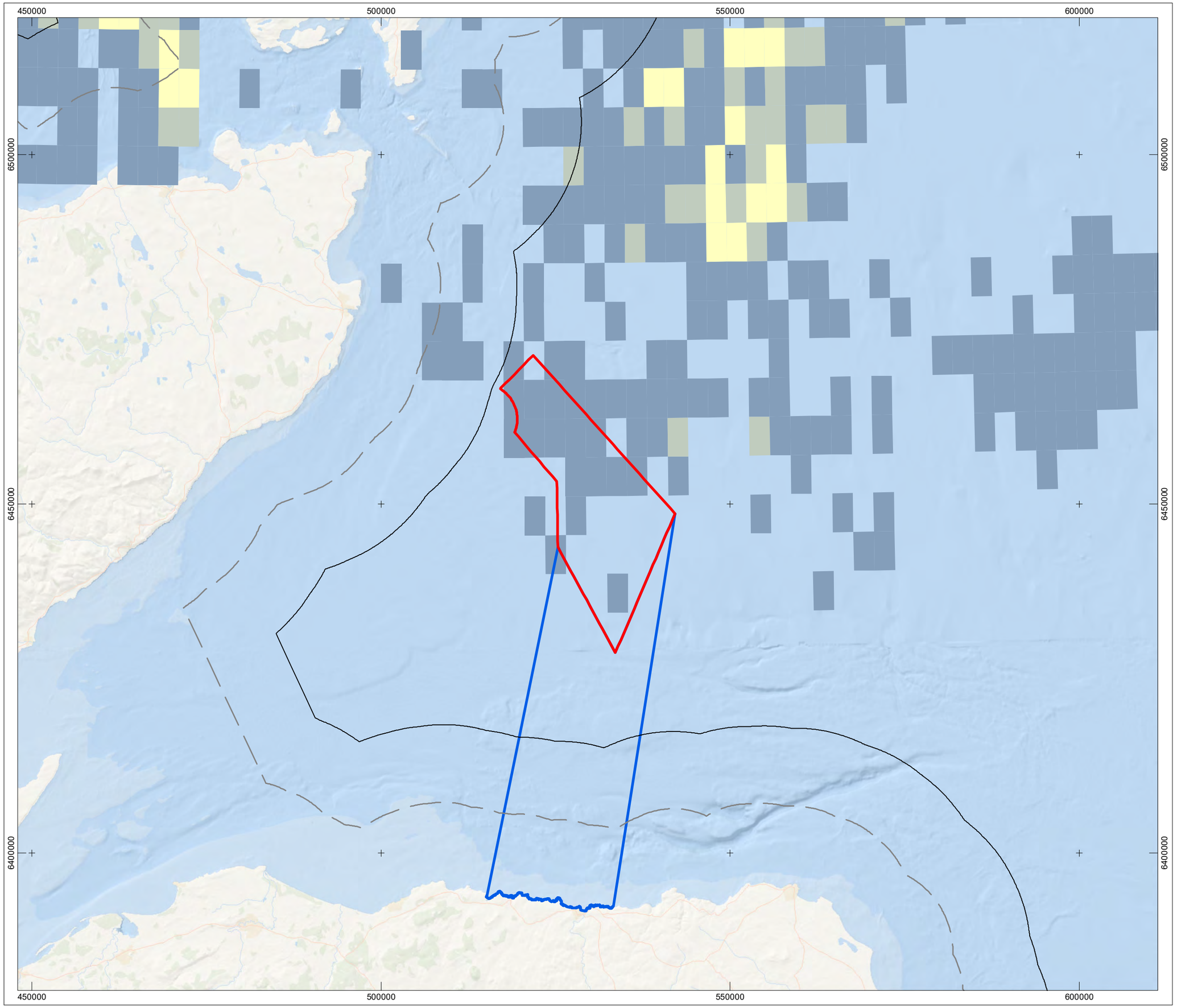

Legend

- Array Area
- Export Cable Corridor
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

UK potting, 2019

Total value, £

- £0.01 - £5,000.00
- £5,000.01 - £10,000.00
- £10,000.01 - £25,000.00
- £25,000.01 - £50,000.00
- £50,000.01 - £75,000.00
- £75,000.01 - £145,000.00

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
FN	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_PO_WNF_COF_MAP_00005_Potting		

Figure 12-8

UK vessels ≥15m length actively fishing using pots and traps (Data source: MMO, 2021, annual data set for 2019)

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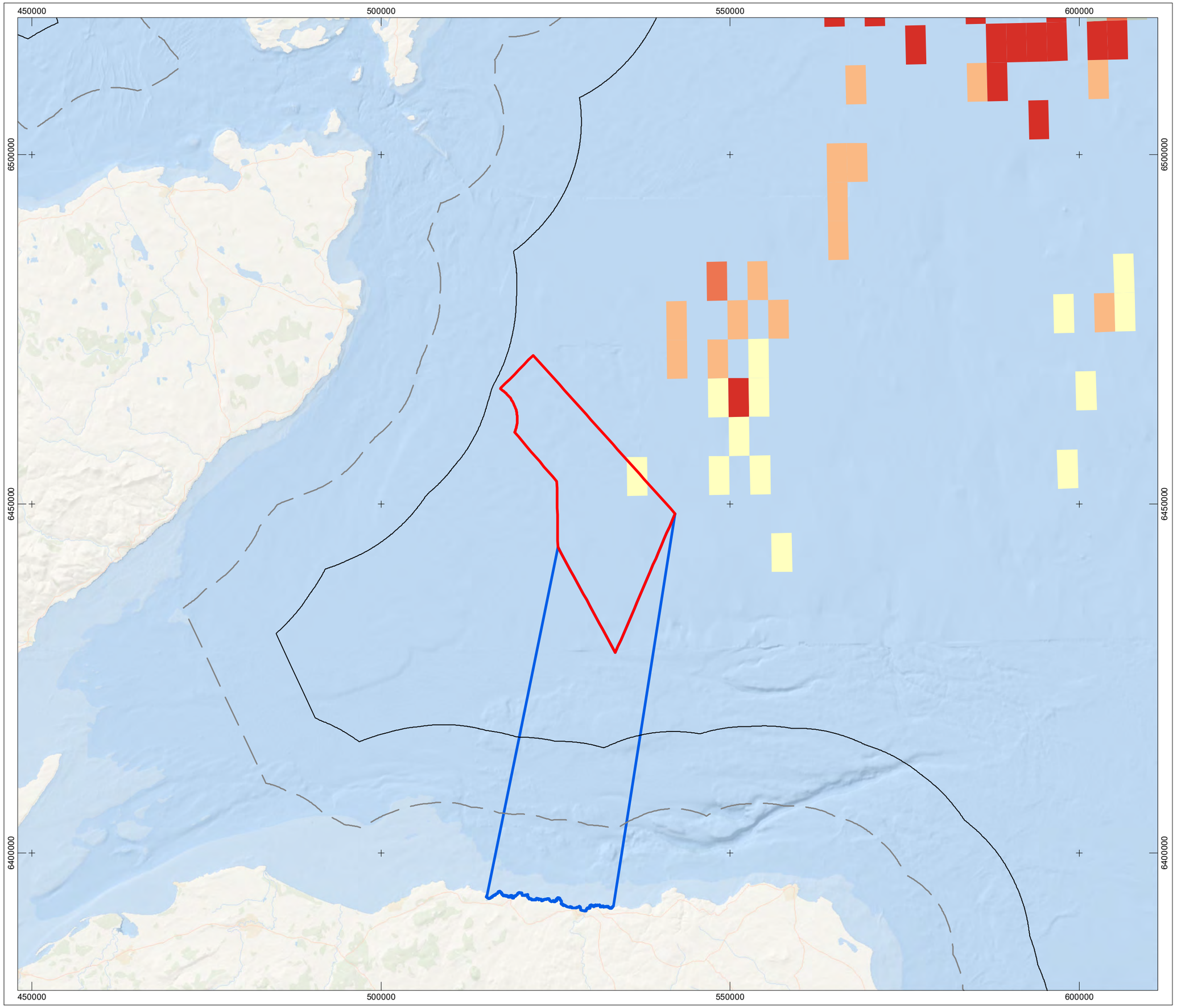

Legend

- Array Area
- Export Cable Corridor
- ICES statistical rectangles
- 12 NM limit
- 6 NM limit

UK pelagic trawl, 2019

Total value, £

- £0.02 - £5,000.00
- £5,000.01 - £10,000.00
- £10,000.01 - £25,000.00
- £25,000.01 - £50,000.00
- £50,000.01 - £75,000.00
- £75,000.01 - £267,000.00

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
FN	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_PO_WNF_COF_MAP_00006_PelagicTrawl		

Figure 12-9

UK vessels ≥15m length actively fishing using pelagic trawl (Data source: MMO, 2021, annual data set for 2019)

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12.3.2.9 In summary, based on the data gathered to inform this scoping exercise, the key fleets operating across the study area include (in no particular order):

- Local creel fleet targeting brown crab and lobster (vessels typically 15 m and under in length), with lobster targeted across the Offshore ECC (ICES rectangle 44E7) and brown crab targeted across both the Offshore ECC and Array Area (44E7 and 45E7);
- Local jigging fleet targeting mackerel, predominately across the Offshore ECC, but also to a lesser extent in the Array Area;
- Demersal trawl fleet targeting haddock (across the Offshore ECC and Array Area), nephrops (across the Offshore ECC), squid (predominately across the Offshore ECC, but also the Array Area) and whitefish (across both Offshore ECC and Array Area);
- Scallop dredging fleet targeting scallops, predominately across the Area Array; and
- Scottish seine fleet targeting whitefish, across both Offshore ECC and Array Area.

12.3.2.10 Salmon fishing and sea trout fishing rights in Scotland include coastal fixed engine and net and coble fisheries. There are a number of fixed engine sites for wild salmon and sea trout around the Dornoch and Cromarty Firths and near Banff and a number of net and coble sites around the Dornoch, Cromarty and Moray Firths around Fraserburgh (Scottish Government, 2019). These sites have been reported to be active at some point during the period between 2011 to 2016, with one site adjacent to, but outside the eastern edge of the Offshore ECC. The EIA will explore if these sites remain active.

12.3.2.11 There are no aquaculture facilities within the Commercial Fisheries study area (Scottish Government, 2019) and it is considered unlikely that there would be any aquaculture development offshore in the vicinity of the Proposed Development unless there is beneficial co-location with offshore wind development.

12.4 Embedded Mitigation Considered Within the EIA

12.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

12.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Commercial Fisheries are noted within Table 12.2 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Commercial Fisheries receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring;
- M-5: Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP;
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction phases of the Proposed Development;
- M-14: Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting;
- M-17: Development of and adherence to a Fisheries Management and Mitigation Strategy (FMMS). The FMMS will set out the means of ongoing fisheries liaison through construction and O&M phases of the Proposed Development and detail any mitigation measures to be put in place to limit effects on Commercial Fisheries activity. This will include the following project policies: Fisheries Liaison Policy and Engagement Schedule, Conflict Avoidance Policy, Incident Response Policy;
- M-18: Appointment of a Company Fisheries Liaison Officer (CFLO). The CFLO will support ongoing liaison and ensure clear communication between the Proposed Development and Commercial Fisheries;
- M-19: Development of and adherence to a Navigational Safety Plan (NSP). The NSP will describe measures put in place by the Proposed Development related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Proposed Development activity to other sea users (e.g., via Notice to Mariners);
- M-20: Adherence to best practice guidance with regards to fisheries liaison and procedures in the event of interactions between the Proposed Development and fishing activities (e.g., FLOWW, 2014; 2015);
- M-21: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins;
- M-22: Participation in any fisheries working group to assist with liaison between the Proposed Development and the fishing community;

- M-23: Application for and use of Safety Zones of up to 500 m during construction, major maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards;
- M-24: Any objects dropped on the seabed during works associated with the Proposed Development will be reported and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.

12.5 Scoping of Impacts

12.5.1.1 Potential impacts on Commercial Fisheries have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 12.2.

Table 12.2. EIA scoping assessment for Commercial Fisheries.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Reduction in access to, or exclusion from established fishing grounds	M-1, M-5, M-12, M-14, M-17, M-18, M-19, M-20, M-21, M-22, M-23, M-24	Scoped in	Installation and decommissioning activities have potential to create loss of fishing opportunities. This effect is expected to be localised, and short term; furthermore, the operational range of relevant fleets will not typically be limited to the Proposed Development. Further assessment required to conclude impact significance.	✓	✓	✓	✓	✓
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	M-12, M-17, M-18, M-20, M-21, M-22	Scoped in	Any reduced access to fishing grounds creates the potential for displacement of fishing activity. This effect is expected to be short-term and localised, and the operational range of relevant fleets will not typically be limited to the Proposed Development. Further assessment required to conclude impact significance.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity	M-12	Scoped in	Installation and decommissioning activities may lead to disturbance of commercially important fish and shellfish resources and therefore displace or disrupt a range of fishing activity. Further assessment required to conclude impact significance; assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment (see Chapter 9) and it will be assumed that Commercial Fisheries will be affected as a result of any loss of resources.	✓	✓	✓	✓	✓
Increased vessel traffic associated with the Proposed Development within fishing grounds leading to interference with fishing activity	M-17, M-18, M-19, M-20, M-21	Scoped in	Movement of vessels associated with the Proposed Development adding to the existing volume of marine traffic in the area, may lead to interference of fishing activity. Further assessment required to conclude impact significance; assessment will be informed by the outcomes of the Shipping and Navigation impact assessment (see Chapter 13) and Navigational Risk Assessment (NRA).	✓	✓	✓	✓	✓
Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Proposed Development	M-17, M-18, M-19, M-20, M-21	Scoped out	This effect will be localised to Safety Zones and therefore limited deviations to steaming routes are expected. Given adequate notification, it is expected that vessels, which typically have an operational range beyond that of the Proposed Development (as indicated by VMS data presented above), will be in a position to avoid temporary construction/decommissioning areas with no or minimal impact on their steaming times. As such the impact has been scoped out of the EIA.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Operation and Maintenance								
Reduction in access to, or exclusion from established fishing grounds	M-1, M-5, M-12, M-14, M-17, M-18, M-19, M-20, M-21, M-22, M-23, M-24	Scoped in	Accessibility within the Array Area will be dependent on WTG spacing, WTG layout and foundation type. In particular, mooring systems of floating foundations may affect the ability of commercial fishing fleets in deploying certain gears. Further assessment required to conclude impact significance.	✓	✓	✓	✓	✓
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	M-12, M-17, M-18, M-20, M-21, M-22	Scoped in	Any reduced access to fishing grounds creates the potential for displacement of fishing activity. This effect is expected to be localised and the operational range of relevant fleets will not typically be limited to the Proposed Development. Further assessment required to conclude impact significance.	✓	✓	✓	✓	✓
Disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity	M-12	Scoped in	O&M of the Proposed Development may lead to disturbance of commercially important fish and shellfish resources, and changes to habitat, and therefore displace or disrupt a range of fishing activity. Further assessment required to conclude impact significance; assessment will be informed by the outcomes of the Fish and Shellfish Ecology impact assessment (see Chapter 9) and it will be assumed that Commercial Fisheries will be affected as a result of any loss of resources.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Increased vessel traffic associated with the Proposed Development within fishing grounds leading to interference with fishing activity	M-17, M-18, M-19, M-20, M-21	Scoped in	Movement of vessels associated with O&M of the Proposed Development adding to the existing volume of marine traffic in the area, may lead to interference of fishing activity. Further assessment required to conclude impact significance; assessment will be informed by the outcomes of the Shipping and Navigation impact assessment (see Chapter 13) and NRA.	✓	✓	✓	✓	✓
Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Proposed Development	M-17, M-18, M-19, M-20, M-21	Scoped out	This effect will be localised to Safety Zones associated with temporary maintenance works on installed structures and therefore limited deviations to steaming routes are expected. Given adequate notification, it is expected that vessels, which typically have an operational range beyond that of the Proposed Development (as indicated by VMS and ScotMap data presented above), will be in a position to avoid temporary maintenance areas around installed infrastructure with no or minimal impact on their steaming times. As such the impact has been scoped out of the EIA.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Physical presence of infrastructure and potential exposure of that infrastructure leading to gear snagging	M-1, M-5, M-14, M-17, M-18, M-19, M-20, M-21, M-23, M-24	Scoped in	Standard industry practice and protocol (e.g., seabed infrastructure will be buried and/or marked on nautical charts) will minimise the risk of gear snagging, but it remains likely to be an area of industry concern. Further assessment required to conclude impact significance. Safety aspects associated with this impact, including damage to property and vessel stability, will be considered within the Shipping and Navigation impact assessment (see Chapter 13).	✓	✓	✓	✓	✓

12.6 Potential Cumulative Impacts

12.6.1.1 Cumulative effects on Commercial Fisheries resulting from the effects of the Proposed Development and other developments (noting that there is already significant offshore wind farm development in the Moray Firth) will be assessed in accordance with the guidance and methodologies set out in Chapter 4 (EIA Methodology). Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Commercial Fisheries, cumulative interactions may occur with other planned OWF as well as other activities in the study area.

12.6.1.2 The potential impacts considered in the cumulative assessment will be in line with those described above for the Proposed Development alone assessment, though it is possible that some will be screened out on the basis that the impacts are highly localised (i.e., they occur only within the Proposed Development) or where management measures in place for the Proposed Development and other projects will reduce the risk of impacts occurring.

12.6.1.3 The Commercial Fisheries CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

12.7 Potential Transboundary Impacts

12.7.1.1 Transboundary impacts will be considered based on any potential displacement of fishing activity into the Norwegian EEZ, which is expected to be highly unlikely based on data reviewed within this Offshore Scoping Report.

12.8 Proposed Approach to EIA

12.8.1 Relevant Data Sources

12.8.1.1 Detailed analysis of baseline datasets will be undertaken within the Offshore EIA to characterise long-term (i.e., over several years) patterns in Commercial Fisheries activity across the study area and predict potential impacts upon future commercial fishing activities. Data sources include those set out within Table 12.1, as well as information from other projects in the Moray Firth, such as pre-construction monitoring from two squid fishery scout surveys undertaken by Brown and May Marine in July/August and October 2021 and 2022 for the Moray West OWF.

12.8.1.2 Consultation with the commercial fishing industry will be undertaken in order to ground-truth available baseline data and gain further understanding of Commercial Fisheries activity by smaller vessels across the inshore portion of the study area. Analysis of data and the results of consultation will provide an extended baseline characterisation of the study area, which will underpin and inform the impact assessment.

12.8.1.3 No site-specific surveys are proposed to inform the Commercial Fisheries assessment of the EIAR.

12.8.2 Ongoing Consultation

12.8.2.1 Two additional project interfaces will inform the EIA throughout the duration of the consenting phase:

- Close interface with the project Fisheries Liaison Officer (FLO) who will be appointed in autumn 2022 and in position throughout the consenting phase, to application submission and beyond.
- Close interface with the Caledonia OWF Fishery Manager supporting the Proposed Development who holds key relationships between Caledonia OWF and the fishing industry.

12.8.2.2 It is highlighted that Ocean Winds has established a comprehensive network of fishing industry contacts built through the development of the Moray East and Moray West projects and subsequent construction of Moray East.

12.8.2.3 In addition to the above, dedicated EIA consultation meetings will be held directly with fishing industry representatives, including local and national Fishermen's Associations and Organisations in order to ground truth the Commercial Fisheries baseline characterisation, discuss the impacts throughout the lifespan of the Proposed Development and discuss and agree mitigation approaches.

12.8.3 Guidance

12.8.3.1 The Commercial Fisheries impact assessment will follow the EIA methodology set out in Chapter 4 (EIA Methodology). Specific to Commercial Fisheries, the following guidance documents will also be considered:

- Good Practice Guidance for assessing fisheries displacement by other licensed marine activities (Xodus, 2022)
- Best Practice Guidance for Fishing Industry Financial and Economic Impact Assessments (United Kingdom Fisheries Economic Network and Seafish, 2012);
- Fisheries Liaison with Offshore Wind and Wet Renewables group (FLOWW) Recommendations for Fisheries Liaison: Best Practice guidance for offshore renewable developers (FLOWW, 2014 and noted to be currently in the process of being updated; BERR, 2008b);
- FLOWW Best Practice Guidance for Offshore Renewables Developments: Recommendations for Fisheries Disruption Settlements and Community Funds (FLOWW, 2015);
- Options and opportunities for marine fisheries mitigation associated with wind farms (Blyth-Skyrme, 2010);
- Cumulative impact assessment guidelines, guiding principles for cumulative impacts assessments in offshore wind farms (RenewableUK, 2013);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403 (Cefas, 2012);
- Fisheries Liaison Guidelines – Issue 6 (UK Oil and Gas, 2015);

- Fishing and Submarine Cables – Working Together (International Cable Protection Committee, 2009); and
- Offshore Wind Farms – Guidance note for Environmental Impact Assessment in respect of FEPA and CPA requirements (Cefas), Marine Consents and Environment Unit (MCEU), DEFRA and Department of Trade and Industry (DTI), 2004).

12.8.3.2 Impacts will be assessed for each relevant fleet/fishery active in the study area, and where relevant, impacts associated with the Array Area and the Offshore ECC will be separately assessed.

12.8.4 Assessment Methodology

12.8.4.1 The general approach to EIA methodology is provided in Chapter 4 (EIA Methodology). Definitions specific to Commercial Fisheries in relation to assessing the sensitivity of the receptor and magnitude of an impact are provided in Table 12.3 and Table 12.4 respectively.

Table 12.3. Definition of terms relating to the sensitivity of the receptor.

Sensitivity	Definition
High	Receptor is highly vulnerable to impacts that may arise from the Proposed Development and recoverability is long term or not possible. And/or: No alternative fishing grounds are available.
Medium	Receptor is somewhat vulnerable to impacts that may arise from the Proposed Development and has moderate levels of recoverability. And/or: Moderate levels of alternative fishing grounds are available and/or fishing fleet has moderate operational range.
Low	Receptor is not generally vulnerable to impacts that may arise from the Proposed Development and/or has high recoverability. And/or: High levels of alternative fishing grounds are available and/or fishing fleet has large to extensive operational range; fishing fleet is adaptive and resilient to change
Negligible	Receptor is not vulnerable to impacts that may arise from the Proposed Development and/or has high recoverability. And/or: Extensive alternative fishing grounds available and/or fishing fleet is highly adaptive and resilient to change.

Table 12.4. Definition of terms relating to the magnitude of an impact.

Magnitude of Impact	Definition	
Major	Adverse	Impact is of long-term duration (e.g., greater than 12 years duration) and/or is of extended physical extent; And: Impact is expected to result in one or more of the following: ▪ Substantial loss of target fish or shellfish biological resource (e.g., loss of substantial proportion of resource within Proposed Development area); and ▪ Substantial loss of ability to carry on fishing activities (e.g., substantial proportion of effort within Proposed Development area).
	Beneficial	Impact is expected to result in one or more of the following: Large scale or major improvement of resource quality, measurable against biomass reference points; and ▪ Extensive restoration or enhancement of habitats supporting Commercial Fisheries resources.
Moderate	Adverse	Impact is of medium-term duration (e.g., less than 12 years) and/or is of moderate physical extent; And: Impact is expected to result in one or more of the following: ▪ Partial loss of target fish or shellfish biological resource (e.g., moderate loss of resource within Proposed Development area); and ▪ Partial loss of ability to carry on fishing activities (e.g., moderate reduction of fishing effort within Proposed Development area).
	Beneficial	Impact is expected to result in one or more of the following: ▪ Moderate improvement of resource quality; and ▪ Moderate restoration or enhancement of habitats supporting Commercial Fisheries resources.
Minor	Adverse	Impact is of short-term duration (e.g., less than 5 years) and/or is of limited physical extent; And: Impact is expected to result in one or more of the following: ▪ Minor loss of target fish or shellfish biological resource (e.g., minor loss of resource within Proposed Development area); and ▪ Minor loss of ability to carry on fishing activities (e.g., minor reduction of fishing effort within Proposed Development area).
	Beneficial	Impact is expected to result in one or more of the following: ▪ Minor benefit to or minor improvement of resource quality; and ▪ Minor restoration or enhancement of habitats supporting Commercial Fisheries resources.
Negligible	Impact is expected to be undetectable compared to pre-project baseline conditions.	

12.9 Scoping Questions

12.9.1.1 The questions in Table 12.5 are posed to consultees to frame and focus responses to the Commercial Fisheries scoping exercise, which will in turn inform the Scoping Opinion.

Table 12.5. EIA scoping questions for Commercial Fisheries.

Scoping Questions – Commercial Fisheries
Do you agree with the data sources to be used to characterise the Commercial Fisheries baseline within the EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Commercial Fisheries?
Do you agree with the project impacts which have been scoped out of the EIA for Commercial Fisheries?
Do you agree that the embedded mitigation measures described provide a suitable means for managing and mitigating the potential effects of the Proposed Development on Commercial Fisheries receptors?
Do you agree that all relevant stakeholders with which consultation will be undertaken have been identified (also see Chapter 5: Consultation Process)?
Do you agree with the proposed approach to assessment?

13 Shipping and Navigation

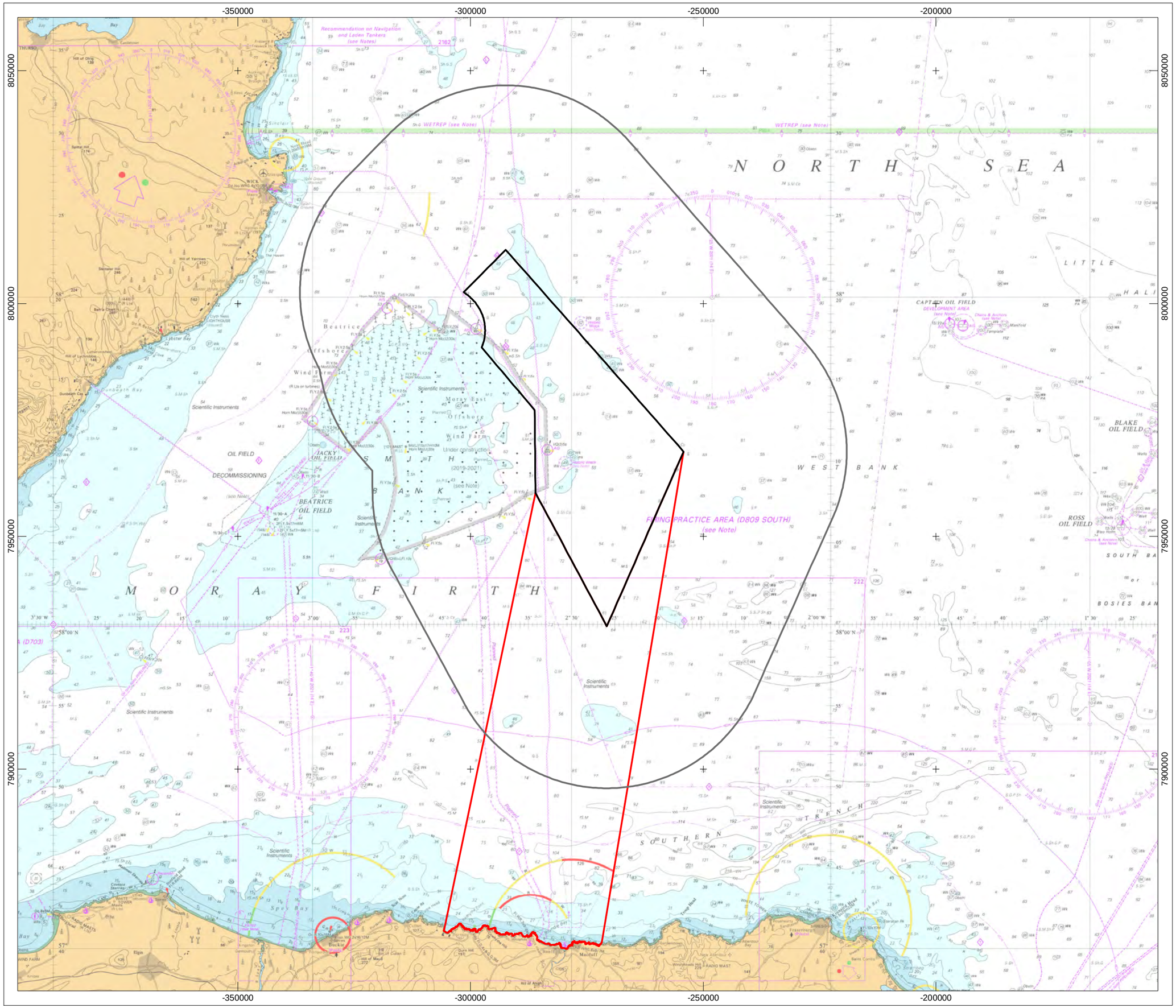
13.1 Introduction

13.1.1.1 This chapter of the Offshore Scoping Report identifies the Shipping and Navigation receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

13.2 Study Area

13.2.1.1 The assessment within this chapter has primarily been undertaken within a study area defined as a 10 nm buffer of the Array Area boundary as shown in Figure 13.1 (hereafter referred to as the Shipping and Navigation study area). This is a standard buffer used for Shipping and Navigation assessment as it captures relevant routeing in the area that may be affected while still remaining site specific to the WTG, OSP and inter-array cables associated with the Proposed Development. It is noted that the SMP for Offshore Wind Energy (Scottish Government, 2020a) highlighted a corridor of higher density traffic overlaps within the NE4 Plan Option, within which the Array Area is located.

13.2.1.2 High level assessment of the navigational feature baseline within the Offshore ECC has also been undertaken for the purposes of the Offshore Scoping Report. Detailed assessment will be undertaken within an additional study area at NRA stage to cover the Offshore ECC. This study area will depend on the location and size of the Offshore ECC; however, it is anticipated that a 2 nm buffer of the Offshore ECC will be used for this purpose.



Legend

- Shipping and Navigation Study Area
- Array Area
- Offshore Export Cable Corridor

Scale at A3: 1:750,000

0 20 40 km

N

CRS: WGS 1984 World Mercator (EPSG:32630)		
Produced:	Reviewed:	Approved:
DS	JM	SW
Date: 10/08/2022	Revision: 01	
REF: UKCAL1_AN_WNF_SN_MAP_00001_Overview		

Figure 13.1

Shipping and Navigation study area

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

13.3 Baseline Environment

13.3.1 Data Sources

13.3.1.1 The data sources that have been used to inform this Shipping and Navigation chapter of the Offshore Scoping Report are presented within Table 13.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

Table 13.1. Summary of key publicly available datasets for Shipping and Navigation.

Title	Source	Year	Author
Automatic Identification System (AIS) data collected via onshore receivers for the period 1st – 14th July 2021 and 18th – 31st December 2021	Onshore AIS receivers	2021	Anatec
UKHO Admiralty Chart 115, updated 25 November 2021	UKHO	2021	UKHO
UKHO Admiralty Chart 222, updated 30 July 2020	UKHO	2020	UKHO
Admiralty Sailing Directions North Coast of Scotland Pilot, 10th Edition NP52 (UKHO, 2018)	UKHO	2018	UKHO
Marine Accident Investigation Branch (MAIB) Incident Data	MAIB	2010 – 2019	MAIB
RNLI Incident Data excluding False Alarms and Hoaxes	RNLI	2010 – 2019	RNLI

13.3.1.2 The primary data source is the AIS data given it establishes the marine traffic baseline. To ensure the focus of the assessment is routine traffic, any vessel deemed to be engaged in a temporary operation (e.g., a survey) has been excluded from the analysis. It should be considered that vessels associated with the construction of Moray East OWF were recorded, however these vessels have been retained given they are likely to provide an indication of the operational traffic patterns associated with that development. The key limitation of this data set is that it is likely to underrepresent smaller vessels not required to broadcast via AIS (fishing vessels less than 15 m in length and recreational vessels). This will be addressed at NRA stage.

13.3.2 Overview of Baseline Environment

Navigational Features

13.3.2.1 Figure 13.2 presents the navigational features charted within the Shipping and Navigation study area and Offshore ECC.

13.3.2.2 Two operational wind farms are located within the Shipping and Navigation study area, namely the Beatrice OWF and the Moray East OWF[38]. The Beatrice OWF is marked on two of its northern corners by buoys. The Moray East OWF export cables also intersect both the Shipping and Navigation study area and Offshore ECC to its landfall point at Inverboyndie.

[38] Construction buoyage around Moray East is known to have been removed, however is still shown on charts.

13.3.2.3 The key harbour within the Offshore ECC is Macduff, which is primarily used by fishing vessels (UKHO, 2018). Pilotage to Macduff is non-compulsory (UKHO, 2018), however is available with the pilot boarding point being located 1.4 km from the entrance to the harbour. There is also a harbour at Portsoy, which is mainly used by fishing and recreational vessels, and recreational marinas at Banff and Whitehills (UKHO, 2018). Beyond the Offshore Cable Corridor Scoping Area, other noteworthy ports and harbours include the port of Fraserburgh, Cullen, Buckie and Lossiemouth in the south, as well as the Wick Harbour to the northwest.

13.3.2.4 A total of 27 charted wrecks are located within the Shipping and Navigation study area, with three wrecks within the Array Area itself and one wreck within the Offshore ECC. There are also two historic wrecks; one of these is located within the Array Area itself and the other is located just outside the Array Area on the northeastern side.

13.3.2.5 In addition to the Moray East OWF export cables, two subsea cables also run through the Shipping and Navigation study area and through the Array Area itself, specifically:

- The Caithness to Moray power cable; and
- The SHEFA-2 communications cable between Banff and the Faroe Islands.

13.3.2.6 A designated anchorage area is located approximately 1.2 km outside of the entrance to Macduff Harbour. The pilot book and charts also indicate that suitable anchorage can be found within Banff Bay and off Portsoy (UKHO, 2018).

13.3.2.7 Practice and Military Exercise Areas (PEXAs) are located throughout the Shipping and Navigation study area; these are associated with the air force department of the military and are used for various activities, including firing practice. Two of these PEXAs intersect the Array Area.

13.3.2.8 There is no oil and gas infrastructure within the Shipping and Navigation study area; however, it is noted that the platforms associated with the Beatrice and Jacky fields are located to the west. Current understanding is that both fields are to be decommissioned in the near future.

Marine Traffic

13.3.2.9 This section establishes the marine traffic baseline based on the preliminary assessment of 28 days (1 – 14 July 2021 and 18 – 31 December 2021) of AIS data. Figure 13.3 presents the 28 days of AIS data colour-coded by type within the Shipping and Navigation study area.

13.3.2.10 The majority of the traffic within the Shipping and Navigation study area was recorded during the summer period; an average of 33 unique vessels was recorded per day during the summer, whereas an average of 13 unique vessels was recorded per day during the winter. This was observed to be primarily associated with a decrease in fishing vessel and wind farm vessel activity during the winter period. An average of between six and seven unique vessels were recorded passing through the Array Area itself during the entire 28-day period.

13.3.2.11 The most common traffic types within the Shipping and Navigation study area were observed to be wind farm vessels, cargo vessels and fishing vessels.

13.3.2.12 The significant majority of cargo vessel traffic was associated with routeing to the northeast of the Array Area on southeast/northwest transits, noting a proportion of this traffic intersected the Array Area. It is noted that a drop in cargo and tanker traffic was observed during the winter period, which may imply vessels pass further offshore during adverse conditions.

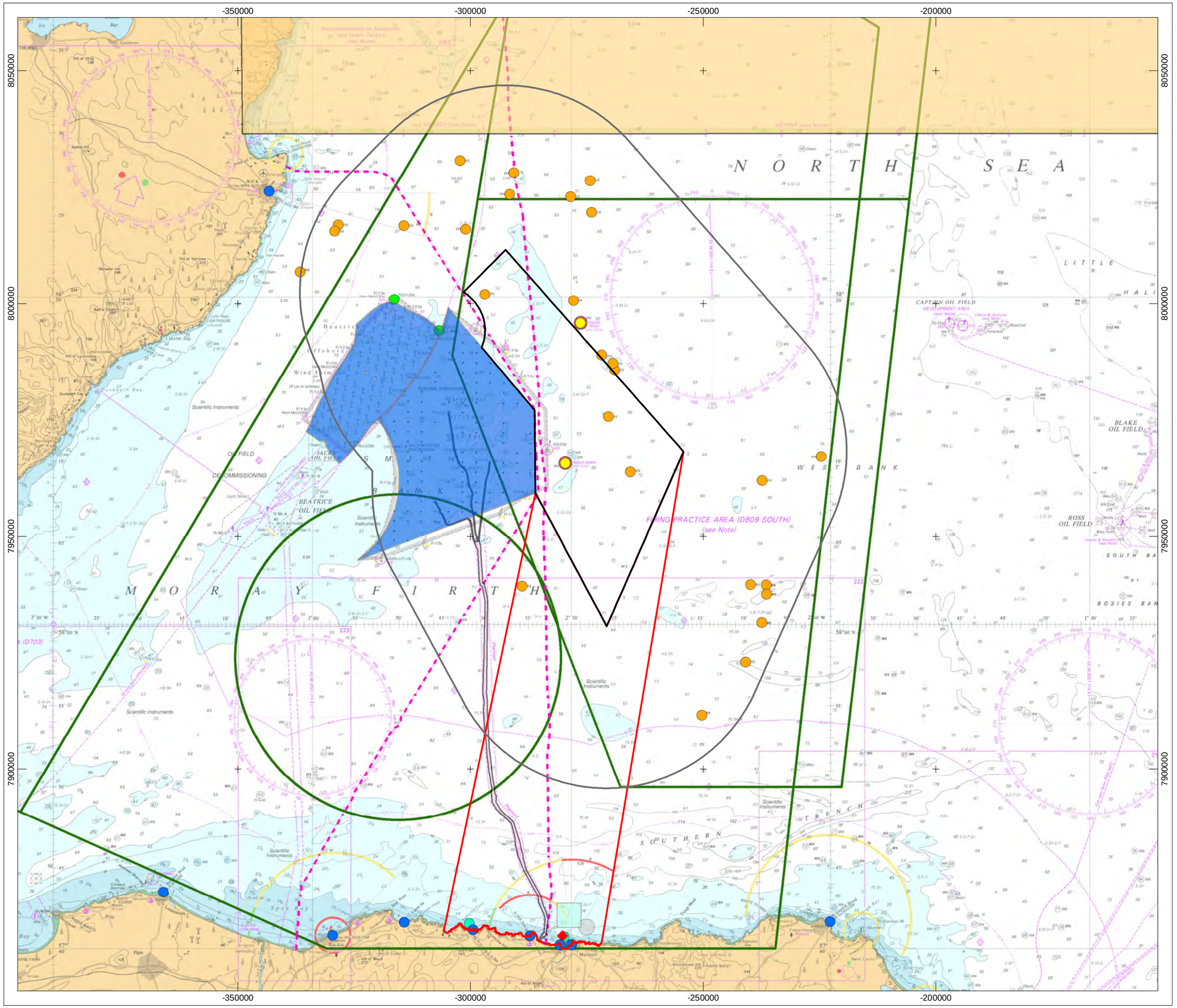
13.3.2.13 The wind farm traffic in the Shipping and Navigation study area was observed to be associated with the Moray East and Beatrice OWFs and was approximately four times higher during the summer period compared to the winter period. Fishing traffic levels were around two to three times higher during the summer period compared to the winter period, noting behaviour indicating active fishing (i.e., gear deployed) was exhibited below the Array Area to the southwest and southeast, and also within the Beatrice and Moray East OWFs.

13.3.2.14 It is noted that two instances of tankers at anchor were recorded to the south of the Array Area and within the Offshore ECC.

Maritime Incidents

13.3.2.15 The marine incident data assessed indicates incident rates within the Shipping and Navigation study area are generally low. The RNLI data indicated 14 incidents within the Shipping and Navigation study area over the ten-year period assessed, one of which was located within the Array Area itself. The incident within the Array Area, which occurred in 2019, involved a fishing vessel experiencing machinery failure, and was responded to by Fraserburgh station.

13.3.2.16 The MAIB data indicated five incidents occurred within the Shipping and Navigation study area over the same ten-year period, with two within the Array Area itself. The incidents within the Array Area both involved fishing vessels, one experiencing an accident and one experiencing loss of control, and occurred in 2018 and 2019 respectively. There were 23 MAIB incidents and 114 RNLI incidents recorded within the Offshore ECC, and most of these incidents were concentrated close to the coast.



Legend

- Shipping and Navigation Study Area
- Array Area
- Offshore Export Cable Corridor

Navigational Features

- WETREP
- Windfarm
- Moray East Export Cables
- Ports and Harbours
- Pilot boarding area
- Preferred Anchorage
- Designated Anchorage
- Wreck
- Historic wreck
- Area to be avoided
- Aid to navigation
- Spoil ground
- Subsea cable
- PEXA (Practice and Exercise Area)

Scale at A3: 1:750,000

N

0 20 40 km

CRS: WGS 1984 World Mercator (EPSG:32630)		
Produced:	Reviewed:	Approved:
DS	JM	SW
Date: 10/08/2022	Revision: 01	
REF: UKCAL1_AN_WNF_SN_MAP_00003_navigationalFeatures		

Figure 13.2

Navigational features in the Shipping and Navigation study area and Offshore ECC

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

-350000 -300000 -250000 -200000

8050000 8000000 7950000 7900000

Legend

- Shipping and Navigation Study Area
- Array Area
- Offshore Export Cable Corridor

Vessel Type

- Fishing
- Dredger
- Tug
- Passenger
- Cargo
- Tanker
- Other
- Recreational
- Oil and Gas
- Wind Farm Support

Scale at A3: 1:750,000

0 20 40 km

N

CRS: WGS 1984 World Mercator (EPSG:32630)		
Produced:	Reviewed:	Approved:
DS	JM	SW
Date: 10/08/2022	Revision: 01	
REF: UKCAL1_AN_WNF_SN_MAP_00002_28DaysAIS		

Figure 13.3

Vessels by type (28 days, AIS data) in the Shipping and Navigation study area

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

13.4 Embedded Mitigation Considered Within the EIA

13.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

13.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Shipping and Navigation are noted within Table 13.2 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Shipping and Navigation receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring.
- M-2: Development of and adherence to a DSLP. The DSLP will confirm the layout and design parameters of the Proposed Development.
- M-5: Where practicable, cable burial will be the preferred means of cable protection. Cable burial will be informed by the cable burial risk assessment and detailed within the CaP.
- M-9: Development of and adherence to a MPCP. The MPCP will identify potential sources of pollution and associated spill response and reporting procedures.
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction Proposed Development phases.
- M-13: Development of and adherence to a VMP. The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development, and consider vessel coordination including indicative transit route planning.
- M-14: Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.
- M-15: Blade clearance of at least 35 m above MSL (minimum blade clearance of 35 m will be maintained for floating WTGs due to tidal movements)[39].
- M-17: Development of and adherence to a FMMS. The FMMS will set out the means of ongoing fisheries liaison through construction and O&M phases of the Proposed Development and detail any mitigation measures to be put in place to limit effects on commercial fisheries activity.
- M-19: Development of and adherence to a NSP. The NSP will describe measures put in place by the Proposed Development related to navigational

[39] A 35 m air gap has been shown to be achievable for fixed foundations. This has not been required to date for floating projects due to their limited scale; however, Caledonia OWF believe it should be achievable.

safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Proposed Development activity to other sea users (e.g., via Notice to Mariners).

- M-21: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.
- M-23: Application for and use of Safety Zones of up to 500 m during construction, major maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards.
- M-25: Development of and adherence to an Emergency Response Cooperation Plan (ERCoP). The ERCoP will be prepared in line with MCA guidance and confirms what measures the Proposed Development has in place to support any emergency response.
- M-26: Marine coordination and communication to manage project vessel movements.
- M-27: Compliance with MCA Marine Guidance Note (MGN) 654 (MCA, 2021a) and its annexes where applicable. Also MGN 543 Search and Rescue annex 5 (MCA, 2018).
- M-28: Appropriate marking of the Proposed Development on Admiralty and aeronautical charts. This will include provision of the positions and heights of structures to the UKHO, CAA, MoD and Defence Geographic Centre (DGC).
- M-29: The construction area will be buoyed, as described in the NSP. Buoyage will be defined in consultation with the NLB.
- M-30: Marine navigation marking and lighting of the Proposed Development, as described in the LMP, will be defined in agreement with NLB and in line with International Association of Lighthouse Authorities (IALA) Recommendation O-139 (IALA, 2013).
- M-31: Compliance with regulatory expectations on moorings for floating wind and marine devices (Health and Safety Executive (HSE) and MCA, 2017).

13.5 Scoping of Impacts

13.5.1.1 Potential impacts on Shipping and Navigation have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 13.2. MGN 654 (MCA, 2021a) requires assessment of these impacts within the NRA and as such no impacts are proposed to be scoped out at this stage. It is noted that within the NRA impacts will be referred to as hazards, and effects as risk.

Table 13.2. EIA Scoping assessment for Shipping and Navigation

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Increased vessel to vessel collision risk resulting from displacement (third party to third party)	M-14, M-21, M-28	Scoped in	Baseline marine traffic data indicates certain vessels are likely to deviate and as such collision risk in the area may increase. Non-AIS traffic will need to be considered and quantitative modelling undertaken to assess the risk.	✓	✓	✗	✗	✗
Increased vessel to vessel collision risk (third party vessel and a project vessel)	M-13, M-14, M-21, M-23, M-26, M-28, M-29	Scoped in	The increased levels of traffic in the area associated with the construction and decommissioning of the Proposed Development may lead to increased collision risk (project vessel to third party vessel).	✓	✓	✓	✓	✓
Vessel to structure allision risk (powered)	M-9, M-12, M-13, M-14, M-15, M-21, M-23, M-27, M-28, M-29	Scoped in	The presence of surface structures will create new allision risk to vessels under power. Non-AIS traffic will need to be considered and quantitative modelling undertaken to assess the risk.	✓	✓	✗	✗	✗
Vessel to structure allision risk (drifting)	M-3, M-12, M-13	Scoped in	The presence of surface structures will create new allision risk to vessels Not Under Command (NUC). Non-AIS traffic will need to be considered and quantitative modelling undertaken to assess the risk.	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Reduced access to local ports, harbours and marinas	M-21, M-26	Scoped in	Cable installation/decommissioning and/or project vessel transits and activities may impact access to local ports.	✓	✓	✓	✓	✓
Operation and Maintenance								
Increased vessel to vessel collision risk resulting from displacement (third party to third party)	M-14, M-21, M-28	Scoped in	Baseline marine traffic data indicates certain vessels are likely to deviate and as such collision risk in the area may increase. Non-AIS traffic will need to be considered and quantitative modelling undertaken to assess the risk.	✓	✓	✗	✗	✗
Increased vessel to vessel collision risk (third party vessel and a project vessel)	M-13, M-14, M-21, M-23, M-26, M-28, M-29	Scoped in	The increased levels of traffic in the area associated with the O&M of the Proposed Development may lead to increased collision risk (project vessel to third party vessel).	✓	✓	✓	✓	✓
Vessel to structure allision risk (powered)	M-2, M-9, M-12, M-13, M-14, M-15, M-17, M-21, M-23, M-27, M-28, M-29	Scoped in	The presence of surface structures will create new allision risk to vessels under power. Non AIS traffic will need to be considered and quantitative modelling undertaken to assess risk.	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Vessel to structure allision risk (drifting)	M-2, M-9, M-12, M-13	Scoped in	The presence of surface structures will create new allision risk to vessels NUC. Non-AIS traffic will need to be considered and quantitative modelling undertaken to assess risk.	✓	✓	✗	✗	✗
Reduced access to local ports	M-26	Scoped in	Cable maintenance and/or project vessel transits and activities may impact access to local ports.	✓	✓	✓	✓	✓
Reduction of under keel clearance as a result of subsea infrastructure	M-1, M-5, M-17, M-21, M-27, M-28	Scoped in	The presence of subsea infrastructure (e.g., cable protection may lead to an increase in under keel interaction risk. Non-AIS traffic will need to be considered.	✗	✓	✓	✓	✓
Anchor interaction with subsea cables/mooring lines	M-5, M-13, M-21, M-28	Scoped in	The presence of subsea infrastructure (e.g., subsea cables, mooring lines) may lead to an increase in anchor interaction risk. Non-AIS traffic will need to be considered.	✗	✓	✓	✓	✓
Loss of station	M-14, M-27, M-31	Scoped in	In the event of mooring line failure the floating structures would create a collision risk to passing traffic.	✗	✓	✗	✗	✗
Interference with navigation, communications and position fixing equipment from the development	M-1, M-5, M-21, M-27, M-28	Scoped in	The Proposed Development infrastructure (e.g., WTGs, subsea cables) may impact on equipment on board vessels including potential effects of Electromagnetic Interference from cables.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Reduction of Search and Rescue capability	M-13, M-14, M-24, M-27	Scoped in	There may be an increase in incident rates associated with the Proposed Development which may lead to a reduction in search and rescue resource capability. The layout of structures may also impact search and rescue resource access in the area.	✓	✓	✗	✗	✗

13.6 Potential Cumulative Impacts

13.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Shipping and Navigation, cumulative interactions may occur with other planned OWF as well as other activities in the study area.

13.6.1.2 All impacts identified on an in isolation basis will be considered within the NRA for the potential for cumulative effects. In terms of cumulative projects to be included, other developments within a 50 nm radius will be screened in or out of the cumulative assessment based on a number of factors, including:

- Status of project;
- Data confidence level;
- Proximity to Proposed Developments;
- Location relative to routeing passing the site.

13.6.1.3 The Shipping and Navigation CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

13.7 Potential Transboundary Impacts

13.7.1.1 Transboundary impacts associated with vessels transiting to/from outside of the UK including transboundary ports will be considered within the in isolation assessment, and cumulatively with the presence of other offshore developments and activities within the cumulative assessment.

13.8 Proposed Approach to EIA

13.8.1 Relevant Data Sources

13.8.1.1 The key additional data source that will be required to inform the Shipping and Navigation assessment and the NRA will be MGN 654 (MCA, 2021a) compliant marine traffic survey data. The collection approach will be agreed with the MCA and NLB; however, on an indicative basis will likely include two seasonally weighted 14-day periods, with data collected via AIS, radar and visual observations by an on site survey vessel. As per MGN 654 (MCA, 2021a) these surveys would be undertaken within two years of application submission.

13.8.1.2 Other data sources considered as part of the NRA process will include:

- RYA Coastal Atlas (RYA, 2018);
- Vessel monitoring system data; and
- Consultation input into baseline.

13.8.2 Guidance

13.8.2.1 The primary guidance used to inform the Shipping and Navigation assessment and the NRA will be MGN 654 (MCA, 2021a) and its annexes, which sets out what developers must include and assess within an NRA for an OWF. Compliance with MGN 654 will be demonstrated via completion of the MGN 654 checklist which will be included as an appendix to the NRA.

13.8.2.2 Other guidance considered will include:

- International Maritime Organization (IMO) guidelines for Formal Safety Assessment (FSA) (IMO, 2018);
- IALA Recommendation R139 and Guidance G1162 on the Marking of Man-Made Offshore Structures (IALA, 2021)
- MGN 372 Offshore Renewable Energy Installations (OREIs) – Guidance to Mariners Operating in the Vicinity of UK OREIs (MCA, 2008);
- The RYA's Position on Offshore Energy Developments: Paper 1 – Wind Energy (RYA, 2019); and
- MCA and HSE Regulatory Expectations on Moorings for Floating Wind and Marine Devices (MCA and HSE, 2017).

13.8.3 Assessment Methodology

13.8.3.1 As required under the MCA Methodology (Annex 1 to MGN 654) (MCA, 2021a), and in line with international marine risk assessment standards, it is proposed that the IMO FSA (IMO, 2018) approach will be applied for impact assessment. The FSA methodology is centred on risk control, and assesses each impact in terms of its frequency of occurrence and severity of consequence in order that its significance can be determined as "broadly acceptable", "tolerable", or "unacceptable" via a risk matrix as shown in Table 13.3. Any impact assessed as "unacceptable" will require additional mitigation measures implemented beyond those considered embedded to reduce the impact to within "tolerable" or "broadly acceptable" parameters.

Table 13.3. IMO FSA Risk Matrix.

Frequency	Frequent	Tolerable	Tolerable	Unacceptable	Unacceptable	Unacceptable
	Reasonably Probable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable	Unacceptable
	Remote	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable	Unacceptable
	Extremely Unlikely	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable	Tolerable
	Negligible	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Broadly Acceptable	Tolerable
		Negligible	Minor	Moderate	Serious	Major
		Severity				

13.8.3.2 Severity and consequence will be determined via the NRA findings which will be based on various factors including:

- Quantitative modelling (via Anatec's CollRisk software);
- Output of the baseline assessment including marine traffic surveys;
- Consideration of embedded environmental measures in place;
- Lessons learnt from other OWFs;
- Levels of stakeholder concern; and
- Outputs of consultation.

13.8.3.3 The NRA process will be informed via consultation with key shipping and navigation stakeholders. This is expected to include:

- Dedicated key stakeholder meetings (e.g., MCA, NLB);
- Regular operator outreach (i.e., consultation with regular users of the area);
- A Hazard workshop with local stakeholders;
- Liaison via Fishing Liaison Officer where appropriate; and
- Other consultation as directed by the NRA process.

13.9 Scoping Questions

13.9.1.1 The questions in Table 13.4 are posed to consultees to frame and focus responses to the Shipping and Navigation scoping exercise, which will in turn inform the Scoping Opinion.

Table 13.4. EIA scoping questions for Shipping and Navigation.

Scoping Questions – Shipping and Navigation
Do you agree with the data sources, including project specific surveys, to be used to characterise the Shipping and Navigation baseline within the NRA and the Offshore EIA?
Do you agree that all potential impacts (hazards and associated risks) have been identified for Shipping and Navigation?
Do you agree with the project impacts (hazards and associated risks) which have been scoped out of the EIA for Shipping and Navigation?
Do you agree that cumulative impacts and transboundary impacts (hazards and associated risks) for Shipping and Navigation may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Shipping and Navigation that have been identified for the Proposed Development?

14 Marine Archaeology and Cultural Heritage

14.1 Introduction

14.1.1.1 This chapter of the Offshore Scoping Report identifies the Marine Archaeology and Cultural Heritage receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

14.2 Study Area

14.2.1.1 The Marine Archaeology and Cultural Heritage study area is defined by the Proposed Development footprint plus a 3 km buffer. This will be used to capture the relevant data on designated and non-designated marine archaeological assets, and to provide the necessary context for understanding archaeological potential and heritage significance of receptors that may be affected by the Proposed Development.

14.3 Baseline Environment

14.3.1 Data Sources

14.3.1.1 The data sources that have been used to inform the Marine Archaeology and Cultural Heritage baseline of the Offshore Scoping Report are presented within Table 14.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development. The United Kingdom Hydrographic Office (UKHO) Wreck Database data was available at the time of writing. The desk-based review was completed in accordance with the relevant sections of the Chartered Institute for Archaeologists (CifA) Standard and Guidance for historic environment desk-based assessment (CifA, 2014; revised January 2017 and October 2020).

Table 14.1. Summary of key publicly available datasets for Marine Archaeology and Cultural Heritage.

Title	Source	Year	Author
United Kingdom Hydrographic Office (UKHO) Wreck Database	https://www.admiralty.co.uk/access-data/marine-data	2022	UKHO
Canmore (Unavailable at time of writing)	https://canmore.org.uk	2022	HES
Archaeology Service Historic Environment Record (HER) (For Aberdeenshire and Moray) (Unavailable at time of writing)	https://online.aberdeenshire.gov.uk/smrpub/default.aspx	2022	Aberdeenshire Council

14.3.1.2 For this Offshore Scoping Report, the primary resource are wreck sites with UKHO; verified positions were examined to assess the potential requirement for scoping in marine cultural heritage assets. The potential for submerged archaeological assets such as palaeolandscapes and prehistoric remains was assessed using relevant available public literature and baseline knowledge, which has been enhanced recently by technical assessments from neighbouring OWFs in the Moray Firth.

14.3.2 Overview of Baseline Environment

14.3.2.1 Marine historic assets are defined in the Marine (Scotland) Act 2010, Section 73(5) as vessels, vehicles, aircraft, parts of such, contents of such, buildings and other structures, caves, deposits, artefacts or any other thing or groups of things that evidence previous human activity.

14.3.2.2 Marine archaeological and cultural heritage receptors located within the offshore environment associated Proposed Development can be characterised as comprising four fundamental categories:

- Seabed prehistory;
- Maritime archaeology;
- Aviation archaeology; and
- Intertidal heritage receptors.

14.3.2.3 The known marine archaeological and cultural heritage receptors located within the study area are listed in Table 14.2, and shown in Figure 14.1.

Statutory Designations

14.3.2.4 There are three sites with statutory designations under the Protection of Military Remains Act 1986 present within the study area. These consist of two shipwrecks, specifically the controlled site HMS Exmouth (WA 2008) and the protected place HMS Lynx (WA 2025). In addition, if there were any aircraft material from the Heinkel 111 confirmed at WA 2050, it would also be legally protected (Figure 14.1).

Seabed Prehistory

14.3.2.5 Submerged landscapes are where human beings and early hominids previously lived or hunted on terrain which was at that time dry land, or where they exploited marine resources on the coast which is now submerged by Holocene sea-level change and geomorphological development.

14.3.2.6 Hominids and humans have occupied the British Isles at various times, with the earliest occupation extending back to around one million years (Parfitt *et al*., 2010), with coastal areas clearly attracting human populations, including landscapes that are now submerged (Bailey *et al*., 2020; SPLASCOS viewer). Regionally, archaeological evidence for early prehistory in North and North East Scotland currently exists from the Late Upper Palaeolithic, following the end of the last Ice Age, from circa 15,000 years ago (Ballin, 2017).

14.3.2.7 There are currently no known submerged prehistoric assets within the study area, in large part due to significant data gaps in shallow coastal waters, with potential constrained by increased water depths in the northern North Sea (Bicket and Tizzard, 2015; Dawson *et al*., 2017).

14.3.2.8 Nearshore areas around Scotland's coasts retain higher potential for encountering Late Pleistocene and Early Holocene submerged palaeolandscapes; for example, within the Offshore ECC and landfall areas (as encountered by earlier OWF projects in the area). There is potential for the presence of as yet undiscovered *in situ* palaeolandscape deposits (e.g., peats, estuarine and low-energy coastal sediments of archaeological interest) prehistoric sites and finds, located within the inundated nearshore palaeogeography. Any prehistoric discoveries will be regarded of national importance, above or below sea level.

Maritime Archaeology

14.3.2.9 Maritime archaeological sites can be considered to comprise two broad categories: the remains of vessels that have been lost as a result of stranding, foundering, collision, enemy action and other causes (e.g., shipwrecks); and those sites that consist of vessel-related material (e.g., wreck material in terms of Merchant Shipping Act 1995).

14.3.2.10 Wreck-related debris includes (but is not limited to) equipment lost overboard or deliberately jettisoned such as fishing gear, ammunition and anchors or the only surviving remains of a vessel such as its cargo or a ballast mound.

14.3.2.11 Shipwrecks on the seabed provide an insight on the types of vessels used in the past, the nature of shipping activity in the wider area and the changing usage of the marine environment through different periods. Such remains are considered more likely in sediments which promote the preservation of wreck sites (e.g., finer grained sediments that are not subject to high levels of mobility), particularly where such sediments have seen limited, recent disturbance.

14.3.2.12 There are 48 records of maritime archaeological sites in the study area (Table 14.2). These comprise:

- 15 wreck sites;
- 24 wreck sites that are now listed as dead (i.e., they have not been located by repeated surveys, although there may still be wreck material at these locations);
- One wreck that has been lifted (i.e., almost wholly salvaged, although there may still be wreck material at this location);
- One obstruction or foul ground; and
- Seven obstructions or records of foul ground that are now listed as dead.

14.3.2.13 Most of the known wreck sites are from the 20th Century, in particular relating to the first and second World Wars. Shipwreck inventories and documentary sources are usually biased towards the 18th Century and later when more systematic reporting began. Therefore, there are few known historical records of wrecks from medieval or earlier periods. There is high potential for both unknown, unrecorded vessels and reported but unlocated losses to have sunk in the Array Area and Offshore ECC over many centuries.

Table 14.2. Maritime heritage receptors.

WA ID	UKHO ID	Type	Description	Easting (UTM 30 N)	Northing (UTM 30 N)
2001	1325	Wreck	An unknown wreck, listed as dead.	519864	6472266
2002	1327	Wreck	Wreck of a fishing vessel, wreck is intact, upright and with nets extended.	518395	6470619
2003	98198	Obstruction	Unknown.	518528	6467861
2004	1194	Wreck	Wreck of the steam ship LLANISHEN, sunk 1940 whilst in ballast. Listed as dead.	527219	6467733
2005	1315	Wreck	Wreck of the fishing vessel TRIDENT, sunk 1974. Wreck measures 49 x 23 x 6.6 m with a moderate magnetic signature. Wreck is generally intact and on its side. An abandoned trawl lies nearby.	519446	6466327
2006	1192	Wreck	Possibly the wreck of the Norwegian steam ship MARSTENEN, sunk 1940. Listed as dead, position more likely to be UKHO 71117.	528208	6465884
2007	71117	Wreck	Possibly the wreck of the Norwegian steam ship MARSTENEN, sunk 1940 carrying a cargo of natural fibers and other materials. Wreck measures 86 x 23 x 7.1 m and has a strong magnetic signature. Described as collapsed and degraded.	529432	6465589
2008	1191	Wreck (protected)	Wreck of the destroyer HMS EXMOUTH, sunk 1940. Wreck measures 76 x 65 x 4.3 m with a moderate magnetic signature. Wreck is collapsed and degraded.	530335	6463094
2009	71120	Wreck	Probably part of the Danish steam ship TEKLA, sunk in 1940. Measures 36 x 30 x 2.6 m. Related to UKHO 1190.	532690	6459604
2010	1190	Wreck	Part of the Danish steam ship TEKLA, sunk in 1940. Measures 79 x 40 x 3.4 m with no magnetic signature. Related to UKHO 71120. Wreck is highly degraded and broken into two sections.	532666	6459383
2011	1186	Wreck	An unknown wreck, listed as dead.	533048	6458871

WA ID	UKHO ID	Type	Description	Easting (UTM 30 N)	Northing (UTM 30 N)
2012	1188	Wreck	Probably the wreck of the steam ship MAKALLA, sunk 1940. Wreck measures 118 x 30 x 3.4 m with a strong magnetic signature. Wreck is collapsed and broken up.	534021	6458546
2013	1305	Wreck	Wreck of the fishing vessel VIRGINIA ROSE, sunk 1981. Listed as dead.	532172	6458493
2014	71122	Wreck	An unknown wreck with a strong magnetic signature, measuring 72.6 x 39 x 4.5 m. Described as broken up into two main parts, with debris in between.	534213	6457844
2015	1310	Obstruction	A buoy sunk in 1982, listed as dead.	530430	6456147
2016	64280	Foul ground	An anchor, listed as dead.	524964	6453839
2017	1180	Wreck	Probably the wreck of the trawler HMS JASPER, sunk 1915. Wreck measures 36 x 7 x 3.4 m with a strong magnetic signature. Wreck is upright and intact.	533578	6452478
2018	1179	Wreck	Wreck of the fishing vessel COMMANDER BOYLE, sunk 1915. Listed as dead.	531757	6449212
2019	79582	Wreck	Wreck of a fishing vessel, measuring 22.7 x 6.8 x 3.8 m. Sitting upright and intact with forward part collapsed.	529295	6448415
2020	1178	Obstruction	Unknown, listed as dead.	541078	6448184
2021	58700	Wreck	Wreck, related to HMS LYNX, UKHO 1324. Listed as dead.	528707	6447871
2022	58699	Wreck	An unknown wreck with a strong magnetic signature, measuring 96.4 x 17.2 x 8.6 m. Described as upright by not full intact.	529587	6447848
2023	58701	Wreck	An unknown wreck, listed as dead.	529651	6447581
2024	1177	Wreck	Wreck of the steam ship DALVEEN, sunk 1940 with a cargo of grain. Listed as dead.	540105	6447432
2025	1324	Wreck (protected)	Wreck of the destroyer HMS LYNX, sunk 1915. Wreck measures 59.8 x 9.6 x 4.3 m with a strong magnetic signature. Wreck is upright with the bow or stern missing. Related to UKHO 58700.	528702	6447208

WA ID	UKHO ID	Type	Description	Easting (UTM 30 N)	Northing (UTM 30 N)
2026	1176	Wreck	Wreck of the German submarine U 309, sunk in 1945. Wreck measures 53.8 x 7.6 x 3.6 m with a strong magnetic signature. Wreck is intact and on its side.	536138	6446363
2027	1172	Obstruction	Unknown, listed as dead.	532105	6442535
2028	1169	Wreck	Wreck of a destroyer sunk 1915. Listed as dead.	522000	6441414
2029	79583	Wreck	The wreck of a fishing vessel, measuring 33.6 x 6.6 x 5.5 m with a strong magnetic signature. Wreck is upright and intact.	523874	6433172
2030	2166	Wreck	Wreck of the steam ship HILLFERN, sunk 1940. Listed as dead.	533939	6423254
2031	2188	Foul ground	Foul ground, listed as dead.	520557	6423194
2032	2189	Wreck	An unknown wreck, listed as dead.	523488	6411119
2033	2193	Wreck	An unknown wreck, listed as dead.	531525	6408299
2034	2190	Aircraft	The wreck of an aircraft, listed as dead.	525968	6407640
2035	2194	Wreck	An unknown wreck, listed as dead.	530430	6406868
2036	2192	Foul ground	Foul ground, listed as dead.	523350	6406480
2037	2200	Wreck	An unknown wreck, listed as dead.	523739	6405029
2038	2158	Wreck	The wreck of the trawler LOCH LOYAL, wrecked 1940. Listed as dead.	522490	6403939
2039	2184	Wreck	An unknown wreck, listed as dead.	535543	6403601
2040	2201	Wreck	An unknown wreck, listed as dead.	522641	6403538
2041	2198	Wreck	An unknown wreck, listed as dead.	514630	6402975
2042	2199	Wreck	An unknown wreck, listed as dead.	520817	6401642
2043	2155	Obstruction	Unknown, listed as dead.	513994	6400499
2044	2176	Wreck	An unknown wreck, listed as dead.	531470	6398372
2045	2174	Wreck	An unknown wreck, listed as dead.	536638	6397674
2046	2197	Wreck	An unknown wreck, listed as dead.	520447	6396353

WA ID	UKHO ID	Type	Description	Easting (UTM 30 N)	Northing (UTM 30 N)
2047	82718	Wreck	Wreck of the fishing vessel LAWRET sunk in 2015. Was lifted a few days later.	519574	6394468
2048	2150	Wreck	Wreck of the Norwegian sailing vessel EBENEZER, sunk 1900 carrying a cargo of coal. Listed as dead.	525594	6393692
2049	2208	Wreck	Wreck of the fishing vessel FORTITUDE, wrecked 1988. Wreck has a wooden hull.	529924	6392826
2050	2175	Aircraft	Wreck of a HEINKEL 111 aircraft, sunk 1941. Located in 1976.	535193	6392651

Aviation Archaeology

14.3.2.14 Marine aviation archaeology receptors comprise the remains or associated remains of military and civilian aircraft that have been lost at sea (Wessex Archaeology, 2008). Evidence is divided into three primary time periods based on major technological advances in aircraft design: Pre-1939; 1939-1945; and post-1945. There are reported sites of aircraft crash sites in the study area and there is particularly high potential for the discovery aircraft from 1939-1945.

14.3.2.15 There were a number of airfields in the vicinity of the Proposed Development during the Second World War, with Royal Air Force (RAF) Banff particularly proximate, along with wider activity from Axis forces based in Norway undertaking missions to mainland Scotland, and maritime patrol activities from both sides throughout the period. The remains of crashed military aircraft are protected under the Protection of Military Remains Act 1986, and cannot be disturbed without a licence.

14.3.2.16 There are two records of aviation sites in the study area:

- WA 2034 is an aircraft wreck that was reported by a local fishing skipper in 1986. It was not relocated in 1987 and is now listed as dead; and
- WA 2050 is a German Heinkel 111 that crashed in 1941. It was located in 1976.

14.3.2.17 Maritime aircraft crash sites can retain a significant amount of material, whilst being an ephemeral target to identify, with the potential for in situ human remains. Military aircraft are protected under the Protection of Military Remains Act 1986.

Intertidal Archaeology

14.3.2.18 Intertidal heritage receptors comprise of other heritage receptors located below MHWS and above MLWS. There are no intertidal heritage receptors in the UKHO wreck dataset.

14.3.2.19 There is also potential for such remains to extend into the intertidal zone below the beach sands, though none are known.

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Legend

- Marine Heritage Receptors
- PMRA 1986 Designated Sites
- Study Area
- Offshore Export Cable Corridor
- Array Area

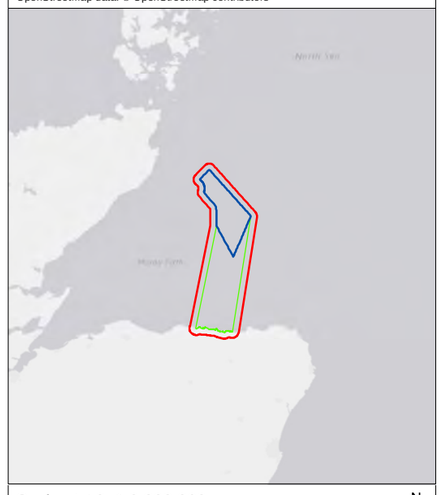

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Figure 14.1

Marine Heritage Receptors

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

14.4 Embedded Mitigation Considered within the EIA

14.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

14.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Marine Archaeology and Cultural Heritage are noted within Table 14.3 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Marine Archaeology and Cultural Heritage receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring;
- M-2: Development of and adherence to a DSLP. The DSLP will confirm the layout and design parameters of the Proposed Development;
- M-4: Scour protection where there is the potential for scour to develop around infrastructure (foundations and cables).
- M-10: Development of and adherence to a DP. The DP will outline measures for the decommissioning of the Proposed Development.
- M-32: Development of and adherence to a Written Scheme of Archaeological Investigation (WSI). The Marine WSI will include the implementation of a Protocol for Archaeological Discoveries (PAD) in accordance with 'Protocol for Archaeological Discoveries: Offshore Renewables Projects'.
- M-33: Seabed preparation, installation activities and installed infrastructure will avoid any identified seabed heritage assets and anthropogenic geophysical anomalies identified as Archaeological Exclusion Zones and described in the WSI.

14.5 Scoping of Impacts

14.5.1.1 Potential impacts on Marine Archaeology and Cultural Heritage have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 14.3.

14.5.1.2 The potential activities during construction and decommissioning phases of the Proposed Development are:

- Direct physical impacts:
  - Intrusive seabed and intertidal surveys such as geotechnical coring, and UXO inspection and clearance;
  - Installation of WTGs, OSPs, offshore export cable, and other infrastructure (e.g., foundations, mooring systems, inter-array and interconnector cabling, buoys) on/into the seabed and intertidal zone, in the water column or above the surface;

- Use of vessels during installation, deployment, O&M and decommissioning (e.g., jack-up barge, multi-cat, workboat, dive-support vessel, crane-barge, tug, specialist cable-laying vessel); and
- Removal of device(s), export cable and other infrastructure (e.g., foundations, mooring systems, inter-array and interconnector cabling, buoys) from the seabed and intertidal zone.

- Indirect physical impacts:
  - Scour associated with changes to hydrodynamic regimes and seabed sediment distributions from construction activities and structures.

14.5.1.3 The potential activities during O&M activities associated with the Proposed Development are:

- Direct effects such as:
  - Other maintenance activities (e.g., biofouling removal; ROV/diver inspection or repairs);
  - Use of vessels (e.g., jack-up barge; multi cat; workboat; dive-support vessel; crane-barge; tug); and
  - Use of equipment to monitor devices in situ or other environmental parameters (e.g., ROV, cameras or acoustic devices).
- Indirect effects such as changes in local scouring and sedimentation patterns.

14.5.1.4 Given the distance of the Array Area from the coast and onshore receptors, potential setting effects induced by the presence of WTGs and OSP (i.e., infrastructure above the sea surface) are not considered applicable to this Offshore Scoping Report. However, this impact pathway will be included as part of the Onshore Scoping Report.

Table 14.3. EIA Scoping assessment for Marine Archaeology and Cultural Heritage.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Loss of or damage to known marine and intertidal historic environment assets from direct impacts	M-1, M-4, M-10, M-33	Scoped in	Any elements of the Proposed Development that impact on the seabed or intertidal zone (i.e., WTGs, OSP, export, inter-array and interconnector cables) have the potential to result in the damage/loss of archaeological features if such assets are shown to be present. Similar effects may be expected from vessel jack-up or anchoring systems that impact the seabed, or the removal of devices and other infrastructure in ways that disturb the seabed or intertidal zone during decommissioning activities. Effects are considered to be permanent.	✓	✓	✓	✓	✓
Loss of or damage to unknown marine and intertidal historic environment assets from direct impacts	M-1, M-4, M-10, M-32, M-33	Scoped in	Any elements of the Proposed Development that impact on the seabed or intertidal zone (i.e., WTGs, OSP, export, inter-array and interconnector cables) have the potential to result in the damage/loss of unknown archaeological features, which may lie undiscovered on or below the surface of the seabed or in the intertidal zone, if any are present. Similar effects may be expected from vessel jack-up or anchoring systems that impact the seabed, or the removal of devices and other infrastructure in ways that disturb the seabed or intertidal zone during decommissioning activities. Effects are considered to be permanent.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Loss of or damage to submerged prehistoric landscapes from physical impacts	M-1, M-4, M-10, M-32, M-33	Scoped in	Any elements of the Proposed Development that impact on the seabed or the intertidal zone (i.e., WTGs, OSP, export, inter-array and interconnector cables) have the potential to result in the damage/loss of submerged prehistoric landscape deposits or features, if any are present. Similar effects may be expected from vessel jack-up or anchoring systems that impact the seabed, or the removal of devices and other infrastructure in ways that disturb the seabed and intertidal zone during decommissioning activities. Although the likelihood of impact is low, effects are considered to be permanent.	✓	✓	✓	✓	✓
Indirect disturbance to assets caused by cable burial methods and/or cable protection	M-4	Scoped in	Indirect impacts to known and potential seabed prehistory, maritime and aviation assets caused by changes to the hydrodynamic and sedimentary regimes due to sediment redistribution.	✓	✓	✓	✓	✓
Operation and Maintenance								
Loss of or damage to known marine historic environment assets from direct impacts	M-4, M-32, M-33	Scoped in	Any elements of the Proposed Development that could result in localised scouring (i.e., WTGs, OSP, export, inter-array and interconnector cables) have the potential to result in the damage/loss of archaeological features lying on the seabed if such assets are shown to be present. Maintenance vessel jack-up or anchoring systems that impact the seabed, or the repeated removal and replacement of devices and other infrastructure in ways that disturb the seabed also have the potential to result in	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
			the damage/loss of any archaeological features lying on the seabed. Effects are considered to be permanent.					
Loss of or damage to unknown marine historic environment assets from direct impacts	M-4, M-32, M-33	Scoped In	Any elements of the Proposed Development that could result in localised scouring (i.e., WTGs, OSP, export, inter-array and interconnector cables) have the potential to result in the damage/loss of unknown archaeological features, which may lie undiscovered on or below the surface of the seabed, if any are present. Maintenance vessel jack-up or anchoring systems that impact the seabed, or the repeated removal and replacement of devices and other infrastructure in ways that disturb the seabed also have the potential to result in the damage/loss of any such features. Effects are considered to be permanent.	✓	✓	✓	✓	✓
Loss of or damage to submerged prehistoric landscapes from direct impacts	M-4, M-32, M-33	Scoped In	Any of the device designs, cables and other infrastructure on the seabed or in the water column above that result in localised scouring have the potential to result in the damage/loss of submerged prehistoric landscape deposits or features, if any are present. Maintenance vessel jack-up or anchoring systems that impact the seabed, or the repeated removal and replacement of devices and other infrastructure in ways that disturb the seabed also have the potential to result in the damage/loss of any such features. Although the likelihood of impact is low, effects are considered to be permanent.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Indirect disturbance to assets caused by additional cable protection used during repair and maintenance	M-4	Scoped In	Indirect impact to known and potential seabed prehistory, maritime and aviation assets caused by potential scour and plume effects resulting in increased protection to, or deterioration through erosion.	✓	✓	✓	✓	✓

14.6 Potential Cumulative Impacts

14.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Marine Archaeology and Cultural Heritage, cumulative interactions may occur with other planned OWF as well as other activities in the study area.

14.6.1.2 The EIAR will include consideration of the potential cumulative impact (direct and indirect) of the Proposed Development and other developments on the marine historic environment.

14.6.1.3 With regards to indirect effects, effects to local hydrodynamic and sediment transport regime will need to be assessed within the EIA in order to assess the significance of these impacts upon the known and unknown marine historic environment.

14.6.1.4 The Marine Archaeology and Cultural Heritage CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

14.7 Potential Transboundary Impacts

14.7.1.1 With regards to effects on the marine archaeology, the potential impacts of the Proposed Development in the Scottish Marine Area are unlikely to lead to any significant transboundary effects. Direct impacts resulting from the Proposed Development are expected to be confined to the Array Area and Offshore ECC and, therefore, are not predicted to result in transboundary effects.

14.8 Proposed Approach to EIA

14.8.1 Relevant Data Sources

14.8.1.1 The key desktop data sources that will be examined for the EIA marine baseline characterisation include:

- Canmore, the national historic environment record of Scotland, administered by HES;
- The Aberdeenshire and Moray HERs;
- UKHO wreck register;
- Various online resources including the British Geological Survey (BGS) Geology of Britain Viewer;
- Published and unpublished literature (including a detailed review of reports for previous fieldwork carried out within the proximity to the proposed development boundary);
- Existing geotechnical, geophysical and geoarchaeological data; and
- Available Light Detection and Ranging (LiDAR) and aerial photography.

14.8.1.2 Further primary data will be obtained from geophysical and geotechnical surveys covering the Proposed Development. The data will be archaeologically assessed to provide an enhanced baseline assessment of the known and potential underwater heritage assets, beyond documentary sources, alone. The marine geophysical surveys (side scan sonar, sub-bottom profiler, multi-beam echosounder, magnetometry) will be conducted to appropriate professional standards for

archaeological review (as outlined in Plets *et al*., 2013) and support post-consent mitigation strategies (The Crown Estate, 2021).

14.8.1.3 Geotechnical surveys (borehole, Cone Penetrometer Tests and vibrocores) will be conducted for the Proposed Development, primarily to provide seabed information for engineering design solutions. These will be informed by relevant guidance (e.g., Gribble and Leather, 2011) to ensure the logs are suitable for archaeological review and core material is kept for potential analysis if sediments of archaeological interest are identified. This will inform whether submerged palaeolandscape deposits and prehistoric archaeological remains are present in the Array Area or the Offshore ECC.

14.8.1.4 If required, an intertidal walkover survey will be undertaken at the proposed landfall in order to ground-truth previously recorded heritage assets and to identify any new assets that may be of relevance to the assessment.

14.8.1.5 The marine geophysical and geotechnical datasets collected for the Proposed Development will be archaeologically assessed to identifying anthropogenic geophysical anomalies and the presence of submerged palaeolandscape deposits, with previously unknown or unconfirmed locations.

14.8.2 Guidance

14.8.2.1 The data gathering, analysis, impact assessment and mitigation recommendations for the EIA will be conducted in accordance with professional best-practice, and technical guidelines, appropriate and proportionate to the Proposed Development, as follows:

- The Joint Nautical Archaeology Policy Committee and Crown Estate. (2006). Maritime Cultural Heritage and Seabed Development: JNAPC Code of Practice;
- Wessex Archaeology. (2007). Historic Environment Guidance for the Offshore Renewable Energy Sector, commissioned by COWRIE Ltd (project reference ARCH-11-05);
- Oxford Archaeology and George Lambrick Archaeology and Heritage. (2008). Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy, commissioned by COWRIE Ltd (project reference CIARCH-11-2006);
- Gribble, J. and Leather, S. for EMU Ltd. (2011). Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector, commissioned by COWRIE Ltd (project reference GEOARCH-09);
- Plets, R., Dix, J. and Bates, R. (2013). Marine Geophysics Data Acquisition, Processing and Interpretation: Guidance Notes. Swindon: English Heritage Publishing;
- The Crown Estate. (2021). Archaeological Written Schemes of Investigation for Offshore Wind Farm Projects, Wessex Archaeology Ltd for The Crown Estate;
- The Crown Estate. (2014). Protocol for Archaeological Discoveries: Offshore Renewables Projects, Wessex Archaeology Ltd for The Crown Estate;
- The Chartered Institute for Archaeologists (CifA) Codes, Standards and Guidance. Available online at https://www.archaeologists.net/codes/cifa;

- HES. (2016). Managing Change in the Historic Environment: Setting; and
- SNH and HES. (2018). Environmental Impact Assessment Handbook: Guidance for competent authorities, consultation bodies, and others involved in the Environmental Impact Assessment process in Scotland. V5. Edinburgh.

14.8.2.2 As the Proposed Development is located within Scottish and UK Territorial Waters, there is guidance to consider in relation to the marine historic environment. These are outlined below and will also be considered in relation to the Marine Archaeology and Cultural Heritage EIA:

- Scotland's National Marine Plan (Scottish Government, 2015a) covers both Scottish inshore waters (out to 12 nm) and offshore waters (12 to 200 nm). It contains policies and advice concerning the marine historic environment, including that development and use of the marine environment should protect and, where appropriate, enhance heritage assets in a manner proportionate to their significance and that as well as designated marine heritage assets there are likely to be a number of undesignated sites of demonstrably equivalent significance, which are yet to be fully recorded or await discovery;
- Scotland's National Marine Plan also recommends that Historic Marine Planning Partnerships and licensing authorities should seek to identify significant historic environment resources at the earliest stages of planning or development process and preserve them in situ wherever feasible. Adverse impacts should be avoided, or, if not possible, minimised and mitigated. Where this is not possible licensing authorities should require developers to record and advance understanding of the significance of the heritage asset before it is lost, in a manner proportionate to that significance;
- The Historic Environment Policy Statement for Scotland 2019 includes policies that decisions affecting any part of the historic environment require understanding of its significance and consideration of avoiding or minimising detrimental impacts; and
- HES Designation Policy and Selection Guidance 2019 stands alongside the Historic Environment Policy Statement for Scotland 2019 and outlines the principles and criteria that underpin the designation of Historic Marine Protected Areas.

14.8.3 Assessment Methodology

14.8.3.1 The approach adopted for the EIA will follow that outlined within Chapter 4 (EIA Methodology), and will be based on the maximum design envelope approach and on relevant legislation and policy in order that the licensing authorities have sufficient and adequate information on which to base a decision.

14.8.3.2 A desk-based assessment will be conducted to identify any possible (as well as known) submerged cultural heritage within the Array Area and Offshore ECC. It would capture marine historic assets that have the potential to be present due to an unknown location of loss, since there could be assets of moderate and high heritage value present. The desk-based assessment would be conducted to appropriate professional standards (CIfA Standards and Guidance 2014 and as revised).

14.8.3.3 The importance of marine historic environment assets would be evaluated to inform the assessment. The level of importance assigned depends on a number of factors, including intrinsic, contextual and associative characteristics. This will be based on:

- HES. (2019). Designation Policy and Selection Guidance, including Annexes;
- English Heritage. (2012). Ships and Boats: Prehistory to Present. Designation Selection Guide. Swindon: English Heritage; and
- Wessex Archaeology. (2011). Assessing Boats and Ships 1860-1913, 1914-1938 and 1939-1950. Archaeological Desk-Based Assessments in 3 volumes. Salisbury: Wessex Archaeology.

14.8.3.4 The assessment would address the identification of any marine historic assets on the seabed, so that avoidance of impact can be embedded in the project design, and if avoidance is not possible, then an evidence-based approach will be used to design suitable mitigation strategies in consultation with MS-LOT and HES.

14.8.3.5 For any marine archaeology impacts scoped in, the assessment will be based on analysis of desk-based sources (including GIS based gazetteer) and geophysical and geotechnical data collected specifically for the Proposed Development. The assessment of the magnitude of impact and the significance of effect on marine historic environment assets will be based on SNH and HES's Environmental EIA Handbook: Guidance for competent authorities, consultation bodies, and others involved in the EIA process in Scotland (V5, 2018). Specific detailed methodology for the historic environment will be agreed in consultation with statutory stakeholders and curators.

14.9 Scoping Questions

14.9.1.1 The questions in Table 14.4 are posed to consultees to frame and focus responses to the Marine Archaeology and Cultural Heritage scoping exercise, which will in turn inform the Scoping Opinion.

Table 14.4. EIA scoping questions for Marine Archaeology and Cultural Heritage.

Scoping Questions – Marine Archaeology and Cultural Heritage
Do you agree with the data sources, including project specific surveys, to be used to characterise the Marine Archaeology and Cultural Heritage baseline within the EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Marine Archaeology and Cultural Heritage?
Do you agree with the project impacts which have been scoped out of the EIA for Marine Archaeology and Cultural Heritage?
Do you agree that transboundary impacts for Marine Archaeology and Cultural Heritage may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Marine Archaeology and Cultural Heritage that have been identified for the Proposed Development?

15 Military and Civil Aviation

15.1 Introduction

15.1.1.1 This chapter of the Offshore Scoping Report identifies the Military and Civil Aviation receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, on Military and Civil Aviation.

15.1.1.2 WTGs have the potential to cause a variety of adverse effects on Military and Civil Aviation receptors. WTGs can impact the radars used by civilian and military air traffic controllers because the characteristics of moving WTG blades are similar to those of aircraft, leading to spurious returns, or clutter, on radar displays. This can affect the safe provision of air traffic services or interfere with tracking of aircraft by the military. WTGs can also have the potential to present a physical obstruction for aviation activities such as military low flying or helicopter Search and Rescue operations.

15.1.1.3 Aviation stakeholders potentially affected include the United Kingdom (UK) CAA, NATS, the MoD, Highlands and Islands Airports Limited and offshore helicopter operators such as Bristow Group, who currently delivers the UK SAR contract on behalf of Her Majesty's Coastguard.

15.2 Study Area

15.2.1 Overview

15.2.1.1 In considering the spatial coverage of the Military and Civil Aviation study area, the overriding factor is the potential for WTGs within the Array Area to have an impact on civil and military radars, taking into account required radar operational ranges. In general, Primary Surveillance Radars (PSRs) installed on civil and military airfields have an operational range of between 40 and 60 nautical miles (nm). All radar-equipped airfields within 60 nm of the Array Area are therefore included in the study area. En route radars operated by NATS (En Route) plc (NERL) and military Air Defence (AD) radars are required to provide coverage at ranges in excess of 60 nm and so all such radars with potential Radar Line of Sight (RLoS) of WTGs in the Array Area are also included in the study area.

15.2.1.2 The Military and Civil Aviation study area is defined by the Proposed Development footprint plus an appropriate buffer. This includes the airspace between the Array Area and the UK mainland, extending from Wick Airport to the north, to Aberdeen Airport to the south. Airports and radars within the study area that are under consideration as part of this Offshore Scoping Report are shown in Figure 15.1.

15.2.1.3 The following criteria have been used to identify receptors within the study area (and discussed further below):

- Civil Aerodromes;
- MoD;
- NERL Facilities; and
- Other Aviation Activities.

15.2.2 Civil Aerodromes

15.2.2.1 Civil Aviation Publication (CAP) 764 Policy and Guidelines on Wind Turbines (CAA, 2016) states the distances from various types of aerodromes where consultation should take place. These distances include:

- Aerodromes with a surveillance radar – 30 km;
- Non-radar equipped licensed aerodromes with a runway of more than 1,100 m – 17 km;
- Licensed aerodromes where the WTGs will lie within airspace coincidental with any published Instrument Flight Procedure (IFP);
- Unlicensed aerodromes with runways of more than 800 m – 4 km;
- Unlicensed aerodromes with runways of less than 800 m – 3 km;
- Gliding sites – 10 km; and
- Other aviation activity such as parachute sites and microlight sites within 3 km.

15.2.2.2 CAP 764 goes on to state that these distances are for guidance purposes only and do not represent ranges beyond which all WTG developments will be approved or within which they will always be objected to. For example, aerodromes may utilise their radars at ranges considerably in excess of 30 km.

15.2.2.3 As well as examining the technical impact of WTGs on Air Traffic Control (ATC) facilities, it is also necessary to consider the physical safeguarding of ATC operations using the criteria laid down in CAP 168 Licensing of Aerodromes (CAA, 2019) to determine whether the Proposed Development will breach obstacle clearance criteria.

15.2.3 Ministry of Defence

15.2.3.1 It is necessary to consider the aviation, air defence and other activities of the MoD. This includes:

- MoD airfields, both radar and non-radar equipped;
- MoD AD radars; and
- MoD Practice and Exercise Areas (PEXAs) for both aviation and non-aviation activities.

15.2.4 NERL Facilities

15.2.4.1 It is necessary to consider the possible effects of WTGs upon NERL radar systems – a network of primary and secondary radar facilities around the country.

15.2.5 Other Aviation Activities

15.2.5.1 Other aviation activities of relevance could include:

- General military low flying training operations; and
- Military and civilian 'off-route' fixed-wing and helicopter operations, including SAR missions and offshore helicopter operations in support of the oil and gas industry.

500000
600000
6500000
6400000
Wick
Lossiemouth
Allanshill
Inverness
Buchan
Aberdeen
Perwinnes

Legend

- Array Area
- Offshore Export Cable Corridor
- Wick Minimum Sector Altitude radius 25nm
- Air Defence Radars
- Civil Airports
- Military Airfields
- NERL Radars

Scale at A3: 1:750,000

0 20 40 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MAV_MAP_00032		

Figure 15.1

Airports and radars within the Military and Civil Aviation study area

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

15.3 Baseline Environment

15.3.1 Data Sources

15.3.1.1 The primary sources of aviation related data that have been used to inform this Military and Civil Aviation chapter of the Offshore Scoping Report are the UK civil and military Aeronautical Information Publications (AIPs). The AIPs contains details on airspace and en-route procedures as well as charts and other air navigation information. A summary of these and other data sources is presented within Table 15.2. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

15.3.1.2 In addition, Caledonia OWF submitted a request for a NATS Technical an Operational Assessment (TOPA) for the Proposed Development which was prepared and issued by the NATs Safeguarding Office in August 2022.

Table 15.1. Summary of key publicly available datasets for Military and Civil Aviation.

Title	Source	Year	Author
CAP 032 UK AIP	https://nats-uk.ead-it.com/cms-nats/opencms/en/Publications/AIP/	2022	CAA
UK Military AIP	https://www.aidu.mod.uk/aip/	2022	MoD
Wind farm self-assessment maps	https://www.nats.aero/services-products/catalogue/n/wind-farms-self-assessment-maps/	2012	NATS
Offshore Infrastructure Data	https://opendata-nstauthority.hub.arcgis.com/maps/-nsta-offshore-infrastructure-etrs89/about	2022	Oil and Gas Authority

15.3.2 Overview of Baseline Environment

15.3.2.1 Figure 15.2 presents an overview of the existing military and civil airspace environment. The following sections provide further details.

Existing Moray Firth Projects

15.3.2.2 Details are provided below regarding the Beatrice, Moray East and Moray West OWFs, providing context for historic aviation status in the Moray Firth with regards to OWFs.

Moray East (and Beatrice)

15.3.2.3 Section 36 consents were granted in 2014 for the construction and operation of three OWFs, namely Telford OWF, Stevenson OWF and MacColl OWF, but more commonly combined in reference to the Moray East OWF. Resulting from the impact of the Moray East OWF on the MoD Air Traffic Control radar at RAF Lossiemouth, the original consents were granted, subject to conditions requiring each of the developments to submit an Air Traffic Control Radar Mitigation Scheme prior to the erection of operation of any WTGs, to be approved following consultation with the MoD. Following the assignation of the respective consents to Moray Offshore Windfarm (East) Limited on 8 June 2018, a Radar Mitigation Scheme Agreement was entered into between Moray Offshore Windfarm (East) Limited and the MoD in September 2018, in relation to the identification, trialling and implementation of a mitigation solution.

15.3.2.4 Until such a time as a suitable enduring solution is identified, the Moray East OWF has deployed an interim solution, agreed by the MoD, to mitigate the impacts on the MoD Air Traffic Control radar at RAF Lossiemouth. In July 2015, the Moray East OWF and Beatrice OWF submitted an Airspace Change Proposal for a Transponder Mandatory Zone (TMZ) for both developments to the CAA, providing an interim solution until the implementation of a technical mitigation solution. This was agreed by the CAA in January 2016 and implemented in advance of the completion of the Moray East OWF construction.

15.3.2.5 The Moray East OWF consents also resulted in an objection from the NATS, the main provider of air traffic navigation services in the UK. The Section 36 consents were granted for the Moray East OWF, subject to a Primary Radar Mitigation Scheme (PRMS) being agreed with the Operator and submitted to and approved in writing by the Scottish Minister, to avoid the impact of the OWF on the Primary Radar located at Allanshill. A secondary condition was imposed on the Moray East OWF, noting that in advance of any blades being fitted to the WTGs, the development had to show evidence of the implementation of the PRMS.

Moray West

15.3.2.6 In June 2019, Section 36 consents were granted for the construction and operation of the Moray West OWF. These consents were subject to two conditions related to aviation. The first requires the submission of a PRMS, following an objection by NATS on the effects on the Allanshill Primary Surveillance Radar. The second is for the submission of an Air Traffic Control Radar Mitigation Scheme, to mitigate impacts to the MoD Air Traffic Control radar at RAF Lossiemouth. The Moray West OWF is currently working to discharge these conditions, in advance of commencing construction. The mitigation solution recently agreed comprises the establishment of a TMZ above the OWF and a technical solution to 'blank' the WTGs from the affected radar.

500000

600000

6500000

6400000

MORAY CTA 7

MORAY CTA 3

MORAY CTA 6

Legend

- Array Area
- Offshore Export Cable Corridor
- Moray Control Area (CTA)
- Air to Air Refuelling Area (AARA) Area 04
- Moray Firth Transponder Mandatory Zone (TMZ)
- Northern Managed Danger Area
- Moray Firth Danger Area
- Tain Danger Area

Scale at A3: 1:650,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

Produced:	Reviewed:	Approved:
BPHB	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MAV_MAP_00033		

Figure 15.2

Existing airspace environment

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Civil Aviation

15.3.2.7 The airspace above and adjacent to the Array Area is used by civil and military aircraft and lies within the Scottish Flight Information Region (FIR) for air traffic control. This airspace is regulated by the UK CAA. The Scottish FIR is adjacent to the Polaris FIR, whose boundary is approximately 235 km to the north-east of the Array Area at its closest point and is regulated by CAA Norway.

15.3.2.8 Airspace is classified as either controlled or uncontrolled and is divided into a number of classes depending on what kind of Air Traffic Service (ATS) is provided and under what conditions. In the UK, there are five classes of airspace, specifically A, C, D, E and G. The first four are controlled airspace classes while Class G is uncontrolled. Within controlled airspace, aircraft are monitored and instructed by ATC, whereas in uncontrolled airspace aircraft are not subject to ATC instruction but rather operate according to a simple set of regulations. ATC may still provide information, if requested, to ensure flight safety.

15.3.2.9 Aircraft operate under one of two flight rules: Visual Flight Rules (VFR) or Instrument Flight Rules (IFR). VFR flight is conducted with visual reference to the natural horizon while IFR flight requires reference solely to aircraft instrumentation.

15.3.2.10 From sea level to Flight Level (FL) 195, approximately 19,500 feet (ft) or 5,950 m AMSL, the airspace in the vicinity of the Array Area is Class G uncontrolled airspace. This airspace is used predominantly by low level flight operations and generally by aircraft flying under VFR. Under VFR flight the pilot is responsible for maintaining a safe distance from terrain, obstacles, and other aircraft.

15.3.2.11 The western extent of the Array Area lies partially within the Moray Firth TMZ. Within a TMZ the carriage and operation of aircraft transponder equipment is mandatory. This enables such aircraft to be detected and tracked by Secondary Surveillance Radar (SSR) systems. The Moray Firth TMZ surrounds the Beatrice OWF and Moray East OWF and is currently used as a temporary measure to mitigate the impact the associated WTGs have on PSR, with a permanent solution being trialled (see above). The establishment of a TMZ over the Array Area of the Proposed Development is one of the potential mitigation measures to be considered during the design process.

15.3.2.12 Above FL 195 is Class C controlled airspace in the form of a Temporary Reserved Area (TRA). This airspace, TRA 008B, has an upper vertical limit of FL 245, approximately 24,500 ft AMSL, and is available for use by both military and civil aircraft, though its main use is to accommodate VFR military flying activity. Laterally, the closest controlled airspace to the Array Area is the Moray Control Area (CTA), which is divided into CTAs 1 to 17. Of these elements, the closest to the Array Area is CTA 6, approximately 6.5 km to the west. Moray CTA 6 is Class E controlled airspace with a lower limit of FL 75, approximately 7,500 ft AMSL, and an upper limit of FL 155, approximately 15,500 ft AMSL.

15.3.2.13 The nearest UK civil airport to the Array Area is Wick Airport, which is approximately 26 km to the north-west. Wick Airport provides daily scheduled flights to Aberdeen Airport and is regularly used by helicopters operating offshore. Aberdeen Airport is 89 km south and Inverness Airport 109 km south-west of the Array Area. Aberdeen Airport is Scotland's third airport and the 16th busiest in the UK while Inverness is fourth and 19th respectively.

15.3.2.14 Airports with published IFPs have associated Minimum Sector Altitudes (MSAs). An MSA defines the minimum safe altitude an aircraft can descend to within a sector of radius 25 nm, approximately 46 km. These sectors provide obstacle clearance protection of at least 1,000 ft to aircraft within that area and allows pilots of aircraft flying under IFR the reassurance of properly designated obstacle and terrain clearance protection whilst making an approach and landing at an airport in poor weather. The Wick Airport MSA extends over the Array Area, as shown in Figure 15.1, and is 1,800 ft AMSL. To provide 1,000 ft vertical obstacle clearance over WTGs with a maximum tip height of 350 m (1,148 ft) AMSL the MSA will need to be increased. Further impact on Wick IFPs will be determined by specialist analysis and consultation with the Airport.

15.3.2.15 Inverness Airport is equipped with a combined PSR/SSR facility. A preliminary RLoS analysis indicates that Inverness PSR will not have visibility of WTGs within the Array Area. RLoS coverage at 350 m AMSL for Inverness PSR is illustrated in Figure 15.3.

15.3.2.16 NERL provides en route civil air traffic services within the Scottish FIR and operates a network of radar facilities providing en route information for both civil and military aircraft. The closest NERL radars to the Array Area are based at Allanshill, 42 km to the south, and Perwinnes, 89 km to the south.

15.3.2.17 Preliminary RLoS analysis for WTGs with a maximum tip height of 350 m AMSL indicates that all WTGs within the Array Area will be visible to Allanshill radar, but not to Perwinnes radar, as depicted in Figure 15.4. NERL radar facilities are combined PSR and SSR systems. NATS do not consider the impact of WTGs on SSR to be material or relevant for turbines that are beyond 15 nm, approximately 28 km, from their SSR facilities. Furthermore, CAP 764 states that WTG effects on SSR "…are typically only a consideration when the turbines are located very close to the SSR i.e., less than 10 km". The nearest SSR facility, at Allanshill, is 42 km from the Array Area.

15.3.2.18 In summary, the civil radar that has been identified as being potentially impacted by WTGs within the Array Area is the NERL PSR facility at Allanshill. Potential impact on Wick Airport's IFPs has also been identified.

500000

600000

6500000

6400000

Inverness

Legend

- Array Area
- Offshore Export Cable Corridor
- Civil Airport
- Inverness RLoS 350m AMSL

Scale at A3: 1:650,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	SM	DH
Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MAV_MAP_00034		

Figure 15.3

RLoS coverage at 350m AMSL
for Inverness PSR

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

500000
600000
6500000
6400000
Allanshill
Perwinnes

Legend

- Array Area
- Offshore Export Cable Corridor
- NERL Radars
- Perwinnes RLoS 350m AMSL
- Allanshill RLoS 350m AMSL

Scale at A3: 1:750,000

N

0 20 40 km

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

Produced:	Reviewed:	Approved:
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Date: 09/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_MAV_MAP_00035		

Figure 15.4

RLoS coverage at 350 m AMSL
for Allanshill and Perwinnes PSRs

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Military Aviation

15.3.2.19 The Array Area lies entirely within the Moray Firth Danger Area, specifically EGD809S, which when active has vertical limits from the surface up to 55,000 ft AMSL. Ordnance, munitions and explosives, unmanned aircraft system, and high energy manoeuvre activities take place within this danger area and the MoD will need to know of any new obstacles that could affect these operations.

15.3.2.20 Approximately 55 km south-west of the Array Area is the Tain Danger Area, EGD703, which when active has vertical limits from the surface up to 15,000 ft AMSL. Similar activities to those within Moray Firth Danger Area take place within Tain Danger Area, with the addition of para dropping, electronic and optical hazard activities.

15.3.2.21 The Array Area also lies beneath the Northern Managed Danger Area (MDA), one of four MDA complexes in UK airspace that provide segregated airspace for military flying training. Specifically, the Array Area is beneath danger area EGD712D which, when activated, has vertical limits from FL 245 to FL 660 (approximately 66,000 ft AMSL).

15.3.2.22 Approximately 44 km south-east of the Array Area is Air to Air Refuelling Area (AARA) Area 04. AARA Area 04 is permanently available to military traffic and has vertical limits from FL 70 (approximately 7,000 ft AMSL) to FL 240 (approximately 24,000 ft AMSL).

15.3.2.23 All the above areas are depicted in Figure 15.2. There are no known further PEXAs, including PEXAs for non-aviation activities, within the study area.

15.3.2.24 The nearest PSR-equipped military airfield to the Array Area is RAF Lossiemouth, 63 km (34 nm) to the south-west. Controllers at this station may offer a Lower Airspace Radar Service (LARS) to aircraft operating outside controlled airspace up to FL 100 (approximately 10,000 ft AMSL) within the limits of radio and radar cover. The maximum range for the Lossiemouth LARS provision is 40 nm. Preliminary RLoS analysis indicates that Lossiemouth ATC PSR will have visibility of WTGs within most of the Array Area.

15.3.2.25 The nearest MoD AD radar to the Array Area is based at Remote Radar Head Buchan, 70 km to the south-east. Preliminary RLoS modelling indicates that WTGs within most of the Array Area will be visible to Buchan AD PSR. RLoS coverage at 350 m AMSL for Lossiemouth ATC PSR and Buchan AD PSR is illustrated in Figure 15.5.

15.3.2.26 In summary, the military radars that have been identified as being potentially impacted by WTGs within the Array Area are the ATC PSR at Lossiemouth and the AD PSR at Buchan.

500000
600000
6500000
6400000
Lossiemouth
Buchan

Legend

- Array Area
- Offshore Export Cable Corridor
- Air Defence Radars
- Military Airfields
- Lossiemouth RLoS 350m AMSL
- Buchan RLoS 350m AMSL

Scale at A3: 1:750,000

0 20 40 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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Figure 15.5

RLoS coverage at 350 m AMSL for Lossiemouth ATC and Buchan AD PSRs

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Helicopter Main Routing Indicators

15.3.2.27 A network of offshore routes over the North Sea are flown by civilian helicopters in support of oil and gas installations and defined as Helicopter Main Routing Indicators (HMRIs). These routes have no lateral dimensions, however there should be no obstacles within 2 nm of the route centreline. The closest HMRI to the Array Area is HMRI X-Ray which tracks between Aberdeen and the Atlantic Rim and passes the Array Area by more than 8 nm to the west.

15.3.2.28 HMRIs in the vicinity of the Array Area are depicted in Figure 15.6.

Offshore Helidecks

15.3.2.29 To help achieve a safe operating environment, a 9 nm consultation zone for planned obstacles exists around offshore helicopter destinations. Within 9 nm, obstacles such as WTGs can potentially impact upon the feasibility of helicopters to safely fly low visibility or missed approach procedures at the associated helideck site. The closest helidecks to the Array Area are associated with the three platforms within the Beatrice oil field, however, at a minimum range of more than 13 nm to the west, they are beyond the 9 nm consultation zone (it is also understood that the Beatrice oil field will be decommissioned in the near future).

15.3.2.30 Oil and gas platforms in the vicinity of the Array Area are depicted in Figure 15.6.

Search and Rescue

15.3.2.31 There are ten helicopter SAR bases around the UK with Bristow Helicopters providing helicopters and aircrew. The nearest SAR base is at Inverness Airport. The obstacle environment created by WTGs within the Array Area has the potential to impact on SAR operations.

500000
550000
6500000
6450000
6400000
HMRI Yankee
HMRI X-Ray
CAPTAIN WPPA
CAPTAIN
CAPTAIN BLPA
BEATRICE B
BEATRICE CSS
BEATRICE AP
BEATRICE AD
BEATRICE C
ROSS

Legend

- Array Area
- Offshore Export Cable Corridor
- Array Area 9nm Buffer
- Helicopter Main Routing Indicators (HMRIs)
- HMRI 2nm Consultation Buffer
- Oil and Gas Platforms

Scale at A3: 1:400,000
0 10 20 km
N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

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Figure 15.6

HMRIs and oil and gas platforms in the vicinity of the Array Area

CALEDONIA Offshore Wind Farm
OW OCEAN WINDS

15.4 Embedded Mitigation Considered within the EIA

15.4.1.1 Synergies will be tested with existing mitigation solutions for the adjacent Moray East, Moray West and Beatrice OWFs to explore potential opportunities to collaborate on mitigation.

15.4.1.2 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

15.4.1.3 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Military and Civil Aviation are noted within Table 15.4 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Military and Civil Aviation receptors:

- M-14: Development and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting;
- M-25: Development of and adherence to an ERCoP. The ERCoP will be prepared in line with MCA guidance and confirms what measures the Proposed Development has in place to support any emergency response;
- M-28: Appropriate marking of the Proposed Development on Admiralty and aeronautical charts. This will include provision of the positions and heights of structures to the UK Hydrographic Office, CAA, MoD and Defence Geographics Centre;
- M-34: Aviation lighting and marking, as described in the LMP, will be installed in accordance with Article 223 of the UK Air Navigation Order (ANO) 2016 which sets out the mandatory requirements to be followed for lighting of offshore WTGs;
- M-35: The layout of the Proposed Development, as presented in the Design Specification and Layout Plan, will be finalised in discussion with the MCA and the NLB in order to ensure the specific WTG layout is compatible with potential Search and Rescue activity; and
- M-36: Failures to Proposed Development lighting and marking will be appropriately reported and rectified as soon as practicable. Interim hazard warnings will be put in place as required.

15.5 Scoping of Impacts

15.5.1.1 Potential impacts on Military and Civil Aviation have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 15.2.

15.5.1.2 WTGs have the potential to affect military and civil aviation (fixed-wing and helicopters), either through their physical dimensions limiting access and affecting safe passage, or through their effects on PSR systems which can impact the safe provision of an ATS. PSR impacts are caused by the characteristics of rotating WTG blades being similar to aircraft, leading to spurious clutter on ATC radar displays. The creation of a new obstacle environment increases the risk of collision for military low flying aircraft and helicopters engaged in SAR operations.

15.5.1.3 Helicopter traffic as a result of planned activities in support of the Proposed Development may raise the overall level of air traffic in the area and increase the likelihood of aircraft-to-aircraft collision.

Table 15.2. EIA scoping assessment for Military and Civil Aviation.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction								
Creation of an aviation obstacle environment	M-14, M-25, M-28, M-34, M-35, M-36	Scoped in	Construction of the wind farm will involve tall crane vessels and the installation of infrastructure above sea level which could pose a physical obstruction to low flying aircraft, increasing the risk of collision or requiring aircraft to fly extended routes to avoid obstacles. Specifically, tall crane vessels and above sea level infrastructure will have a potential impact on military activities within the Moray Firth Danger Area and SAR operations, and WTGs may impact the Wick Airport IFPs.	✓	✓	✗	✗	✗
Increased air traffic in the area related to wind farm activities	M-14, M-25, M-28, M-34, M-35, M-36	Scoped in	Helicopter traffic associated with the construction phase could impact on existing traffic in the area, increasing the risk of aircraft collision. Existing traffic may include military aircraft engaged in activities within the Moray Firth Danger Area and aircraft associated with SAR operations.	✓	✓	✗	✗	✗
Impact on civil and military PSR systems	-	Scoped out	To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. PSRs that can see the rotating blades of WTGs can mistake them for aircraft and so present them on the radar display as clutter. Until WTG blades in RLoS are allowed to rotate at operational speeds, they will not generate PSR clutter. Similarly, tall construction vessels and cranes that are in RLoS will not be moving fast enough to generate PSR clutter.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impacts from the Offshore ECR		Scoped out	The final offshore ECR will be below sea level and will have no impact on aviation activities. Surface vessels will not generate any PSR clutter.	✗	✗	✗	✗	✗
Operation and Maintenance								
Creation of an aviation obstacle environment	M-14, M-25, M-28, M-34, M-35, M-36	Scoped in	The presence of completed WTGs could pose a physical obstruction to low flying aircraft, increasing the risk of collision or requiring aircraft to fly extended routes to avoid obstructions. Specifically, WTGs will have a potential impact on military activities within the Moray Firth Danger Area and SAR operations, and WTGs may impact the Wick Airport IFPs.	✓	✓	✗	✗	✗
Increased air traffic in the area related to wind farm activities	M-14, M-25, M-28, M-34, M-35, M-36	Scoped in	Helicopter traffic associated with maintenance activities could impact on existing traffic in the area, increasing the risk of aircraft collision. Existing traffic may include military aircraft engaged in activities within the Moray Firth Danger Area and aircraft associated with SAR operations.	✓	✓	✗	✗	✗
Impact on NERL Allanshill, and MoD Lossiemouth ATC and Buchan AD PSR systems	-	Scoped in	To discriminate wanted aircraft targets from unwanted clutter, PSRs ignore static objects and only display moving targets. PSRs that can see the rotating blades of WTGs can mistake them for aircraft and so present them on ATC radar displays as clutter. Controllers may not be able to distinguish aircraft from the clutter.	✓	✓	✗	✗	✗
Impacts from the Offshore ECR	-	Scoped out	The offshore cable route will be below sea level and will have no impact on aviation activities.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impacts on civil and military SSR systems	-	Scoped out	NATS do not consider the impact of WTGs on SSR to be material or relevant for turbines that are beyond approximately 28 km from their SSR facilities. Furthermore, CAP 764 states that WTG effects on SSR "…are typically only a consideration when the turbines are located very close to the SSR i.e., less than 10 km". The nearest SSR facility, at Allanshill, is 42 km from the Array Area.	✗	✗	✗	✗	✗
Impact on Inverness Airport PSR	-	Scoped out	RLoS modelling indicates that the WTGs will not be visible to Inverness PSR.	✗	✗	✗	✗	✗
Impact on NERL Perwinnes PSR	-	Scoped out	RLoS modelling indicates that the WTGs will not be visible to Perwinnes PSR.	✗	✗	✗	✗	✗
Decommissioning								
Increased air traffic in the area related to wind farm activities	M-14, M-25, M-28, M-34, M-35, M-36	Scoped in	Helicopter traffic associated with the decommissioning phase could impact on existing traffic in the area, increasing the risk of aircraft collision. Existing traffic may include military aircraft engaged in activities within the Moray Firth Danger Area and aircraft associated with SAR operations.	✓	✓	✗	✗	✗
Impacts from the Offshore ECR	-	Scoped out	The final offshore ECR will be below sea level and will have no impact on aviation activities.	✗	✗	✗	✗	✗
Creation of an aviation obstacle environment	M-14, M-25, M-28, M-34, M-35, M-36	Scoped out	During the decommissioning phase the existing WTGs will be gradually dismantled and therefore the aviation obstacle environment will be removed. No specific decommissioning impacts are foreseen above those present in the construction and O&M phases.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impact on NERL Allanshill, and MoD Lossiemouth ATC and Buchan AD PSR systems	-	Scoped out	During the decommissioning phase the blades of WTGs will cease rotating, therefore the impact on PSRs will gradually reduce until the last WTG ceases operation. Any mitigations will remain in place until the blades of the last WTG stop rotating. There will be no other specific impacts on PSRs during decommissioning.	X	X	X	X	X

15.6 Potential Cumulative Impacts

15.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Military and Civil Aviation, cumulative interactions may occur with other planned OWFs as well as other activities in the study area.

15.6.1.2 The cumulative assessment will consider the impacts in combination with other existing and future offshore wind farms and associated aviation activities, including increased collision risk and cumulative impacts on radar. The wind farms and other activities relevant to the assessment will be identified through a screening exercise. Consultation with other offshore wind farm project developers in the area will be undertaken to understand what mitigations exist or are planned and how these may impact or harmonise with potential mitigations for the Proposed Development.

15.6.1.3 The Military and Civil Aviation CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

15.7 Potential Transboundary Impacts

15.7.1.1 The potential impacts of WTGs on aviation are localised and the Array Area is completely within UK airspace, with the nearest Norwegian operated airspace 235 km to the north-east. Furthermore, the Array Area is significantly beyond the expected radar coverage from the nearest non-UK airport.

15.7.1.2 Due to the localised nature of any potential impacts, transboundary impacts are unlikely to occur and, therefore, it is proposed that this impact will be scoped out from further consideration within the EIA.

15.8 Proposed Approach to EIA

15.8.1 Relevant Data Sources

15.8.1.1 No additional data sources beyond those described in Table 15.1 are expected to be required to inform the EIA.

15.8.2 Guidance

15.8.2.1 A summary of the relevant guidance that will be used for the EIA is provided in Table 15.3.

Table 15.3. Summary of guidance sources for Military and Civil Aviation.

Source	Summary
CAP 032 UK AIP (CAA, 2022)	Contains information on facilities, services, rules, regulations, and restrictions in UK airspace.
CAP 168 Licensing of Aerodromes (CAA, 2022a)	Sets out the standards required at UK licensed aerodromes relating to management systems, operational procedures, physical characteristics, assessment and treatment of obstacles, and visual aids.
CAP 437 Standards for Offshore Helicopter Landing Areas (CAA, 2021a)	Provides the criteria applied by the CAA in assessing offshore helicopter landing areas for worldwide use by helicopters registered in the UK and includes winching area 'best practice' design criteria for WTGs.
CAP 670 Air Traffic Services Safety Requirements (CAA, 2019)	Highlights the requirements to be met by providers of civil air traffic services and other services in the UK in order to ensure that those services are safe for use by aircraft.
CAP 764 Policy and Guidelines on Wind Turbines (CAA, 2016)	Details the CAA policy and guidelines associated with WTG impacts on aviation that aviation stakeholders and wind energy developers need to consider when assessing a development's viability.
CAP 1616 Airspace Change (CAA, 2021b)	Explains the CAA's regulatory process for changes to airspace.
ANO 2016 (CAA, 2022b)	Sets out the Rules of the Air and includes the application of lighting to WTGs in UK territorial waters (articles 222 and 223).
UK Military AIP (MoD, 2022)	The main resource for information and flight procedures at all military aerodromes.
MoD Obstruction Lighting Guidance (Low Flying Operations Flight, 2020)	Includes requirements for the lighting of offshore developments.
MCA MGN 654 Safety of Navigation: OREIs – Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021a)	Highlights issues to consider when assessing navigational safety and emergency response, caused by Offshore Renewable Energy Installation (OREI) developments.
MCA document Offshore Renewable Energy Installations: Requirements, Guidance and Operational Considerations for SAR and Emergency Response (MCA, 2021b)	Forms part of MGN 654 Annex 5 and includes design, equipment and operational requirements.
International Civil Aviation Organisation (ICAO) Annex 14 Aerodrome Design and Operations (ICAO, 2018)	Includes recommendations for the marking and lighting of WTGs.

15.8.3 Assessment Methodology

15.8.3.1 The EIA process will be supported by further desk-based studies, including RLoS modelling, that will identify and examine in greater detail sensitive aviation and radar receptors. RLoS is determined using radar propagation modelling software and 3D terrain data. Studies will be undertaken in parallel with consultation with relevant stakeholders to provide a detailed understanding of potential impacts. It is expected that consultation will be an iterative process, allowing for any concerns that are raised to be considered throughout the pre-application phase and in finalising the consent application. The assessment of Military and Civil Aviation will also comply with the guidance documents listed in Table 15.3.

15.8.3.2 In respect of impacts on Buchan AD PSR, an Air Defence and Offshore Wind (AD&OW) Windfarm Mitigation Task Force (the Task Force) has been established as a collaborative initiative between MoD, BEIS, OWIC and The Crown Estate. The aim of the Task Force is to enable the co-existence of UK Air Defence and offshore wind, allowing offshore wind to contribute towards meeting the UK Government's Net Zero target without degrading the nation's AD surveillance capability. Caledonia OWF is engaging with this initiative.

15.8.3.3 The corresponding AD&OW Strategy and Implementation Plan sets the direction for this collaboration through identifying, assessing, and deploying solutions that will enable the co-existence of AD&OW operations such that neither is unduly nor excessively compromised. This plan may lead to significant changes to current AD PSR characteristics and capabilities that in turn affect the potential impact that the Proposed Development may have.

15.9 Scoping Questions

15.9.1.1 The questions in Table 15.4 are posed to consultees to frame and focus responses to the Military and Civil Aviation scoping exercise, which will in turn inform the Scoping Opinion.

Table 15.4. EIA scoping questions for Military and Civil Aviation.

Scoping Questions – Military and Civil Aviation
Do you agree with the data sources, including project specific surveys, to be used to characterise the Military and Civil Aviation baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Military and Civil Aviation?
Do you agree with the project impacts which have been scoped out of the EIA for Military and Civil Aviation?
Do you agree that transboundary impacts for Military and Civil Aviation may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Military and Civil Aviation that have been identified for the Proposed Development?

16 Seascape, Landscape and Visual Impact

16.1 Introduction

16.1.1.1 This chapter of the Offshore Scoping Report identifies the seascape, landscape and visual receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

16.1.1.2 This chapter is supported by the following figures:

- Figure 16.1. Seascape, landscape and visual impact assessment (SLVIA) study area;
- Figure 16.2. Blade tip ZTV with preliminary viewpoint locations;
- Figure 16.3. Blade tip ZTV with visual receptors and preliminary viewpoint locations – Highland;
- Figure 16.4. Blade tip ZTV with visual receptors and preliminary viewpoint locations – Moray and Aberdeenshire;
- Figure 16.5. Landscape planning designations, Wild Land Areas (WLAs), and Gardens and Designed Landscapes; and
- Figure 16.6. Coastal and landscape character.

16.2 Study Area

16.2.1.1 The proposed seascape, landscape, and visual impact assessment (SLVIA) study area is defined by the Array Area and covers a radius of 50 km from its boundary, as illustrated in Figure 16.1. Broadly, the SLVIA study area covers a large area of the North Sea seascape including parts of the Moray Firth and the Caithness and Sutherland, Inner Moray Firth, Moray and Aberdeenshire coasts.

16.2.1.2 Taking a precautionary approach, an initial 60 km boundary is also shown on the SLVIA scoping figures. This is to ensure that any key receptors on the fringes of the proposed 50 km study area for the SLVIA are identified and considered at the scoping stage.

16.2.1.3 Informed by professional judgement, a 50 km SLVIA study area is defined as the outer limit of the area where significant visual effects could occur. A 40 km radius study area has been set for landscape and coastal receptors/character, as it is considered unlikely for significant effects on landscape or coastal character to occur beyond this range.

16.2.1.4 Institute of Environmental Management and Assessment (IEMA) Guidance (IEMA, 2015; 2017) recommends a proportionate EIA focused on the significant effects and a proportionate EIAR chapter. An overly large SLVIA study area may be considered disproportionate if it makes the understanding of the key impacts of the Proposed Development more difficult.

16.2.1.5 This is supported by Landscape and Visual Impact Assessment (LVIA) Guidance produced by the Landscape Institute (GLVIA3) (Landscape Institute, 2013). This guidance recommends that '*the level of detail provided should be that which is reasonably required to assess the likely significant effects*'. It also states that '*the study area should include the site itself and the full extent of the wider landscape around it which the proposed development may influence in a significant manner*'.

16.2.1.6 Other wind farm specific guidance, such as NatureScot's Visual Representation of Wind Farms Guidance (NatureScot, 2017a) recommends that Zone of Theoretical Visibility (ZTV) distances are used for defining study area based on WTG height. This guidance recommends a 45 km radius for WTG greater than 150 m to blade tip; however, it does not go beyond WTGs above 150 m in height. The height of current offshore WTG models has now exceeded the heights covered in this guidance. The NatureScot guidance recognises that greater distances may need to be considered for larger WTGs used offshore, as is the case for the SLVIA study area for the Proposed Development. A precautionary approach is taken in defining a 50 km radius study area for the Proposed Development due to the larger WTGs of up to 350 m blade tip height (above/MHWS) proposed.

16.2.1.7 The SLVIA will generally focus on locations from where it may be possible to see the Proposed Development, as defined by the Blade Tip ZTV; see Figure 16.2 (wide extent) and Figure 16.3 and Figure 16.4 (coastal extent on 1:50,000 Ordnance Survey base mapping).

16.2.1.8 Consideration of the Blade Tip ZTV (Figure 16.2) indicates that theoretical visibility of the Proposed Development mainly occurs within 50 km and that beyond this distance, the geographic extent of visibility will become increasingly restricted. At distances over 50 km, the lateral (or horizontal) spread of the Proposed Development will also occupy a small portion of available views and the apparent height (or 'vertical angle') of the WTGs would also appear very small; therefore, significant visual effects are unlikely to arise at greater than this distance, even if the WTGs are visible.

16.2.1.9 The influence of earth curvature begins to limit the apparent height and visual influence of the WTGs visible at long distances (such as over 50 km), as the lower parts of the WTGs would be partially hidden behind the apparent horizon, leaving only the upper parts visible above the skyline.

16.2.1.10 The variation of weather conditions influencing visibility off the Scottish coast has also informed the SLVIA study area. Based on initial review of Met Office visibility data used in the Moray West OWF Environmental Statement, visibility beyond 50 km is considered to be infrequent with lesser visibility frequency reported for the Highland coast than from the Moray coast. This is supported by the visibility analysis in the Offshore Energy Strategic Environmental Assessment (White Consultants, 2020), which considered Met Office visibility data for eight coastal stations. Averaging all coastal stations, the visual range recorded was just under 24 km around 50% of the time, just under 30 km for 33% of the time, around 34 km for 20% of the time, and 40 km+ for 10% of the time.

16.2.1.11 In considering the SLVIA study area, the sensitivity of the receiving seascape, landscape and visual receptors has also been reviewed, taking particular account of the landscape designations shown in Figure 16.6, and other visual receptors. It is clear that the principal issues for the SLVIA are the location of Array Area off the Caithness and Sutherland (Highland), Moray and Aberdeenshire coasts and, therefore, its exposure to and visibility from these locations, including from the Causeymire – Knockin Flows Wild Land Area, and the Dunnet Head, Duncansby Head and Flow Country and Berriedale Coast Special Landscape Areas which are within 50 km of the Array Area.

16.2.1.12 Potential cumulative effect interactions with other offshore wind farms have also influenced the definition of the SLVIA study area. Other offshore wind farms within the SLVIA study area are shown in Figure 16.1. Receptors, including the designated and defined areas listed above would generally view the Array Area

partially or fully beyond these existing and under construction offshore wind farms, reducing the potential for significant effects beyond a 50 km radius.

16.2.1.13 Assessment of seascape, landscape, and visual effects as a result of the Proposed Development are proposed to be scoped out beyond 50 km. The study area will be reviewed and amended in response to such matters as refinement of the Proposed Development, the identification of additional impact pathways and in response, where appropriate, to feedback from consultation. Feedback from consultees is requested specifically on the SLVIA study area.

Design Envelope Approach

16.2.1.14 Consideration of the Proposed Development and potential seascape, landscape and visual impacts is based on a 'Design Envelope' approach following the Scottish Government (2022a) Guidance for applicants on using the design envelope for applications under Section 36 of the Electricity Act 1989. A design envelope assessment approach is used in the SLVIA due to the uncertainty of the detail of the final project due to the nature of the Proposed Development and evolving technology.

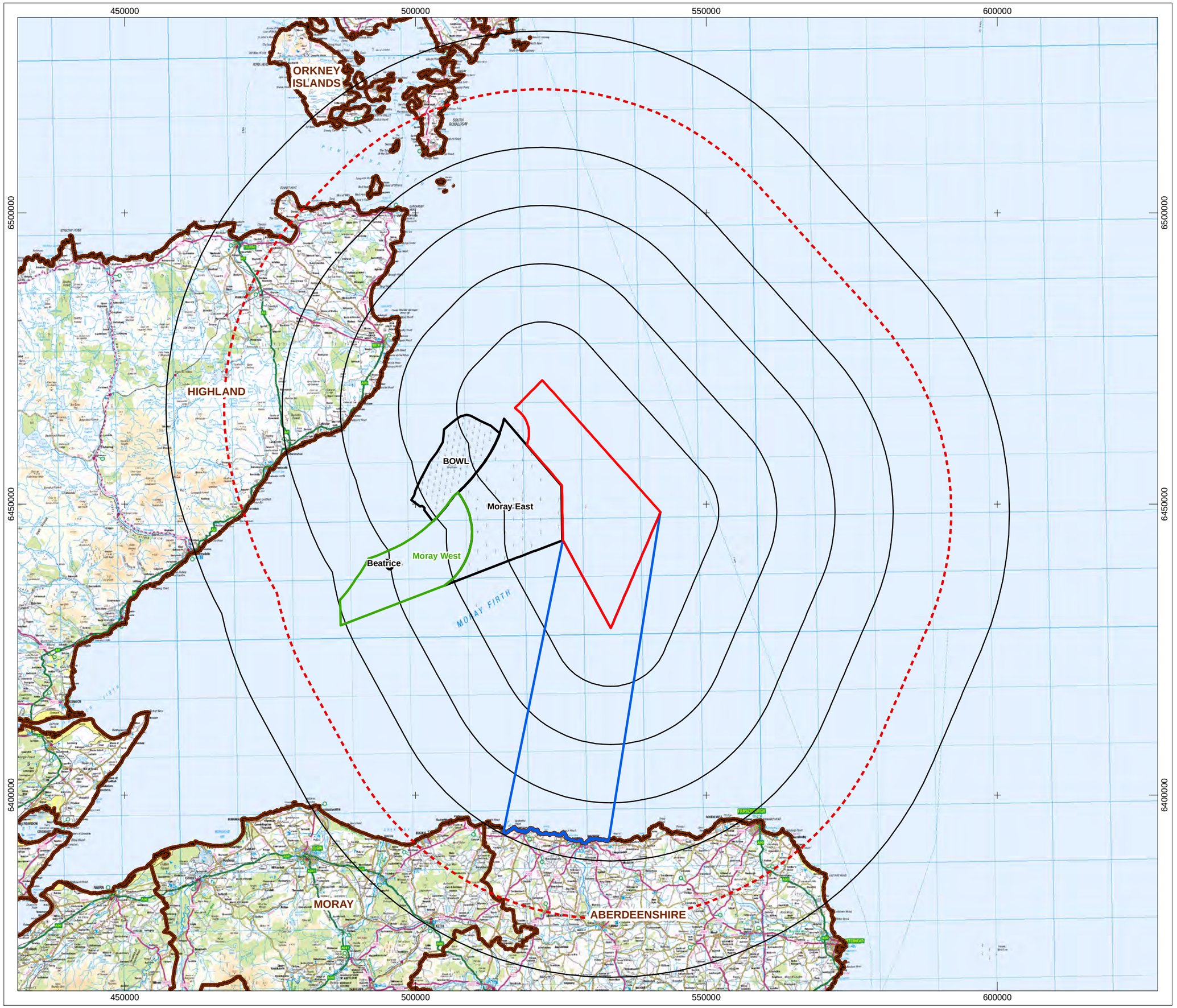
16.2.1.15 In accordance with the guidance the SLVIA will:

- be undertaken on the basis of the relevant design parameters applicable to the characteristics of the Proposed Development included in the application documents; and
- for each of the different receptors, establish those parameters likely to result in the maximum adverse effect (the worst-case scenario) and be undertaken accordingly to determine significance.

16.3 Baseline Environment

16.3.1 Data Sources

16.3.1.1 The data sources that have been used to inform this Seascape, Landscape, and Visual Impact chapter of the Offshore Scoping Report are presented within Table 16.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.



Legend

- Array Area
- Offshore Export Cable Corridor
- 10km Distance Radii 50km
- Study Area
- Local Authority Boundary

Cumulative Offshore Wind Farms

- Operational
- Consented

Scale at A3: 1:600,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
JM	CW	DH
Date: 02/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ELS_MAP_00001		

Figure 16.1

Seascape, landscape and visual impact assessment (SLVIA) study area

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

450000 500000 550000 600000

6500000 6450000 6400000

Viewpoints

1 - Duncansby Head
2 - Keiss
3 - Wick (path south of South View)
4 - Sarclet (Sarclet Haven Info Board)
5 - Whaligoe Steps
6 - Lybster (end of Main Street)
7 - Dunbeath (near Heritage Centre)
8 - Morven
9 - Navidale
10 - Lossiemouth Harbour
11 - Portnockie (Bow Fiddle Rock Info Point)
12 - Cullen (viaduct)
13 - Findlater Castle
14 - Portsoy
15 - Ferry Route (Kirkwall to Aberdeen)
16 - Burwick Ferry Landing
17 - Macduff, viewpoint outside Macduff Parish Church, Station Brae
18 - Gardenstown, Seatown, Harbour Road
19 - B9031, west of Fraserburgh
20 - Rosehearty Harbour

Legend

- Array Area
- Offshore Export Cable
- Corridor 10km Distance Radii
- 50km Study Area
- Viewpoint Location

Blade Tip Zone of Theoretical Visibility
- Higher Theoretical Visibility
- Lower Theoretical Visibility

Blade tip:	350m above MHWS	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included

Scale at A3: 1:600,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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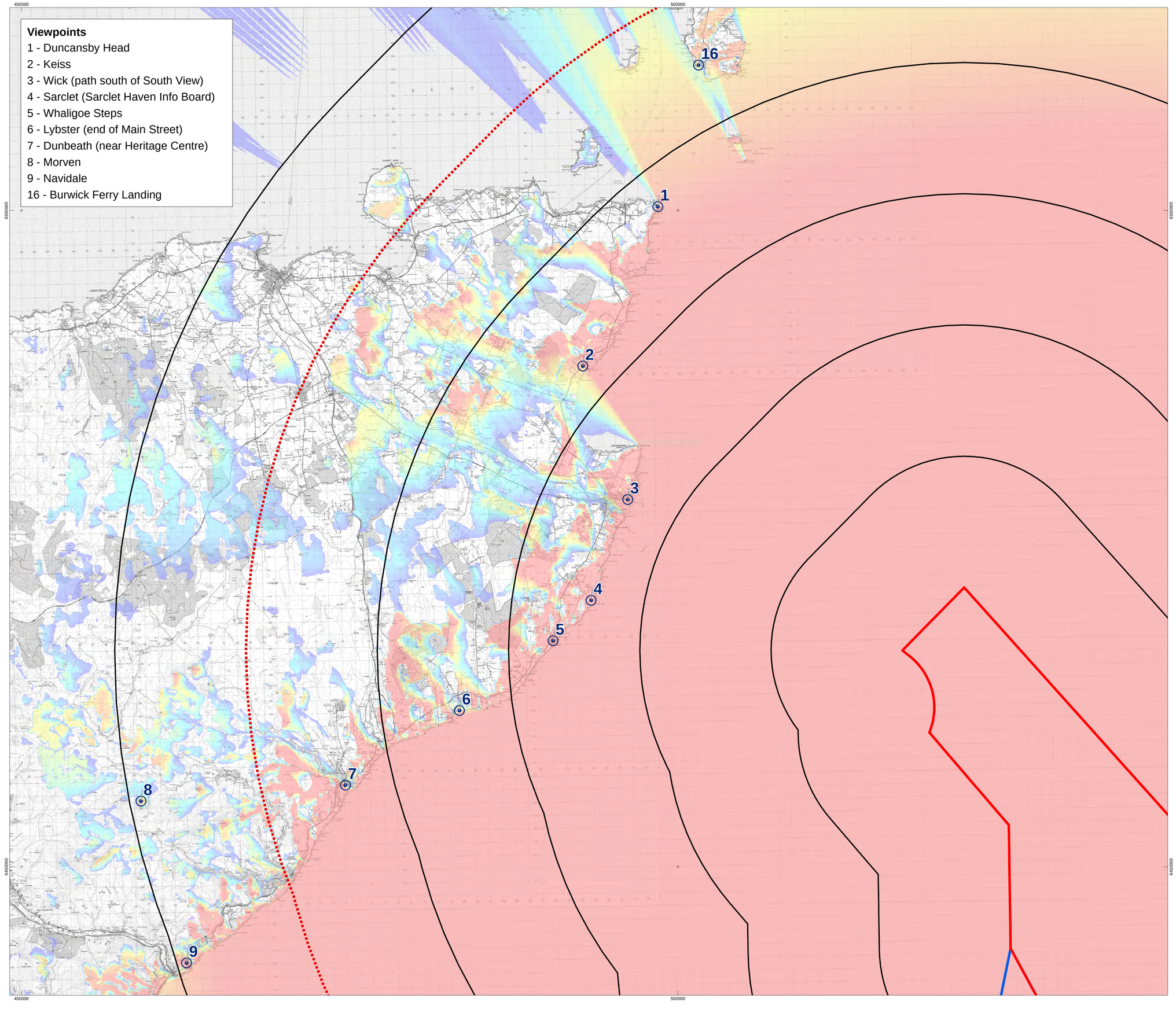
REF: UKCAL1_GO_WNF_ELS_MAP_00002		

Figure 16.2

Blade tip ZTV with preliminary viewpoint locations

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS



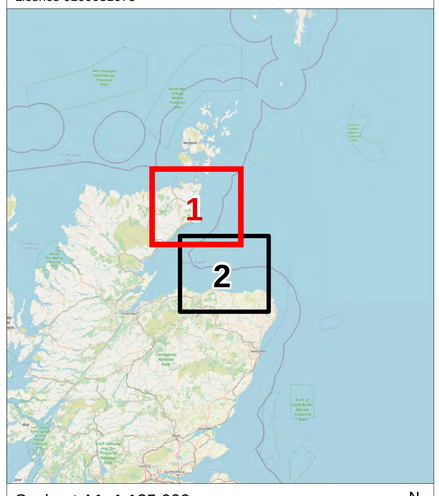
Legend

- Array Area
- Export Cable Corridor
- 10km Distance Radii
- 50km Study Area
- Viewpoint Location

Blade Tip Zone of Theoretical Visibility

- Higher Theoretical Visibility
- Lower Theoretical Visibility

Blade tip:	350m above MHWS	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included



Scale at A1: 1:135,000

0 7 14 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

Produced:	Reviewed:	Approved:
JM	CW	DH

Date: 02/08/2022	Revision: 01

REF: UKCAL1_GO_WNF_ELS_MAP_0003

Figure 16.3
Blade tip ZTV with visual receptors and preliminary viewpoint locations - Highland

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Viewpoints

10 - Lossiemouth Harbour
11 - Portnockie (Bow Fiddle Rock Info Point)
12 - Cullen (viaduct)
13 - Findlater Castle
14 - Portsoy
15 - Ferry Route (Kirkwall to Aberdeen)
17 - Macduff, viewpoint outside Macduff Parish Church, Station Brae
18 - Gardenstown, Seatown, Harbour Road
19 - B9031, west of Fraserburgh
20 - Rosehearty Harbour

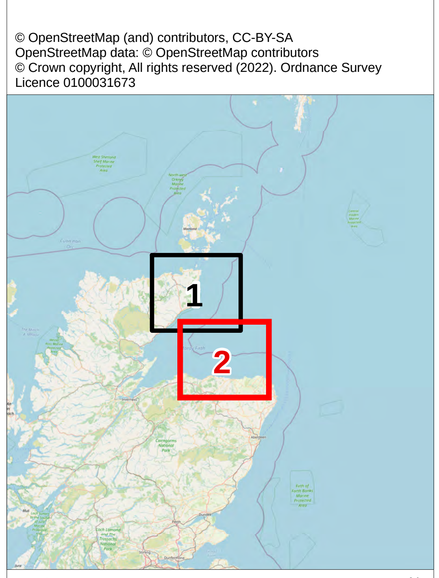
500000
550000
6400000

Legend

- Array Area
- Export Cable Corridor
- 10km Distance Radii
- 50km Study Area
- Viewpoint Location

Blade Tip Zone of Theoretical Visibility
- Higher Theoretical Visibility
- Lower Theoretical Visibility

Blade tip:	350m above MHWS	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included



Scale at A1: 1:135,000
0 7 14 km
N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

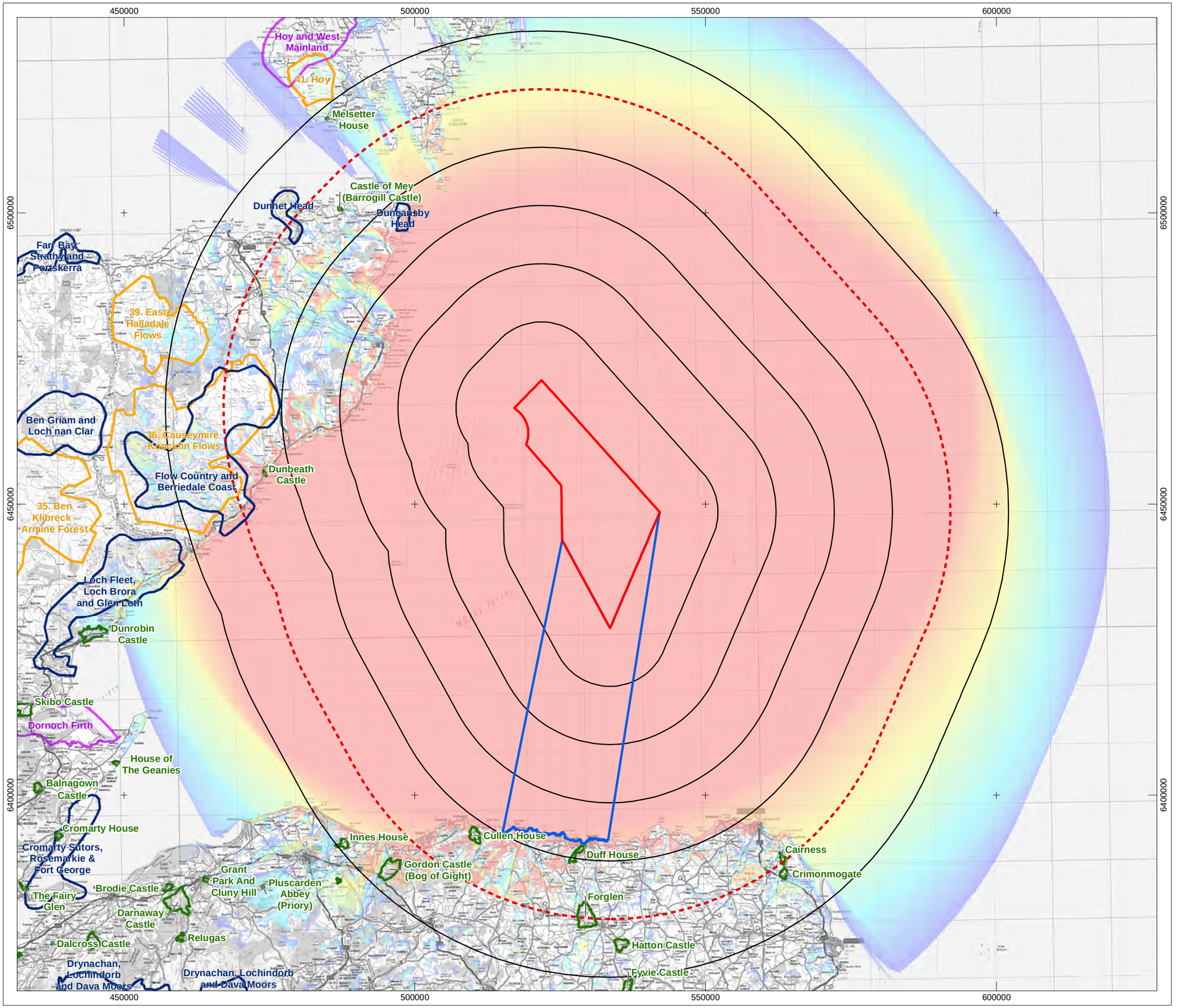
Produced:	Reviewed:	Approved:
JM	CW	DH

Date: 02/08/2022 | Revision: 01

REF: UKCAL1_GO_WNF_ELS_MAP_0004

Figure 16.4
Blade tip ZTV with visual receptors and preliminary viewpoint locations - Moray and Aberdeenshire

CALEDONIA Offshore Wind Farm
OW OCEAN WINDS



Legend

- Array Area
- Offshore Export Cable Corridor
- 10km Distance Radii
- 50km Study Area
- Garden and Designed Landscape
- Special Landscape Area
- National Scenic Area
- Wild Land Area (2014)

Blade Tip Zone of Theoretical Visibility
- Higher Theoretical Visibility
- Lower Theoretical Visibility

Blade tip:	350m above MHWS	Observer height:	2m
DTM:	OS Terrain 50 DTM	Surface features:	Excluded
DTM resolution:	50m	Earth curvature:	Included

Scale at A3: 1:600,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
JM	CW	DH
Date: 02/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ELS_MAP_00005		

Figure 16.5
Landscape planning designations, Wild Land Areas (WLAs), and Gardens and Designed Landscapes

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

450000 500000 550000 600000

6500000 6450000 6400000

NatureScot (2019) Landscape Character Types

- 10. Cliffs and Rocky Coast - Aberdeenshire
- 12. Beaches, Dunes and Links - Aberdeenshire
- 14. Gently Undulating Coastal Farmland
- 15. Broad Ridges and Valleys
- 16. Coastal Farmland with Ridges and Valleys
- 17. Coastal Agricultural Plain - Aberdeenshire
- 18. Low Hills and Basins
- 19. Farmed Rolling Ridges and Hills
- 20. Undulating Agricultural Heartland
- 21. Farmland and Wooded Policies
- 25. Farmed Strath - Aberdeenshire
- 27. Farmed Moorland Edge - Aberdeenshire
- 32. Farmed and Wooded River Valleys
- 134. Sweeping Moorland and Flows
- 135. Rounded Hills - Caithness & Sutherland
- 138. Lone Mountains
- 140. Sandy Beaches and Dunes
- 141. High Cliffs and Sheltered Bays
- 142. Strath - Caithness & Sutherland
- 143. Farmed Lowland Plain
- 144. Coastal Crofts & Small Farms
- 281. Beaches, Dunes and Links - Moray & Nairn
- 282. Cliffs and Rocky Coast - Moray & Nairn
- 283. Coastal Forest
- 284. Coastal Farmlands - Moray & Nairn
- 288. Upland Farmland
- 293. Low Forested Hills
- 295. Holms
- 296. Whaleback Islands
- 298. Low Island Pastures
- 301. Coastal Basin
- 302. Inclined Coastal Pasture
- 306. Coastal Hills and Heath
- 307. Cliffs - Orkney
- 308. Coast with Sand - Orkney
- 312. Plateau Heath and Pasture

MORAY FIRTH

Legend

- Array Area
- 10km Distance Radii
- 50km Study Area

SNH (2005) Coastal Character Types

- 0. Coastal Island
- 1. Remote High Cliffs
- 2. Rocky Coastline, Open Sea Views
- 3. Deposition Coastline, Open Views
- 4. Outer Firths
- 6. Narrow Coastal Shelf
- 12. Deposition Coasts of Islands

Scale at A3: 1:600,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)

Produced:	Reviewed:	Approved:
JM	CW	DH
Date: 02/08/2022	Revision: 01	
REF: UKCAL1_GO_WNF_ELS_MAP_00006		

Figure 16.6

Coastal and landscape character

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Table 16.1. Summary of key publicly available datasets for Seascape, Landscape and Visual Impacts.

Title	Source	Year	Author
Aberdeenshire Local Development Plan	https://www.aberdeenshire.gov.uk/planning/Plans-and-Policies/	2017a	Aberdeenshire Council
Special Landscape Areas – Supplementary guidance.	https://www.aberdeenshire.gov.uk/planning/plans-and-policies/aberdeenshire-local-development-plan-2017/	2017b	Aberdeenshire Council
UK Offshore Energy Strategic Environmental Assessment (OESEA 4), Environmental Report	https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1061670/OESEA4_Environmental_Report.pdf	2022	DECC
Moray East OWF – Environmental Statement	https://www.morayeast.com/application/files/6315/8013/6685/Chapter-5-Human-Environment-Baseline.pdf	2012	Moray East OWF
Moray West OWF – Environmental Statement	https://www.moraywest.com/document-library/navigate/358/694	2019	Moray West OWF
Google Earth Pro (2022), Aerial Photography.	Google	2022	Google
Highland wide Local Development Plan	https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/199/highland-wide_local_development_plan	2017	Highland Council
Caithness and Sutherland Local Development Plan	https://www.highland.gov.uk/info/178/local_and_statutory_development_plans/283/caithness_and_sutherland_local_development_plan	2018	Highland Council
Assessment of Highland Special Landscape Areas on behalf of SNH and The Highland Council	https://www.highland.gov.uk/downloads/file/2937/assessment_of_highland_special_landscape_areas	2011	Highland Council
Visualisation Standards for Wind Energy Developments	https://www.highland.gov.uk/downloads/file/12880/visualisation_standards_for_wind_energy_development s	2016	Highland Council
Inventory of Gardens and Designed Landscapes	https://www.historicenvironment.scot/advice-and-support/listing-scheduling-and-designations/gardens-and-designed-landscapes/	N/A	Historic Environment Scotland
Guidelines for Landscape and Visual Impact Assessment: Third Edition	N/A	2013	Landscape Institute and IEMA

Title	Source	Year	Author
Guidance for applicants on using the design envelope for applications under section 36 of the Electricity Act 1989	https://www.gov.scot/publications/guidance-applicants-using-design-envelope-applications-under-section-36-electricity-act-1989/pages/2/	2022	Scottish Government
Interactive maps of the UK's light pollution and dark skies as part of a national mapping project	https://www.nightblight.cpre.org.uk/	2016	LUC/CPRE
National Trust Scotland: Specific visitor attractions/tourist destinations.	https://www.nts.org.uk/visit/places	N/A	National Trust for Scotland
An assessment of the sensitivity and capacity of the Scottish seascape in relation to windfarms	https://www.nature.scot/doc/naturescot-commissioned-report-103-assessment-sensitivity-and-capacity-scottish-seascape-relation	2005	NatureScot
Assessing Impacts on Wild Land Areas – technical guidance	https://www.nature.scot/doc/assessing-impacts-wild-land-areas-technical-guidance	2020	NatureScot
Guidance note: Coastal Character Assessment	https://www.nature.scot/doc/coastal-character-guidance-report	2018	NatureScot
National Coastal Character Map	https://www.nature.scot/national-coastal-character-map	2010	NatureScot
Assessing the Cumulative Impact of Onshore Wind Energy Developments	https://www.nature.scot/doc/guidance-assessing-cumulative-landscape-and-visual-impact-onshore-wind-energy-developments	2021	NatureScot
Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape. Guidance for Scoping an Environmental Statement	https://www.nature.scot/doc/guidance-offshore-renewables-assessing-impact-coastal-landscape-and-seascape-guidance-scoping	2012	NatureScot
Visual Representation of Windfarms: Version 2.2	https://www.nature.scot/doc/visual-representation-wind-farms-guidance	2017	NatureScot
Siting and Designing Windfarms in the Landscape	https://www.nature.scot/doc/siting-and-designing-wind-farms-landscape-version-3a	2017	NatureScot

Title	Source	Year	Author
Scottish Landscape Character Map and Descriptions	https://www.nature.scot/professional-advice/landscape/landscape-character-assessment/scottish-landscape-character-types-map-and-descriptions	2019	NatureScot
The special qualities of the National Scenic Areas. Scottish Natural Heritage Commissioned Report No.374 (iBids and Project no 648)	https://www.nature.scot/doc/naturescot-commissioned-report-374-special-qualities-national-scenic-areas	2010	NatureScot
OPEN internal dataset: Public Rights of Way	OPEN Internal dataset	N/A	Ordnance Survey
Ordnance Survey 1:50,000 scale mapping	N/A	N/A	Ordnance Survey
Ordnance Survey 1:25,000 scale mapping	N/A	N/A	Ordnance Survey
Ordnance Survey County Region, Local Unitary Authority, Railways, Road and Settlements	N/A	N/A	Ordnance Survey
Ordnance Survey Terrain 50 Digital Terrain Model (DTM)	N/A	N/A	Ordnance Survey
Ordnance Survey Terrain 5 Digital Terrain Model (DTM)	N/A	N/A	Ordnance Survey
Orkney Local Development Plan	https://www.orkney.gov.uk/Service-Directory/O/Orkney-Local-Development-Plan.htm	2017	Orkney Island Council
Cruising routes for recreational yachting	TBC	TBC	Royal Yachting Association
National Cycle Network	https://www.sustrans.org.uk/	N/A	Sustrans
Met Office weather station historic visibility data	TBC	TBC	Met Office
Marine and coastal mapping data, ferry routes	Ordnance Survey	N/A	Various

16.3.2 Overview of the Baseline Environment

Coastal Character

16.3.2.1 In Scotland, seascape characterisation can be defined as 'the focus is on the coast and its interaction with the sea and hinterland, relationships that are quite distinctive in the Scottish context' (NatureScot, 2018). Coastal character is the 'distinct, recognisable and consistent pattern of elements on the coast, land and sea that makes one part of the coast different from another' (NatureScot, 2018) and is made up of the margin of the coastal edge, its immediate hinterland, and areas of sea.

16.3.2.2 The extent of the coast is principally influenced by the dominance of the sea in terms of physical characteristics, views and experience. The landward extent of the coast can be narrow, for example where edged by cliffs or settlement; or broad where it includes raised beaches, dunes, or more open coastal pasture or machair. The major determinant in defining the landward and seaward components of the coast is the sea - the key characteristic.

16.3.2.3 The SLVIA will consider coastal character effects within the SLVIA study area.

16.3.2.4 Given the definition in the NatureScot coastal character assessment guidance, the assessment of coastal character effects in this SLVIA focuses on areas of onshore landscape with views of the coast or seas/marine environment, in other words the 'coastal character', on the premise that the most important effect of OWFs is on the perception of the character of the coast.

16.3.2.5 The coastal character of the SLVIA study area is defined at the national level within the research report NatureScot Seascapes Study (Scott *et al*., 2005). This broad classification still stands and six of the National Coastal Character Types (NCCTs) are located within the 50 km study area, as shown in Figure 16.6.

16.3.2.6 It is proposed that the Regional Coastal Character Areas (RCCAs) that were defined and mapped for the Moray West OWF will form the basis of the baseline coastal character description of the SLVIA study area within 40 km and the assessment of the visual aspects of perceived character resulting from the Proposed Development. The geographic coverage of these RCCAs that will be considered in the SLVIA will include the coastline to the north as far as Gills Bay, west of John o' Groats, and to the south as far as St. Combs in Aberdeenshire.

16.3.2.7 Where there are gaps in the RCCA dataset to the east of Banff, these will be completed using the layers of desk information available on NCCTs and terrestrial Landscape Character Types (LCTs), together with detailed site survey information and in accordance with Guidance on Coastal Character Assessment (NatureScot, 2017a).

16.3.2.8 The SLVIA will consider RCCAs within a 40 km radius of the Array Area. This considers the separation distance between the RCCAs and the Proposed Development, the extents, and levels of visibility across the RCCAs, and the association between the RCCAs and the Array Area.

Landscape Baseline

16.3.2.9 There is a hierarchy of published Landscape Character Assessments that describe the baseline landscape character of the landscape in the SLVIA study area, at the national and local level.

16.3.2.10 NatureScot's landscape character map (NatureScot, 2019) and associated LCT descriptions will form the basis of the baseline landscape character description of the SLVIA study area and the assessment of the visual aspects of perceived character resulting from the Proposed Development. These LCTs are shown in Figure 16.6.

16.3.2.11 Set out in Table 16.2 below, is the preliminary appraisal of the potential effects of the offshore elements of the Proposed Development on landscape character. These are considered in respect of all LCTs within the first 40 km radius of the Array Area. This considers the separation distance between the LCTs and the Array Area, the extents, and levels of visibility across the LCTs and the association between the LCTs and the Site. A 40 km radius has been set, as it is considered unlikely for significant effects on landscape character to occur beyond this range. Those LCTs which will be assessed in detail within the SLVIA are identified in Table 16.2. Agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

Table 16.2. Preliminary appraisal of Coastal and Landscape Character Types.

RCCA and LCT	Approx. distance to Proposed Development	Subject to Theoretical Visibility?	Needs Detailed Assessment within SLVIA?
Coastal Character			
RCCAs up to 40 km from the Array Area	It is proposed that RCCAs within 40 km will be included in the SLVIA.		
Landscape Character			
LCT 143 – Farmed Lowland Plain	23.41	Yes	Yes – These LCTs fall within 40 km of the Array Area, are shown to have theoretical visibility, and are therefore proposed to be assessed in the SLVIA.
LCT 144 – Coastal Crofts and Small Farms	23.41	Yes	
LCT 134 – Sweeping Moorland and Flows	25.15	Yes	
LCT 141 – High Cliffs and Sheltered Bays	26.16	Yes	
LCT 140 – Sandy Beaches and Dunes	28.98	Yes	
LCT 10 – Cliffs and Rocky Coast - Aberdeenshire	34.57	Yes	
LCT 15 – Broad Ridges and Valleys	36.00	Yes	
LCT 14 – Gently Undulating Coastal Farmland	37.03	Yes	
LCT 32 – Farmed and Wooded River Valleys	37.87	Yes	
LCT 16 – Coastal Farmland with Ridges and Valleys	39.32	Yes	
LCT 20 – Undulating Agricultural Heartland	39.75	Yes	
LCT 282 – Cliffs and Rocky Coast - Moray and Nairn	40.23	Yes	No – These LCTs are located more than 40 km from the Array Area. Whilst these LCTs are shown to have some theoretical visibility, the
LCT 284 – Coastal Farmlands – Moray and Nairn	41.16	Yes	

RCCA and LCT	Approx. distance to Proposed Development	Subject to Theoretical Visibility?	Needs Detailed Assessment within SLVIA?
LCT 293 – Low Forested Hills	42.63	Yes	separating distances involved, and the operational/consented OWF context would limit the potential for significant effects on the character of these landscapes to occur.
LCT 298 – Low Island Pastures	42.78	Yes	
LCT 307 – Cliffs – Orkney	43.05	Yes	
LCT 17 – Coastal Agricultural Plain – Aberdeenshire	43.96	Yes	
LCT 312 – Plateau Heath and Pasture	44.17	Yes	
LCT 301 – Coastal Basin	44.51	Yes	
LCT 306 – Coastal Hills and Heath	44.63	Yes	
LCT 12 – Beaches, Dunes and Links – Aberdeenshire	45.61	Yes	
LCT 295 – Holms	46.85	Yes	
LCT 18 – Low Hills and Basins	46.90	Yes	
LCT 302 – Inclined Coastal Pasture	47.79	Yes	
LCT 135 – Rounded Hills – Caithness and Sutherland	47.81	Yes	
LCT 142 – Strath – Caithness and Sutherland	48.54	Yes	
LCT 288 – Upland Farmland	48.76	Yes	
LCT 308 – Coast with Sand – Orkney	48.92	Yes	
LCT 281 – Beaches, Dunes and Links – Moray and Nairn	49.79	Yes	
LCT 138 – Lone Mountains	50.02	Yes	
LCT 311 – Low Moorland	50.69	Yes	
LCT 21 – Farmland and Wooded Policies	52.45	Yes	
LCT 19 – Farmed Rolling Ridges and Hills	52.86	Yes	
LCT 296 – Whaleback Islands	53.76	Yes	
LCT 299 – Undulating Island Pasture	54.88	Yes	
LCT 283 – Coastal Forest	55.08	Yes	
LCT 27 – Farmed Moorland Edge – Aberdeenshire	56.07	Yes	
LCT 314 – Moorland Hills – Orkney	58.29	Yes	
LCT 25 – Farmed Strath – Aberdeenshire	59.66	No	No – this LCT would not experience theoretical visibility of the Proposed Development.

Landscape Planning Designations and Defined Wild Land Areas

16.3.2.12 There are no designations to protect the character of the seascape. There are, however, terrestrial areas within the 50 km study area that have been attributed a landscape planning designation and some of these include areas of sea, close to the coast. These landscape planning designations include Gardens and Designed Landscapes (GDLs), which are selected for inclusion in the Inventory of Gardens and Designed Landscapes by Historic Environment Scotland, and locally important Special Landscape Areas (SLAs), which are designated through the Highland-wide Local Development Plan (The Highland Council, 2012) and Caithness and Sutherland Local Development Plan (The Highland Council, 2018).

16.3.2.13 There is also the Causeymire-Knockfin Flows Wild Land Area (WLA), defined by NatureScot, shown in Figure 16.5. Wild Land is recognised in Scottish Planning Policy and regional planning policy as a nationally important mapped interest, and not a designation. While WLAs are afforded protection for their wildness qualities, they are not statutorily protected in the way that National Parks and National Scenic Areas are for their scenic qualities. There are no National Scenic Areas or National Parks within 60 km of the Array Area as shown in Figure 16.5.

16.3.2.14 In the preliminary appraisal, set out in Table 16.3, the potential effects of the Proposed Development are considered in respect of landscape designations and defined areas. This considers the separation distance between the landscape designation and the Proposed Development, the extents, and levels of visibility across the landscape designation, the association between the landscape designated area and the location of the Proposed Development, and existing influences from other development including OWFs and onshore wind farms.

16.3.2.15 The findings of this preliminary appraisal consider that three Gardens and Designed Landscapes (GDLs) have the potential to be significantly affected by the Proposed Development and, therefore, require a detailed assessment. The other GDL within 50 km of the Array Area, Castle of Mey, does not have the potential to be significantly affected owing to the lack of theoretical visibility. The effect on a further two GDLs (Forglen and Cairness) would not be significant due to the separation distances of these properties from the Array Area, the wooded nature of the GDLs and the influence of the separating landscape. Beyond 50 km there are a further five GDLs. Taking into consideration the substantial separation distances between these designated landscapes and the Array Area, there would be no potential for significant effects.

16.3.2.16 The closest SLAs to the Array Area include Flow Country and Berriedale Coast at approximately 40.3 km to the west, Dunnet Head at 34.7 km to the north-west, and Duncansby Head at approximately 47.1 km to the north-west. It is recommended that these SLAs are scoped into the detailed assessment owing to their close association with the seascape context where the Proposed Development would be located. The SLVIA will assess the likely effects of the Proposed Development on these SLAs, based on the citations presented in The Highland Council (2011).

16.3.2.17 The assessment of effects on WLAs follows guidance set out in NatureScot's recently published 'Assessing Impacts on Wild Land: Technical Guidance' (NatureScot, 2020c). Whether a WLA assessment is required, is discussed in paragraph 5 of this Guidance, with the need considered to be highly likely where the Proposed Development is located within a WLA, but less likely where the Proposed Development is located outwith the WLA, as is the case for the Causeymire-Knockfin Flows WLA. Taking into consideration the considerable

separation distance, and existing influence of the operational Beatrice Offshore Demonstrator, Beatrice OWF and Moray East OWF that are located in closer proximity to this WLA, it is considered that there is no potential for the Causeymire-Knockfin Flows WLA or the East Halladale Flows WLA to be significantly affected by the Proposed Development and it is proposed they are scoped out of the detailed assessment.

16.3.2.18 Those landscape designations which will be assessed in detail within the SLVIA are identified in Table 16.3. Agreement to this is sought through this scoping exercise, in order to enable the SLVIA to be focussed on key considerations.

Visual Baseline

16.3.2.19 The visual baseline resource experienced from the coastline within the SLVIA study area is diverse. The NCCT (2005) profiles for both the North Aberdeenshire/Moray coast, and East Caithness and Sutherland coast, broadly describe that in views from within the study area the seascape is perceived as open and expansive.

16.3.2.20 The coastline of the study area is generally rural in character with a predominantly agricultural land use and a strong association with the sea. There are numerous settlements along the coastline, with the largest of these being Fraserburgh, Banff and Macduff, Buckie, Lossiemouth, and Wick, and these are connected by main 'A' or 'B' roads that generally run close to, or on, the coast.

16.3.2.21 Concentrations of visual receptors along routes, in settlements and at visitor attractions located along the coast are generally sited slightly above sea level due to the underlying geology of the area. The main transport routes tend to run along the coast or are set back from it, running along more even ground, and provide links between the various settlements and linking the bridging points of the numerous water bodies. Locations around the confluences of the rivers and smaller water bodies present coastal areas, which have been eroded and these have often been exploited as areas suitable for settlement.

16.3.2.22 Older settlement areas and housing along the coast tends to have been sited and designed to reduce exposure from the coastal weather conditions. This means that older properties often do not have open outlooks towards the sea.

16.3.2.23 Modern parts of settlements and individual properties tend to still be arranged in order to limit the effects of exposure through their orientation and planting. However, modern building and glazing techniques mean that some newer properties or additions tend to be designed in order to obtain sea views.

Table 16.3. Preliminary appraisal of Landscape Designations and Defined Wild Land Areas.

WLA and Landscape Designations	Approx. distance to Proposed Development	Subject to Theoretical Visibility?	Needs Detailed Assessment within SLVIA?
Wild Land Areas (WLAs)			
Causeymire-Knockfin Flows WLA	41.38	Yes	No – The WLA lies within the 50 km study area and is shown to have theoretical visibility; however, when considering the influence of existing OWFs, which lie in closer proximity to this WLA, together with the separation distance to the Array Area, there would be no potential for significant effects on the qualities and attributes of this WLA to occur.
East Halladale Flows WLA	53.83	Yes	No – Considering the separating distance involved, and influence of existing OWFs that are in closer proximity.
Special Landscape Areas (SLAs)			
Duncansby Head SLA	34.67	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility, and coastal associations of this SLA.
Flow Country and Berriedale Coast SLA	40.30	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility, and coastal associations of this SLA.
Dunnet Head SLA	47.12	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility, and coastal associations of this SLA.
Gardens and Designed Landscapes (GDLs)			
Duff House GDL	37.61	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility.
Cullen House GDL	41.40	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility.
Dunbeath Castle GDL	44.14	Yes	Yes – Taking into consideration the proximity to the Array Area, potential for theoretical visibility.
Castle of Mey (Barrogill Castle) GDL	44.98	No	No – No theoretical visibility from this GDL.
Forglen GDL	47.25	No	No – due the separation distance from the Array Area, the wooded and valley nature of the GDL and influence of the intervening landscape.

WLA and Landscape Designations	Approx. distance to Proposed Development	Subject to Theoretical Visibility?	Needs Detailed Assessment within SLVIA?
Cairness GDL	48.33	No	No – due the separation distance from the Array Area, the wooded nature of the GDL and the influence of the intervening landscape.
Crimonmogate GDL	50.88	Yes	No – Considering the separating distances involved there would be limited influence upon associations between the designated/defined areas and the location of the Array Area.
Hatton Castle GDL	53.48	No	
Gordon Castle (Bog of Gight) GDL	53.76	Yes	
Melsetter House GDL	57.98	Yes	
Innes House GDL	58.16	Yes	

Zone of Theoretical Visibility

16.3.2.24 The visual baseline described is largely defined by the ZTV shown in Figure 16.2, Figure 16.3 and Figure 16.4. The ZTV shows the main area in which the Proposed Development would theoretically be visible, highlighting the different groups of people (visual receptors) who may experience views of the WTGs located within the Array Area and assisting in the identification of viewpoints where they may be affected. The ZTVs are based on WTGs of 350 m to blade tip (above MSL, but also MHWS for floating WTGs) and represents a likely worst-case scenario for the SLVIA considered in the scoping assessment, which may include floating WTGs.

16.3.2.25 The blade tip ZTV also illustrates the main coastal areas of the SLVIA study area with theoretical visibility of the Proposed Development. These areas of visibility have the potential to extend over relatively wide terrestrial areas; extending from Inverallochy in the south-east, along the coastlines of Aberdeenshire and Moray, to Buckie; in Highland from West Dunnet on the mainland to the north-west, along the Caithness and Sutherland Coastline from Duncansby Head in the north, to Berriedale to the south; and on the southern coastline and coastal hinterland of South Ronaldsay, Orkney.

16.3.2.26 To the west, the closest coastal areas with visibility of the Proposed Development will be from Duncansby Head to Latheron along the Highland coastline, with the closest onshore location to the Array Area at Helman Head, south of Wick, at approximately 23.3 km. Theoretical visibility occurs to the north west at West Dunnet; however, it is considered that actual visibility will be screened by intervening forestry. To the south, the closest coastal areas with visibility of the Proposed Development will be from Cullen to Rosehearty, with the closest location at Troup Head, at approximately 34.5 km.

Visual Receptors

16.3.2.27 The principal visual receptors in the study area are likely to be found along the closest sections of coastline. These include people within settlements, driving on roads, visitors to tourist facilities or historic environment assets, and people engaged in recreational activity such as those using walking and cycle routes.

16.3.2.28 A detailed assessment will be undertaken in the SLVIA for those visual receptors that are most susceptible to changes, which may experience significant visual effects as a result of the Proposed Development and will focus on visual receptors where the sea is a strong influence in the baseline view, along the coastlines of the study area and immediate hinterland, including:

- Coastal settlements – the Highland coastal settlement of Helmsdale, Dunbeath, Lybster, Keiss, and Wick; and Moray/North Aberdeenshire coastal settlement of Lossiemouth, Buckie, Cullen, Banff, and Fraserburgh, with smaller settlements at Findhorn, Kinloss, Portgordon, Findochty, Portknockie, Portsoy, Whitehills, Gardenstown, Rosehearty, Inverallochy and St. Combs located within the sheltered bays along this coast
- Recreational routes – walkers, equestrians and cyclists using the public rights of way network including long-distance trails such as the Speyside Way, Moray Coast Trail, and Formartine and Buchan Way, and National Cycle Route 1.
- Vehicular routes – main transport routes including the A882, A836, AA9(T), A90, A95, A96, A97, A98, A99, A941, A942, A948, A947, A950, A952, A961, A981, A990, with a number of 'B' roads and minor roads connecting the more remote parts of the study area. Within the study area, coastal sections of the A9, the A99 and the A836, form part of the North Coast 500, while the North East 250 includes coastal sections from Buckie to Fraserburgh. The study includes one main railway line in Highland, running between Inverness to Wick and Thurso (namely the Far North Line).
- Visitors to tourist facilities – such as beaches, public open space, common land, coastal caravan, and camping sites.

Representative Viewpoints

16.3.2.29 A proposed list of representative viewpoints is presented in Table 16.4 based on the ZTV for the Proposed Development (Figure 16.2, Figure 16.3 and Figure 16.4), the landscape and visual receptors described above, and informed by other projects including the viewpoints selected for the Moray East OWF and Moray West OWF.

16.3.2.30 The viewpoints represent sensitive visual receptors in the study area which have potential to be significantly affected and also a number of viewpoints outwith the proposed SLVIA study area to illustrate that significant effects would not occur from these locations. The selection of the viewpoints also considers the representation of different landscape and coastal character receptors, within which they are located, as well as the representation of the surrounding cumulative context. This means that the visual assessment is able to inform the wider assessment. While the aim is to achieve a distribution of viewpoints from different directions and distances across the study area, the priority is to ensure that the closer range or most sensitive receptors with the greatest potential to be significantly affected are fully represented.

16.3.2.31 Comment on the proposed viewpoint locations is invited as part of this request for a Scoping Opinion. Visualisations and figures will be produced to NatureScot's standards as set out in 'Visual Representation of Wind farms: Version 2.2' (NatureScot, 2017a).

Table 16.4. Proposed representative viewpoint locations.

ID	Description	Approximate Grid Reference	Approximate Distance to Array Area (km)	Reason for Selection
1	Duncansby Head	ND 340525 973250	37	High Cliffs and Sheltered Bays LCT, Duncansby Head RCCA, Duncansby Head SLA, visitor attraction.
2	Keiss	ND 334622 961190	32	Small Farms and Crofts LCT, Close to Sinclair's Bay RCCA, settlement, major road,
3*	Wick (path south of South View)	ND 337892 950970	23	Town LCT, Wick Bay RCCA, settlement, Core Path
4	Sarclet (Sarclet Haven Info Board)	ND 334992 943334	24	Small Farms and Crofts LCT, Sarclet Head RCCA, visitor attraction, scattered settlement
5	Whaligoe Steps	ND 332051 940296	26	Small Farms and Crofts LCT, Sarclet Head RCCA, visitor attraction
6	Lybster (end of Main Street)	ND 324843 935082	34	Small Farms and Crofts LCT, Lybster Bay RCCA, settlement, Core Path
7	Dunbeath (near Heritage Centre)	ND 316071 929526	44	Small Farms and Crofts LCT, Dunbeath Bay RCCA, in vicinity of Dunbeath Castle, settlement
8	Morven	ND 300482 928539	59	Lone Mountains LCT, Flow Country and Berriedale Coast SLA, Causeymire-Knockfin Flows WLA, hill walkers
9	Navidale	ND 303766 916161	59	Coastal Shelf LCT, Helmsdale to Berriedale Coastal Shelf RCCA, in vicinity of Loch Fleet, Loch Bora and Glen Loth SLA, major road, scattered settlement, close to settlement
10	Lossiemouth Harbour	NJ 323654 871295	59	Coastal LCT, Rossiemouth to Burghead Coast RCCA, settlement, close to Moray Coastal Trail, close to major road, harbour, close to Core Path
11	Portnockie (Bow Fiddle Rock Info Point)	NJ 349411 868741	40	Coastal LCT, Portgordon to Portnockie Coast RCCA, visitor attraction, Core Path, close to settlement
12*	Cullen (viaduct)	NJ 350995 867102	41	Coastal Lowlands LCT, Close to Cullen Bay RCCA, close to Cullen GDL, settlement, NCR 1, close to Moray Coastal Trail
13	Findlater Castle	NJ 354169 867086	39	The Coast LCT, Sandend Bay RCCA, visitor attraction, castle access path.
14	Portsoy	NJ 359071 866382	38	The Coast LCT, Sandend Bay RCCA, settlement
15	Ferry Route (Kirkwall to Aberdeen) – wireline only	ND 397455 906915	18	Passengers on ferries and other boats.

ID	Description	Approximate Grid Reference	Approximate Distance to Array Area (km)	Reason for Selection
16	Burwick Ferry Landing	ND 343787 983985	44	Coastal Hills and Heath LC. Passengers on ferries and other boats, Views from South Ronaldsay, Orkney Islands
17	Macduff, viewpoint outside Macduff Parish Church, Station Brae	NJ 370129 864384	37	Cliffs and Rocky Coast - Aberdeenshire LCT. Settlement at Macduff and Banff. Recognised viewpoint on Ordnance Survey mapping.
18*	Gardenstown, Seatown, Harbour Road	NJ 379733 864606	37	Cliffs and Rocky Coast - Aberdeenshire LCT. Settlement.
19*	B9031, west of Fraserburgh	NJ 398009 866949	41	Cliffs and Rocky Coast - Aberdeenshire LCT. Coastal road, close to settlement
20	Rosehearty Harbour	NJ 393116 867808	38	Cliffs and Rocky Coast - Aberdeenshire LCT. Settlement
Note, viewpoints proposed for night-time visual assessment are indicated with an asterisk (*).				

Preparation of Visualisations

16.3.2.32 It is proposed that the approach followed in the preparation of visualisations for Moray East and Moray West OWF SLVIAs is emulated for the Proposed Development. This includes visualisations prepared in accordance with the NatureScot (2017a) and Highland Council (2016) visualisation standards with the following visualisations to be prepared as appropriate:

- Daytime baseline photographs and cumulative wirelines to include a 90-degree field of view (cylindrical projection);
- Wireline view to include a 53.5-degree field of view (planar projection) for viewpoints to be agreed;
- Daytime photomontage to include a 53.5-degree field of view (planar projection) for viewpoints to be agreed;
- 75 mm single frame colour photomontage for viewpoints to be agreed (Highland viewpoints only);
- Single Frame Panoramic Viewer colour montage images (for agreed key viewpoints in Highland);
- Night-time baseline photographs and cumulative wirelines to include a 90-degree field of view (cylindrical projection) for selected viewpoints to be agreed; and
- Night-time photomontage to include a 53.5-degree field of view (planar projection) for agreed selected viewpoints to be agreed.

16.3.2.33 Photomontages illustrating the Proposed Development should be possible to prepare out to a range of 35-40 km. Viewpoints proposed for night-time visual assessment are indicated with an asterisk in Table 16.4.

16.4 Embedded Mitigation Considered within the EIA

16.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

16.4.1.2 Embedded mitigation measures of relevance to SLVIA are noted within Table 16.5 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to SLVIA receptors:

- M-3: Development of and adherence to a CMS. The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures.
- M-13: Development of and adherence to a VMP. The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development and consider vessel coordination including indicative transit route planning.
- M-14: Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.
- M-30: Marine navigation marking and lighting of the Proposed Development, as described in the LMP, will be defined in agreement with NLB and in line with IALA Recommendation O-139 (IALA, 2013).
- M-34: Aviation lighting and marking, as described in the LMP, will be installed in accordance with Article 223 of the UK Air Navigation Order (ANO) 2016 which sets out the mandatory requirements to be followed for lighting of offshore WTGs. Mitigation of the effects of civil aviation lighting may also be possible through agreement with the CAA and the MoD.
- M-37: The layout of the Proposed Development, as presented in the DSLP, will be finalised to ensure, as far as practicable, the reduction of seascape, landscape and visual effects on the closest coastal receptors.

16.4.1.3 The requirement and feasibility of any mitigation measures will be consulted upon with relevant consultees throughout the EIA process.

16.5 Scoping of Impacts

16.5.1.1 Potential impacts on seascape, landscape, and visual impact have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 16.5.

16.5.1.2 Impacts pathways arising from the Proposed Development at landfall would primarily affect terrestrial (onshore) landscape and visual receptors. Therefore, these project aspects will be considered as part of the Onshore Landscape and Visual Impact Assessment (LVIA) and thus will be detailed within the Onshore Scoping Report.

Table 16.5. EIA scoping assessment for Seascape, Landscape and Visual Impact.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Impact (daytime) of the construction of the offshore elements of the Proposed Development on coastal character	M-3	Scoped in	Potential for short-term, temporary impacts on perceived seascape coastal character, arising as a result of the construction activities and structures located within the Proposed Development, which may alter the seascape character of the area within the Array Area itself and the perceived character of the wider seascape through visibility of these changes.	✓	✓	✗	✗	✗
Impact (daytime) of the construction of the offshore elements of the Proposed Development on perceived landscape character/special qualities of designated landscapes	M-3	Scoped in	Potential for short-term, temporary impacts on perceived landscape character and special qualities of designated landscapes, arising because of the construction activities and structures within the Proposed Development, which may be visible from the coast (during good to excellent visibility conditions) and may therefore affect the perceived character and qualities of the landscape.	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impact (daytime) of the construction of the Proposed Development on visual receptors/ views	M-3	Scoped in	Potential for short-term, temporary impacts on views and visual amenity experienced by people from principal visual receptors and representative viewpoints, arising because of the construction activities and structures, which may be visible from the coast (during good to excellent visibility conditions) and may therefore affect views and visual amenity.	✓	✓	✗	✗	✗
Construction phase seascape, landscape, and visual impacts of the offshore elements of the Proposed Development outside the 50 km radius SLVIA study area (Figure 16.1)	-	Scoped out	The 50 km radius SLVIA study area is defined to an outer limit within which significant effects could occur. Significant effects will not occur beyond 50 km due to the limited changes to views arising from the Proposed Development over such distances, particularly since the Array Area is located largely beyond, east of, the operational Beatrice Offshore Demonstrator, Beatrice OWF and Moray East OWF.	✗	✗	✗	✗	✗
Impacts of the construction of the Proposed Development on physical aspects of landscape character	-	Scoped out	Due to the location of the Proposed Development at considerable distance offshore it will only impact on the perception of character and qualities – which is considered as an indirect effect in LVIA. No physical attributes that define landscape character or special qualities of designated landscapes will be changed because of the Proposed Development.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
The seascape, landscape, and visual impacts of the offshore cable route construction	-	Scoped out	Limited influence on seascape, landscape, and visual receptors due to sporadic, temporary nature of above sea construction processes. The activities mainly occur from vessels, which are already an apparent component of the baseline seascape and views.	X	X	X	X	X
Impact of the Array Area lighting on seascape coastal, landscape character and visual receptors at night during construction	-	Scoped out	Navigational lights associated with construction buoyage and construction vessels will not be visible from the coast. Aviation marking lights may be required on top of cranes associated with heavy lift vessels or jack up vessels, however, these will be temporary in nature and will largely be indistinguishable behind or in the context of existing wind farms which have visible aviation lighting.	X	X	X	X	X
Impact (daytime) of the decommissioning of the offshore elements of the Proposed Development on seascape coastal character	-	Scoped out	The residual effects on seascape character arising because of the decommissioning of the Proposed Development are likely to be the same or lesser magnitude and significance as those arising from construction, with the residual effects being short-term and temporary occurring during the length of the decommissioning phase. Such effects will not be assessed in detail.	X	X	X	X	X

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impact (daytime) of the decommissioning of the offshore elements of the Proposed Development on perceived landscape character and special qualities of designated landscapes	-	Scoped out	The residual effects on perceived landscape character arising because of the decommissioning of the Proposed Development are likely to be the same or lesser magnitude and significance as those arising from construction, with the residual effects being short-term and temporary occurring during the length of the decommissioning phase. Such effects will not be assessed in detail.	✗	✗	✗	✗	✗
Impact (daytime) of the decommissioning of the offshore elements of the Proposed Development on visual receptors/views	-	Scoped out	The residual effects on visual receptors/views arising because of the decommissioning of the Proposed Development are likely to be the same or lesser magnitude and significance as those arising from construction, with the residual effects being short-term and temporary occurring during the length of the decommissioning phase. Such effects will not be assessed in detail.	✗	✗	✗	✗	✗
Operation and Maintenance								
Impact (daytime) of the operation and maintenance of the Proposed Development on seascape coastal character	M-13, M-37	Scoped in	Potential for significant effect. Long term, reversible effects on perceived seascape character of Regional Coastal Character Areas, arising as a result of the operational WTGs, OSPs and maintenance activities located within the Array Area, which may alter the perceived character.	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Effects (daytime) of the operation and maintenance of the offshore elements of the Proposed Development on perceived landscape character/special qualities of designated landscapes	M-13, M-37	Scoped in	Potential for significant effect. Long term, reversible effects on perceived landscape character of LCTs and qualities of designated landscapes, arising because of the operational WTGs, OSPs, and maintenance activities, which will be visible from the coast (during good to excellent visibility conditions) and may therefore affect the perceived character and qualities of the landscape.	✓	✓	✗	✗	✗
Effects (daytime) of the operation and maintenance of the offshore elements of the Proposed Development on visual receptors/views	M-13, M-37	Scoped in	Potential for significant effect. Long term, reversible effects on views and visual amenity experienced by people as principal visual receptors and representative viewpoints, arising because of the operational WTGs, OSPs, and maintenance activities when visible from the coast during very good to excellent visibility conditions. WTGs will often be seen behind the operational wind farms however, their taller height and horizontal spread of the WTGs may result in effects on views.	✓	✓	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Effects (night-time) of the operation and maintenance of the Proposed Development visible aviation lighting on visual receptors/ views	M-13, M-14, M-30, M-34, M-37	Scoped in	Potential for significant effect. Long term, reversible effects on views and visual amenity experienced by people from principal visual receptors and representative viewpoints arising because of the marine navigation and visible aviation lights.	✓	✓	✗	✗	✗
Operation and maintenance phase seascape, landscape, and visual impacts of the offshore elements of the Proposed Development outside the 50 km radius SLVIA study area (Figure 16.1)	-	Scoped out	The 50 km radius SLVIA study area is defined to an outer limit within which significant effects could occur. Significant effects will not occur beyond 50 km due to the limited changes to views arising from the Proposed Development over such considerable distance, particularly since the Array Area is also located in part beyond, or will be appreciated in the context of, the operational Beatrice OWF and Moray East OWF.	✗	✗	✗	✗	✗
The seascape, landscape, and visual effects of the operation of the offshore cable route	-	Scoped out	The offshore cable is located below the sea surface so would not be visible as part of the seascape or views once operational and would therefore have no operational effect on seascape, landscape, and visual receptors.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Impact of the Proposed Development lighting on seascape coastal character and landscape character at night during operation and maintenance	-	Scoped out	The matter of visible aviation lighting assessment will be assessed as wholly a visual matter as it is considered that the proposed aviation lighting will not have significant effects on the perception of landscape or seascape character, which is not readily perceived at night in darkness. No attributes of seascape or landscape character will be changed because of the lighting of the Proposed Development.	X	X	X	X	X
Impact of the operation and maintenance of the Proposed Development on the views experienced by offshore visual receptors	-	Scoped out	The Proposed Development is in the immediate vicinity of other operational wind farms in the open sea at a considerable distance from the coast. Whilst there may be some increase in the density and spread of WTGs within this area and in views from vessels, offshore receptors likely to be in close proximity to the Array Area are not of high sensitivity and therefore this increase is unlikely to give rise to a significant visual effect.	X	X	X	X	X

16.6 Potential Cumulative Impacts

16.6.1.1 The assessment of cumulative effects describes the effects arising from the addition of the Proposed Development to a cumulative baseline of operational, under construction, consented and application stage OWFs, along with other large-scale energy developments within a 50 km study area, shown on Figure 16.1. This assessment will include supporting graphics such as cumulative ZTVs and cumulative wirelines.

16.6.1.2 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For SLVIA, cumulative interactions may occur with other planned OWFs as well as other activities in the study area.

16.6.1.3 Consultees will be asked to comment on the content of the final cumulative wind farm list and cut-off date for further updates prior to the completion of the SLVIA. This is not only to ensure the most up-to-date information is available, but also to allow sufficient time for the SLVIA to be produced. As with the assessment of significance of effects of the Proposed Development in isolation, the significance of cumulative effects is determined through a combination of the sensitivity of the coastal, landscape or visual receptor and the magnitude of change upon it.

16.7 Potential Transboundary Impacts

16.7.1.1 Due to the concentrated nature of any potential impacts on the seascape, landscape, and visual resource to the UK coastline within the 50 km SLVIA study area, transboundary impacts are unlikely to occur on seascape, landscape, or visual receptors. Therefore, transboundary impacts will be scoped out from further consideration within the SLVIA.

16.8 Potential Effects of Visible Aviation Lighting

16.8.1.1 The WTGs will be lit in accordance with civil aviation and navigation requirements. The visual effect of WTG lighting at night will be of importance to the statutory and non-statutory consultees, as well as people living and moving around in the study area. It is, therefore, proposed that an assessment of WTG lighting be included as part of the SLVIA.

16.8.1.2 A night-time impact assessment and visualisations illustrating WTG lighting at night, will be prepared for inclusion in the SLVIA. The hub height ZTV will be used to identify where there would be direct line of sight of the lights from the surrounding area. In order to inform this assessment, photographs will be taken from four of the readily accessible viewpoints at dusk and will prepare visualisations to represent the effects of lighting on these views in accordance with NatureScot guidance (see Table 16.4).

16.8.1.3 In terms of how lighting is captured in visualisations, ongoing work is being undertaken by NatureScot, in respect of WTG lighting visualisations for onshore turbines over 150 m. The main change in the latest version of the NatureScot's 'Visual Representation of Wind Farms' (NatureScot, 2017a) is in paragraphs 174-177 and relates to WTG lighting. For WTGs exceeding 150 m, the need to consult on new lighting visuals is now required.

16.8.1.4 Night-time visualisations will be produced using photographs taken after the period of Civil Twilight, when in addition to the WTG aviation lights other artificial lighting (such as street lights and lights on buildings) are on, to show how the visible aviation lighting will look compared to the existing baseline at night. The need for remote views in the hours of darkness is not anticipated.

16.8.1.5 The SLVIA specialist undertaking the assessment work for the Proposed Development has undertaken night-time lighting assessments and visualisations for several other wind farm projects around the UK. This will inform the basis of professional judgement regarding the level of effect arising from the proposed lighting.

16.9 Proposed Approach to EIA

16.9.1 Relevant Data Sources

16.9.1.1 The SLVIA will be informed by desk-based studies and field survey work undertaken within the SLVIA study area. The landscape, seascape and visual baseline will be informed by desk-based review of landscape and seascape character assessments, and the ZTV, to identify receptors that may be affected by the offshore elements of the Proposed Development and produce written descriptions of their key characteristics and value.

16.9.1.2 A preliminary desk-based assessment will be undertaken of seascape, landscape and visual receptors using ZTV analysis, to identify which landscape and visual receptors are unlikely to be significantly affected, which will be subject to a simple assessment, and those that are more likely to be significantly affected by the Proposed Development, which require a detailed assessment.

16.9.1.3 Interactions will be identified between the offshore elements of Proposed Development and seascape, landscape, and visual receptors, to predict potentially significant effects arising and measures may be proposed to mitigate effects.

16.9.1.4 For those receptors where a detailed assessment is required, primary data acquisition will be undertaken through a series of surveys. These surveys will include field survey verification of the ZTV from RCCAs/LCTs, micro-siting of viewpoint locations, panoramic baseline photography and visual assessment survey from all representative viewpoints (as listed in Table 16.4). Given that many of the viewpoints have been agreed previously with consultees, viewpoint photography and visual assessment surveys are planned to be started in during Autumn 2022 subject to appropriate weather conditions. If optimal weather conditions are not available, photography may be undertaken in early 2023.

16.9.1.5 Further visual assessment surveys are then likely to be undertaken prior to the application submission, using the photomontage visualisations to undertake field survey assessment of visual effects from each representative viewpoint. Sea-based offshore surveys are not proposed to be undertaken as part of the SLVIA. Illustrative wirelines (without baseline photography) will be prepared for offshore viewpoints if required.

16.9.1.6 Detailed assessment methods will be based on quantifying impacts through modelling to enable prediction of seascape, landscape, and visual effects. Assessment of the sensitivity of seascape, landscape and visual receptors will be undertaken, together with an assessment of the magnitude of change arising as a result of the offshore elements of the Proposed Development. Judgements on sensitivity and magnitude will be combined to arrive at an overall assessment as to whether the offshore elements of the Proposed Development will have an effect that is significant or not significant on each seascape, landscape, and visual receptor.

16.9.1.7 The SLVIA undertaken as part of the EIA will prepare the necessary information to assess the night-time visual effects of the proposed lighting of the offshore elements of Proposed Development.

16.9.2 Guidance

16.9.2.1 The assessment will be undertaken in accordance with the methods outlined in the following good practice guidance documents:

- Landscape Institute with the Institute of Environmental Management and Assessment. (2013). Guidelines for Landscape and Visual Impact Assessment. Third Edition.
- Landscape Institute. (2019). Visual Representation of Development Proposals Technical Guidance Note 06/19.
- Landscape Institute (2021). Assessing landscape value outside national designations.
- NatureScot. (2021). Assessing the Cumulative Impact of Onshore Wind Energy Developments.
- NatureScot. (2017a). Visual Representation of Windfarms: Version 2.2.
- NatureScot. (2017b). Siting and Designing Windfarms in the Landscape, Guidance (Version 3a).
- The Highland Council. (2016). Visualisation Standards for Wind Energy Developments.

16.9.3 Assessment Methodology

16.9.3.1 The objective of the assessment of the Proposed Development will be to predict the significant effects on the seascape, landscape, and visual resource. In accordance with the EIA Regulations, the SLVIA effects will be assessed to be either significant or not significant. The methodology to undertake the SLVIA will reflect the 'Guidelines for Landscape and Visual Impact Assessment: Third Edition' (Landscape Institute, 2013).

16.9.3.2 The SLVIA will assess the effects of changes resulting from the Proposed Development on seascape/landscape as a resource, the views available to people and their visual amenity. The SLVIA will be undertaken using the following steps:

- The features of the Proposed Development that may result in seascape, landscape and visual effects will be described. The overall scope of the assessment will be defined, including the study area and range of possible seascape, landscape, and visual effects.
- The seascape/landscape baseline will be established using seascape/landscape character assessment and the ZTV of the Proposed Development, to identify seascape and landscape receptors that may be affected and their key characteristics and value.
- The visual baseline will be established by identifying the ZTV, identifying the people who may be affected and identifying visual receptors and selecting representative viewpoints.
- A preliminary or 'simple' assessment will be undertaken of seascape, landscape and visual receptors using desk-based information, wirelines and ZTV analysis, to identify which seascape, landscape and visual receptors are unlikely to be significantly affected and can be scoped out of the assessment

(in consultation with relevant stakeholders) and those that are more likely to be significantly affected by the Proposed Development, which require to be assessed in full.

- Interactions are identified between the Proposed Development and seascape, landscape, and visual receptors, to predict likely significant effects arising and measures that are proposed to mitigate effects.
- An assessment of the susceptibility of seascape, landscape and visual receptors to specific change and the value attached to landscape receptors and views will be undertaken, combining these judgements to assess the sensitivity of the landscape and visual receptors to the Proposed Development.
- An assessment of the size/scale of seascape/landscape impact, the degree to which seascape/landscape elements are altered and the extent to which the impacts change the key characteristics of the landscape will be undertaken, combining these judgements to assess the magnitude of change on each seascape/landscape receptor.
- An assessment of the size/scale of visual impact, the extent to which the change would affect views, whether this is unique or representative of a wider area, and the position of the Proposed Development in relation to the principal orientation of the view and activity of the receptor will be undertaken. These judgements are combined to assess the magnitude of change on the visual receptor.
- The assessments of sensitivity to change and magnitude of change will be combined to assess the significance of seascape, landscape, and visual effects.

16.9.3.3 The significance of effects will be assessed through a combination of two considerations – the sensitivity of the landscape or visual receptor/view and the magnitude of change that will result from the Proposed Development. In accordance with GLVIA3 (Landscape Institute, 2013), the SLVIA methodology requires the application of professional judgement, but generally, the higher the sensitivity and the higher the magnitude of change the more likely that a significant effect will arise.

16.9.3.4 The objective of the cumulative SLVIA is to describe, visually represent and assess the ways in which the Proposed Development will have additional effects when considered together with other existing, consented or application stage developments and to identify related significant cumulative effects arising. The guiding principle in preparing the cumulative SLVIA will be to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process.

16.10 Scoping Questions

16.10.1.1 The questions in Table 16.6 are posed to consultees to frame and focus responses to the Seascape, Landscape and Visual Impact scoping exercise, which will in turn inform the Scoping Opinion.

Table 16.6. EIA scoping questions for Seascape, Landscape and Visual Impact.

Scoping Questions – Seascape, Landscape and Visual Impact
Do you agree with the data sources, including project specific surveys, to be used to characterise the SLVIA baseline within the (Offshore) EIA?
Are consultees content that the assessment of the effects on coastal seascape character and terrestrial landscape character should focus on a 40 km study area?
Do consultees agree with the proposal to scope out the landscape planning designations where no further assessment is proposed in the SLVIA as set out in Table 16.3?
Do consultees agree with the proposed list of representative viewpoints identified in Table 16.4 and shown on Figure 16.2, Figure 16.3 and Figure 16.4?
Do consultees agree with the approach to the assessment of visible aviation lighting and the proposed night-time viewpoints identified in Table 16.4?
Do consultees agree with the approach to cumulative assessment, or have any comments relating to the cumulative sites shown on Figure 16.1?
Do you agree that all pathways, receptors, and potential impacts have been identified for SLVIA?
Do you agree with the Proposed Development impacts which have been scoped out of the EIA for SLVIA?
Do you agree that transboundary impacts for SLVIA may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to SLVIA that have been identified for the Proposed Development?

17 Socio-economics, Tourism and Recreation

17.1 Introduction

17.1.1.1 This chapter of the Offshore Scoping Report identifies the Socio-economic, Tourism and Recreation receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development. The impacts associated with onshore elements, such as the onshore substation, will be considered as part of the Onshore Scoping Report and assessed separately as part of the EIAR.

17.2 Study Area

17.2.1.1 The Socio-economics, Tourism and Recreation onshore study areas for the assessment of effects on employment and economy onshore have been defined in line with the guidance on identification of 'local areas' for the offshore developments published by the Scottish Government (Scottish Government, 2022c). This guidance identified six principles for identifying study areas for offshore development, these are:

- Principle 1 (Dual Geographies) - The local area for the supply chain and investment impacts should be separate from the local area(s) for wider socio-economic impacts, including tourism and recreation;
- Principle 2 (Appropriate Impacts) – The appropriate impacts to be considered for assessments should be identified before defining the local areas;
- Principle 3 (Epicentres) – The local areas should include all the epicentres of the appropriate impacts;
- Principle 4 (Accountability) – The local areas used in the assessment should comprise of pre-existing economic or political geographies (community councils, local authorities, development agencies) to enhance accountability;
- Principle 5 (Understandable) – The local areas should be defined in such a way that they are understandable to the communities they describe; and
- Principle 6 (Connected Geography) – The local area for the supply chain and investment impacts should consist of connected (including coastal) pre-existing economic or political geographies.

17.2.1.2 In line with this guidance, the study areas for the socio-economic impacts are different from those used for the assessment of tourism and recreation impacts.

17.2.1.3 The Socio-economic study area is the smallest connected geography area that will include all likely epicentres of impact, such as sites for onshore infrastructure construction and the likely location of the key port locations in the UK.

17.2.1.4 The exact location of the ports that will be used during the construction and operation have not been decided at this time. To ensure that the geographies for the socio-economic impact assessment are accountable and understandable, local authorities have been used as the building blocks of the economic and demographic study areas.

17.2.1.5 Therefore, this shall be defined as the combined local authorities of:

- Aberdeen City;
- Aberdeenshire;
- Highland; and
- Moray.

17.2.1.6 This study area has been defined as 'North Scotland' throughout this chapter.

17.2.1.7 In addition to the above study area, the socio-economic impacts shall also be assessed at the level of Scotland and the UK.

17.2.1.8 For tourism and recreation, the onshore study area is a reduced one and focused on the local administrative areas that contain the Onshore ECC, as well as the coastal areas to the west of the Array Area. All of the potential landfall sites and the Onshore ECC are located in the Aberdeenshire Council area. This local authority covers a large geography and, therefore, a Tourism and Recreation study area has been refined based on the electoral wards, within Aberdeenshire, that will contain this infrastructure. These are the electoral wards of:

- Banff and District;
- Central Buchan;
- Troup; and
- Turriff and District.

17.2.1.9 These are the four areas which constitute the Aberdeenshire Tourism and Recreation Study Area (TRSA). A separate Highland TRSA including relevant electoral wards within the Highland Council area to the west of the Array Area will be defined as part of the EIA.

17.3 Baseline Environment

17.3.1 Data Sources

17.3.1.1 The data sources that have been used to inform this Socio-economic, Tourism and Recreation chapter of the Offshore Scoping Report are presented within Table 17.1. These data sources will be taken forward and used to inform the EIA, alongside any additional site-specific data that is collected for the Proposed Development.

Table 17.1. Summary of key publicly available datasets for Socio-economics, Recreation and Tourism.

Title	Source	Year	Author
Socio-Economic			
Mid-2020 Electoral Ward Population Estimates	https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-estimates/2011-based-special-area-population-estimates/electoral-ward-population-estimates	2021	National Records of Scotland
Population Estimates - local authority based by five-year age band	https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationestimates/datasets/populationestimatesforukenglandandwalesscotlandandnorthernireland	2021	Office for National Statistics (ONS)
2018-based population projections for council areas	https://www.nrscotland.gov.uk/statistics-and-data/statistics/statistics-by-theme/population/population-projections/sub-national-population-projections	2020	National Records of Scotland
Principal Population Projections, 2018-based	https://www.ons.gov.uk/peoplepopulationandcommunity/populationandmigration/populationprojections/bulletins/nationalpopulationprojections/2018based	2019	ONS
Annual Population Survey Oct 2020 – Sep 2021	https://www.nomisweb.co.uk/datasets/apsnew	2022	ONS
Annual Survey of Hours and Earnings 2021	https://www.nomisweb.co.uk/datasets/asher	2022	ONS
Business Register and Employment Survey 2020	https://www.nomisweb.co.uk/datasets/newbrespub	2021	ONS
Tourism and Recreation			
GB Day Visitor Survey 2019	https://www.visitbritain.org/gb-day-visits-survey-latest-results	2020a	Kantar TNS
GB Tourism Survey 2019	https://www.visitbritain.org/great-britain-tourism-survey-latest-monthly-overnight-data	2020b	Kantar TNS
Grampian Factsheet	https://www.visitscotland.org/binaries/content/assets/dot-org/pdf/research-papers-2/regional-factsheets/grampian-factsheet-2019.pdf	2020	VisitScotland
International Passenger Survey	https://www.visitbritain.org/inbound-tourism-performance-britain	2020	ONS
Visit a Place, Explore by Region	https://www.historicenvironment.scot/visit-a-place/	2022	HES
Visit Aberdeenshire	https://www.visitabdn.com	2022	Visit Aberdeenshire
Club or Centre Database	https://www.rya.org.uk/wheres-my-nearest	2022	RYA

17.3.2 Socio-economic Context

17.3.2.1 The nature of effects considered by the Socio-economics, Tourism and Recreation assessment apply at a range of spatial levels. It is therefore proposed that a four-tier approach to baseline characterisation, identification of potential receptors and assessment of effects. The socio-economic baseline is proposed to cover the following four tiers:

- The Aberdeenshire TRSA – defined as the electoral wards of:
  - Banff and District;
  - Central Buchan;
  - Troup; and
  - Turriff and District;
- North Scotland – defined as the local authorities of
  - Aberdeen City,
  - Aberdeenshire,
  - Highland; and
  - Moray;
- Scotland; and
- The UK.

17.3.2.2 The Aberdeenshire TRSA and North Scotland areas are shown in Figure 17.1. A separate Highland TRSA including relevant electoral wards within the Highland Council area to the west of the Array Area will be defined as part of the EIA.

300000
400000
500000
6500000
6400000
6300000
Highland
Moray
Aberdeenshire
Aberdeen City
Banff and District
Troup
Central Buchan
Turriff and District

Legend

- Array Area
- Offshore Export Cable Corridor
- North Scotland
- Aberdeenshire Tourism and Recreation Study Area (TRSA)

Scale at A3: 1:1,000,000

0 25 50 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
BPHB	DL	DH
Date: 02/09/2022	Revision: 01	
REF: UKCAL1_GO_WNF_SEC_MAP_00043		

Figure 17.1

The Aberdeenshire Tourism and Recreation Study Area (TRSA)

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Population

17.3.2.3 As shown in Table 17.2 (ONS, 2021a; National Records of Scotland, 2021), North Scotland had a population of 821,000 in 2020, which is equal to 15.0% of the total population of Scotland.

17.3.2.4 On the North Scotland population, a higher share are 65 and over (20.0%) compared to Scotland (19.3%) and the UK (18.6%). A lower share of the population is aged 16-64 (63.1%) compared to Scotland, but the share is higher than in the UK (62.4%). However, a lower share of the population is aged under 16 in North Scotland (16.9%) and Scotland (16.8%) than in the UK as a whole.

Table 17.2. Population, 2020 (Source: ONS, 2021a; National Records of Scotland, 2021).

Group	Aberdeenshire TRSA	North Scotland	Scotland	UK
Total	47,624	821,000	5,466,000	67,081,200
0-15	17.5%	16.9%	16.8%	19.0%
16-64	60.5%	63.1%	63.9%	62.4%
65+	22.1%	20.0%	19.3%	18.6%

Population Projections

17.3.2.5 Population projections are produced for countries and local authorities in Scotland (National Records of Scotland, 2019) but not for electoral wards. Population projections are also produced for the UK as a whole (ONS, 2019), which are based on recent trends in demographics, migration, fertility and mortality. The most recent comparable year is 2018.

17.3.2.6 Between 2018 and 2043, the population of North Scotland is expected to rise by 0.8%. This is lower than for Scotland as a whole (2.5%). In comparison, the population of the UK is expected to grow significantly faster (9.0%).

17.3.2.7 By 2043, the share of the population aged 16-64 in North Scotland is expected to decrease to 60.3%, a slightly higher share than Scotland (59.4%) and the UK (59.0%). However, the share aged 65 and over will increase over the same period to 24.9%, lower than Scotland (25.9%) but higher than the UK (24.0%). The population projections by age are shown in Table 17.3.

Table 17.3. Population projections by age, 2018-2043.

Group	North Scotland		Scotland		UK	
	2018	2043	2018	2043	2018	2043
Total	820,090	826,914	5,438,100	5,574,819	66,437,568	72,419,993
0-15	16.9%	14.8%	17.0%	14.6%	19.0%	17.0%
16-64	64.2%	60.3%	63.8%	59.4%	62.7%	59.0%
65+	18.9%	24.9%	19.2%	25.9%	18.3%	24.0%

Economic Activity

17.3.2.8 As shown in Table 17.4, the North of Scotland has an economic activity rate that is higher (78.5%) and a lower unemployment rate (4.1%), than both Scotland and the UK (ONS, 2022a). It also has a higher full-time median annual gross wage (£30,608) than the UK (£30,257) but is lower than Scotland (£31.659) (ONS, 2022).

Table 17.4. Economic indicators, 2021.

Economic Indicator	North Scotland	Scotland	UK
Economic Activity Rate (%)	78.5%	76.1%	78.3%
Unemployment Rate (%)	4.1%	4.3%	4.8%
Median Annual Gross Wage (resident)	£30,608	£31,659	£30,257

Industrial Structure

17.3.2.9 The Business Register and Employment Survey (BRES) collects statistics on employment by sector (ONS, 2021b). This shows that there are 14,595 jobs within the Aberdeenshire TRSA and 427,715 within North Scotland. This represents 16.8% of all Scottish employment of around 2.5 million. Employment by sector is shown in Table 17.5 for each of the study areas.

17.3.2.10 The Aberdeenshire TRSA has a relatively low share of employment in sectors associated with tourism, such as accommodation and food services, and arts, entertainment and recreation.

17.3.2.11 North Scotland, which might be expected to benefit from contracts related to development and construction, has a relatively high share of employment in professional, scientific and technical services, as well mining and quarrying, primarily driven by the offshore oil and gas sector.

17.3.2.12 The share of employment in the construction sector, which would be expected to benefit during the construction phase, is similar in North Scotland to elsewhere in the UK, while the share of employment in manufacturing is higher.

Table 17.5. Industrial Structure, 2020.

Industry	Aberdeenshire TRSA	North Scotland	Scotland	UK
Human health and social work activities	15.2%	15.2%	16.1%	13.2%
Wholesale and retail trade; repair of motor vehicles and motorcycles	13.6%	12.7%	13.7%	14.7%
Education	9.1%	6.9%	8.0%	8.6%
Administrative and support service activities	4.0%	5.6%	7.7%	8.6%
Accommodation and food service activities	6.6%	7.8%	7.1%	7.1%
Professional, scientific and technical activities	6.5%	9.5%	7.0%	8.8%
Manufacturing	16.1%	8.2%	7.0%	7.7%
Public administration and defence	2.7%	4.3%	6.2%	4.4%
Construction	12.1%	5.3%	5.1%	4.9%
Transportation and storage	4.5%	4.1%	4.3%	5.0%
Information and communication	0.8%	1.9%	3.5%	4.3%
Agriculture, forestry and fishing	1.7%	6.0%	3.1%	1.6%
Financial and insurance activities	0.3%	0.7%	3.1%	3.4%
Arts, entertainment and recreation	1.3%	1.9%	2.2%	2.3%
Other service activities	1.5%	1.4%	1.7%	2.0%
Real estate activities	0.4%	1.1%	1.5%	1.9%
Mining and quarrying	0.8%	6.0%	1.1%	0.2%
Electricity, gas, steam and air conditioning supply	2.2%	0.6%	0.8%	0.4%
Water supply; sewerage, waste management and remediation	0.5%	0.8%	0.7%	0.7%
Total	14,595	427,715	2,544,000	30,545,750

17.3.3 Tourism and Recreation Baseline

17.3.3.1 The tourism and recreation baseline in this section identifies the scale and key attractions of the tourism economy. This includes an overview of visitor numbers and their spend (which is not available at the level of the Aberdeenshire TRSA), key attractions and key assets of marine recreation within the Aberdeenshire TRSA.

Visits and Spend of Tourists

17.3.3.2 A range of statistics are available on tourism visitor numbers and visitor spend in North Scotland and Scotland, including the GB Day Visitor Survey (Kantar TNS, 2020a), the GB Tourism Survey (Kantar TNS, 2020b) and the International Passenger Survey (ONS, 2020), which are averages over a 3-year period (2017-2019). These are not available at the level of electoral wards and therefore no data is available for the Aberdeenshire TRSA, though data for Aberdeenshire as a whole has been included.

17.3.3.3 As shown in Table 17.6, the latest figures show that there were around 31 million visitors to North Scotland, with total spending of around £1.9 billion. This represented around 19% of visitor numbers in Scotland and 18% of visitor spending.

17.3.3.4 Day visitors represented 88% of total visitors, spending £906 million a year which represents 47% of Scottish spending. Domestic overnight visitors represent 10% of visitors and 35% of visitor spend, while international visitors represent 3% of visitor numbers, but 18% of spend.

Table 17.6. Visits and visitor spending, 2019.

Visits/Spend	Aberdeenshire	North Scotland	Scotland	UK
Visits (million)				
Day Visitors	9	27	145	1,795
Domestic Overnight	<1	3	12	1212
International Overnight	<1	1	4	40
Total Visits	10	31	161	1,957
Spend (£ million)				
Day Visitors	193	906	5,186	58,623
Domestic Overnight	52	679	2,989	24,099
International Overnight	32	316	1,538	27,413
Total Spend	276	1,902	10,714	110,135

Local Tourism Attractions

17.3.3.5 VisitScotland (VisitScotland, 2022) provides a database of popular visitor attractions in Scotland, which has been supplemented by attractions listed on HES (2022) and Visit Aberdeenshire (Visit Aberdeenshire, 2022). On this basis, 20 key attractions were identified within the Aberdeenshire TRSA and are shown in Table 17.7.

Marine Recreation

17.3.3.6 The National Marine Plan defines 11 SMRs, which extend to 12 nautical miles. In 2016, Land Use Consultants (LUC, 2016) published the results of a survey on tourism in SMR. The coastline of the Aberdeenshire TRSA is entirely covered by the Moray Firth SMR. The survey found that Moray Firth, which covers the area on the East Coast from above Wick to Fraserburgh, experiences the fifth highest level of activity amongst the 11 total SMRs. The region accounts for almost 10% of all marine recreation activities which took place in the SMRs in 2015.

17.3.3.7 There are 44 marine recreation and tourism businesses located in Moray Firth, accounting for 12% of businesses in the sector around Scotland, average compared to all 11 SMRs. In Moray Firth, the type of marine recreation tourism business which recorded the highest concentration of recreation and tourism activity was organised or led excursions on the coast or at sea, with over ten businesses providing this activity in the region. This activity accounts for a quarter of all marine recreation and tourism activity in the region. Moray Firth had the fifth highest number of businesses dedicated to this activity compared to other SMRs, with Clyde hosting 25 businesses providing organised or led excursions to the coast or at sea, West Highlands hosting 19, Argyll hosting 16 and Forth and Tay hosting 13.

17.3.3.8 The activities of instruction or training in coastal or marine recreation and the hire or charter of equipment or boats were each supported by 9 businesses in Moray Firth. The SMR had the fourth highest number of businesses providing instruction or training in coastal and marine recreation, preceded by Clyde (20), Argyll (10) and Forth and Tay (10). Moray Firth had the second highest number of businesses offering the provision of facilities providing coastal or marine recreation, preceded only by Clyde (17).

17.3.3.9 Across Scotland's SMRs, the most common marine and coastal recreation and tourism activity served by local businesses was bird and wildlife watching activities, accounting for 40% of all tourism activities served by marine tourism and recreation businesses. This was followed by general marine and coastal recreation, which accounted for over 25%, and sailing cruising including dinghy cruising, which also accounted for over 25% of activity.

17.3.3.10 Visitors to SMRs in 2015 spent a median £55 per day during recreation and tourism trips to the coast.

Marine Tourism and Recreation Assets

17.3.3.11 Using a search of the RYA website (RYA, 2022), three marine recreation and tourism assets located in, or neighbouring, the Aberdeenshire TRSA were identified and are shown in Table 17.8. A small number of surfing clubs were also identified as part of the tourism and recreation attractions in Table 17.7.

Table 17.7. Tourism and Recreation study area attractions.

Attraction	Description
Banff Castle	A ruined 12th century former royal castle
Banff Harbour Marina	A recreational harbour which hosts small fishing boats and pleasure craft
Deer Abbey	A ruined Cistercian Monastery
Delgatie Castle	Castle originally constructed in 1030
Duff House	Country house containing collections of furniture and art
Duff House Royal Golf Club	Golf course which looks out on to the Moray Firth
Eden Castle	A ruined tower house built in 1577
George Watt Surf School	Water sports centre offering surfing classes
Fyvie Castle and Estate	A 13th century castle with extensive grounds, managed by the National Trust for Scotland
Glendronach Distillery	Whisky distillery with a visitor centre offering tours
Inchdrewer Castle	A 16th century tower house which looks across to Banff Bay
Macduff Marine Aquarium	Aquarium showcasing Scotland's sea creatures and underwater habitats
Museum of Banff	Museum founded in 1828 featuring displays of Banff silver
Rhuallan Raptors	Falconry centre featuring educational talks, flying displays and hunting trips
RSPB Scotland Loch of Strathbeg Nature Reserve	Nature reserve providing habitat to a variety of wildlife
Sandend Beach	Broad sandy beach located In the small fishing village of Sandend
St Mary's Parish Church	Large church built in 1790 located in the South of Banff
Suds Surf School	Water sports centre providing classes in surfing, bodyboarding and stand-up paddleboarding
Troup Head Nature Reserve	Coastal cliff top nature reserve which provides habitat to Scotland's only mainland gannet colony
Turriff Golf Club	Eighteen-hole golf course which hosts events and competitions

Table 17.8. Marine Tourism and Recreation Assets in the Aberdeenshire TRSA.

Attraction	Description
Banff Sailing Club	Membership club which offers yacht racing and cruising as well as social events
Rosehearty Community Boat Club	Membership club which provides racing and social events, as well as boat storage
The Three Harbours Association	Membership club offering racing, cruising, and windsurfing

17.3.4 Strategic Context

National Performance Framework

17.3.4.1 Scotland's National Performance Framework (National Planning Framework (NPF); Scottish Government, 2018c), first published in 2018, sets out the ambitions of the Scottish Government across a range of economic, social and environmental factors. The framework includes 'increased wellbeing' as part of its purpose and combined measurement of how well Scotland is doing in economic terms with a broader range of wellbeing measures. The NPF is designed to give a more rounded view of economic performance and progress towards achieving sustainable and inclusive economic growth and wellbeing across Scotland.

17.3.4.2 The aims for Scotland set out in the NPF are:

- To create a more successful country;
- To give opportunities to all people living in Scotland;
- To increase the wellbeing of people living in Scotland;
- To create sustainable and inclusive growth; and
- To reduce inequalities and give equal importance to economic, environmental and social progress.

National Planning Framework

17.3.4.3 In 2021, the Scottish Government published a draft consultation for the NPF 4 (Scottish Government, 2021), which will set out Scotland's spatial strategy to 2045. It affirms the importance of Scotland's transition to a net zero economy through green investment and green jobs, with wind energy highlighted as playing a significant role in the coming years. It also states that renewable energy developments must take account of net economic impact including local and community socio-economic benefits, as well as impacts on tourism and recreation.

National Strategy for Economic Transformation

17.3.4.4 In March 2022, the Scottish Government released the National Strategy for Economic Transformation (Scottish Government, 2022b), which set out its ambition for Scotland's economy over the next 10 years. The Scottish Government's vision is to create a wellbeing economy where society thrives across economic, social and environment dimensions, which delivers prosperity for all Scotland's people and places. Of particular importance is the ambition to be greener, with a just transition to net zero, a nature-positive economy and a rebuilding of natural capital.

17.3.4.5 A key longer-term challenge identified in the strategy is to address deep-seated regional inequality, which includes in rural and island areas that face problems such as a falling labour supply, poorer access to infrastructure and housing. The transition to net zero presents a further challenge of delivering positive employment, revenue and community benefits.

17.3.4.6 To deliver its vision and address the economy's challenges, five programmes of action have been identified (with a sixth priority of creating a culture of delivery), including:

- Establishing Scotland as a world-class entrepreneurial nation;
- Strengthening Scotland's position in new markets and industries, generating new, well-paid jobs from a just transition to net zero;
- Making Scotland's businesses, industries, regions, communities and public services more productive and innovative;
- Ensuring that people have the skills they need to meet the demands of the economy, and that employers invest in their skilled employees; and
- Reorienting the economy towards wellbeing and fair work.

17.3.4.7 The strategy notes that Scotland has substantial energy potential, with a quarter of Europe's wind potential, and that it has developed a growing green industrial base. This provides a strong foundation for securing new market opportunities arising from the transition to net zero, for example in the hydrogen economy and in the decarbonisation of heating systems, where Scotland may be able to secure first-mover advantage and will need continuing investment and support. Renewable energy also has a role to play in supporting productive businesses and regions across Scotland.

Offshore Wind Policy Statement

17.3.4.8 The Scottish Government's 2020 Offshore Wind Policy Statement (Scottish Government, 2020d) highlights the substantial potential of Scotland's waters for offshore wind and the importance of the sector in the transition to net zero.

17.3.4.9 When the policy statement was published in October 2020, the ScotWind leasing round was expected to lead to an additional 11 GW of offshore wind capacity by 2030, generating substantial economic impacts in Scotland's offshore wind supply chain. In contrast, the ScotWind leasing round is now expected to lead to an additional 25GW of offshore wind capacity (CES, 2022a), with particular economic opportunities related to floating offshore.

Highlands and Islands Enterprise, 2019-2022 Strategy

17.3.4.10 The strategy for the Highlands and Islands, though expected to be updated relatively soon, sets out a vision for the region as well as key priorities and opportunities (Highlands and Islands Enterprise, 2019). Central to the strategy is increasing population choosing to live, work, study and invest in the region.

17.3.4.11 A number of opportunities for regional sectors are identified including the marine economy, and tourism, food and drink and creative industries. Included in these regions is the energy sector, which represents an economic, social and industrial opportunity, as well as an opportunity to support the transition from the oil and gas sector.

17.3.4.12 Key to this is the offshore wind sector, with significant potential in the waters off the Moray Coast and the potential for the world's largest cluster of offshore wind construction ports at the Cromarty Firth.

Moray Economic Strategy 2019-2029

17.3.4.13 The Moray Economic Strategy (Moray Economic Partnership, 2019) sets out a vision for Moray as a place with a diverse economy, increasing population and productive economy that encourages strong communities to flourish.

17.3.4.14 The strategy notes that the Moray economy is expected to see a decline in employment, in contrast to the rest of Scotland, and identifies a number of key sectors that can drive growth such as aerospace and defence, food and drink, life sciences and tourism. Construction and engineering are also highlighted as key sectors for growth, building on experience in the offshore oil and gas industry as well as more general construction.

17.3.4.15 While not mentioned the offshore wind sector is likely to contribute to the Moray economy with coastal ports benefitting from O&M contracts.

Regional Economic Strategy: Securing the Future of the North East Economy

17.3.4.16 In 2015, Opportunity North East, in collaboration with Aberdeen City Council and Aberdeenshire Council, published a regional economic strategy for the North East, which aimed to present a 20-year vision for the wellbeing of the region and its people (Opportunity North East, 2015).

17.3.4.17 Building on the Scottish Government's economic strategy (Scottish Government, 2015) and the recent decline in the price of oil (at the time of writing), the strategy envisions a stronger, more diverse economy and centres the four principles of investment in infrastructure, innovation, inclusive economic growth and internationalisation. Key sectors that were identified include the energy sector (including renewables and hydrogen), tourism, food and drink and fisheries and agriculture.

17.3.4.18 Offshore wind has gained increasing prominence more recently, including in the Aberdeen City Region Deal (Aberdeen City Region, 2022). Investments of over £350 million have been made in the Net Zero Technology Centre, which focuses on reducing emissions (including in the oil and gas sector), the deployment of offshore wind and integration of the new energy system. A further £350 million has been invested in the Aberdeen South Harbour, which is intended to play a significant role in offshore wind and maximising the benefits of ScotWind.

17.4 Embedded Mitigation Considered within the EIA

17.4.1.1 Certain measures have been adopted by the Proposed Development in order to reduce the potential for negative Socio-economic, Tourism and Recreation effects and to maximise any positive effects that are identified. This includes a Supply Chain Manager and a Community Engagement Officer who will work to ensure that the local area benefits from the Proposed Development and that disruption is minimised.

17.4.1.2 As part of the Supply Chain Development Statement (SCDS; Ocean Winds, 2021), Caledonia OWF has committed to support the development of the Scottish supply chain and maximise the potential economic benefits to Scotland, though this is contingent on the activities of a range of stakeholders and developers.

17.4.1.3 In addition, mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

17.4.1.4 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Socio-economics, Tourism and Recreation are noted within Table 17.9 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Socio-economics, Tourism and Recreation receptors:

- M-13: Development of and adherence to a VMP. The VMP will confirm the types and numbers of vessels that will be engaged on the Proposed Development, and consider vessel coordination including indicative transit route planning.
- M-14: Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting.
- M-19: Development of and adherence to a NSP. The NSP will describe measures put in place by the Proposed Development related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Proposed Development activity to other sea users (e.g., via Notice to Mariners).
- M-21: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins.

17.4.1.5 These mitigation activities are expected to reduce the disruption associated with the Proposed Development, reducing potential adverse impacts for tourism and recreation users.

17.5 Scoping of Impacts

17.5.1.1 Potential impacts on Socio-economics, Tourism and Recreation have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 17.9.

Table 17.9. EIA Scoping assessment for Socio-economics, Tourism and Recreation.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Employment and Gross Value Added (GVA) impacts	-	Scoped in	The development, construction and decommissioning of the Proposed Development will require expenditure with companies and organisations in each of the study areas. This will support employment and generate GVA in these organisations and the wider economy.	✓	✓	✓	✓	✓
Tourism and recreation activity and economic value	-	Scoped in	Changes to visitor behaviour as a result of the construction and decommissioning of the offshore and onshore elements of the Proposed Development, which may impact on the performance of the tourism economy.	✓	✓	✓	✓	✓
Demographic changes and demand for housing and other services	-	Scoped in	The potential influx of new people into the area to support the development, construction and decommissioning of the Proposed Development may have impacts on the demand for community services and structure of the population.	✓	✓	✓	✓	✓
Operation and Maintenance								
Employment and GVA impacts	-	Scoped in	The O&M of the Proposed Development will require expenditure with companies and organisations in each of the study areas. This will support employment and generate GVA in these organisations and the wider economy.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Tourism and recreation activity and economic value	-	Scoped in	Changes to visitor behaviour as a result of the O&M of the offshore and onshore elements of the Proposed Development, which may impact on the performance of the tourism economy.	✓	✓	✓	✓	✓
Demographic changes and demand for housing and other services	-	Scoped out	There is unlikely to be a significant change in population within the study areas as a result of the operational phase of the Proposed Development.	✗	✗	✗	✗	✗

17.6 Potential Cumulative Impacts

17.6.1.1 Chapter 4 (EIA Methodology) details how potential cumulative impacts will be assessed through a CIA and gives examples of those projects likely to be assessed. For Socio-economic, Tourism and Recreation, cumulative interactions may occur with other planned OWFs as well as other activities in the study area.

17.6.1.2 There is the potential for the Socio-economic, Tourism and Recreation impacts estimated from the Proposed Development to interact with impacts from other projects, such as the development of other ScotWind OWFs. In particular, there is the potential for cumulative issues to have an impact on the availability of Scottish content in the supply chain. These could be either positive or negative, as the cumulative ScotWind developments will make a stronger case for inward investment and the creation of new manufacturing and fabrication facilities in Scotland. However, it could also result in capacity issues of those providers.

17.6.1.3 To address this, the EIA (CIA) shall consider:

- Other offshore renewable energy projects and associated infrastructure, such as the other ScotWind projects and grid infrastructure upgrades;
- The capacity of the proposed manufacturing and fabrication facilities within the Cromarty Firth, as outlined in the Green Port proposals; and
- The potential timing of the Proposed Development in relation to the other cumulative developments.

17.6.1.4 There may also be cumulative benefits (synergies) associated the operation phase, as O&M bases that are currently in use, for example related to Moray East OWF and Moray West OWF, or will be used by ScotWind developments. This may lead to economies of scale, or potential capacity constraints.

17.7 Potential Transboundary Impacts

17.7.1.1 In general, the majority of socio-economic effects generated by the Proposed Development and considered within the assessment will be localised and relevant to the study area and ZoI, including impacts on recreation and tourism.

17.7.1.2 The widest study area used in this assessment is the UK. However, the Proposed Development will result in supply chain expenditure abroad, in addition to demand for specialist skills which are not available locally. This will, in turn lead to socio-economic impacts to areas outside the UK in the form of job creation and contribution to GVA/Gross Domestic Product (GDP) growth. These will not be considered as part of the economic impact assessment because the economic impacts will be dependent on properties of the national economies for where this activity occurs. At the stage of the assessment, it will not be known what these countries will be and therefore it will not be possible to reliably model these impacts.

17.7.1.3 Given the limited spatial extent of the effects and issues related to economic and supply chain assessment beyond the UK it is proposed to scope transboundary impacts out of the further EIA process for socio-economic receptors.

17.8 Proposed Approach to EIA

17.8.1 Relevant Data Sources

17.8.1.1 In addition to data provided by Caledonia OWF, Ocean Winds and previous experience of Economics specialists in supporting the Proposed Development, the sources that shall be used in this assessment will include:

- Mid-2020 Electoral Ward Population Estimates (National Records of Scotland, 2021)
- 2018-based principal population projections for council areas (National Records of Scotland, 2019);
- Business Register and Employment Survey (ONS, 2021b);
- Annual Business Survey (ONS, 2022b);
- Annual Survey of Hours and Earnings 2021 (ONS, 2022a);
- Population Estimates – local authority based by five year age band (ONS, 2022c);
- Principal Population Projections 2018-based (ONS, 2019);
- International Passenger Survey 2019 (ONS, 2020)
- GB Day Visitor Survey 2019 (Kantar TNS, 2020a)
- The GB Tourism Survey 2019 (Kantar TNS, 2020b)
- People Skills Survey 2021 – 2026 (Offshore Wind Industry Council, 2021);
- Collaborating for Growth: Strategies for Expanding the UK Offshore Wind Supply Chain (OWIC, 2020);
- Guidance on assessing the socio-economic impacts of OWFs (Oxford Brookes University, 2020);
- Offshore Wind O&M a £9 billion per year opportunity by 2030 for the UK to seize (ORE Catapult, 2020); and
- Guide to an OWF (BVG Associates, 2019).

17.8.1.2 In addition, the Scottish Census is expected to be published in advance of the EIAR chapter being drafted and where relevant this will be consulted as a data source.

17.8.2 Guidance

17.8.2.1 The socio-economic effects of the Proposed Development, including both the offshore and onshore activities, will be assessed together and presented in a single chapter of the EIAR.

17.8.2.2 The Scottish Government is in the process of developing guidance on the assessment of the socio-economic impacts of offshore wind energy projects. It is expected that this shall be published in 2022, thus prior to the completion of the EIA. It is assumed that this guidance shall build on current best practice, including guidance and principle contained within:

- Glasson *et al*. (2018). Guidance on assessing the socio-economic impacts of OWFs; and
- Scottish Government (2016). Draft advice on Net Economic Benefit and Planning.

17.8.3 Assessment Methodology

17.8.3.1 The economic impacts which will be considered will be reported in terms of:

- GVA – this is a measure of economic value added by an organisation or industry and is typically estimated by subtracting the non-staff operational costs from the revenues of an organisation;
- Years of Employment – this is a measure of employment which is equivalent to one person being employed for an entire year and is typically used when considering short term employment impacts, such as those associated with the development and construction phase of the Proposed Development; and
- Jobs – this is a measure of employment which considers the headcount employment in an organisation or industry. This measure is used when considering long term impacts such as the jobs supported during the operational phase of the Proposed Development.

17.8.3.2 The economic impacts associated with the supply chain will be assessed in line with the approach considered in the UK Offshore Wind Sector Deal (UK Government, 2020), the focus of the assessments will be the direct and indirect (supply chain) effects. In addition to this, the Proposed Development shall also consider the effects of staff spending and the economic impact that this subsequent increase in demand stimulates (the induced effect).

17.8.3.3 The offshore elements will include the construction and installation of new foundations and WTGs, the OSPs and the construction and installation of new inter-array/interconnector cables and export cabling.

17.8.3.4 It is acknowledged that, at the time of writing, the exact levels of expenditure are unknown by Caledonia OWF. This expenditure is what shall drive the positive economic impacts. The socio-economic assessment shall therefore consider the 'Worst Case Scenario' of the lowest, realistic levels of expenditure associated with the Proposed Development.

17.8.3.5 The analysis for the Proposed Development will cover the following stages:

- The development stage;
- The construction stage;
- The O&M stage; and
- The decommissioning stage.

17.8.3.6 The impacts during the development and construction phases will be based on the actual expenditure that has occurred to date as well as the planned expenditure associated with these stages. In addition to the total impact over the period, the assessment will also consider the timings of impacts during this stage to understand the peaks and troughs of this activity.

17.8.3.7 The impacts during the operational phase for the Proposed Development will be based on projected operational expenditure.

17.8.3.8 In instances where impacts are expected to occur over a number of years, such as the operational phase, a discount rate will be applied. This allows impacts that occur sooner to be valued more highly than impacts that occur in the future, a concept known as time preference. In this instance a discount rate of 3.5% will be chosen, which is in line with the UK Government's Green Book (UK Government, 2020).

17.9 Scoping Questions

17.9.1.1 The questions in Table 17.10 are posed to consultees to frame and focus responses to the Socio-economics, Tourism and Recreation scoping exercise, which will in turn inform the Scoping Opinion.

Table 17.10. EIA scoping questions for Socio-economics, Tourism and Recreation.

Scoping Questions – Socio-economics, Tourism and Recreation
Do you agree with the characterisation of the existing environment?
Do you agree that all pathways, receptors and potential impacts have been identified for Socio-economics, Tourism and Recreation?
Do you agree with the project impacts which have been scoped out of the EIA Socio-economics, Tourism and Recreation?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Socio-economics, Tourism and Recreation that have been identified for the Proposed Development?

18 Climate

18.1 Introduction

18.1.1.1 This chapter of the Offshore Scoping Report identifies the Climate receptors of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

18.1.1.2 There are three individual climate change assessments which will be undertaken:

- GHG Emissions[40] assessment (i.e., carbon assessment) – this will identify the estimated GHG emissions associated with construction, O&M and decommissioning, in comparison with current and future baseline GHG emissions. It will also identify mitigation measures to reduce GHG emissions through the life cycle of the Proposed Development. The term 'carbon' is used interchangeably to refer to GHG emissions.
- Climate Change Resilience (CCR) assessment – this will identify what climate changes are expected to occur in the future, and the vulnerability of the Proposed Development to those identified changes in climate.
- In-combination Climate Change Impact (ICCI) assessment – this will identify where a changing climate will combine with environmental impacts arising from the Proposed Development, resulting in significant effects on environmental receptors within the scope of the EIA which are not present under current climate conditions.

18.2 Study Area

18.2.1 GHG Assessment

18.2.1.1 The spatial study area for the GHG emissions assessment includes sources and removals of GHG emissions arising from construction and operation of the Proposed Development, as set out below.

18.2.1.2 For the assessment of GHG emissions associated with construction of the Proposed Development, the study area is defined by the emissions sources associated with constructing the Proposed Development. This includes emissions associated with the extraction, manufacture, and transportation of materials to the construction site (which may be sourced at a large distance from the site of the Proposed Development) as well as emissions associated with construction processes on site (such as fuel/energy use, and construction waste management).

18.2.1.3 For the assessment of operational GHG emissions associated with the Proposed Development over the appraisal period, emissions arising from maintenance and replacement of development will be estimated. In addition, GHG emissions associated with the Proposed Development's operational energy consumption will be considered within the assessment. An assessment will also be made of the likely electricity generation output arising from the Proposed Development during operation (based on a common operational profile used across the EIA), which will

[40] The 'basket' of GHGs defined under the Kyoto Protocol (which will form the basis of this assessment) comprises carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), perfluorocarbons (PFCs), hydrofluorocarbons (HFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF_3).

be contextualised against the forecast marginal carbon intensity of grid electricity for the UK in future years[41].

18.2.1.4 Aligning with PAS 2080: Carbon Management in Infrastructure, IEMA (2022) guidance and best practice, a summary of GHG emission sources included within the lifecycle assessment informing this assessment can be found below within Table 18.1.

Table 18.1. Summary of GHG study area components within the Climate assessment.

Project Stage	PAS 2080 Lifecycle Stage	Description	Justification for Inclusion in/Exclusion from Assessment
Pre-construction	A0	Preliminary studies, consultation	Excluded – work predominantly office-based and assumed to be negligible.
Construction	A1-3	Raw material supply	Included.
	A4	Transport to works site	Included.
	A5	Construction/ installation processes	Included – emissions associated with plant use and fuel for vehicles/shipping during construction, and any waste arising from construction processes.
	D	Land use change	Excluded – offshore components assumed to be negligible.
Operation	B1	Use	Excluded – GHG emissions associated with fabric of products and materials once they have been installed is assumed to be negligible.
	B2, B3 and B4	Maintenance, Repair and Replacement	Included.
	B5	Refurbishment	Excluded – the Proposed Development is not expected to undergo refurbishment during its lifetime[42].
	B6	Operational energy use	Excluded – GHG emissions associated with energy consumption (i.e., lighting) are likely to be negligible offshore. Any assessment of low carbon electricity generation benefits will be included in this lifecycle stage.
	B7	Operational water use	Excluded – GHG emissions associated with water use on site are likely to be negligible offshore.
	B8	Other operational processes	Excluded – other GHG emissions associated with the Proposed Development (such as management of operational waste) are likely to be negligible offshore.
	B9	User utilisation of infrastructure	Excluded – not applicable to the Proposed Development.
	D	Ongoing land use emissions and sequestered	Excluded – offshore components assumed to be negligible.
End of Life	C1	Deconstruction	Included.
	C2	Transport	Included.
	C3	Waste processing for recovery	Included.
	C4	Disposal	Included.

[41] Benefits from generation and export of low carbon electricity in the GHG assessment will need clear attribution to distinct project assessments to avoid double-counting across associated/linked projects.
[42] At the end of the Proposed Development's lifetime, there will be an assessment of the viability for re-powering versus decommissioning. If re-powering was deemed feasible, an assessment process would be completed at a later stage (not included as part of the current EIA/application process).

18.2.1.5 The temporal boundary for GHG emissions assessment constitutes the construction phase (assumed to commence offshore work in 2028 for a duration of approximately three years), operational phase and decommissioning phase.

18.2.2 CCR Assessment

18.2.2.1 The study area for the CCR assessment is based on the construction footprint and includes temporary and completed works within the redline boundary. The assessment includes all potential climate hazards for infrastructure and assets associated with the Proposed Development and the assessment of climate effects are assessed over the assumed appraisal period for the Proposed Development.

18.2.2.2 The spatial boundary for the Proposed Development includes the Array Area (25 km from the coast), the Offshore ECC and landfall up to MHWS. This means there are both offshore and coastal elements within this boundary. The primary source of information to identify future changes in climate for the assessment will be the Met Office (2022) UKCP18 climate projections. These projections are developed to reflect likely climate change for land and coastal areas, and not specifically for offshore areas. However, for the purposes of a proportionate assessment of climate risk, the baseline and projection data used within the CCR assessment are taken from the UKCP18 projections for the local area and are assumed to broadly reflect changes in the vicinity of those elements of the Proposed Development in the offshore area. Some impacts identified via UKCP18 (e.g., flooding) will not be applicable to offshore areas.

18.2.3 ICCI Assessment

18.2.3.1 The study area for the ICCI Assessment is the study area for each environmental discipline as described in the individual topic chapters.

18.3 Baseline Environment

18.3.1 Overview of the Baseline Environment

GHG Assessment

18.3.1.1 Aligning with IEMA (2022) guidance, the baseline (Do-Minimum (DM) scenario) is the reference against which the impact of the Proposed Development will be compared and assessed. Assumptions are made on the projected cumulative GHG emissions over the study period under this DM scenario. The DM scenario comprises the cumulative GHG emissions within the study area without implementation of the Proposed Development.

18.3.1.2 The GHG baseline has been taken as a continuation of the current situation in which no proposed energy infrastructure is delivered. Therefore, as there are currently no activities ongoing on the site, the baseline emissions associated with the Proposed Development (both current and future) are assumed to be zero.

CCR Assessment

18.3.1.3 The Met Office generates climatologies for different areas of the UK, known as climate regions, including historical regional climate information. The Proposed Development is located within the Northern Scotland climate region. High-level climate observations for Northern Scotland over a 30-year averaging period between 1981-2010 are presented in Table 18.2.

ICCI Assessment

18.3.1.4 The baseline for the ICCI Assessment will be the baseline as described in each environmental discipline chapters.

Table 18.2. High level climate observations for the Northern Scotland climate region (1981-2010) (Source: Met Office, 2016).

Climatic Conditions	Climate Observations 1981-2010
Temperature	Mean annual temperatures were around 9°C close to the Moray Firth. January (winter) mean daily temperatures ranged from -1°C to 2°C, whilst July (summer) mean daily maximum temperatures were approximately 19°C around the Moray Firth.
Sunshine	Average annual sunshine totals were approximately 1300 hours, with average hours decreasing further from the coast.
Rainfall	Annual average rainfall near the Moray Firth was around 700mm. In the area, rainfall tends to be more evenly distributed throughout the year.
Snowfall	Snow usually occurs between November and April, and rarely lies at lower levels outwith this time. It is more common at higher altitudes than in coastal areas.
Wind	Northern Scotland is the windiest part of the UK, with the windiest season in winter months. This is due to Atlantic depressions moving across the UK, starting with winds from south/southwest. Spring has the maximum frequency of winds from the northeast.
Air Frost	Air frost occurs when the temperature at 1.25 m above the ground falls below 0°C. The average number of days with air frost varies from 90 to 140 days per year.
Ground Frost	Ground frost occurs when a temperature below 0 °C is measured on a grass surface. The average number of days with ground frost varies from 90 to 140 days per year.

18.4 Embedded Mitigation Considered within the EIA

18.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

18.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Climate are noted within Table 18.5 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Climate receptors:

- M-3: Development of and adherence to a CMS. The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures;
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management; and
- M-12: Development of and adherence to a PEMP, which will set out commitments to environmental monitoring in pre-, during and post-construction Proposed Development phases.

18.5 Scoping of Impacts

18.5.1 GHG Assessment

18.5.1.1 The Proposed Development will lead to the generation of GHG emissions during construction. However, the Proposed Development will support the generation of low carbon electricity during operation which will (assuming it reduces or avoids fossil fuel use) provide a net benefit against a future baseline in the absence of the Proposed Development.

18.5.1.2 The potential sources of GHG emissions during the Proposed Development lifecycle are outlined in Table 18.3.

Table 18.3. Potential sources of GHG emissions during project lifecycle.

Sub-stage of PAS 2080 Lifecycle	Potential Source of GHG Emissions
Construction	
Product stage; including raw material supply, transport and manufacture (A1-3)	Embodied GHG emissions associated with the required raw materials. Vehicle emissions for transportation prior to factory gate. Energy use for fabrication of offshore project elements (e.g., WTGs). Industrial and energy emissions in the manufacture of materials.
Construction process stage: including transport to and from works site as well as construction and installation processes (A4-A5)	Vehicle and shipping emissions for transportation of materials to site. Energy and fuel use in construction processes.
Operation	
Operation and maintenance (including repair and replacement) (B2- B5)	Energy consumption for infrastructure operation and activities of organisations conducting routine maintenance including extraction, manufacture, transportation and installation energy use. Embodied carbon associated with materials used for repair and replacement activities.
End-of-Life	
Decommissioning (C1-4)	Energy consumption in deconstruction processes. Vehicle and shipping emissions for transportation of materials away from site. Waste management of decommissioning materials.

18.5.2 CCR Assessment

18.5.2.1 During the construction phase (currently assumed 2028-2030) of the Proposed Development, there is potential for the anticipated changes to the climate (such as extreme weather events) to negatively impact the Proposed Development.

18.5.2.2 During the operational phase of the Proposed Development, there is potential for the anticipated changes to the climate and extreme weather events to impact on the Proposed Development.

18.5.2.3 The potential weather events during the Proposed Development lifecycle are outlined in Table 18.4. The potential impacts provided above for both GHG and CCR assessments are summarised in Table 18.5.

Table 18.4. Summary of weather events and the potential impacts on the Proposed Development across the full project lifecycle.

Primary Weather Event	Potential Impacts
Heavy rain	Delay to construction programme Damage to WTG blades in use, such as leading edge erosion
High winds and gales	Damage to WTGs/rotor blades from wind/wind borne debris in use Uneven loading of WTGs Delay to construction programme
Increased temperatures and prolonged periods of hot weather	Health impacts of workers from breathing problems and sunstroke Heat stress on electronic equipment Increased frequency of maintenance and repair/replacement
Increased frequency of extreme weather events	Damage to WTGs/rotor blades from wind Uneven loading of WTGs Increased requirement for maintenance and repair Increased costs (e.g., associated with increased frequency of maintenance and repair)
Lightning	Structural damage to infrastructure Power surges and tripping electricity breakers. Fires Health impacts from direct strikes
Snow and ice	Damage to WTGs/rotor blades Health impacts from slipping on ice and chest illnesses
Fog	Danger to workers/shipping due to reduced visibility

Table 18.5. EIA Scoping assessment for Climate

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
GHG emissions associated with raw material supply, transportation and manufacture	M-3, M-8, M-12	Scoped in	The Proposed Development will lead to generation of GHG emissions during construction.	✓	✓	✓	✓	✓
GHG emissions associated with construction processes including transportation to site and installation processes	M-3, M-8, M-12	Scoped in	The Proposed Development will lead to generation of GHG emissions during construction.	✓	✓	✓	✓	✓
GHG emissions associated with decommissioning processes and waste materials	M-8, M-12	Scoped in	The Proposed Development will lead to generation of GHG emissions during decommissioning.	✓	✓	✓	✓	✓
Climate Change Resilience of construction period	M-3, M-8, M-12	Scoped in	There is potential for anticipated changes to climate (such as extreme weather events) to negatively impact the Proposed Development during construction and decommissioning.	✓	✓	✓	✓	✓

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Operation and Maintenance								
GHG emissions associated with operation including energy use	M-8, M-12	Scoped in	The Proposed Development will support the generation of low carbon electricity during operation, however net benefits against a future baseline will be assessed.	✓	✓	✓	✓	✓
GHG emissions associated with maintenance including materials used for repair and replacement activities	M-8, M-12	Scoped in	The Proposed Development will lead to generation of GHG emissions during maintenance cycles associated with material replacement and repair activities.	✓	✓	✓	✓	✓
Climate Change Resilience of operational period	M-8, M-12	Scoped in	There is potential for anticipated changes to climate (such as extreme weather events) to negatively impact the Proposed Development during operation.	✓	✓	✓	✓	✓

18.6 Potential Cumulative Impacts

18.6.1.1 In line with IEMA GHG guidance (IEMA, 2022), cumulative impacts will be scoped out of the GHG Assessment.

18.6.1.2 For the CCR assessment a cumulative impact would be where other development may increase climate risks to the Proposed Development. Given the discrete nature of offshore infrastructure it is not considered likely that other developments would increase risks. These will be scoped out of the assessment.

18.6.1.3 For the ICCI assessment, cumulative ICCI impacts would occur where climate change impacted upon other environmental receptors which were themselves at risk from cumulative impacts. It is expected these cases are likely to be minimal but risks of ICCI cumulative impacts will be scoped into the main review of ICCI risks.

18.7 Potential Transboundary Impacts

18.7.1.1 GHG emissions are inherently transboundary and will be assessed against national carbon targets which represent the international consensus on reducing global GHG concentrations.

18.7.1.2 For the CCR and ICCI assessments, it is not considered likely that there will be significant transboundary impacts, and these are scoped out of the assessment.

18.8 Proposed Approach to EIA

18.8.1 Relevant Data Sources

GHG Assessment

18.8.1.1 The information to inform this carbon assessment will be from a combination of project specific information available at the current design stage alongside publicly available industry benchmarks that can be used to provide a preliminary estimate of embodied carbon emissions and operational energy.

18.8.1.2 The carbon emissions for the Proposed Development will be calculated by converting 'activity' data into carbon emissions through the application of referenced typical emissions conversion factors widely used within the industry.

18.8.1.3 The main emissions factors used in the assessment will be from the following sources:

- Greenhouse Gas Reporting: Conversion Factors (published annually);
- Inventory of Carbon and Energy database V3; and
- Valuation of energy use and greenhouse gas emissions for appraisal: supplementary guidance to the HM Treasury Green Book.

18.8.1.4 The main reference periods for assessing emissions will be in line with the UK Carbon Budget periods, covering 2025-2037 (Fourth, Fifth and Sixth Carbon Budgets), summarised in Table 18.6.

Table 18.6. Carbon budget periods.

Carbon Budget and Period	Carbon Budget Limit	Reduction Below 1990 levels
Fourth (2023-2027)	1,950 $MtCO_2e$	50% by 2025
Fifth (2028-2032)	1,725 $MtCO_2e$	68% by 2030*
Sixth (2033-3037)	965 $MtCO_2e$	78% by 2035
* Originally 57% when Fifth Carbon Budget was enshrined in law, has recently been increased to 68% as the UK's National Determined Contribution ahead of the United Nations' Conference of the Parties (26) (COP26) in November 2021 (BEIS, 2020).		

CCR Assessment

18.8.1.5 As part of the CCR Assessment, future projected climate conditions and extreme weather events for the area encompassing the Proposed Development will be provided for the 2060s. These time periods will cover the assumed operational life of the Caledonia OWF.

18.8.1.6 Using the historical baseline data, changes in average climate conditions will be obtained from the UKCP18 probabilistic projections of climate change to establish the future climate baseline.

18.8.1.7 In the EIAR, climate change projections for a range of meteorological parameters will be presented for different probability levels within the RCP8.5 high emission scenario for the near-term and long-term future time periods for the 2060s.

18.8.2 Guidance

18.8.2.1 The Proposed Development will be assessed within the context of the UK's evolving carbon agenda. This assessment will use the most up-to-date guidance that is feasible under project programming constraints.

18.8.2.2 The assessments within the EIAR will be carried out with due consideration of the following guidance documents:

- IEMA (2022). EIA Guide to Assessing GHG Emissions and Evaluating their Significance; and
- IEMA (2020). EIA Guide to Climate Change Resilience and Adaptation.

18.8.3 Assessment Methodology

GHG Assessment

18.8.3.1 The carbon assessment will be consistent with the best practice approach set out in the IEMA guidance on assessing GHG emissions and evaluating their significance.

18.8.3.2 The GHG assessment will quantify and report the GHG emissions anticipated to be generated or avoided by the Proposed Development. This will be reported in tonnes of carbon dioxide equivalent (tCO_2e), a single metric of the global warming potential of the main GHGs.

18.8.3.3 The methodology focuses on assessing the impact of the Proposed Development on carbon emissions by quantifying the net carbon emissions arising from each lifecycle stage. Emissions associated with the Proposed Development will be compared to the baseline DM scenario (as described under 'Baseline Conditions' above) to quantify the net impact of the Proposed Development.

18.8.3.4 As part of the assessment process, the wider Proposed Development team will identify opportunities to reduce the whole-life carbon of the Proposed Development across both construction and operational phases.

18.8.3.5 The Proposed Development is expected to result in increased GHG emissions through the construction stage. It will generate and export renewable energy throughout the operational stage. These assumptions will be confirmed within the EIAR and will be presented in the context of wider sectoral and geographic GHG emissions.

CCR Assessment

18.8.3.6 The CCR assessment relates to the resilience of the Proposed Development to climate change impacts. This will be reported in the form of potential hazards to development assets. The study period for assessment of climate risks will cover the construction, operation and decommissioning phases of the Proposed Development.

18.8.3.7 The CCR assessment will be qualitative. It will identify likely future climate hazards and will consider potential impacts and risks arising from these for the Proposed Development. A qualitative appraisal of the significance of impacts will be carried out based on consideration of the likelihood and consequence of each impact in line with the approach set out in IEMA guidance on Climate Change Resilience and Adaptation.

18.8.3.8 Key issues related to climate change include extreme weather events, sea level rise and storm surges. These will need to be taken into consideration during construction and operation of the Proposed Development.

18.8.3.9 Risks will be scored as either: very high, high, medium, low, or very low. The risk assessment will identify the need for any additional resilience measures to protect against the impacts of climate change, based on those risks assessed as high' or 'very high'. High level resilience measures will be designed as part of a workshop with key engineering and design experts.

18.8.3.10 It is considered unlikely that significant climate resilience effects will be identified, or where the potential for these are identified it is expected that adequate mitigation will be included within wider environmental and engineering design approaches. This will be confirmed within the EIAR.

ICCI Assessment

18.8.3.11 Following consideration of potential climate change impacts, professional judgement will be used by environmental discipline experts to produce high level, qualitative statements about potential topic specific impacts resulting from projected climate change (i.e., changes and trends in climate averages and extreme weather events) for receptors and resources in the area surrounding the Proposed Development. These will include recommendations for any required mitigation measures as well as allowances for future monitoring to ensure the identification of unexpected impacts on environmental receptors and resources.

18.8.3.12 The potential significance of in-combination climate change impacts will be assessed qualitatively, based upon the professional judgement of relevant environment and climate change specialists.

18.8.3.13 All environmental topics within the subsequent EIAR may be affected by changes in climatic conditions. The Proposed Development will be designed to be resilient to forecasted changes in climate and the in-combination impacts will be assessed for all topics.

18.9 Scoping Questions

18.9.1.1 The questions in Table 18.7 are posed to consultees to frame and focus responses to the Climate scoping exercise, which will in turn inform the Scoping Opinion.

Table 18.7. EIA scoping questions for Climate.

Scoping Questions – Climate
Do you agree with the data sources to be used to characterise the Climate baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for Climate?
Do you agree with the project impacts which have been scoped out of the EIA for Climate?
Do you agree that transboundary impacts for Climate may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Climate that have been identified for the Proposed Development?

19 Other Human Activities

19.1 Introduction

19.1.1.1 This chapter of the Offshore Scoping Report identifies the Other Human Activities of relevance to the Proposed Development and considers the potential impacts from the construction, O&M and decommissioning of the Proposed Development, up to MHWS.

19.2 Study Area

19.2.1.1 The Other Human Activities study area is defined by the Proposed Development footprint (Array Area, Offshore ECC and any associated infrastructure), plus a buffer of 10 nm. This buffer aligns with the Shipping and Navigation buffer described in this Offshore Scoping Report (see Chapter 13: Shipping and Navigation) and considers the movement of other mobile marine activities.

19.3 Baseline Environment

19.3.1 Data Sources

19.3.1.1 For the purpose of this Offshore Scoping Report, a desk-based review of existing and known/planned activities and projects was undertaken using relevant spatial and scientific data sources. The data sources that have been used to inform this Other Human Activities chapter are presented within Table 19.1. These data sources will be taken forward and used to inform the EIA.

Table 19.1. Summary of key publicly available datasets for Other Human Activities.

Title	Source	Year	Author
The Marine Scotland NMPi Maps	Marine Scotland – National Marine Plan Interactive (atkinsgeospatial.com)	2022	Marine Scotland
Scotland's National Marine Plan (revised)	Scotland's National Marine Plan: https://www.gov.scot/publications/national-marine-plan-review-2018-three-year-report-implementation-scotlands	2018	The Scottish Government
Sectoral marine plan: regional locational guidance	https://www.gov.scot/publications/sectoral-marine-plan-regionallocational-guidance	2020	The Scottish Government
Energy and Infrastructure Spatial Data	https://www.crownestatescotland.com/resources/documents	2022b	CES

19.3.2 Overview of Baseline Environment

19.3.2.1 The findings from the initial desk-based review to support this Offshore Scoping Report are set out in the following sections, providing an understanding of the marine environment with regards to Other Human Activities within the vicinity of the Proposed Development. The key Other Human Activities identified from this research include:

- Offshore renewables (wind, wave and tidal marine infrastructure);
- Utilities (telecommunications and subsea cables);
- Oil and gas (including carbon capture and storage marine infrastructure);
- Marine dredging and disposal (capital, maintenance and aggregate); and
- Other marine infrastructure.

19.3.2.2 Chapter 15 (Military and Civil Aviation) provides a comprehensive description of relevant MoD activities across the Other Human Activities study area and, therefore, has not been considered within this chapter.

Offshore Renewables

Offshore Wind

19.3.2.3 As shown in Figure 19.1, there are three offshore wind renewable energy projects within the study area, namely 'Beatrice', 'Moray East' and 'Moray West', which are at different stages of development.

19.3.2.4 Beatrice OWF became operational in June 2017, following eight years of development and three years of construction. It is operated and maintained from its project base at Wick Harbour on the northeast coast of Scotland. Beatrice OWF has an installed capacity of 588 MW consisting of 84 Siemens Gamesa WTGs and is a joint venture between SSE Renewables (40%), Red Rock Power Limited (25%), TRIG (17.5%) and Equitix (17.5%) (BOWL, 2022). The Array Area of the Proposed Development is approximately 5 km from the Beatrice Array Area. The Beatrice OWF has two parallel export cables totalling 130 km in length (65 km each), running southwest where it intersects with the Offshore ECC to make landfall 1.5 km west of Portgordon harbour (BOWL, 2022).

19.3.2.5 Moray East OWF was developed by Moray Offshore Windfarm East Ltd, a joint venture company owned by Ocean Winds (56.6 %), Diamond Green Limited (33.4%), and CTG (10%). It is fully operational after gaining consent to build in 2014, with a capacity of 950 MW consisting of 100 Vestas V164 WTGs as well as three OSPs (Moray Offshore Windfarm East Ltd, 2022). Moray East OWF shares the eastern boundary of its Array Area with the western boundary of the Proposed Development Array Area, and the export cables of the Moray East OWF crosses the Offshore ECC of the Proposed Development, making landfall near Whitehills on the Aberdeenshire coast.

19.3.2.6 Moray West OWF lies 15 km west of the Proposed Development and the Offshore ECC of the Proposed Development overlaps the planned cable route of Moray West OWF as it is set to make landfall east of Sandend Bay. The Moray West OWF project secured consent to build in 2019 for up to 85 WTGs and two OSPs, with a generating capacity of up to 850 MW. Ocean Winds, as the majority shareholder, is developing the Moray West OWF project, which is a 50:50 joint venture between ENGIE and EDP Renewables. Onshore construction has already commenced and

offshore construction is anticipated to begin in between 2022-2023 (Moray Offshore Windfarm (West) Limited, 2022).

19.3.2.7 Following the announcement of the ScotWind leasing round in January 2022, there are a further five offshore wind lease areas across the Moray Firth and northern North Sea in addition to the Proposed Development. The locations of these ScotWind projects in relation to the Proposed Development can be seen in Figure 19.2 and a summary of the Plan Option, project name and developer is provided Table 19.2.

Table 19.2. Summary of ScotWind projects and developers in the Moray Firth and northern North Sea.

Plan Option	Project Name	Developer
NE2	Cluaran Ear-Thuath	Thistle Wind Partners
NE3	Stromar	Ørsted, Falck Renewables and Bluefloat Energy
NE6	Broadshore	BlueFloat Energy and Falck Renewables
NE7	MarramWind	SPR and Shell
NE8	Buchan Offshore Wind	Floating Energy Alliance

Wave and Tidal

19.3.2.8 The Crown Estate and CES are responsible for leasing areas of the UK seabed that are suitable for installation of wave and tidal arrays, and for managing the associated seabed rights. There are currently no planned wave or tidal energy projects identified within the study area, with the closest wave energy lease site being over 66 km away, and the closest tidal energy lease site being over 40 km from the Proposed Development Array Area (Marine Scotland, 2022).

450000
500000
550000
600000
6500000
6450000
6400000

Highland Wind
Inner Sound
Beatrice
Moray East
Moray West
Buchan Deep Demo

Legend

- Array Area
- Offshore Export Cable Corridor
- Study Area
- Operational Offshore Wind Farm
- Consented Offshore Wind Farm
- Operational Tidal Farm
- Export Cable Corridor

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Figure 19.1

Offshore renewable developments in relation to the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

500000
550000
600000
650000
6550000
6500000
6450000
6400000

Cluaran Ear-Thuath
Stromar
Buchan
Broadshore
Marram

Legend

- Array Area
- Offshore Export Cable Corridor
- Study Area
- Adjacent ScotWind Awarded Projects

Scale at A3: 1:650,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Figure 19.2

ScotWind Project Areas in relation to the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

Subsea Cables and Utilities

Telecommunications

19.3.2.9 The SHEFA-2 fibre-optic telecommunications cable, operated by Shefa Ltd (a subsidiary of Faroese Telecom), links the Faroe Islands to mainland Scotland via the Northern Isles (Figure 19.3). It runs south from the Orkney Islands to the Scottish mainland at Inverboyndie and is buried under the seabed surface as it transits the Moray Firth. Shefa has specific seabed rights granted as part of its seabed lease with CES. In particular, permission must be granted by the cable owner for any works planned to be undertaken within 250 m either side of the cable. Where works are within 1 km of the cable, the operator must be notified prior to any works being undertaken (Shefa, 2022).

Caithness – Moray Link

19.3.2.10 Scottish and Southern Electricity Networks (SSEN) owns the Caithness – Moray Link, a 113 km subsea HVDC cable that runs between Noss Head on the east Caithness coast and Portgordon on the south coast of the Moray Firth (Figure 19.3). This cable became operational in 2019, providing transmission reinforcement along the East Coast of Scotland, with two onshore convertor stations at Spittal (Caithness) and Blackhillock (Moray) (SSEN, 2022).

Beatrice Demonstrator Cables

19.3.2.11 The two Beatrice Demonstrator WTGs are connected in series via a 0.9 km cable (PL2331), with power supplied to Beatrice A via a 1.9 km long submarine cable (PL2331). These cables are buried to a depth of 1 m below the seabed, except where the cable crosses the main oil export pipeline (PL16). Repsol Sinopec Resources UK intend to decommission the subsea power cables as part of the decommissioning of the Beatrice Demonstrator WTGs in 2024-2027 (Repsol Sinopec Resources UK, 2022).

Oil and Gas

19.3.2.12 The Proposed Development is located within 20 km of an area which supports oil exploration and production activity; however, both the Jacky and Beatrice oil fields (Figure 19.4) are no longer producing and are scheduled for decommissioning.

19.3.2.13 It is understood that the indicative decommissioning timeline of the Beatrice Oil Field is as follows:

- Well plugging and abandonment on Beatrice Bravo and Charlie is expected to occur prior to commencing removal of the Beatrice Field infrastructure in 2024;
- Well plug and abandonment on Beatrice Alpha from 2022-2027; and
- Platform and subsea facility removal operations for the Beatrice field facilities from 2025 to 2030 (Respol Sinopec Resources UK, 2018).

19.3.2.14 Oil and gas extracted from the Beatrice Oil Field was historically exported to shore via an installed pipeline west of the Proposed Development and runs to shore at Nigg in the Cromarty Firth. There is also a mid-line structure between Beatrice Alpha and the Jacky Platform which was installed in 2008. In 2018, Repsol Sinopec Resources UK published a DP which aims to have subsea structures (including pipelines) removed between 2028-2030 (Repsol Sinopec Resources UK, 2018).

19.3.2.15 In addition to the Jacky and Beatrice oil fields, the Proposed Development is within close proximity to the following licensed Oil and Gas blocks:

- 12/27c: 4.4 km southwest of the Proposed Development; and
- 18/2: 8.7 km southwest of the Proposed Development.

Carbon Capture and Storage

19.3.2.16 The Scottish Government has a clear policy to decarbonise electricity generation by 2030 and it is intended that carbon capture and storage (CCS) will support this. It is understood that there are no current plans to develop CCS projects in the study area and it is unlikely that any offshore storage opportunities in the Moray Firth will be further investigated prior to or during the installation of the Proposed Development (Marine Scotland, 2022). On this basis, potential interactions between the Proposed Development and CCS activity will not be assessed further.

Marine Dredging and Disposal

19.3.2.17 Dredging and disposal activity within the Moray Firth is sporadic and associated with port and harbour maintenance and coastal marine disposal sites. As illustrated in Figure 19.5, the closest 'open' marine disposal sites to the Proposed Development are at Buckie and Macduff. No marine aggregate extraction is licensed within the study area.

Other Marine Infrastructure

Aquaculture

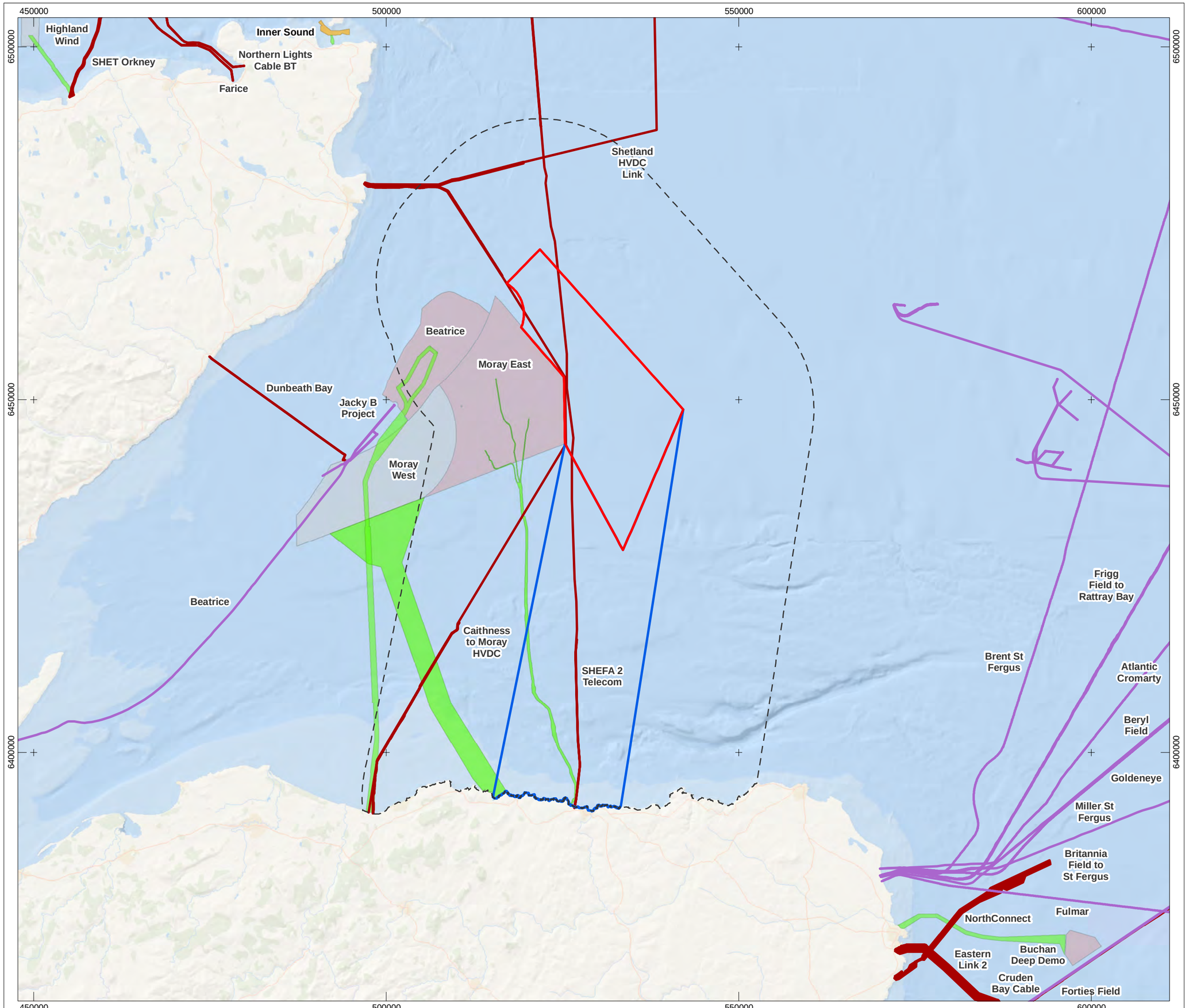
19.3.2.18 There are no active finfish or shellfish marine aquaculture sites within the study area. The north of Scotland coastline has also been identified as an area where the development of new aquaculture sites is restricted and only existing aquaculture sites can be extended (Marine Scotland, 2022).

Nuclear

19.3.2.19 There are no nuclear facilities or plans for future nuclear developments in the Moray Firth (Scottish Government, 2017).

Offshore Wind Innovation and Targeted Oil and Gas (INTOG)

19.3.2.20 The Proposed Development and greater study area is encompassed by the Sectoral Marine Plan "Area where no projects will be considered" and there are no areas highlighted in the Moray Firth for future development of INTOG projects (Marine Scotland, 2022).



Legend

- Array Area
- Offshore Export Cable Corridor
- Study Area
- Operational Offshore Wind Farm
- Consented Offshore Wind Farm
- Operational Tidal Farm
- Export Cable Corridor
- Subsea Cable
- Pipeline

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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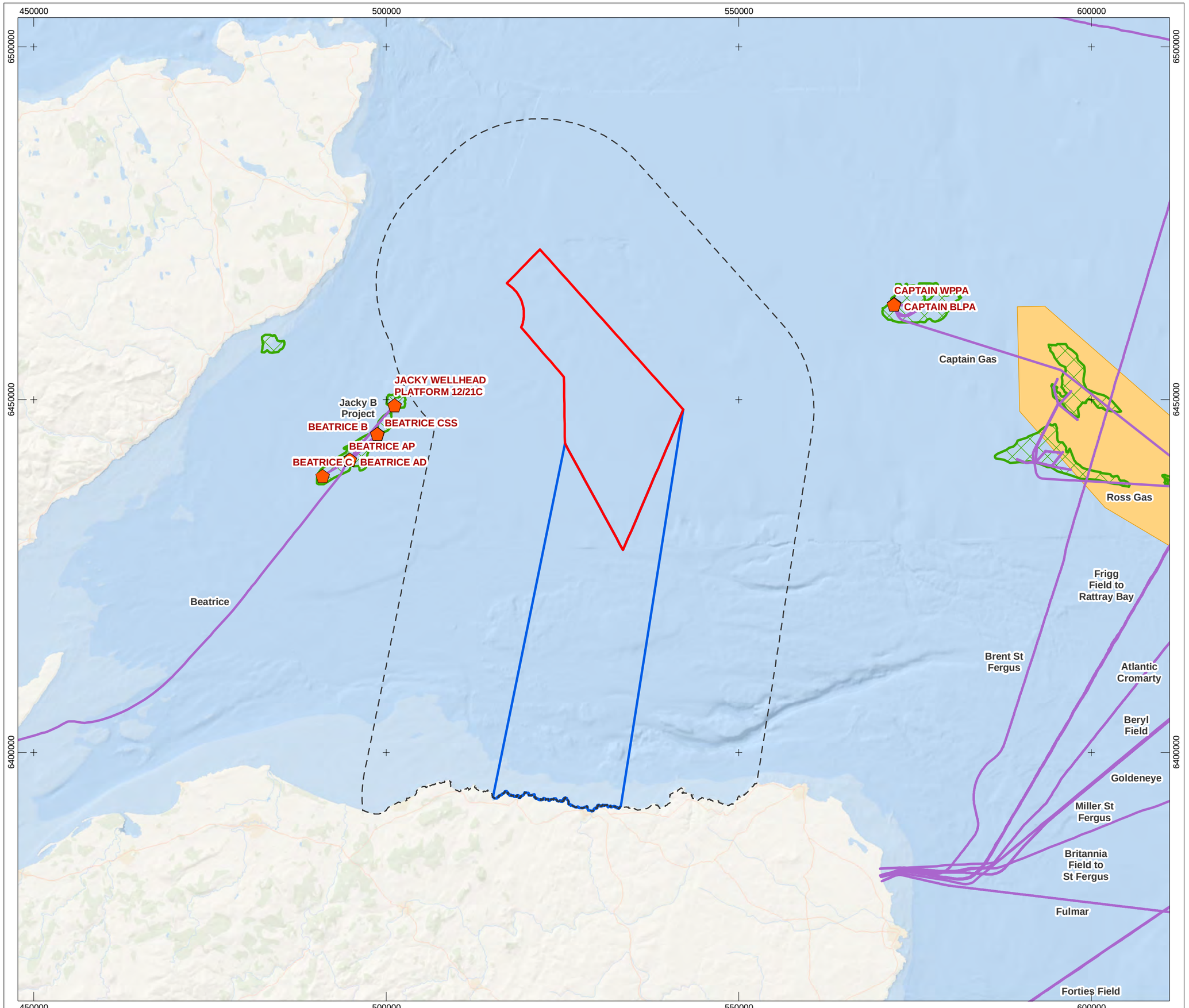
Figure 19.3

Utilities, subsea cables and pipelines in relation to the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS



Legend

- Array Area
- Offshore Export Cable Corridor
- Study Area
- Carbon Capture Storage Lease Area
- Oil and Gas Platform
- Pipeline
- Hydrocarbon Field

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
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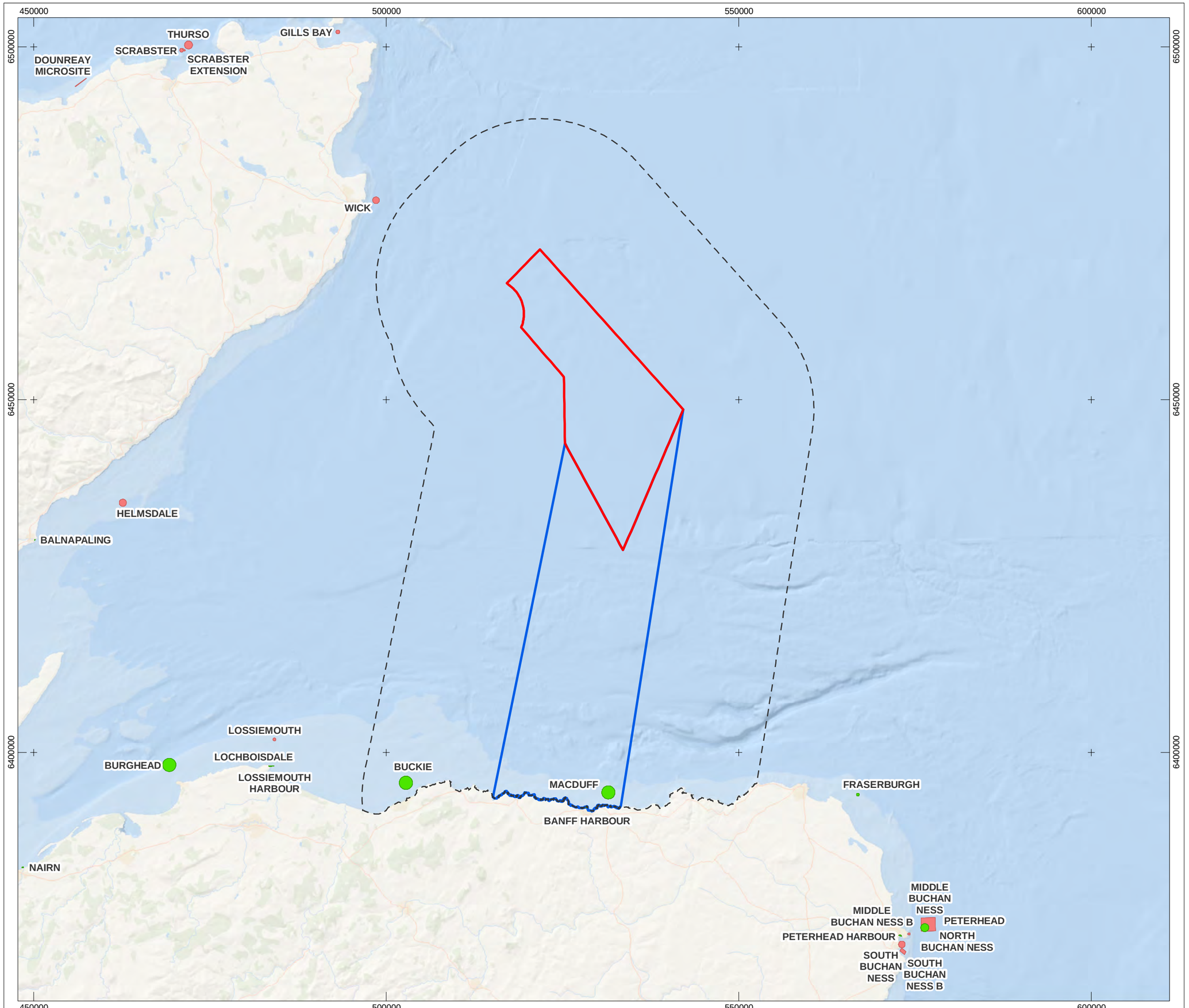
Figure 19.4

Oil and gas marine infrastructure in relation to the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS



Legend

- Array Area
- Offshore Export Cable Corridor
- Study Area

Disposal Sites

- Open
- Closed

Scale at A3: 1:500,000

0 10 20 km

N

CRS: WGS 1984 UTM Zone 30N (EPSG:32630)		
Produced:	Reviewed:	Approved:
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Figure 19.5

Licensed marine disposal sites in relation to the Proposed Development

CALEDONIA Offshore Wind Farm

OW OCEAN WINDS

19.4 Embedded Mitigation Considered within the EIA

19.4.1.1 Mitigation measures will be considered throughout the design process of the Proposed Development. These measures will be included with the objective to reduce the potential for impacts upon the environment. The measures will evolve throughout the development process as the EIA progresses and in response to consultation. Caledonia OWF is committed to the implementation of these measures as well as standard sectoral practices and procedures.

19.4.1.2 Certain measures have been adopted by the Proposed Development to reduce the potential for impacts to the environment. Relevant embedded mitigation measures for Other Human Activities are noted within Table 19.3 alongside identified impact pathways. Included below are those specific embedded mitigation measures considered relevant to Other Human Activities receptors:

- M-1: Development of and adherence to a CaP. The CaP will confirm planned cable routing, burial and any additional protection and will set out methods for post-installation cable monitoring;
- M-3: Development of and adherence to a CMS. The CMS will confirm construction methods and the roles and responsibilities of parties engaged in construction. It will detail any construction-related mitigation measures;
- M-8: Development of and adherence to an EMP. The EMP will set out mitigation measures and procedures relevant to environmental management, including but not limited to the following topics: Chemical usage, invasive non-native marine species, dropped objects, pollution prevention and contingency planning, and waste management;
- M-9: Development of and adherence to a MPCP. The MPCP will identify potential sources of pollution and associated spill response and reporting procedures;
- M-14: Development of and adherence to a LMP. The LMP will confirm compliance with legal requirements with regards to shipping, navigation and aviation marking and lighting;
- M-19: Development of and adherence to a NSP. The NSP will describe measures put in place by the Proposed Development related to navigational safety, including information on Safety Zones, charting, construction buoyage, temporary lighting and marking, and means of notification of Proposed Development activity to other sea users (e.g., via Notice to Mariners);
- M-21: Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via Notices to Mariners and Kingfisher Bulletins;
- M-23: Application for and use of Safety Zones of up to 500 m during construction, maintenance and decommissioning phases. Where appropriate, guard vessels will also be used to ensure adherence with Safety Zones or advisory passing distances, as defined by risk assessment, to mitigate any impact which poses a risk to surface navigation during construction, maintenance and decommissioning phases. Such impacts may include partially

installed structures or cables, extinguished navigation lights or other unmarked hazards;

- M-24: Any objects dropped on the seabed during works associated with the Proposed Development will be reported and objects will be recovered where they pose a hazard to other marine users and where recovery is possible;
- M-25: Development of and adherence to an ERCoP. The ERCoP will be prepared in line with MCA guidance and confirms what measures the Proposed Development has in place to support any emergency response;
- M-26: Marine coordination and communication to manage Proposed Development vessel movements; and
- M-38: Crossing and proximity agreements with known existing pipeline and cables operators will be sought.

19.5 Scoping of Impacts

19.5.1.1 Potential impacts on Other Human Activities have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. These impacts are outlined in Table 19.3.

Table 19.3. EIA Scoping assessment for Other Human Activities.

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Construction (and Decommissioning)								
Temporary obstruction to other OWFs	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	The study area overlaps with the Array Area and/or Offshore ECC of the Moray East, Moray West and Beatrice OWFs. As such, during the construction of infrastructure and adherence to safety distances around construction vessels, there is potential to obstruct activities necessary for their development.	✓	✓	✓	✓	✓
Temporary obstruction to the wave and tidal renewable energy developments and associated activities	-	Scoped out	There are no wave or tidal renewable developments in the study area.	✗	✗	✗	✗	✗
Temporary obstruction to utilities developments and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	Due to the proximity of subsea cables associated with utilities to the study area, this will be included in future assessment as part of the EIA.	✓	✓	✓	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Temporary obstruction to oil and gas developments and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped out	Due to the distance of decommissioning activities associated with Beatrice oil and gas platforms to the study area, this will not be included in future assessment as part of the EIA.	✗	✗	✗	✗	✗
Temporary obstruction to CCS developments and associated activities	-	Scoped out	There are no current plans to develop CCS projects in the Moray Firth and it is unlikely that any offshore storage opportunities in the Moray Firth will be further investigated prior to or during the installation of the Proposed Development.	✗	✗	✗	✗	✗
Temporary obstruction to licensed marine disposal sites and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	Macduff is an open licensed disposal site which falls within the Offshore ECC of the Proposed Development. Buckie is an open licensed disposal site which lies approximately 12km from the Offshore ECC of the Proposed Development.	✗	✗	✗	✓	✗
Temporary obstruction to marine aggregates activities	-	Scoped out	There are no marine aggregates areas in the vicinity of the Proposed Development.	✗	✗	✗	✗	✗
Temporary obstruction to nuclear energy activities	-	Scoped out	There are no nuclear energy sites in the vicinity of the Proposed Development.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Temporary obstructions to aquaculture activities	-	Scoped out	There are no aquaculture sites in the vicinity of the Proposed Development.	✗	✗	✗	✗	✗
Temporary obstructions to INTOG activities	-	Scoped out	The Proposed Development and greater study area is encompassed by the Sectoral Marine Plan "Area where no projects will be considered" and there are no areas highlighted in the Moray Firth for future development of INTOG projects.	✗	✗	✗	✗	✗
Operation and Maintenance								
Temporary obstruction to other OWFs	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	The study area overlaps with the Array Area and/or Offshore ECC boundaries of the Moray East, Moray West and Beatrice OWF projects. As such, during the O&M of infrastructure and adherence to safety distances around construction vessels, there is potential to obstruct activities necessary for their development.	✓	✓	✓	✓	✓
Temporary obstruction to the wave and tidal renewable developments and associated activities	-	Scoped out	There are no wave or tidal renewable developments in the study area.	✗	✗	✗	✗	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Temporary obstruction to utilities developments and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	Due to the proximity of subsea cables associated with utilities to the study area, this will be included in future assessment as part of the EIA.	✓	✓	✓	✓	✗
Temporary obstruction to oil and gas developments and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped out	Due to the distance of decommissioning activities associated with Beatrice oil and gas platforms to the study area, this will not be included in future assessment as part of the EIA. Furthermore, by the time the Proposed Development is operational, it is anticipated these platforms will have been decommissioned.	✗	✗	✗	✗	✗
Temporary obstruction to CCS developments and associated activities	-	Scoped out	There are no current plans to develop CCS projects in the Moray Firth and it is unlikely that any offshore storage opportunities in the Moray Firth will be further investigated prior to or during the installation of the Proposed Development.	✗	✗	✗	✗	✗
Temporary obstruction to licensed marine disposal site and associated activities	M-14, M-19, M-21, M-23, M-24, M-25, M-26, M-38	Scoped in	Macduff is an open licensed disposal site which falls within the Offshore ECC of the Proposed Development. Buckie is an open licensed disposal site which lies approximately 12 km from the Offshore ECC of the Proposed Development.	✗	✗	✗	✓	✗

Impact Pathway	Relevant Embedded Mitigation	Scoped In/Out	Justification	Aspects to be Considered in EIA				
				Fixed WTGs and OSP	Floating WTGs	Inter-Array and Interconnector Cables	Export Cables	Landfall
Temporary obstruction to marine aggregates activities	-	Scoped out	There are no marine aggregates areas in the vicinity of the Proposed Development.	X	X	X	X	X
Temporary obstruction to nuclear energy activities	-	Scoped out	There are no nuclear energy sites in the vicinity of the Proposed Development.	X	X	X	X	X
Temporary obstructions to aquaculture activities	-	Scoped out	There are no aquaculture sites in the vicinity of the Proposed Development.	X	X	X	X	X
Temporary obstructions to INTOG activities	-	Scoped out	The Proposed Development and greater study area is encompassed by the Sectoral Marine Plan "Area where no projects will be considered" and there are no areas highlighted in the Moray Firth for future development of INTOG projects.	X	X	X	X	X

19.6 Potential Cumulative Impacts

19.6.1.1 There is the potential for cumulative impacts from the Proposed Development to interact with those from adjacent marine activities, resulting in a cumulative effect on Other Human Activities receptors.

19.6.1.2 Given the overlap of the study area and the proximity of the Proposed Development Array Area and Offshore ECC to other renewable energy developments in the Moray Firth, there is potential for cumulative impacts to arise, particularly with regard to Moray West, Moray East and Beatrice OWFs. As can be seen in Figure 19.1, there is also potential for cumulative impacts to arise from the simultaneous development of other ScotWind lease areas in the northern North Sea (see Figure 19.2). However, the impacts on Other Human Activities are anticipated to be localised around the offshore infrastructure of the Proposed Development itself, vessels supporting the Proposed Development and associated safety zones.

19.6.1.3 In addition to offshore wind developments in the vicinity of the Proposed Development, according to the DP set out by Repsol Sinopec Resources UK (2018), there could be potential for cumulative impacts to arise during the removal of infrastructure, pipelines and subsea cables of the Beatrice and Jacky oil field, which is anticipated to run up to 2030 at the latest.

19.6.1.4 The Other Human Activities CIA for the Proposed Development will consider the maximum adverse design scenario for each adjacent project and any associated activities in line with the methodology outlined in Chapter 4 (EIA Methodology).

19.7 Potential Transboundary Impacts

19.7.1.1 There are no Other Human Activities receptors that have been identified associated with neighbouring EEZ and, therefore, there is considered to be no potential for transboundary impacts from the construction, O&M and decommissioning of the Proposed Development.

19.7.1.2 As such, potential transboundary impacts have been scoped out of this Offshore Scoping Report and, therefore, will not be assessed further as part of the EIAR for the Proposed Development.

19.8 Proposed Approach to EIA

19.8.1 Relevant Data Sources

19.8.1.1 No site-specific surveys are planned for the Other Human Activities receptors of the Proposed Development. For the EIA, stakeholder engagement and consultation will be a primary source of data.

19.8.1.2 The assessment of impacts from the Proposed Development on Other Human Activities receptors will apply publicly available data (as set out in Table 19.1), which will be adapted through consultation with relevant stakeholders during the EIA. This will identify all current or known/planned activities in the vicinity of the Proposed Development.

19.8.1.3 Consultees will include (but not limited to):

- Marine Renewable Energy lease owners;
- Utilities operators;
- Oil and gas operators;
- Carbon capture and storage developers;
- Marine dredging and disposal operators;
- Other marine infrastructure; and
- The seabed owner.

19.8.1.4 Any potential impacts that are scoped in will be identified and assessed on a desk-based capacity, while considering the maximum design envelope of the Proposed Development for both the project-specific and cumulative impacts.

19.8.1.5 Aligning with other chapters of the EIAR for the Proposed Development, such as Shipping and Navigation (see Chapter 13) or Military and Civil Aviation (see Chapter 15), the information from both direct and indirect impacts will be incorporated. The magnitude of an impact will be drawn from the maximum design scenario of the Proposed Development, while the sensitivity of a receptor will be based on the capacity to accommodate any change and the value/importance of each receptor.

19.8.2 Guidance

19.8.2.1 The approach to EIA will follow the general approach and guidance outlined in Chapter 4 (EIA Methodology) of this Offshore Scoping Report. In addition, the assessment of Other Human Activities will also comply with the following guidance documents where they are specific to this topic:

- Assessment of Impact of Offshore Wind Energy Structures on the Marine Environment (Marine Institute, 2000);
- European Subsea Cables Association (ESCA) Guideline No 6, The Proximity of Offshore Renewable Energy Installations and Submarine Cable Infrastructure in UK Waters (ESCA, 2016);
- International Cable Protection Committee (ICPC) recommendations (ICPC, 2021);
- Oil and Gas UK, Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2015);
- The Crown Estate Guidance: Export transmission cables for offshore renewable installations – Principles of cable routeing and spacing (The Crown Estate, 2012a); and
- The Crown Estate Guidance: Submarine cables and offshore renewable energy installation – Proximity study (The Crown Estate, 2012b).

19.9 Scoping Questions

19.9.1.1 The questions in Table 19.4 are posed to consultees to frame and focus responses to the Other Human Activities scoping exercise, which will in turn inform the Scoping Opinion.

Table 19.4. EIA scoping questions for Other Human Activities

Scoping Questions – Other Human Activities
Do you agree with the data sources, including project specific surveys, to be used to characterise the other human activities baseline within the Offshore EIA?
Do you agree that all pathways, receptors and potential impacts have been identified for other human activities?
Do you agree with the project impacts which have been scoped out of the EIA for other human activities?
Do you agree that cumulative impacts and transboundary impacts for other human activities may be scoped out of the Offshore EIA?
Do you agree with the proposed approach to assessment?
Do you agree on the suitability of proposed embedded mitigation of relevance to Other Human Activities that have been identified for the Proposed Development?

20 Summary of Offshore EIA Scoping

20.1 Summary of Impacts and Commitments

20.1.1.1 A summary of the environmental impacts that will potentially occur during construction, O&M and decommissioning of the Proposed Development is presented within Appendix A (Impacts Register). This Impacts Register captures all of the potential impacts that have been identified within this Offshore Scoping Report and the register will be updated as the EIA progresses and the EIAR is produced. Any additional potential impacts that are identified within the Scoping Opinion or during stakeholder/public consultation will be added to the Impacts Register to allow it to be tracked through the Offshore EIA process.

20.1.1.2 Throughout the Offshore Scoping Report, each technical assessment has taken into account the embedded mitigation that will be committed to as part of the design of the Proposed Development. Appendix B (Mitigation Commitment Register) sets out a full list of these embedded mitigation measures that are referred to within each technical chapter of the Offshore Scoping Report. This Mitigation Commitment Register will be further developed as the EIA is progressed to ensure each embedded mitigation measure is incorporated and captured as the commitment is identified. The method in which the commitment will be secured is also provided within the Mitigation Commitment Register.

20.2 Topics Scoped into the Offshore EIA

20.2.1.1 The following environmental topics are scoped in to the EIA for the Proposed Development:

- Marine and Coastal Processes;
- Marine Water and Sediment Quality;
- Benthic Subtidal and Intertidal Ecology;
- Fish and Shellfish Ecology;
- Offshore Ornithology;
- Marine Mammals and Other Megafauna;
- Commercial Fisheries;
- Shipping and Navigation;
- Marine Archaeology and Cultural Heritage;
- Military and Civil Aviation;
- Seascape, Landscape and Visual Impact;
- Socio-economics, Tourism and Recreation;
- Climate; and
- Other Human Activities.

20.2.1.2 Separately, Offshore Airborne Noise and Vibration, Offshore Air Quality, Health and Major Accidents and Disasters have been scoped out of the EIA for the Proposed Development as part of this Offshore Scoping Report (see Table 4.3).

21 Proposed Structure of the EIA Report

21.1 Introduction

21.1.1.1 The following chapter sets out the proposed approach to the completion of, and the information presented within, any future EIAR that is completed for the Proposed Development. The EIAR will be produced to meet with the legislative requirements in relation to Scotland, and in particular, to comply with the EIA Regulations and other relevant good practice guidance. In producing the EIAR, it is recognised that individual topics will have their own specific guidance and standards which will be applied in addition to the generic EIA wide standards.

21.2 EIAR Structure

21.2.1.1 It is proposed that the EIAR will be set out in accordance with (or similar to) the proposed volumes and content outlined in Table 21.1. It is being proposed that the offshore and onshore reports will be combined within one overall EIAR, which will help to present and understand the whole project assessment. The proposed contents of the onshore EIAR (Volume 3) will be outlined as part of the separate Onshore Scoping Report.

21.2.1.2 The EIAR will be prepared by competent experts, will make use of the latest and most appropriate scientific methodology and assessment procedures, and support the correct interpretation of data. Information on the competent experts for respective topics will be provided within the EIAR.

21.2.1.3 The technical chapters will include the following layout:

- Introduction;
- Policy and guidance;
- Consultation;
- Design basis for assessment;
- Impact assessment for methodology;
- Baseline environment;
- Potential effects;
- Mitigation measures and monitoring;
- Transboundary and inter-related effects;
- Cumulative effects; and
- Residual effects.

21.2.1.4 It is envisaged that a range of Technical Appendices will support the EIAR, with those relating to the offshore elements of the Proposed Development listed in Table 21.2.

Table 21.1. Proposed structure for the EIAR covering both offshore and onshore elements of the Proposed Development.

Volume	Contents	Chapters		Outline
Volume 1	Overview	1. Introduction 2. Legislation and Policy Context 3. Proposed Development Description 4. Site Selection, Alternatives and Design Evolution 5. Consultation 6. EIA Methodology 7. Cumulative Effects		The introductory chapters of the EIAR will introduce the Proposed Development, providing the relevant project context; including an introduction, the planning and policy context, the EIA methodology being used, any alternative design options that have been considered, as well as a description of the Proposed Development and construction strategy. This should summarise the findings of the EIAR in a clear, accessible format that uses non-technical language and supporting graphics.
Volume 2	Offshore EIAR	Physical	8. Marine and Coastal Processes 9. Marine Water and Sediment Quality 10. Underwater Noise	Assessment chapters for each offshore environmental aspect will be provided in accordance with Article IV of the EIA Directive for the Offshore infrastructure seawards of MHWS. These chapters will provide a description of the relevant environmental receptors, a description of the existing baseline characterisation within the appropriate study area, relevant project committed embedded mitigation, identification of potential impacts and the anticipated significant effects. Any mitigation measures will be identified and residual effects summarised. The assessment of cumulative effects will be considered within each technical chapter, rather than as a separate chapter.
		Biological	11. Nature Conservation and Designated Sites 12. Benthic Subtidal and Intertidal Ecology 13. Fish and Shellfish Ecology 14. Offshore Ornithology 15. Marine Mammals and Other Megafauna	
		Human	16. Commercial Fisheries 17. Shipping and Navigation 18. Military and Civil Aviation 19. Marine Archaeology and Cultural Heritage 20. Seascape and Visual 21. Other Human Activities 22. Climate and Carbon 23. Socio-economics, Tourism and Recreation	
Volume 3	Onshore EIAR	24. Land Use 25. Terrestrial Ecology and Ornithology 26. Landscape and Visual 27. Terrestrial Archaeology and Cultural Heritage 28. Hydrology and Hydrogeology 29. Geology, Soils and Contaminated Land 30. Air Quality 31. Airborne Noise and Vibration 32. Traffic and Transport 33. Climate and Carbon 34. Socio-economics, Tourism and Recreation		The Onshore EIAR will follow the same structure as the Offshore EIAR as described above.

Volume	Contents	Chapters	Outline
Volume 4	Summary	35. Schedule of Mitigation (Offshore) 36. Schedule of Mitigation (Onshore) 37. Summary and Conclusions	Summary chapters will provide a concise presentation of the key findings and mitigation commitments.
Volume 5	Technical Appendices	See Table 21.2.	Technical appendices for the offshore assessment chapters that support and are cross-referenced with Volume 2 will be included (as well as those relating to the Onshore EIAR). These may include modelling outputs, background reports and/or supporting documents.
Volume 6	Figures	N/A	Presentation of visualisations and photomontages.

Table 21.2. Indicative list of Technical Appendices to support the EIAR.

Technical Appendices
Draft Environmental Management Plan
Draft Decommissioning Programme
Offshore Wind Farm and OfTI Scoping Opinions
Scoping and Consultation Gap Analysis
Cumulative Impact Assessment Screening List
Commitments Register
Physical Processes Baseline
Physical Processes Numerical Modelling
Benthic Survey and Baseline Characterisation Report
Marine Mammal Baseline Characterisation Report
Underwater Noise Modelling Report
Draft European Protected Species (EPS) Risk Assessment / Licence Application
Ornithology Technical Report
Ornithology Collision Risk Modelling
Ornithology Displacement
Commercial Fisheries Baseline Characterisation Report
Draft Fisheries Management and Mitigation Strategy
Navigational Risk Assessment (NRA)
Initial Aviation Assessment (including TOPA Assessment)
Radar Propagation Modelling
SLVIA Methodology
SLVIA Baseline Landscape Character
SLVIA Visibility
SLVIA Cumulative Wirelines Illustrating Moray East Current Base Case Layout
Greenhouse Gas Assessment
Socio-economics Baseline Analysis
Marine Archaeology Baseline Characterisation Report
UXO Risk Assessment
Water Framework Directive (WFD) Compliance Assessment

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