Bowdun Offshore Wind Farm, Offshore EIA Report

Volume 3, Technical Appendix 4.1: Scoping Report

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Executive Summary

Thistle Wind Partners Limited (TWP) is a Joint Venture (JV) comprising of DEME, Qair Marine, and Aspiravi International, who collectively bring extensive expertise in development and delivery of offshore renewable energy. TWP has created Bowdun Offshore Wind Farm Limited (the Applicant), a Special Purpose Vehicle (SPV), established specifically for the development of the Bowdun Offshore Wind Farm (OWF) Project.

The Applicant has entered into an Option Lease Agreement with Crown Estate Scotland (CES) and has secured the rights to develop a commercial scale 1 GW OWF project in the East (E)3 Plan Option Area (POA) of Scotland, to the east of the Aberdeenshire coast, Scotland.

The Bowdun OWF includes both the Offshore (seaward of Mean High Water Springs (MHWS)) and Onshore (landward of Mean Low Water Springs (MLWS)) Infrastructure (collectively known as the Project) required to generate and transmit electricity to an onshore Grid Connection Point. The Applicant is seeking consent to develop the Offshore Generation and Transmission Assets of the Project (hereafter referred to as the Proposed Development), which are the subject of this Environmental Impact Assessment (EIA) Scoping Report (hereafter referred to as the Offshore Scoping Report).

The Offshore Generation Assets are located 38 km, at its closest point, from land and cover an area of 187 km^2. The Offshore Transmission Assets extend from the Offshore Generation Assets and will make Landfall at Benholm, Aberdeenshire. These assets include:

- Offshore Generation Assets:
  - up to 67 Wind Turbines (each comprised of three rotor blades, a nacelle housing the generating unit, hub, and tower section) and associated supporting structures which may be fixed or floating foundations including mooring and anchoring systems;
  - a network of up to 156 km of Inter-Array Cables (IACs) which may be either static or dynamic cables depending on the Wind Turbine foundations used;
  - up to 35 km of Interconnector Cables;
  - Subsea Collectors, used to connect Wind Turbines in clusters to Offshore Substation Platforms (OSPs); and
  - scour and cable protection.
- Offshore Transmission Assets:
  - up to three OSPs with fixed foundations and supporting infrastructure including scour protection;
  - up to four Offshore Export Cables totalling approximately 320 km in length; and
  - cable protection and utility crossings where required.

The Applicant intends to submit separate applications for the consents, licences, and permissions required for the Offshore and Onshore Infrastructure of the Project. The onshore elements of the Project, which includes the Onshore Transmission Assets above MLWS, will be the subject of a separate Onshore Scoping Report, under The Town and Country Planning (Scotland) Act 1997, which will be submitted to Aberdeenshire Council.

The Applicant is seeking the following permissions, licences, and consents for the Proposed Development:

- Section 36 Consent under the Electricity Act 1989 for the Offshore Generation Assets;
- Marine Licence, covering the Offshore Generation Assets, under the Marine and Coastal Access Act (MCAA) 2009;
- Marine Licence, covering the Offshore Transmission Assets, under the Marine (Scotland) Act 2010 for the assets which lie within 12 nm of the coast, and the MCAA 2009;
- Safety zone declarations during construction and operation under the Energy Act 2004; and
- Decommissioning scheme under the Energy Act 2004.

In applying for these consents, licences and permissions, an EIA Report is required to be prepared and submitted to support these applications. The EIA is required to fulfil the requirements of the following regulations:

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

This Offshore Scoping Report has been prepared to support a request for a formal Scoping Opinion from Scottish Ministers in relation to the Proposed Development, and includes a summary of the existing physical, biological, and human environment, based on known and accessible data sources, as well as an overview of any site-specific surveys undertaken to date. The potential scope of impacts associated with the construction, operation and maintenance, and decommissioning phases of the Proposed Development, and the proposed methodology for assessing the significance of effect for the technical topics, are also presented in this Offshore Scoping Report.

The following technical topics have been considered within this Offshore Scoping Report:

- offshore physical environment
    - physical processes;
    - subsea noise; and
    - offshore water quality.

- offshore biological environment
  - benthic ecology;
  - fish and shellfish ecology;
  - marine mammals; and
  - offshore ornithology.
- offshore human environment
  - commercial fisheries;
  - shipping and navigation;
  - aviation and radar;
  - infrastructure and other users;
  - major accidents and disasters;
  - socio-economics, tourism and recreation;
  - marine archaeology;
  - seascape, landscape and visual impacts;
  - cultural heritage; and
  - climatic change.

A standalone major accidents and disasters assessment is proposed to be scoped out, as all identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, Risk Assessment Method Statements (RAMS), and/or management plans.

It is proposed to scope out the offshore water quality as a dedicated section of the Offshore EIA Report and to ensure the potential significant effects on water quality are addressed as part of the Water Framework Directive (WFD) compliance assessment (to be submitted as a separate technical annex) and also as part of the assessment of the key receptors that could be subject to potentially significant effects due to change in the water quality of the receiving environment in the relevant EIA topic section.

The Applicant welcomes responses from consultees to this Offshore Scoping Report and requests a formal opinion on the baseline (including data sources), methodology proposed, Embedded Mitigation, and potential impacts (scoped in and out), potential inter-related effects, potential cumulative effects, and potential transboundary impacts.

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Glossary

Defined term	Definition
0-group fish	Fisheries statistics term which refers to fish within their first year of life.
Additional Mitigation	Also referred to as secondary mitigation which is defined by IEMA as: Actions that will require further activity in order to achieve the anticipated outcome. These may be imposed as part of the planning consent, or through inclusion in the EIA Report (sic).
Aerodynamic noise	Noise generated by air passing over an object, for example Wind Turbine blades.
Air Gap	The distance between the sea surface and the blade tip. This can be measured from Highest Astronomical Tide (HAT), Lowest Astronomical Tide (LAT) and Mean High Water Springs (MHWS). Regardless of parameter used, conversion factors are applied to ensure the distance will always be the same. Important parameter in Collision Risk Modelling (CRM).
Air Quality Management Areas (AQMA)	Places where national air quality objectives are not likely to be achieved.
Annex I	Habitats of community interest (in danger of disappearance in their natural range and/or for which there is a particular responsibility to conserve) as identified in Annex 1 of the Habitats Directive (Council Directive 92/43/EEC).
Annex II	Species of community interest whose conservation requires the designation of Special Areas of Conservation (SACs) under the Habitats Directive (Council Directive 92/43/EEC).
Annex IV	Species of community interest in need of strict protection under the Habitats Directive (Council Directive 92/43/EEC).
Annual Energy Production (AEP)	The amount of energy generated in a year. This is based on wind yield resources, Wind Turbine specifications, and estimated energy loss (transmission losses).
Applicant (the)	Bowdun Offshore Wind Farm Limited.

Defined term	Definition
Appropriate Assessment (AA)	An assessment to determine the implications of a plan or project on a European site in view of that site's conservation objectives. An Appropriate Assessment forms part of the Habitats Regulations Appraisal (HRA) and is required when a plan or project (either alone or in combination with other plans or projects) is likely to have a significant adverse effect on a European site.
Array Area	The Array Area is the area in which the Offshore Generation Assets will be located and is shown shaded in purple in Figure 1.1, of this Offshore Scoping Report.
Barrier effects	The effect by which a bird has to make longer transits between a breeding or roosting location to an area of foraging. An Offshore Wind Farm (OWF) could act as a barrier in which a species has to fly around to reach the other side, some species are unlikely to travel through or over.
Benthic	Living on or in the seabed.
Biotope	A term which refers to the combination of physical environment (habitat) and its distinctive assemblage of conspicuous species. The biotope concept is used to enable description and comparison. Within biotope names, Latin names of species are used in full on every mention (e.g. *Genus species*) and never abbreviated or referred to using a common name.
Blue carbon	Carbon captured by the world's ocean and coastal ecosystems. Typically includes carbon stored within ocean sediments and ocean vegetation such as seagrasses or kelp.
Bowdun Offshore Wind Farm (OWF) Limited	A Special-Purpose Vehicle (SPV) (legal entity) for the purpose of developing the Project. Bowdun Offshore Wind Farm Limited will be the Applicant for the Offshore Application.
Cetacean	Aquatic mammals, including whales, dolphins, and porpoises.
Circalittoral	The subzone of the rocky sublittoral below that dominated by algae (the infralittoral) and dominated by animals.

Defined term	Definition
Civil Aviation Publication (CAP)	Guidance material and policies for the aviation industry, ensuring the safe conduct of aircraft operations. CAPs include detailed information on various aspects of aviation, such as procedures, standards, best practices, and regulatory requirements. They address both technical and operational matters.
Collision	The effect by which a bird may be impacted by direct collision. Birds passing through an offshore wind farm are at risk of colliding with the Wind Turbines (moving and stationary parts).
Commercial fishing	Any form of fishing activity legally undertaken where the catch is sold for taxable profit.
Contracts for Difference (CfD)	The UK Government's main mechanism for supporting low-carbon electricity generation.
The Convention on the International Regulations for Preventing Collisions at Sea (COLREGS)	A composite of 'Collision Regulations', referring to The Convention on the International Regulations for Preventing Collisions at Sea.
Crown Estate Scotland (CES)	Division of the Scottish Government responsible for the management of land and property in Scotland owned by the monarch.
Cultural significance	Cultural significance means aesthetic, historic, scientific or social value for past, present or future generations. Cultural significance can be embodied in a place itself, its fabric, setting, use, associations, meanings, records, related places and related objects.
Cumulative effects	The effects of the Proposed Development assessed together with effects from one or more different projects on the same receptor/resource.
Danger Area	Airspace of defined dimensions within which activities dangerous to the flight of aircraft may exist at specified times.
Demersal fish	Fish which live and feed on or near the seabed.
Diadromous fish	Fish which move between freshwater and seawater as part of their life cycle.

Defined term	Definition
Digital Aerial Surveys (DAS)	A method for undertaking baseline ornithological and marine mammal data collection surveys. Usually undertaken over a period of 24 months.
Discount rate	Socio-economic impacts that occur sooner are valued higher than impacts that occur in the future.
Displacement	An impact that occurs when a bird is forced away from an area of habitual usage. This can be temporary (i.e. a ship moving) or permanent (i.e. the placement of Offshore Infrastructure).
Draft Plan Option (DPO)	Draft Plan Option Areas (POAs) identified in the 2019 Draft Sectoral Marine Plan (SMP).
Dynamic cable	A section of suspended cable between the floating infrastructure and the seabed.
Ecological potential	Ecological potential in artificial and heavily modified water bodies is determined by an assessment of whether measures are properly in place to mitigate the impacts of any modification on the ecology of the water body.
Ecological status	An expression of the structure and functioning of aquatic ecosystems associated with surface waters. Such waters are classified as being of Good Ecological Status (GES) when they meet the requirements of the Water Framework Directive (WFD).
Effect	Term used to express the consequence of an impact i.e. the result of change or changes on specific environmental resources or receptors. The significance of an effect is determined by correlating the magnitude of the impact with the importance, or sensitivity of the receptor or resource in accordance with defined significance criteria.

Defined term	Definition
Embedded Mitigation	Measures that are adopted as part of the Proposed Development and therefore assessed within the Environmental Impact Assessment (EIA). The proposed approach for the EIA for the Proposed Development is that Embedded Mitigation includes both primary mitigation and tertiary mitigation. These are defined by the Institute of Environmental Management and Assessment (IEMA) as follows: Primary: Modifications to the location or design of the development made during the pre-application phase that are an inherent part of the Project, and do not require additional action to be taken. Tertiary: Actions that would occur with or without input from the EIA feeding into the design process. These include actions that will be undertaken to meet other existing legislative requirements, or actions that are considered to be standard practices used to manage commonly occurring environmental effects.
Engineering, Procurement, Construction, and Installation (EPCI)	EPCI refers to when all of activities associated with the development and delivery of a particular aspect of the Project are brought together.
Environmental Impact Assessment (EIA)	Assessment of the potential likely significant effects of the Proposed Development on the physical, biological, and human environment during construction, Operations and Maintenance (O&M) and decommissioning.
Environmental Impact Assessment Regulations (EIA Regulations)	Terminology used in the Offshore Scoping Report to refer to three sets of regulations: • The Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017; • The Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and • The Marine Works (Environmental Impact Assessment) Regulations 2007.
Environmental Objective	Objective setting which considers waters that require protection from deterioration as well as waters that require restoration and the timescales needed for recovery.

Defined term	Definition
European Sites	This term recognises Special Protection Areas (SPAs) and SACs which protect species and habitats shared across Europe and were originally designated under European legislation.
Eutrophic	Waters that have become enriched by nutrients (principally phosphorus and nitrogen). The nutrients accelerate plant growth, disturbing the balance of aquatic plants and animals affecting water quality.
Exclusive Economic Zone (EEZ)	An area from the outer limit of the territorial sea up to 200 nm from the coastal baseline, over which a sovereign state has rights regarding marine resources.
Export Cable Corridor	The area of seabed seaward of Mean High Water Springs (MHWS) shaded in blue on Figure 1.1, which connects the Array Area with the Landfall Area within which the Offshore Export Cables will be installed.
Flag State	A Flag State is the state chosen by merchant ships to be registered in, so that the vessel is bound to carry the flag of that state and comply with that state's rules and regulations.
Flight Level	A standard nominal altitude of an aircraft, in hundreds of ft, based upon a standardised air pressure at sea level.
Good Status	A collective term used to refer to the status achieved by a surface water body when both its ecological status and its chemical status are at least good or, for groundwater, when both its quantitative status and chemical status are at least good.
Ground Survey Distance	During the DAS the still images are captured at a set resolution. The Ground Survey Distance is the distance between the centre of two adjacent pixels.
Groundwater	All water which is below the surface of the ground in the saturated zone and in direct contact with the ground or subsoil.

Defined term	Definition
Habitats Regulations	A term that refers to the collective legislation that translates the Habitats Directive into specific legal obligations in Scotland, namely: the Conservation (Natural Habitats, &c.) Regulations 1994; the Conservation of Habitats and Species Regulations 2017; and the Conservation of Offshore Marine Habitats and Species Regulations 2017 (in each case as amended).
Habitats Regulations Appraisal (HRA)	An assessment carried out under the Habitats Regulations to determine if a plan or project could adversely affect the integrity of a European Site.
Heavily Modified Water Bodies (HMWB)	A body of surface water which, as a result of physical alterations by human activity, is substantially changed in character, as designated in accordance with the provisions of Annex II of the WFD.
Helicopter Main Route (HMR)	A network of offshore routes utilised by civilian helicopters operating between the UK mainland and offshore installations.
High Voltage Alternating Current (HVAC)	A system of power transmission and distribution that utilises alternating current at voltages typically exceeding 1000 volts, as defined by the International Electrotechnical Commission (2015). HVAC systems are designed to efficiently deliver electricity over long distances with minimal losses, leveraging transformers to modify voltage levels.
Hydroid	A member of the class Hydrozoa, which are cnidarian invertebrates that are typically branching and form sessile colonies and turfs.
Hydromorphology	A study of the quantity and dynamics of water flow within a water body that has variations in its width, depth, structure and substrate of bed and riparian zone.
Icing Level	The level at which the air contains droplets of supercooled liquid water which results in icing conditions where aircraft lift characteristics can be adversely affected.
Impact	A change caused by an action that occurs during a project's lifetime.

Defined term	Definition
Impulsive sound	Sound which is broadband, very brief with a high rise time and high peak level compared to the energy averaged sound level.
Infauna	Organisms living within the seabed sediment.
Infralittoral	A subzone of the sublittoral in which upward-facing rocks are dominated by erect algae, typically kelps; it can be further subdivided into the upper and lower infralittoral.
Instrument Flight Procedure (IFP)	A published procedure used by aircraft flying in accordance with the instrument flight rules which is designed to achieve and maintain an acceptable level of safety in operations and includes an instrument approach procedure and a standard instrument departure.
Inter-Array Cables (IAC)	Cables which link the Wind Turbines to each other and with the Offshore Substation Platforms (OSPs).
Inter-related effects	The potential effects of multiple impacts from the construction, O&M and decommissioning of the Project, affecting one receptor.
Interconnector Cables	Cables which will connect individual OSPs to each other to provide redundancy against cable failure elsewhere.
Intertidal area	The area between MHWS and Mean Low Water Springs (MLWS).
Invasive Non-Native Species (INNS)	Non-native plants or animals that successfully establish themselves in aquatic and fringing habitats and damage natural flora and fauna.
Isostatic rebound	The rise of land masses that were depressed by the weight of ice during glacial periods.
Kernel density mapping	Method of visualising of abundance data via kernel density modelling.
Landfall	The area in which the Offshore Export Cables make landfall and is also the transitional area between the Offshore Transmission Assets and the Onshore Transmission Assets. Located in the Intertidal area (see definition above) at Benholm.

Defined term	Definition
Levelised Cost of Electricity	A measure of the average net present cost of electricity generation for a generator over its lifetime.
Likely Significant Effect (LSE)	An effect that has the potential to occur as a result of the Proposed Development as determined by the LSE Screening Report.
Macrobenthos	Benthic organisms that are greater than or equal to 0.5 mm.
Marine Directorate (MD)	The Marine Directorate of the Scottish Government, formerly known as Marine Scotland. The planning and licensing authority for Scotland's seas and custodian of Scotland's National Marine Plan (NMP). The Marine Directorate – Licensing Operations Team (MD-LOT) are specifically responsible for managing Section 36 Consent and Marine Licence Applications seaward of MHWS.
Marine Directorate – Science, Evidence, Data and Digital (MD-SEDD)	The scientific division of MD, which provides expert scientific, economic and technical advice and services on issues relating to marine fisheries, aquaculture, marine renewable energy, and the aquatic environment and its flora and fauna.
Marine Licence	A Marine Licence permits the undertaking of different activities in the marine environment, including construction, the deposition or removal of substances or objects, and dredging. The Marine (Scotland) Act 2010 requires Marine Licences to be obtained for licensable activities taking place within Scottish Territorial Waters (MHWS to 12 nm). The Marine and Coastal Access Act (MCAA) 2009 requires a Marine Licence to be obtained for licensable marine activities within the Scottish offshore region (12 nm – 200 nm).
Marine Protected Areas (MPAs)	MPAs are designated under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act (MCAA) 2009. The MPA network protects nationally and internationally important marine wildlife, habitats, geology, and underwater landforms. Scotland's MPAs are significantly important for European, North-East Atlantic, and global MPA networks.

Defined term	Definition
Maximum Design Scenario (MDS)	The scenario within the design envelope likely to result in the greatest impact on a particular topic receptor, and therefore the one that should be assessed for that topic receptor.
Mean High Water Springs (MHWS)	The average tidal height throughout the year of two successive high waters during those periods of 24 hours when the range of the tide is at its greatest.
Mean Low Water Springs (MLWS)	The average tidal height throughout the year of two successive low waters during those periods of 24 hours when the range of the tide is at its greatest.
Micro/meso/macro avoidance	Three scales of avoidance that may be shown by birds in response to OWFs and the individual turbines. Microavoidance is avoidance within metres of the turbine, mesoavoidance is avoidance within the footprint of the wind farm from turbines and macroavoidance is avoidance of the whole wind farm.
Mitigation	Measures to avoid, prevent, reduce or control effects on the environment. See also definitions for Embedded Mitigation and Additional Mitigation.
Morphology	Term used to describe channel form and its process of change in shape and direction over time.
Mysticete	An animal that belongs to a family of whales which use keratinaceous baleen plates in their mouths to sieve planktonic creatures from the water (a sub-group of the order Cetacea).
National Grid	The national electricity transmission network.
Non-impulsive (or continuous) sound	Sound which is either continuous or intermittent but without the characteristics described above for impulsive sound.
Odontocete	An animal that belongs to the family of toothed whales, a sub-group of the order Cetacea.

Defined term	Definition
Offshore Application	Term used to refer to the applications associated with the Proposed Development. The Applicant will apply for: • A Section 36 Consent under the Electricity Act 1989; and • Marine Licence(s) under Marine Scotland Act 2010 and Marine and Coastal Access Act 2009.
Offshore Environmental Impact Assessment (EIA) Report (hereafter, 'Offshore EIA Report')	Document prepared to report the findings of the EIA for the Proposed Development and produced in accordance with the EIA Regulations. An Offshore EIA will be submitted to support the Offshore Application for the Proposed Development.
Offshore Export Cable	Subsea cables used to transmit electricity generated offshore by the Wind Turbines from the OSPs to shore. The Transition Joint Bay (TJB) is the location where the Offshore Export Cable terminates, and the onshore cabling begins.
Offshore Generation Assets	The infrastructure of the Proposed Development required to generate electricity comprising of the Wind Turbines, Wind Turbine foundations and associated infrastructure e.g. IACs.
Offshore Infrastructure	All of the Offshore Infrastructure associated with the Proposed Development that is located seaward of MHWS, comprising the Offshore Generation Assets and the Offshore Transmission Assets.
Offshore Scoping Report	The Report that presents the findings of the EIA scoping process undertaken for the Proposed Development with the purpose of obtaining a Scoping Opinion. The Report defines what is intended to be assessed and reported as part of the EIA.
Offshore Substation Platform(s) (OSPs)	OSPs comprise the support structure, topside and electrical components used for collecting and/or converting electricity generated by the Wind Turbines for transmission by the Offshore Export Cables.
Offshore Transmission Assets	The infrastructure of the Proposed Development required to transmit the generated electricity comprising of the OSPs, Offshore Export Cables and associated infrastructure up to MHWS.

Defined term	Definition
Onshore Scoping Report	Document prepared to comply with The Town and Country Planning (Environmental Impact Assessment) (Scotland) Regulations 2017 in order to provide information on the potential impacts of the Onshore Transmission Assets.
Onshore Substation	Part of an electrical transmission and distribution system. Substations transform voltage from high to low, or the reverse by means of electrical transformers.
Onshore Transmission Assets	The transmission infrastructure associated with the Project above MLWS which will be covered by the Onshore Scoping Report and subsequent EIA Report.
Operation and Maintenance (O&M)	The phase of the Proposed Development following completion of construction. This phase of development includes routine inspections, repairs and replacement of infrastructure and equipment (including interconnector and IACs), scour protection replenishment or replacement, major component replacement, painting and/or other coating works, removal of marine growth, replacement of access ladders and geophysical surveys.
Option Lease Agreement	An agreement between CES and the developer, permitting the future development of offshore wind within an agreed area.
Oslo-Paris [Convention] (OSPAR)	A composite of the words 'Oslo-Paris', referring to the Convention for the Protection of the Marine Environment of the North-East Atlantic.
Palaeocoastline	A former coastline of a past geologic age.
Palaeolandscape	Topographic features of a past geological age.
Particle motion	Component of the pressure wave comprising the movement of particles within the water or sediment relative to an equilibrium point.
Party	A State becomes a party to a Convention and Optional Protocol by signing and ratifying either instrument or by acceding to them.

Defined term	Definition
Pathway	Describes the means or route by which a receptor (such as the coast) can be affected by an identified impact source (such as Wind Turbine foundations in the water column).
Pelagic fish	Fish which live within the water column, not on or near the seabed or at the coasts.
Physical processes	The collective term for the following: hydrodynamics (water levels and currents); winds and waves; stratification and frontal systems; geology and seabed sediments (including sediment transport); seabed geomorphology; and coastal geomorphology.
Piling	The action of installing piles: installation can use various methodologies, the most common of which are impact piling (in which the piles are struck by a 'hammer') and drilling (during which a hole is drilled into the seafloor, the drilling tool is removed, and the pile is slotted into that hole).
Plan Option Area (POA)	A location identified in the Sectoral Marine Plan (SMP) as a preferred area for commercial scale offshore wind development.
Population Viability Analysis (PVA)	Numerical modelling of a population which looks at the difference between the baseline (counterfactual) and impacted scenarios. PVA is used to understand how the population growth rate and population size is affected by the predicted impact.
Practice and Exercise Area (PEXA)	Term used to describe an offshore area used by the military for practice and exercise drills, including submarine exercises and firing practice.
Pre-Application Consultation (PAC)	Statutory pre application consultation with communities and stakeholders with regard to the consent applications for the Project.
Primary Surveillance Radar (PSR)	A radar system that measures the bearing and distance of targets using the detected reflections of radio signals.
Programme of Measures (PoM)	Those actions, defined in detail, which are required to achieve the Environmental Objectives of the WFD within a river basin district.

Defined term	Definition
Project (the)	An overarching term for the Bowdun Offshore Wind Farm (Bowdun OWF) comprising the offshore and onshore infrastructure required to generate and transmit electricity from the Array Area to the onshore Grid Connection Point (GCP). The Project includes the Offshore Generation Assets, the Offshore Transmission Assets and the Onshore Transmission Assets.
Project Design Envelope (PDE)	A description of the range of possible elements that make up the design options for the Proposed Development under consideration when the exact engineering parameters are not yet known.
Proposed Development	Term used to define the Offshore Infrastructure associated with the Project seaward of MHWS for which consent is being sought. Further details of the parameters are included in Section 3: Project Description.
Qualifying Features	The features for which a European Site has been officially designated to protect.
Quaternary	The period of geologic time from about 1.8 million years ago to the present, including the part of the Pleistocene (2.58 million to 11,700 BP) and Holocene (11,700 BP to present) Epochs.
Ramsar Site	Wetlands of international importance, designated under the Ramsar Convention on Wetlands of International Importance 1971.
Recorded Loss	Dataset entry of a maritime or aviation record that has no specific location attached to them but are given often arbitrary spatial attribution.
Report to Inform Appropriate Assessment (RIAA)	The RIAA provides detailed information to support the process of Appropriate Assessment (undertaken by the competent authority) as part of the HRA, which evaluates the potential impacts of a project or plan on European Sites.
River Basin District (RBD)	Administrative area for coordinated water management, composed of multiple river basins (or catchments).

Defined term	Definition
River Basin Management Plan (RBMP)	The purpose of a RBMP is to provide a framework for protecting and enhancing the benefits provided by the water environment.
Rochdale Envelope (also known as Project Design Envelope)	Inter-changeable with PDE.
Safety Zones	An area extending 500 m from the central point of a subsea installation in which other vessels are prohibited from entering, except in circumstances outlined within Section 96 of the Energy Act, 2004.
Scoping Boundary	The boundary within which all elements of the Proposed Development will be located. The Scoping Boundary comprises the Array Area and Export Cable Corridor which ends at MHWS. This area may be refined through future site selection work, with details presented in the Offshore EIA Report.
Scoping Opinion	A document produced by MD-LOT, supported with feedback and advice from consultees, which details what is expected to be included in the Offshore EIA Report and what can be scoped out of the EIA process.
Scoping Workshop	A series of sessions preceding the finalisation of the Offshore Scoping Report to provide an opportunity for the Applicant to consult on the draft scope and for stakeholders to request additional information on key issues.
Scottish local authority	A council constituted under Section 2 of the Local Government etc. (Scotland) Act 1994, providing public services, including planning, and is accountable to their local electorate.
Scottish Ministers (the)	The decision makers with regard to Marine Licence(s) and Section 36 Consent applications in Scottish Offshore and Territorial Waters.
Scottish Offshore Waters	The area between the seaward boundary of Scottish Territorial Waters and the seaward boundary of the Scottish part of the EEZ.
Scottish Territorial Waters	The territorial waters of Scotland that extend from MHWS out to 12 nm, as defined by the Marine (Scotland) Act 2010.

Defined term	Definition
ScotWind Leasing Round	A seabed leasing round run by CES to grant property rights for the seabed in Scottish waters for new commercial scale offshore wind project development. ScotWind Leasing must be sited within POA of the SMP.
Scour protection	Protective materials installed to avoid sediment being eroded away from the base of the foundations and/or buried subsea cable due to the flow of water.
Section 36 Consent	Scottish Ministers' consent under Section 36 of the Electricity Act 1989 required for the generating assets of the Proposed Development.
Sectoral Marine Plan (SMP)	A plan developed by the Scottish Government which provide the strategically planned spatial footprint for offshore wind development in Scotland.
Sectoral Marine Plan Iterative Plan Review (SMP IPR)	The iterative plan review process as new information becomes available (e.g. consented projects, environmental data, cumulative effects assessment, etc.).
Setting	Setting is more than the immediate surroundings of a site or building, and may be related to the function or use of a place, or how it was intended to fit into the landscape or townscape, the view from it or how it is seen from areas round about, or areas that are important to the protection of the place, site or building. 'Setting' is the way the surroundings of a historic asset or place contribute to how it is understood, appreciated and experienced.
Significance	Effect factor that is determined by the magnitude of impact along with the sensitivity of the receptor.
Special Areas of Conservation (SAC)	SACs are areas designated for the conservation of certain plant and animal species listed in the Directive 92/43/EEC on the conservation of natural habitats and of wild fauna and flora.

Defined term	Definition
Special Protection Areas (SPAs)	SPAs are sites that are designated to protect rare or vulnerable birds (as listed on Annex I of the Directive 2009/147/EC on the conservation of wild birds), as well as regularly occurring migratory species.
Spring Tidal Excursion	The distance suspended sediment is transported prior to being carried back on the returning tide.
Statutory Nature Conservation Body (SNCB)	A statutory adviser to the UK and Scottish Governments on Scottish, UK and international nature conservation.
Structure-borne noise	Noise which propagates from source to receiver via a solid material.
Study area	For each environmental topic, the baseline environment will be characterised, and the potential environmental impacts will be described within a topic-specific study area. Specific study areas are defined for each topic and are based on the maximum spatial extent across which potential impacts of the Proposed Development may be experienced by the relevant receptors (i.e. Zone of Influence).
Subaerial	In the open air, i.e. not submerged.
Subsea noise	Noise which propagates underwater.
Subtidal	Areas of the coastal marine environment that lie below the level of MLWS and are continuously submerged by seawater.
Surface water	Waters on the land surface (such as reservoirs, lakes, rivers, transitional waters, coastal waters) within a river basin.
Thistle Wind Partners (TWP)	The Joint Venture (JV) of DEME Group, Qair, and Aspiravi as the energy companies that have partnered to develop the Proposed Development.
Tidal Ellipse	The illustration of the variance of tidal currents in horizontal space.
Transition Joint Bay (TJB)	Used to connect the Offshore Export Cables with the onshore export cables. These are typically concrete lined and are located above MHWS.

Defined term	Definition
United Kingdom Hydrographic Office (UKHO) 'Dead' record	In the UKHO dataset, previously identified material that has since not been detected by repeated surveys, therefore considered to no longer exist at the given location. It may be that the material has become buried, dispersed or has disintegrated over time.
UKHO 'Live' record	Material that has been positively identified on the seabed and reported to UKHO, for example through geophysical survey or diver report.
Visual Flight Rules (VFR)	The set of rules that govern aircraft flying clear of cloud and in good visibility.
Water body	A coherent sub-unit in the river basin (district) to which the Environmental Objectives of the directive must apply. Hence, the main purpose of identifying 'water bodies' is to enable the status to be accurately described and compared to Environmental Objectives.
Water dependent protected areas	Water protected by European legislation including drinking waters, shellfish waters, bathing waters, urban wastewater nutrient sensitive areas or sites designated as SACs or SPAs.
Water Framework Directive (WFD)	Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy. The WFD promotes water management through river basin planning. It covers inland surface waters, estuarine waters, coastal waters and groundwater.
Water quality	The physical, chemical and biological characteristics of water.
Wind Turbines	Structures comprising of a tubular tower, rotor blades, and a nacelle which houses the Wind Turbine generator.
Zone of Theoretical Visibility (ZTV)	A computer-generated tool to identify the likely (or theoretical) extent of visibility of a development. The elevation (or a set of elevations) of the development is tested against a 3D terrain model.

Acronyms

Acronym	Definition
AA	Appropriate Assessment
ABPMer	ABP Marine Environmental Research
AD	Anno Domini
ADD	Acoustic Deterrent Device
AEP	Annual Energy Production
AEZ	Archaeological Exclusion Zone
AIS	Automatic Identification System
ALARP	As Low as Reasonably Practicable
ALDP	Aberdeenshire Local Development Plan
ANO	Air Navigation Order
AQMA	Air Quality Management Area
ATC	Air Traffic Control
AtoN	Aids to Navigation
ATS	Air Traffic Services
BC	Before Christ
BEIS	Department for Business, Energy and Industrial Strategy
BERR	Department for Business, Enterprise and Regulatory Reform
BGS	British Geological Survey
BODC	British Oceanographic Data Centre
BP	Before Present
BSI	British Standards Institution
BTO	British Trust for Ornithology
CAA	Civil Aviation Authority
CaP	Cable Plan

Acronym	Definition
CAP	Civil Aviation Publication
CBA	Cable Burial Assessment
CBRA	Cable Burial Risk Assessment
CCC	Climate Change Committee
CCRA3	UK's third Climate Change Risk Assessment
CCS	Carbon Capture and Storage
CEA	Cumulative Effects Assessment
CEF	Cumulative Effects Framework
Cefas	Centre for Environment, Fisheries, and Aquaculture Science
CEH	Centre for Ecology & Hydrology
CES	Crown Estate Scotland
CfD	Contracts for Difference
CGNS	Celtic and Greater North Seas
CHIA	Cultural Heritage Impact Assessment
CH_4	Methane
CIEEM	Chartered Institute for Ecology and Environmental Management
CIRIA	Construction Industry Research and Information Association
CL	Confidence Limit
CMS	Construction Method Statement
CNS	Central North Sea
CoCP	Code of Construction Practice
COLREGS	The Convention on the International Regulations for Preventing Collisions at Sea
CO_2	Carbon Dioxide
CO_2e	Carbon Dioxide Equivalent

Acronym	Definition
CPS	Cable Protection System
CRM	Collision Risk Modelling
CSIP	Cable Specification and Installation Plan
CV	Coefficient of Variance
DAS	Digital Aerial Surveys
DCF	Data Collection Framework
DDV	Drop Down Video
DEA	Drag Embedment Anchor
DEFRA	Department for Environment Food and Rural Affairs
DESNZ	Department for Energy Security and Net Zero
DPO	Draft Plan Option
DSDP	Deep Sea Drilling Project
DSLP	Development Specification and Layout Plan
DTI	Department of Trade and Industry
DUKES	Digest of UK Energy Statistics
EC	European Commission
EcIA	Ecological Impact Assessment
eDNA	Environmental Deoxyribonucleic Acid
EEA	European Economic Area
EEZ	Exclusive Economic Zone
EGL	Eastern Green Link
EIA	Environmental Impact Assessment
EMF	Electromagnetic Field
EMODNet	European Marine Observation and Data Network
EMP	Environmental Management Plan

Acronym	Definition
EMR	Energy Market Reform
EMSA	European Maritime Safety Agency
EOWDC	European Offshore Wind Deployment Centre
EPCI	Engineering, Procurement, Construction, and Installation
EPS	European Protected Species
EQSD	Environmental Quality Standards Directive
ERCoP	Emergency Response Cooperation Plan
ES	Environmental Statement
ESCA	European Subsea Cables Association
ESO	Electricity System Operator
EU	European Union
EUNIS	European Nature Information System
FeAST	Feature Activity Sensitivity Tool
FLO	Fisheries Liaison Officer
FLOWW	Fisheries Liaison with Offshore Wind and Wet Renewables group
FMMS	Fisheries Management and Mitigation Strategy
FSA	Formal Safety Assessment
GCP	Grid Connection Point
GEBCO	General Bathymetric Chart of the Oceans
GES	Good Ecological Status
GHG	Greenhouse Gas
GIS	Geographic Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment
GPS	Global Positioning System
GVA	Gross Value Added

Acronym	Definition
G7	Group of Seven
HAT	Highest Astronomical Tide
HDD	Horizontal Directional Drilling
HES	Historic Environment Scotland
HMPA	Historic Marine Protected Area
HMR	Helicopter Main Route
HMWB	Heavily Modified Water Body
HNDFUE	Holistic Network Design Follow Up Exercise
HRA	Habitats Regulations Appraisal
HSE	Health and Safety Executive
HVAC	High Voltage Alternating Current
HVDC	High Voltage Direct Current
IAC	Inter-Array Cable
IALA	International Association of Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
IBTS	International Bottom Trawl Survey
ICCI	In-combination Climate Impact
ICES	International Council for the Exploration of the Seas
ICPC	International Cable Protection Committee
IEF	Important Ecological Feature
IEMA	Institute of Environmental Management and Assessment
IFP	Instrument Flight Procedure
IHLS	International Herring Larvae Survey
IHO	International Hydrographic Organisation
IMO	International Maritime Organisation

Acronym	Definition
INNS	Invasive Non-Native Species
INTOG	Innovation and Targeted Oil and Gas
IPCC	Intergovernmental Panel on Climate Change
IPR	Iterative Plan Review
IWRAP	The IALA Waterway Risk Assessment Program
JNCC	Joint Nature Conservation Committee
JV	Joint Venture
KIS-ORCA	Kingfisher Information Service – Offshore Renewable and Cable Awareness
LAT	Lowest Astronomical Tide
LCA	Landscape Character Area
LCT	Landscape Character Types
LGM	Last Glacial Maximum
LiDAR	Light Detection and Ranging
LMP	Lighting and Marking Plan
LSE	Likely Significant Effects
MAIB	Marine Accident Investigation Branch
MarESA	Marine Evidence Based Sensitivity Assessment
MarLIN	Marine Life Information Network
MARPOL	'Marine Pollution' - International Convention for the Prevention of pollution from Ships
MAU	Marine Analytical Unit
MBA	Marine Biological Association
MCA	Maritime & Coastguard Agency
MCAA	Marine and Coastal Access Act 2009
mCRM	Migration Collision Risk Model

Acronym	Definition
MD	Marine Directorate
MDS	Maximum Design Scenario
MD-LOT	Marine Directorate - Licensing Operations Team
MD-SEDD	Marine Directorate - Science, Evidence, Data and Digital
MERP	Marine Ecosystems Research Programme
MGN	Marine Guidance Note
MHWS	Mean High Water Spring
Mil AIP	Military Aeronautical Information Publication
MLWS	Mean Low Water Spring
MMMP	Marine Mammal Mitigation Plan
MMO	Marine Management Organisation
MNCR	Marine Nature Conservation Review
MoD	Ministry of Defence
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MPS	Marine Policy Statement
MRSea	Marine Renewables Strategic environmental assessment
MSFD	Marine Strategy Framework Directive
MSY	Maximum Sustainable Yield
MU	Management Unit
NATS	National Air Traffic Services
NCC	National Coasteering Charter
NEEOG	North-East and Eastern Ornithological Group
NERIFG	North and East Coast Regional Inshore Fisheries Group
NIS	Non-indigenous Species

Acronym	Definition
NLB	Northern Lighthouse Board
NMFS	National Marine Fisheries Service
NMP	National Marine Plan
NMPi	National Marine Plan interactive
NNG	Neart na Gaoithe
NNS	Northern North Sea
NOTAM	Notice To Aviation Missions
NPF4	National Planning Framework 4
NPL	National Physical Laboratory
NRA	Navigational Risk Assessment
NRHE	National Record of the Historic Environment
NSP	Navigation Safety Plan
NSTA	North Sea Transition Authority
NtM	Notice to Mariners
NTSLF	National Tide and Sea Level Facility
N_2O	Nitrous Oxide
OFA	Orkney Fisheries Association
OFTO	Offshore Transmission Owners
ONS	Office for National Statistics
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OREI	Offshore Renewable Energy Installation
ORJIP	Offshore Renewables Joint Industry Programme
OSP	Offshore Substation Platform
OSPAR	Oslo Paris [Convention]
OUV	Outstanding Universal Value

Acronym	Definition
OWEPS	Offshore Wind Energy Policy Statement
OWF	Offshore Wind Farm
OWG	Ornithological Working Group
O&M	Operation and Maintenance
PAC	Pre-Application Consultation
PAD	Protocol for Archaeological Discoveries
PADI	Professional Association of Diving Instructors
PDE	Project Design Envelope
PE	Polyethylene
PEXA	Practice and Exercise Area
PINS	Planning Inspectorate
PMF	Priority Marine Feature
POA	Plan Option Area
PoM	Programme of Measures
PSA	Particle Size Analysis
PSR	Primary Surveillance Radar
PTS	Permanent Threshold Shift
PU	Polyurethane
PVA	Population Viability Analysis
RAF	Royal Air Force
RAMS	Risk Assessment Method Statements
RBD	River Basin District
RBMP	River Basin Management Plan
REWS	Radar Early Warning Systems
RIAA	Report to Inform Appropriate Assessment

Acronym	Definition
RLoS	Radar Line of Sight
rms	Root Mean Square
RNLI	Royal National Lifeboat Institution
ROV	Remotely Operated Vehicle
RSPB	Royal Society for the Protection of Birds
RYA	Royal Yachting Association
SA	Sustainability Appraisal
SAC	Special Area of Conservation
SACFOR	Super Abundant, Abundant, Common, Frequent, Occasional, and Rare
SAR	Search and Rescue
SC	Subsea Collector
SCANS	Small Cetaceans in European Atlantic Waters in the North Sea
SCDS	Supply Chain Development Statement
SCOS	Special Committee on Seals
ScotMER	Scottish Marine Energy Research
SCRM	Stochastic Collision Risk Model
SEA	Strategic Environmental Assessment
SEIA	Socio-Economic Impact Assessment
SEL	Sound Exposure Level
SEPA	Scottish Environment Protection Agency
SEPLA	Suction Embedded Plate Anchors
SFF	Scottish Fishermen's Federation
SIM	Strategic Investment Model
SLVIA	Seascape, Landscape, and Visual Impact Assessment
SMP	Sectoral Marine Plan

Acronym	Definition
SMP IPR	Sectoral Marine Plan Iterative Plan Review
SMU	Seal Management Unit
SNCBs	Statutory Nature Conservation Bodies
SNH	Scottish National Heritage
SOLAS	International Convention for the Safety of Life at Sea
SOWEC	Scottish Offshore Wind Energy Council
SPA	Special Protection Area
SPFA	Scottish Pelagic Fisherman's Association
SPL	Sound Pressure Level
SPV	Special Purpose Vehicle
SSC	Suspended Sediment Concentration
SSE	Scottish and Southern Electricity
SSEN	Scottish and Southern Electricity Networks
STCW	Standards of Training, Certification, and Watchkeeping
SWFPA	Scottish White Fish Producers Association
TAEZ	Temporary Archaeological Exclusion Zones
TCE	The Crown Estate
TJB	Transition Joint Bay
TTS	Temporary Threshold Shift
TWP	Thistle Wind Partners Limited
UHI	University of Highlands and Islands
UK	United Kingdom
UK IAIP	United Kingdom Integrated Aeronautical Information Publication
UKCP18	United Kingdom Climate Projections 2018
UKCS	United Kingdom Continental Shelf

Acronym	Definition
UKHO	United Kingdom Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
UNESCO	United Nations Educational, Scientific and Cultural Organisation
UWWTD	Urban Waste Water Treatment Directive
UXO	Unexploded Ordnance
VFR	Visual Flight Rules
VHF	Very High Frequency
VLA	Vertical Load Anchor
VMP	Vessel Management Plan
VMS	Vessel Monitoring System
VTS	Vessel Traffic Survey
WEWS	Water Environment and Water Services
WFD	Water Framework Directive
WHS	World Heritage Site
WMP	Waste Management Plan
WSI	Written Schemes of Investigation
ZoI	Zone of Influence
ZTV	Zone of Theoretical Visibility

Table of Units

Units	Definition
%	Percent
‘	Minute
£	Great British Pound
°	Degree
°C	Degree Celsius
cm	Centimetre
CO_2e	Carbon Dioxide Equivalent
dB	Decibel
ft	Feet
gCO2/kWh	Grams of Carbon Dioxide per Kilowatt-Hour
GW	GigaWatt
J	Joule
kg	Kilogram
kHz	Kilohertz
kJ	Kilojoule
km	Kilometre
km^2	Square kilometre
kts	knots
kV	Kilovolt
m	Metre
m/s	Metre per second
m^2	Square Metre
mm	Millimetre
MW	MegaWatt

Units	Definition
nm	Nautical mile
$tCO2_e$	Tonnes of Carbon Dioxide Equivalent

1 Introduction

1.1 Background

1.1.1 In 2020, Crown Estate Scotland (CES) launched the ScotWind leasing process to facilitate the increase in offshore wind capacity to meet the Scottish Government's 2045 Net Zero target. Following the ScotWind Leasing Round in 2022, on entering into an Option Lease Agreement with CES, Thistle Wind Partners Limited (TWP) secured the rights to develop a commercial scale Offshore Wind Farm (OWF) project in the E3 Plan Option Area (POA) as defined in the Scottish Government's Sectoral Marine Plan (SMP) for Offshore Wind Energy (Scottish Government, 2020).

1.1.2 This Offshore Scoping Report supports Bowdun Offshore Wind Farm Limited's (hereafter referred to as the Applicant) request for a Scoping Opinion from Marine Directorate - Licensing Operations Team (MD-LOT), acting on behalf of Scottish Ministers, for the offshore elements of the Bowdun OWF (hereafter known as the Proposed Development). The offshore and onshore elements of the Bowdun OWF are collectively known as the Project; an estimated 1 GW OWF with the Array Area located approximately 38 km off the Aberdeenshire coast, at the closest point to land.

1.1.3 The Proposed Development includes the Offshore Generation Assets and the Offshore Transmission Assets, which are located within the Scoping Boundary detailed in Figure 1.1. The Proposed Development is located seaward of Mean High Water Springs (MHWS) out to Scottish Offshore Waters. The onshore infrastructure, which will be subject to a separate onshore planning application under The Town and Country Planning (Scotland) Act 1997, is located landward of Mean Low Water Springs (MLWS).

1.1.4 For the purpose of this Offshore Scoping Report, the Proposed Development refers to the Offshore Infrastructure only. A more detailed description of the Proposed Development is provided in Section 3: Project Description.

1.1.5 The Applicant is seeking the following permissions, licences and consents for the Proposed Development:

- Section 36 Consent under the Electricity Act 1989 for the Offshore Generation Assets;
- Marine Licence covering the Offshore Generation Assets;
- Marine Licence covering the Offshore Transmission Assets;
- Safety Zone declarations during construction and operation under the Energy Act 2004; and
- Decommissioning scheme under the Energy Act 2004.

1.2 TWP and the Environmental Impact Assessment Team

1.2.1 TWP is a Joint Venture (JV) between DEME[1], Qair Marine[2] and Aspiravi International[3]. Together, the TWP partners have a strong background in offshore renewable energy development and delivery, and associated port developments. TWP established the Applicant as a Special Purpose Vehicle (SPV) for the Proposed Development.

1.2.2 DEME is a Belgium based global solutions provider in the highly specialised fields of marine infrastructure, dredging, land reclamation, offshore energy and environmental remediation with over 145 years of experience. DEME is a world leader in fixed foundation installation having installed more than 2,700 offshore Wind Turbines and has been involved in over 70 offshore wind projects globally with capabilities covering Site Investigation to the full Engineering, Procurement, Construction, and Installation (EPCI) scope. Local examples include the Moray East 950 MW offshore wind project: Foundations EPCI and Inter-Array Cables (IACs) installation (completed 2021), and Neart na Gaoithe (NNG) 450 MW: EPCI cable installation (completed 2024).

1.2.3 Qair Marine is an international independent renewable energy and hydrogen producer involved with projects in over 20 countries including onshore and offshore wind energy, solar energy, hydroelectricity, waste-to-energy, and green hydrogen. Qair is developing and constructing the pioneering EolMed project, a 30 MW floating OWF off the coast of Southern France in the Mediterranean Sea set to be commissioned in 2025.

1.2.4 Aspiravi International, part of the Aspiravi Group, develops, implements, and operates renewable energy projects with a total installed capacity of over 1.5 GW. These projects primarily pertain to wind energy, but the Aspiravi Group also owns and operates biomass installations, biogas engines and hydro-electric installations.

1.2.5 TWP contracted RPS to provide consenting support services, leading the Environmental Impact Assessment (EIA) and Habitats Regulations Appraisal (HRA) for the Proposed Development. RPS has over 20 years of experience in the United Kingdom (UK) renewable sector including leading the offshore EIA and HRA for the 4.1 GW Berwick Bank OWF on behalf of Scottish and Southern Electricity (SSE) Renewables. RPS are supported by several technical sub-contractors, referenced in the applicable technical sections, of this Offshore Scoping Report and summarised in Table 1.2.

[1] https://www.deme-group.com/

[2] https://www.qair.energy/marine-renewable/

[3] https://www.aspiravi.com/en/

1.3 Proposed Development Overview

1.3.1 Following an announcement in November 2017, CES subsequently launched the first ScotWind Leasing Round for commercial scale offshore wind energy projects within Scottish waters in June 2020, with the application window open between January and July 2021 (Scottish Government, 2020). In preparation of the leasing process, the SMP defined 15 POAs across four regions around Scotland: North, North-East, East, and West.

1.3.2 The Array Area is located in the 474 km^2 E3 POA which, along with E1 and E2, is in the East region of the SMP. Additional information on this leasing process, and the Applicant's site selection process to date, is provided in Section 6: Site Selection and Consideration of Reasonable Alternatives. Further detail will be included in the Offshore EIA Report. The Export Cable Corridor extends from the Array Area and makes Landfall at Benholm, Aberdeenshire.

Proposed Development Infrastructure

1.3.3 The Proposed Development includes up to 67 Wind Turbines on fixed or floating (including mooring and anchoring systems) foundations, which will be located within the Array Area. The IACs, either dynamic or static depending on the Wind Turbine foundation technology deployed, will be used to connect Wind Turbines to Offshore Substation Platforms (OSPs). Alternatively, Subsea Collectors (SCs) may be used to connect Wind Turbines in clusters to OSPs. Up to three OSPs on fixed foundations, along with Interconnector Cables, will also be located in the Array Area. Electricity will be transmitted to shore by up to four Offshore Export Cables, which will run from the OSPs to Landfall. From there, the onshore Export Cables will connect to the Grid Connection Point (GCP) which forms part of the National Electricity Transmission System (NETS). Further detail is provided in Section 3: Project Description.

Proposed Development Scoping Boundary

1.3.4 The Proposed Development Scoping Boundary encompasses the Array Area and Export Cable Corridor. The Array Area covers an area of 187 km^2 and is located approximately 38 km from the Aberdeenshire coast at its closest point, within Scottish Offshore Waters. Figure 1.1 illustrates the Scoping Boundary of the Proposed Development.

1.3.5 There are multiple OWFs within 50 km of the Proposed Development that are either operational, under construction, or are in the process of obtaining consents. These projects are:

- Seagreen 1 (operational) (Seagreen Wind Energy Limited, 2018);
- Seagreen 1A (consented) (Seagreen Wind Energy Limited, 2021);

- Aberdeen OWF (operational) (Vattenfall, 2018);
- Hywind Scotland (operational) (Marine Data Exchange, 2013);
- Berwick Bank (in planning) (SSE Renewables, 2022);
- Kincardine (operational) (Kincardine Offshore Windfarm Limited, 2016);
- Ossian (in planning) (Ossian OWFL, 2023); and
- Morven (in planning) (Morven Offshore Wind Limited, 2023).

1.3.6 This Offshore Scoping Report outlines the approach to Cumulative Effects Assessment (CEA) (Section 4: EIA Methodology) and the Offshore EIA Report will include consideration of the cumulative effects of the Proposed Development with other projects. These OWFs are shown in Figure 16.3, Section 16: Infrastructure and Other Users.

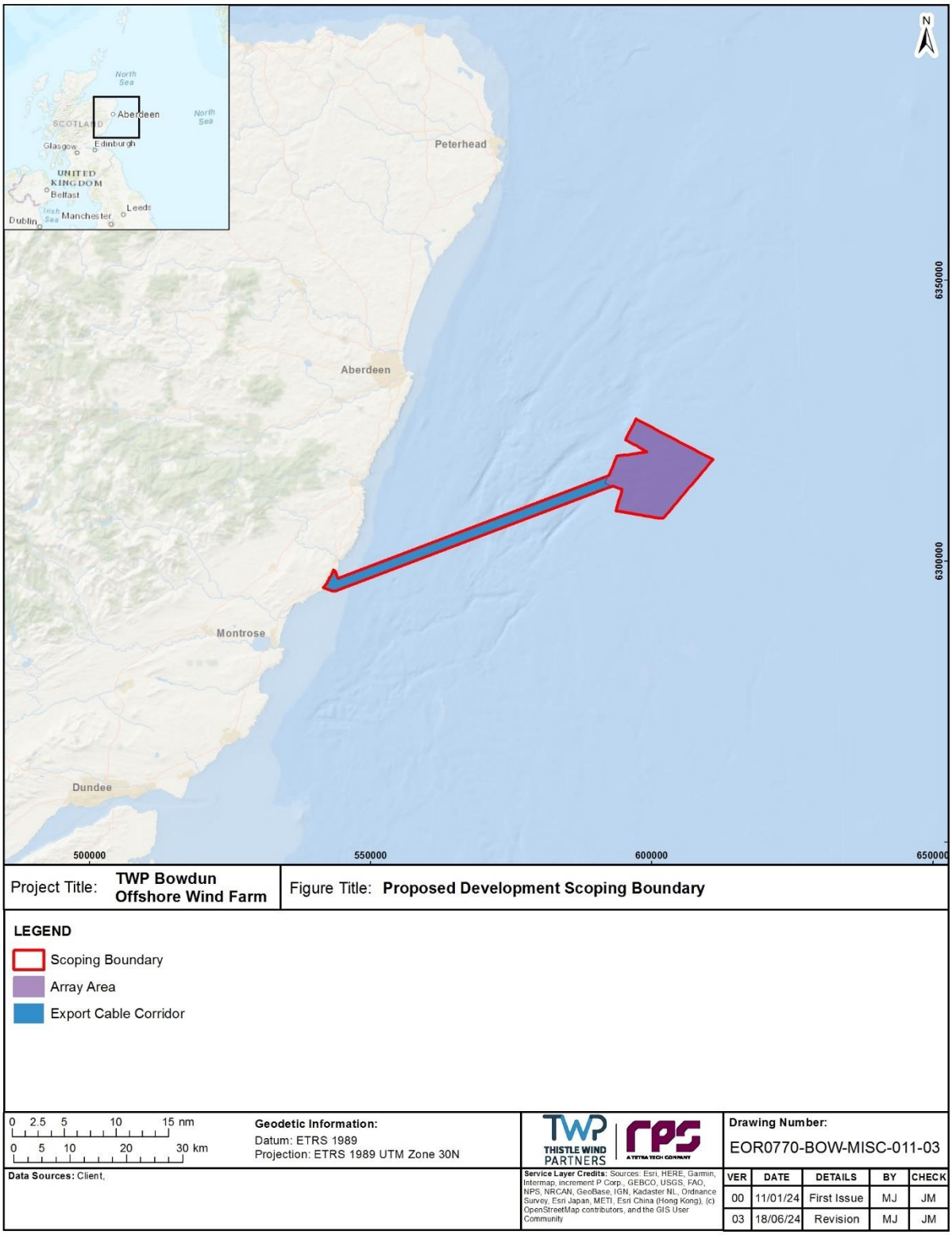


Figure 1.1: Proposed Development Scoping Boundary

1.4 Purpose of the EIA Scoping Report

Purpose

1.4.1 This Offshore Scoping Report has been produced for the primary purpose of requesting a Scoping Opinion from MD-LOT on behalf of Scottish Ministers. An opinion is sought with regards to the scope of the EIA, as detailed within the relevant sections of this Offshore Scoping Report.

1.4.2 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) and Regulation 14 of the Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017 (as amended) (herein referred to as the 'EIA Regulations').

1.4.3 This Offshore Scoping Report includes a description of the Proposed Development (Section 3), the relevant legislation and planning policies (Section 2), an overview of the site selection undertaken to date (Section 6), a summary of the proposed EIA methodology including the approach to CEA (Section 4), and outlines the potential physical, biological and human impacts that may be caused by the Proposed Development (Sections 7 to 23), along with a preliminary list of Embedded Mitigation (Appendix A: Draft Schedule of Mitigation and Commitments).

1.4.4 Where no significant impacts or receptor pathways are identified within the topic sections, this is highlighted and any such topics, potential impacts or receptors are proposed to be scoped out of the EIA. 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 MD-LOT, Statutory Consultees and other key stakeholders and consultees as required.

1.4.5 The onshore elements of the Project, which includes the Onshore Transmission Assets above MLWS, will be the subject of a separate Onshore Scoping Report, under The Town and Country Planning (Scotland) Act 1997, which will be submitted to the Aberdeenshire Council.

1.4.6 For clarity regarding the onshore and offshore consenting regimes in relation to the intertidal area located between MHWS and MLWS the following distinctions are made:

- the Offshore Scoping Report considers all activities associated with the Proposed Development extending seawards from MHWS, including the Offshore Generation and Assets Offshore Transmission Assets; and

- the Onshore Scoping Report considers all activities and infrastructure extending landwards from MLWS. This includes landfall infrastructure, onshore cabling, Onshore Substation and associated ancillary infrastructure.

1.4.7 Where there is an overlap in jurisdiction of consenting and regulatory regimes (i.e. within the Intertidal area), both the Scoping Reports, as well as the subsequent EIA Reports, will present relevant technical assessments.

1.4.8 A summary of the information requirements as set out in the EIA Regulations and where these can be found in this Offshore Scoping Report is provided in Table 1.1.

Table 1.1: Scoping Requirements of EIA Regulations and Sections where These are Addressed

EIA Regulations requirement	Summary Content
A description of the location of the Project including a plan sufficient to identify the landfall.	Section 3 provides a project description and a detailed illustration for the Proposed Development.
A brief description of the nature and purpose of the Project and of its likely significant effects on the environment.	Sections 3 to 6 (inclusive) covers the Proposed Developments purpose, general designs and procedures.
Information on the Proposed Development and the associated environmental impacts to sufficiently define the potential effects and, therefore extent of the Offshore EIA Report.	Sections 7 to 245 (inclusive) describe the potential impacts of the Proposed Development and which impacts are proposed to be scoped in or out of the Offshore EIA Report.

Approach

1.4.9 This Offshore Scoping Report has been prepared to:

- Provide a summary of the current understanding of the existing environment, based on a combination of pre-existing baseline data and site-specific survey data (where available), and the methodologies followed, or proposed, to obtain such data and undertake any analyses; and
- Identify potential impacts to be scoped either in or out of the Offshore EIA Report, accompanied by the evidence that informed such decisions.

1.4.10 Following receipt of the Scoping Opinion, the Offshore EIA Report will focus on the assessment of impacts scoped in to determine any likely significant environmental effects and to highlight where uncertainty is present when determining the significance of effects.

1.4.11 For each topic section, this Offshore Scoping Report includes:

- overview of the proposed study area(s) and the current baseline data including any additional site-specific surveys or data collection;
- a summary of the proposed assessment methodologies to be used for the EIA;
- the proposed Embedded Mitigation;
- any impacts proposed to be scoped in or out of the EIA and the supporting evidence;
- an overview of the approach to considering potential cumulative effects; and
- an initial screening of transboundary effects.

1.4.12 Section 4: EIA Methodology provides further detail of the approach to carrying out the EIA. The EIA process will include an assessment of likely significant environmental effects throughout all phases of development: construction, Operations and Maintenance (O&M), and decommissioning.

1.4.13 Stakeholder consultation is an important aspect of the EIA process. This Offshore Scoping Report presents information to stakeholders to receive further feedback that will be applied to the EIA process. Section 5: Consultation and Engagement outlines the consultation undertaken to date and proposed during the pre-application stage of the EIA process.

1.5 Structure of the Offshore Scoping Report

1.5.1 The structure of the Offshore Scoping Report is outlined in Table 1.2. Cumulative effects will be assessed within each topic-specific section for each phase of the Proposed Development.

Table 1.2: The Structure of the Offshore Scoping Report

Topic	Summary of Contents	Section	Author
Introductory Sections			
Introduction	Background to the Proposed Development and the Applicant. Purpose of and approach to scoping and structure of the Offshore Scoping Report.	Section 1	RPS
Policy and Legislation	Summary of relevant policy and legislation to the Proposed Development.	Section 2	RPS
Project Description	Outlines information relevant to the Proposed Development that is present within the Project Design Envelope (PDE). Includes a description of Offshore Infrastructure and construction methods used for each stage of the Proposed Development.	Section 3	RPS
EIA Methodology	Review of proposed evaluation methodology of likely significant environmental effects, inter-related, cumulative and transboundary effects.	Section 4	RPS
Consultation and Engagement	Overview of consultation to date and proposed approach to stakeholder engagement for the rest of the EIA process.	Section 5	RPS
Site Selection and Consideration of Reasonable Alternatives	Description of the site selection process and alternatives considered by the Applicant to date for the Proposed Development.	Section 6	RPS

Topic	Summary of Contents	Section	Author
Offshore Physical Environment			
Physical Processes	Definition of relevant study area(s), data sources baseline environment and effects proposed to be scoped in and out of the Offshore EIA Report. Modelling methods are included to support the determination of impact magnitude. Presentation of potential impacts on physical processes (tidal flow, waves, currents, and sediment transport).	Section 7	ABPmer
Subsea Noise	Description of modelling procedures, data sources, and noise limitation guidelines required to understand impacts upon sound sensitive receptors, such as marine mammals and fish.	Section 8	Seiche
Offshore Biological Environment			
Benthic Ecology	Definition of relevant study area(s) for benthic ecology. Analysis of desk-based data sources and site-specific survey results and overview of the baseline environment. Key receptors and effects scoped in and out.	Section 9	RPS
Fish and Shellfish Ecology	Definition of relevant study area(s) for fish and shellfish ecology, data sources and baseline environment. Identifies keys receptors and effects proposed to be scoped in and out of the Offshore EIA Report.	Section 10	RPS
Marine Mammals	Definition of relevant scope and study area(s) for marine mammals, data sources and overview of the baseline environment. A detailed approach to assessment (underwater noise modelling). Key receptors and effects proposed to be scoped in and out of the Offshore EIA Report.	Section 11	RPS

Topic	Summary of Contents	Section	Author
Offshore Ornithology	Definition of relevant scope and study area(s) for offshore ornithology, summary of data sources, and overview of the baseline environment. Detailed approach to assessment (modelling). Identifies key receptors and effects proposed to be scoped in and out of the Offshore EIA Report.	Section 12	RPS
Offshore Human Environment			
Commercial Fisheries	Definition of relevant study area(s) for commercial fishing activities, data sources and baseline environment. Detailed approach to the assessment of potential impacts during construction, O&M and decommissioning on key receptors.	Section 13	NiMa
Shipping and Navigation	Definition of the relevant Study Area(s) for shipping and navigation, specific legislations and guidance, data sources and baseline of routes and characteristics. Detailed approach to assessment (Navigational Risk Assessment (NRA)) to assist in understanding impacts upon these from construction, O&M, and decommissioning.	Section 14	NASH Maritime
Aviation and Radar	Overview of the aviation and communication operations within the vicinity of the Scoping Boundary, which is required to assist in understanding impacts upon these from construction, O&M and decommissioning.	Section 15	Coleman Aviation
Infrastructure and Other Users	Evaluation of the available baseline data and survey data for other sea users. These are used to determine the impacts of the Proposed Development on these receptors.	Section 16	RPS

Topic	Summary of Contents	Section	Author
Major Accidents and Disasters	Consideration of the potential for likely significant environmental effects due to the vulnerability of the Proposed Development to major accidents and disasters and the potential for the Proposed Development to contribute to the risk of major accidents and disasters. A standalone major accidents and disasters assessment is proposed to be scoped out, as all identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, Risk Assessment Method Statements (RAMS), and/or management plans.	Section 17	RPS
Socio-Economics, Tourism and Recreation	Approach to the assessment of potential effects of the Proposed Development on socio-economics, tourism and recreation on both offshore and onshore receptors. Considerations for the development of assessment study areas, assumptions applied and impact occurrence, and stakeholder engagement strategy.	Section 18	BiGGAR Economics
Marine Archaeology	Presentation of desk-based review and strategy to ensure marine archaeological receptors are safeguarded from potential interactions with the Proposed Development.	Section 19	RPS
Seascape and Visual Impact	Overview of potential visual impacts on onshore or coastline receptors using Wirelines and Zones of Theoretical Visibility (ZTV).	Section 20	RPS
Cultural Heritage	Identifies onshore cultural heritage sites, through ZTVs, that may be impacted by the Proposed Development.	Section 21	RPS
Climate Change	Identifies the climate change receptors of relevance to the Proposed Development and considers the potential impacts arising from all phases of the Proposed Development. Sets out the proposed scope of the Offshore EIA Report and the methodology to be used in the assessment of climate change impacts for the Proposed Development.	Section 22	RPS

Topic	Summary of Contents	Section	Author
Offshore Water Quality and Water Framework Directive (WFD)	Analysis of potential interactions between the Proposed Development and the offshore water environment, including consideration of WFD within the 3 nm requirement.	Section 23	RPS
Other Environmental Topics			
Topics with supporting information in the Offshore EIA Report	Topics including waste, air quality, airborne noise, and human health which are scoped out of the Offshore EIA and the justification to support the proposed approach.	Section 24	RPS
Offshore Wind Farm Summary			
Overview	A summary of the Offshore Scoping Report including a high-level recap of the topics scoped in and out of the EIA.	Section 25	RPS
References			
References	List of all references used within the Offshore Scoping Report.	References	RPS
Appendices			
Draft Schedule of Mitigation and Commitments	Sets out a summary of the designed in measures and mitigation to be committed to within the Offshore EIA Report.	Appendix A: Draft Schedule of Mitigation and Commitments	RPS
Transboundary Screening	A screening of transboundary impacts has been carried out for each topic section. The outcomes of this screening are presented in this appendix.	Appendix B: Transboundary Screening	RPS
Subsea Noise Modelling Method Statement	Provides detailed information on the proposed approach to subsea noise assessment.	Appendix C: Subsea Noise Modelling Method Statement	Seiche

Topic	Summary of Contents	Section	Author
Marine Protected Area Screening	Provides summary of the approach to the MPA Assessment that is proposed for the Proposed Development and includes the results of a preliminary initial screening of designated MPAs which, it is proposed, are carried forward for consideration in the main MPA Assessment.	Appendix D: Marine Protected Area Screening	RPS
Intertidal Survey Report	Provides the results of the intertidal survey undertaken in September 2023.	Appendix E: Intertidal survey	RPS
Gazetteers of Marine Archaeology	Marine Archaeology identified in the Marine Archaeology Study Area.	Appendix F: Gazetteers of Marine Archaeology	RPS
Water Framework Directive Assessment	Screening of the WFD that shows the impact of the Proposed Development on nearby waterbodies.	Appendix G: Water Framework Directive Assessment	RPS

2 Policy and Legislation

2.1 Introduction

2.1.1 This section outlines the key policies and legislation relevant to the development of OWFs in Scotland and, therefore, the Proposed Development. This includes UK and Scottish policies and legislation, the need for the Proposed Development, planning policy and legislation, and consents and licensing requirements.

2.2 Climate Change Policy and Need for the Project

2.2.1 In April 2019, the First Minister of the Scottish Government declared a climate emergency, which was followed by the UK Government declaring its own climate emergency, along with an environmental emergency, in May 2019. These announcements demonstrate the UK and Scottish Governments' commitment to tackling climate change, which is further demonstrated through the policies outlined within this section.

2.2.2 The challenges associated with climate change, energy supply and security of supply are driving government 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 Scotland.

International Commitments

2.2.3 The Climate Change Act 2008 transposes into UK law, and into Scottish law via the Climate Change (Scotland) Act 2009, the commitments made following signature of the Kyoto Protocol, which came into effect in 2005. This protocol sets international binding Greenhouse Gas (GHG) emission reduction targets. The Climate Change Act 2008 introduced legally binding targets, including the reduction of GHG emissions by 80% by 2050 compared to 1990 levels, subsequently amended by the Climate Change Act 2008 (2050 Target Amendment) Order 2019 to 100% of emissions by 2050 and further amended in 2021 to include a 78% reduction by 2035. As noted below, there are even more ambitious Scottish targets applicable to this Project.

2.2.4 The Paris Agreement 2016 (Paris Agreement under the United Nations Framework Convention on Climate Change) is an international treaty, agreed at the Paris Climate Conference (COP21) in December 2015 and entered into force in November 2016. This agreement aims to improve resilience to climate change impacts and provide support to developing countries to implement climate change mitigation. The targets in this agreement supersede those made in the Kyoto

Protocol, aiming to keep the global temperature to below 2°C above pre-industrial levels, and limit global warming to 1.5°C.

UK Energy Legislation and Policy

2.2.5 The Climate Change Act 2008, as amended by the Climate Change Act 2008 (2050 Target Amendment) Order 2019, sets emission reduction targets as described in paragraph 2.2.3. The establishment of this Act marked the start of the UK's adopted policies to address the climate emergency and made the UK the first Group of Seven (G7) nation to set a climate change goal in reference to the Kyoto Protocol.

2.2.6 As a support to the Climate Change Act 2008, the Energy Act 2023 encourages low carbon electricity generation within the UK and aids the goals set for low carbon industries. The Act provides the framework for setting a decarbonisation target of 2030 for electricity generation within the UK and includes a framework for Energy Market Reform (EMR) to help deliver low carbon electricity generation while reducing costs for consumers. The EMR included the implementation of Contracts for Difference (CfD) which aims to provide long-term price stabilisation and low carbon energy investment. To further support the Climate Change Act 2008, the Energy Act 2023 encourages the development of hydrogen, Carbon Capture and Storage (CCS) and heat infrastructure within the UK.

2.2.7 In March 2019 the UK Government and the Offshore Wind Industry Council signed the UK Offshore Wind Sector Deal (HM Government, 2019). The Sector Deal is a long-term strategy which sets out an ambitious partnership between government and industry to raise the productivity and competitiveness of UK companies to ensure the UK continues to play a leading role as the global market grows in the decades to come. The Sector Deal aims to maximise the advantages for UK industry by the shift to net zero by providing clarity on future CfD rounds, increasing UK content to 60% by 2030 and increasing investment in UK supply chain. 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.

2.2.8 In 2022, UK government published the British Energy Security Strategy (HM Government, 2022) in response to global rises in energy costs. It sets out the UK ambition to deliver 50 GW of offshore wind energy by 2030, including 5 GW of floating wind. This is an increase of 4 GW of floating wind when compared to the Net Zero Strategy: Build Back Greener policy set out in 2021 (HM Government, 2021). The British Energy Security Strategy also sets out steps that the UK Government aims to take to reduce the time taken to develop and deploy offshore wind projects (HM Government, 2022).

2.2.9 As required by the Climate Change Act 2008, the Carbon Budget Delivery Plan (HM Government, 2023) outlines a package of measures and associated timings, and details how they will contribute to meeting the UK's 4th to 6th Carbon Budgets. The ability to meet future carbon budgets requires the delivery of further offshore wind development including floating wind capacity.

2.2.10 The Department for Energy Security and Net Zero (DESNZ) published the Powering Up Britain Policy papers including an Energy Security Plan and Net Zero Growth Plan in 2023 (DESNZ, 2023a). These policies aim to encourage the use of renewable energies including from OWFs, as part of a solution to the climate emergency and details how the UK Government will improve energy security, take advantage of the economic opportunities of the transition to low carbon energy generation and deliver on the commitment to achieving net zero by 2050. Offshore wind is a key element of these publications which includes commitment to developing 5 GW of floating wind by 2030, helping expand and increase the benefits of floating projects by committing to a floating Offshore Wind Manufacturing Investment Scheme, which will provide up to £160 million to increase investment in port infrastructure projects.

Scottish Energy Legislation and Policy

2.2.11 The Climate Change (Scotland) Act 2009 (outlined in Section 2.2.3), as amended by the Climate Change (Emission Reduction Targets) (Scotland) Act 2019, sets out a legally binding target to decrease GHG emissions by 100% lower than 1990 levels by 2045. The Act relies on the Scottish Ministers and other public entities to ensure that future developments are made sustainably and that low emission options are encouraged. This Act is also in accordance with the Paris Agreement goals of limiting global warming levels to below 2°C, whilst pursuing efforts to stop them reaching over 1.5°C. The current Scottish Emissions Reductions Targets encompass reducing GHG emissions by at least 75% by 2030, 90% by 2040, and fully to net-zero by 2045. The Scottish Government announced in April 2024 that new legislation will be brought forward introducing Carbon budgets which will replace the current Scottish targets.

2.2.12 The Scottish Energy Strategy: The Future of Energy in Scotland (Scottish Government, 2017a), presented the plan for decarbonising and improving energy infrastructure within Scotland including 2030 and 2050 vision for Scotland to deliver secure, affordable, clean energy for Scotland's households, communities and businesses. In setting out this vision the strategy relies on future delivery of renewable energy with a target of the equivalent of 50% of the energy for Scotland's heat, transport and electricity consumption to be supplied from renewable sources by 2030. The strategy also emphasizes the importance of CfD auctions for Scottish offshore

wind projects and outlines how the same process can be used and expanded upon for future marine energy developments.

2.2.13 The Offshore Wind Energy Policy Statement (OWEPS) (Scottish Government, 2020b) details expectations for offshore wind developments in the future and how they can help the Scottish Government reach its Climate Change (Emissions Reduction Targets) (Scotland) Act 2019 goals. The OWEPS builds upon to renewable energy targets outlined in the Scottish Energy Strategy (Scottish Government, 2017).

2.2.14 On 10 January 2023, the Scottish Government published the 'Energy Strategy and Just Transition Plan' for consultation, which will eventually replace the Scottish Energy Strategy (Scottish Government, 2023). The Draft Strategy and Plan sets out a 'clear policy position and a route map of actions with a focus out to 2030 that the Scottish Government will take and the changes that the UK Government must deliver', while establishing a vision that by 2045 'Scotland will have a flourishing, climate friendly energy system that delivers affordable, resilient and clean energy to Scottish households, communities and business'. Consultation on the draft Energy Strategy and Just Transition Plan closed in May 2023 with anticipated publication of the final version of the document in 2024.

2.3 Marine Planning Framework

2.3.1 Scottish marine planning is governed by two Acts: the Marine (Scotland) Act 2010 for Scottish inshore waters (out to 12 nm); and the Marine and Coastal Access Act (MCAA) 2009 for Scottish Offshore Waters (between 12 to 200 nm).

2.3.2 The two Acts (referred herein as the Marine Acts) established a legislative framework for marine planning to enable demands on marine environment to be managed in a sustainable way, while providing a regulatory framework for licensing marine developments.

2.3.3 The Marine Acts set out a tiered approach to developing marine planning in the UK and Scotland. The framework includes the following elements:

- UK Marine Policy Statement (MPS);
- Scottish National Marine Plan (NMP);
- SMP for Offshore Wind Energy; and
- Regional Marine Plans.

UK Marine Policy Statement

2.3.4 The UK MPS (UK Government, 2011), prepared under the MCAA (2009), was created by the UK Government and adopted devolved administrations including Scottish Government. The UK MPS provides a framework preparing marine plans within the UK and for taking

decisions on matters affecting the marine environment in the absence of adopted marine plans.

Scottish National Marine Plan

2.3.5 The Scottish Government adopted and published the first NMP (Scottish Government, 2015) in March 2015. Within the NMP, policies are provided for developments and use of marine resources in Scottish Offshore Waters up to 200 nm from the coast. The Scottish NMP, which is compatible with the UK MPS (UK Government, 2011) and other marine plans, supports marine development in Scottish Offshore Waters while incorporating appropriate protections and safeguards for the environment, other sea users and existing marine activities. There are a number of strategic objectives which aim to deliver a robust approach to managing Scotland's marine area including:

- achieving a sustainable marine economy;
- living within environmental limits;
- ensuring a strong, healthy and just society;
- promoting good governance; and
- using sound science responsibly.

2.3.6 The NMP provides both general policies to support delivery of strategic objectives, and specific sectoral objectives which may be achievable over the plan period or set direction for longer term goals. The objectives for offshore wind and other marine renewables are summarised below:

- 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 Offshore Waters;
- contribute to achieving the renewables target to generate electricity consumption from renewable sources by 2020;
- contribute to achieving the decarbonisation target of 50 gCO_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; and
- co-ordinated government and industry-wide monitoring.

2.3.7 The NMP has been reviewed and the effectiveness of its implementation has been reported on twice since its adoption. The latest review in 2021, identified that while the Plan is still effective, it needs to be updated to account for significant national and global developments, which impact the use and management of Scottish marine resources. Key developments include the withdrawal of the UK from the European Union (EU) on 31 January 2020, the Global Climate Emergency, the Scottish Government's commitment to Net Zero by 2045, the COVID-19 pandemic, and the delivery of the Scotland's Blue Economy approach (Scottish Government, 2022a). The second iteration of the NMP (NMP2), which is currently at an early stage of preparation, is likely to take into account the key elements highlighted in the 2021 review, particularly around the climate change emergency. The NMP2, which will be supported by a Strategic Environmental Assessment (SEA), which will be informed by the SEA Scoping Report consulted upon in 2023 (Scottish Government, 2023b).

Sectoral Marine Plan for Offshore Wind

2.3.8 The first SMP for Offshore Wind Energy (Blue Seas Green Energy) (Marine Scotland, 2011) was adopted in 2011, following which, draft wind, wave and tidal SMPs were produced in 2013 (Marine Scotland, 2013).

2.3.9 Subsequently, in 2017, CES announced their intention to run a leasing round for commercial scale offshore wind energy projects in Scottish Offshore Waters. To inform the spatial development of this leasing round, MD-LOT, as Planning Authority for the area undertook a planning exercise to identify areas suitable for the development for offshore wind.

2.3.10 The SMP for Offshore Wind Energy (Scottish Government, 2020b) builds upon the work undertaken in the 2011 and 2013 plans, and incorporates recent technological, policy, regulatory and market development to create a new strategic planning process. The SMP seeks to contribute to achieving Scotland's energy and climate change objectives by providing a spatial strategy and was used to inform the ScotWind leasing process which concluded in 2022. An SEA, HRA and Socio-Economic Impact Assessment (SEIA) was carried out for the SMP.

2.3.11 In the recent ScotWind Leasing Round process, a total of 20 proposed OWF projects were awarded option agreements within 15 POAs, 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 Round'. The SMP identified that E3 (the POA applicable to the Proposed Development) was a site suitable for offshore wind development.

2.3.12 The SMP is subject to the Iterative Plan Review (IPR) process to ensure that it is underpinned by best available evidence, taking into account updates and progression of developments (e.g. detailed site survey results and assessments for projects, the construction of projects, Innovation and Targeted Oil and Gas (INTOG) leasing round and further changes to policy and regulatory context). Work on the next iteration of the SMP is understood to be underway, with consultation expected to commence in Autumn 2024.

2.4 Onshore Plans and Policies

2.4.1 National Planning Framework 4 (NPF4), approved by the Scottish Parliament on the 11 January 2023, and formally adopted in February 2023 is Scotland's terrestrial national spatial strategy. It sets out spatial principles, regional priorities, national developments and national planning policy in support of achieving net zero in Scotland by 2045 (Scottish Government, 2023). The NPF4 is most directly relevant to the Intertidal area where there is an overlap between terrestrial and marine planning systems, although as the most up to date national planning document it sets a clear direction of travel and stresses the urgency of addressing the Climate Emergency. NPF4 identifies net zero energy solutions as a key contributor to net zero emissions by 2045 and includes National Planning Policies to achieve this aim, such as a Climate Emergency Policy which encourages and promotes development that addresses the global climate emergency, and a Green Energy Policy, which encourages and promotes all forms of renewable energy development both onshore and offshore. In addition, the NPF4 categorises offshore renewables over 50 MW as 'national development'.

2.4.2 The Aberdeenshire Local Development Plan (ALDP) (Aberdeenshire Council, 2023) outlines a vision for the entire Aberdeenshire Council administrative area and promotes sustainable economic growth while safeguarding the environment. The ALDP is most relevant to the onshore elements of the Project (those landward of MLWS) which will be subject to the separate onshore planning application but will be considered where relevant to the Proposed Development (i.e. in the intertidal area). The ALDP is in the process of being reviewed and is set to update in 2028 which will cover the period between 2028 and 2038.

2.5 Consenting Process

Consenting Process for Infrastructure in Scottish Offshore Waters

2.5.1 The Proposed Development is a generating station with a capacity of greater than 50 MW located in Scottish Offshore Waters (between 12 nm to 200 nm), and therefore it requires the following consents, licences and permissions:

- a Section 36 Consent under the Electricity Act 1989 which covers the Offshore Generation Assets located in the Array Area;
- a Marine Licence for the Offshore Generation Assets under the MCAA 2009;
- a Marine Licence for the Offshore Transmission Assets under the Marine (Scotland) 2010 and MCAA 2009;
- a Safety Zone declaration during construction and operation under the Energy Act 2004; and
- a decommissioning scheme under Sections 105 to 114 of the Energy Act 2004 which covers all infrastructure seaward of MHWS.

2.5.2 Should additional pre-construction licences be required, these will be discussed and agreed with the relevant consenting authority during the pre-construction phase of the Proposed Development.

The Electricity Act 1989

2.5.3 Under the Electricity Act 1989, a Section 36 Consent is required for the construction and operation of an energy generation station of capacity greater than 50 MW where it is located between 12 nm and 200 nm off the Scottish Coast. The Proposed Development is estimated to generate approximately 1 GW and therefore a Section 36 Consent is required. An application for consent will be submitted to MD-LOT, which acts on behalf Scottish Ministers to process the application.

Marine (Scotland) Act 2010

2.5.4 The Marine (Scotland) Act 2010 provides the legislative provisions for the management of the marine environment in Scottish Offshore Waters between MHWS to 12 nm off the Scottish coast (i.e. Scottish Territorial Waters). This includes the designation of the Marine Protected Areas (MPAs), and the requirement to produce Marine Plans. The Act also requires the granting of Marine Licences to control and regulate certain marine development.

2.5.5 Part 4 (Marine Licensing) of the Marine (Scotland) Act 2010 includes a list of licensable marine activities (Section 21) which apply to the Proposed Development activities including:

- depositing objects within the Scottish marine area from a vehicle, marine structure or floating system;
- construction or alteration of offshore structures within the Scottish marine area in the sea, over the sea, on the seabed or under the seabed;
- removal of an object or substance from the seabed through the use of a vehicle, marine structure or floating system; and
- any form of dredging within the Scottish marine area.

2.5.6 Marine Licence applications are managed and processed by MD-LOT. However, Scottish Ministers may grant a Marine Licence under Part 4 of the Marine (Scotland) Act 2010 with consideration of input and recommendations from MD-LOT and other consultees.

Marine and Coastal Access Act 2009

2.5.7 The MCAA 2009 applies to all UK offshore waters out to 200 nm, except Scottish Territorial Waters between MHWS to 12 nm, which are covered by the Marine (Scotland) Act 2010. Under the MCAA 2009 (Part 4) there is the requirement for a Marine Licence to be obtained prior to the construction, alteration or improvement of any works or deposit of any object in or over the sea, or on or under the seabed.

2.5.8 The licensable activities are broadly the same as listed in Part 4 of the Marine (Scotland) Act 2010. Scottish Minsters may grant a Marine Licence under Part 4 of the MCAA 2009 with consideration of input and recommendations from MD-LOT. It is anticipated that separate Marine Licences will be sought for Offshore Generation Assets and Offshore Transmission Assets for the Proposed Development.

The Energy Act 2004 (as amended)

2.5.9 The Energy Act 2004 (as amended) 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.

2.5.10 Under Section 95 of the Energy Act, 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, O&M, extension or decommissioning. Safety Zones may exclude non-OWF vessels from navigating through a designated Safety Zone area for a specific period.

2.5.11 The Proposed Development expects to apply for Safety Zones during construction and major maintenance activities, and around certain offshore structures (i.e. Wind Turbines) during the O&M phase.

2.5.12 In addition, Sections 105 to 114 of the Energy Act 2004 require a decommissioning programme for an Offshore Renewable Energy Installation (OREI) in Scottish Territorial Waters to be approved by the Scottish Ministers. Decommissioning programmes are expected to include decommissioning standards, financial security, residual liability, and industry cooperation and collaboration.

The Town and Country Planning (Scotland) Act 1997

2.5.13 The Electricity Act 1989 allows for deemed planning permission to be granted for the onshore elements of the Project. However, it is currently proposed that consent for the Onshore Transmission Assets will be secured through a separate application under the Town and Country Planning (Scotland) Act 1997 (as amended). A separate Onshore Scoping Report will be submitted to Aberdeenshire Council and the onshore application will be supported by a separate Onshore EIA Report and associated planning documents.

2.6 The EIA Process

2.6.1 The requirement for EIA originates from the EIA Directive (2011/92/EU, as amended by Directive 2014/52/EU). The primary objective of an EIA is to protect the environment by ensuring that the likely significant environmental effects of a development are properly understood and mitigated where appropriate before relevant consents are granted. The regulations set out a procedure for identifying those developments which should be subject to EIA, as they are likely to have significant environmental effects by virtue of their size, nature or location.

2.6.2 The requirement for a Section 36 Consent and Marine Licences for the Proposed Development triggers the need to consider if an EIA is required under the EIA Regulations. While there is variance in the criteria for EIA screening between the relevant EIA Regulations, due to the size, nature and location of the Proposed Development, it is considered that an EIA is required, and the Offshore Application for the Proposed Development will be supported by an EIA Report.

2.6.3 This Offshore Scoping Report has been produced in order to seek a Scoping Opinion for the Proposed Development which will inform the approach to carrying out the EIA and the production of the Offshore EIA Report. Further detail on the approach to carrying out the EIA is detailed in Section 4: EIA Methodology.

2.7 Nature Conservation Legislation and Policy

Habitats Regulation

2.7.1 Article 3 of EU Council Directive 92/43/EEC on the conservation of natural habitats and wild flora and fauna (hereafter referred to as the

'Habitats Directive') required the establishment of a European network of conservation sites, referred to as Special Areas of Conservation (SACs), in order to help protect and conserve habitats and species identified in Annex I and II of the Directive. These habitats and species (excluding birds) were considered to be most at risk at a European level.

2.7.2 Under Article 4 of the EU Council Directive (2009/147/EC) on the conservation of wild birds (hereafter referred to as the 'Birds Directive') lists of vulnerable bird species (detailed in Annex I of the Directive) are provided protection through the implementation of Special Protection Areas (SPAs).

2.7.3 The requirements of the Habitats and Birds Directive relevant to the Proposed Development are transposed into the following pieces of legislation (hereafter referred to as the 'Habitats Regulations'):

- Conservation (Natural Habitats, &c.) Regulations 1994 (as amended);
- Conservation of Habitats and Species Regulations 2017; and
- Conservation of Offshore Marine Habitats and Species Regulations 2017.

2.7.4 Following the withdrawal of the UK from the EU on the 31 January 2020, the UK is no longer considered an EU Member State, and amendments to Habitat Regulations were required to ensure that they remained operable. The Scottish Government laid the Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 (effective from 01 January 2021). As a result, the functions which once lay with the European Commission (EC), have been transferred to the appropriate authorities or bodies in the UK/Scotland, with SACs and SPAs in the UK no longer classed as forming part of the EU Natura 2000 Network.

2.7.5 Instead, the Habitats Regulations have created a UK-wide network of protected sites, including both the inshore and offshore marine areas in the UK, which retain the same protections as previous Natura 2000 sites and is referred to as the National Site Network. It includes all existing SACs and SPAs, and subsequent new SACs and SPAs which may be designated, and are now referred to as European Sites. Furthermore, under Scottish Government policy, Ramsar Sites (wetlands of international importance designated under the Ramsar Convention) are also protected under the same statutory regimes.

2.7.6 Under the Habitats Regulations, the Scottish Ministers must consider whether any plan or project, is likely to have a significant effect on a European Site before it can be authorised or carried out. If there is potential for a Likely Significant Effect (LSE) to occur then an Appropriate Assessment (AA) of the implications on that site and its Conservation Objectives must be undertaken by the competent authority. This process is known as HRA.

2.7.7 The HRA process, comprising Stage 1 (LSE screening) and, if required, Stage 2 (AA), must be carried out before consent or authorisation can be given for the Proposed Development. Permission should only be granted at Stage 2 for the competent authority where it is determined that the plan or project will not result in an adverse effect on the integrity of a designated site either alone or in-combination with other plans and projects, unless a HRA Derogation process including the identification of compensation measures can be agreed and implemented.

2.7.8 While the HRA is a separate process from the EIA, a LSE Stage 1 Screening Report has been prepared alongside the Offshore Scoping Report. The LSE Stage 1 Screening Report assesses whether the Proposed Development is likely to have LSEs on any European Sites. The HRA process will be progressed alongside the EIA and will be submitted together with the consent application(s), but it will be reported upon separately.

2.7.9 The EIA and HRA will draw from, and cross reference, similar ecological information. A LSE Screening Report will be submitted to MD-LOT, detailing the outcome of LSE screening on the Qualifying Features of relevant European Sites for the Proposed Development.

European Protected Species

2.7.10 European Protected Species (EPS) are species of plants and animals (other than birds) protected by law throughout the EU. They are listed within Annex IV of the Habitats Directive. It is an offence, with certain exceptions, to deliberately or recklessly capture/collect, disturb or injure an EPS.

2.7.11 Certain activities likely to cause disturbance or injury which would otherwise constitute an offence, can be carried out legally under an EPS Licence, as follows:

- Within Scottish Territorial Waters, an EPS Licence may be required under the Conservation (Natural Habitats, &c) Regulations 1994 (as amended) where there is potential for activities to injure or cause disturbance to an EPS. NatureScot is responsible for the administration of most licences in relation to EPS in Scotland. The exception is for purely marine species for purposes under regulation 44(2)(e) to (f), where MD-LOT on behalf of the Scottish Ministers, is the licensing authority.
- Scottish Offshore Waters (Outside 12 nm), an EPS Licence may be required under The Conservation of Offshore Marine Habitats and Species Regulations 2017 where there is potential for activities to injure or cause significant disturbance to an EPS (defined as a population level effect rather than at the level of individuals). MD-LOT is the licencing authority for these EPS Licences.

Priority Marine Features

2.7.12 Scottish Ministers formally adopted a list of 81 Priority Marine Features (PMFs) in 2014. The PMFs cover a variety of habitats and species that are a priority for conservation in Scottish Offshore Waters. PMFs include a range of intertidal and continental shelf habitats, deep sea habitats, mammals, fish and shellfish and other invertebrates.

2.7.13 The PMFs Guidance (SNH, 2016) addresses the policy requirement to converse and protect PMFs, included in The Scottish Government Strategy for Marine Nature Conservation in Scotland's Seas (Scottish Government, 2010), and the NMP (including via policy Gen 9 Natural heritage) (Scottish Government, 2015).

2.7.14 It should be noted that some PMFs are already protected as Qualifying Features or European Sites, or via EPS legislation, and therefore will be considered from the HRA perspective as well as in the EIA where relevant.

3 Project Description

3.1 Introduction

3.1.1 This section provides a description of the various design elements associated with the Proposed Development, including an outline of the Offshore Infrastructure and activities to be undertaken throughout the construction, O&M, and decommissioning phases. This project description utilises the latest design information, combined with an understanding of the current baseline environment, obtained through survey work and desktop studies.

3.1.2 The following Offshore Infrastructure components are covered by this Offshore Scoping Report:

- Wind Turbines;
- Wind Turbine foundations (fixed bottom or floating, including associated moorings and anchoring systems);
- OSPs;
- OSP foundations (fixed bottom);
- Offshore cables (IACs), Interconnector Cables, and Offshore Export Cables);
- Subsea Collectors; and,
- Scour protection, cable protection and utility crossings.

3.1.3 The onshore elements of the Project, which includes transmission infrastructure above MLWS, will be subject to a separate consent application for Planning Permission in Principle under the Town and Country Planning (Scotland) Act 1997 (as amended). A separate Onshore Scoping Report will be submitted to Aberdeenshire Council

3.1.4 Where there is an overlap in jurisdiction of consenting and regulatory regimes (i.e. within the Intertidal Area), both the Offshore Scoping Report and Onshore Scoping Report, as well as the subsequent EIA Reports, will include the relevant technical assessments.

3.2 Project Design Envelope Approach

3.2.1 This Offshore Scoping Report and the subsequent Offshore EIA Report for the Proposed Development intend to follow the proven and accepted practice of the Project Design Envelope (PDE) approach (also known as the 'Rochdale Envelope'), as set out in Scottish Government (2013) guidance. The PDE approach allows for a necessary degree of flexibility in cases where certain details of developments are yet to be finalised at the time of application (for example, Wind Turbine and foundation types) and is referenced in guidance prepared by Marine Directorate (MD) and the Energy Consents Unit in June 2022 for applications under Section 36 of the Electricity Act 1989 (Scottish Government, 2022b).

3.2.2 The PDE approach is based on assessing the maximum potential impact for each element of the Proposed Development's design through the specification of a range of design parameters. However, it is important that a sufficient level of detail is included, such as consideration of a range of possibilities, to allow assessment of the likely significant environmental effects (as defined by the EIA Regulations) and any necessary mitigation measures (Scottish Government, 2013). For example, where the foundation types of a development are not yet confirmed, the PDE approach would consider the foundations with the largest footprint for habitat loss, as this is likely to have the greatest potential for impact on the seabed. If an impact assessment is undertaken on this basis and no likely significant environmental effects are identified, it can be assumed that any variations to project parameters equal to or less than the assessed parameter (i.e. within the assessed 'envelope') will not result in a likely significant environmental effect for the topic under consideration.

3.2.3 Following the PDE approach, a Maximum Design Scenario (MDS) is developed for each topic area and/or impact pathway, to identify the design parameters likely to result in the largest effect for the topic area. The MDS for each topic area may vary depending on identified receptors and impact pathways, however the parameters will all remain within those outlined in the PDE.

3.2.4 The PDE presented within this section of the Offshore Scoping Report is an accurate representation of the Proposed Development based on current information, having been developed to date with consideration of numerous engineering and environmental considerations. However, it is likely to be further refined and developed throughout the design, engineering, and EIA process, particularly following the collection of additional baseline data and identification of potential impacts and mitigation measures.

3.3 Proposed Development Scoping Boundary

3.3.1 The Proposed Development Scoping Boundary comprises of the Array Area, which is located in the E3 POA detailed in the Scottish SMP (Scottish Government, 2020a), and the Export Cable Corridor. The Array Area is located 38 km, at its closest point, from land and covers an area of 187 km^2. The Export Cable Corridor extends from the Array Area and will make Landfall at Benholm on the Aberdeenshire coast, Scotland.

3.3.2 The Proposed Development Scoping Boundary is illustrated in Figure 1.1, Section 1: Introduction.

3.4 Proposed Infrastructure

3.4.1 The main components of the Proposed Development are expected to include:

Offshore Generation Assets

- up to 67 Wind Turbines (each comprised of three rotor blades, a nacelle housing the generating unit, hub, and tower section) and associated supporting structures which may be fixed or floating foundations including mooring and anchoring systems;
- a network of up to 156 km of IACs which may be either static or dynamic cables depending on the Wind Turbine foundations used;
- up to 35 km of Interconnector Cables;
- up to 20 SCs; and
- scour and cable protection (as required).

Offshore Transmission Assets

- up to three OSPs with fixed foundations and supporting infrastructure including scour protection (as required);
- up to four Offshore Export Cables totalling approximately 320 km in length; and
- cable protection and utility crossings where required.

3.4.2 The following sections of the Offshore Scoping Report provide further detail for each design aspect, along with the maximum and minimum scenarios that comprise the PDE. However, the high-level parameters of the Proposed Development are summarised in Table 3.1.

Table 3.1: High Level Design Parameters of the Proposed Development

Parameter	MDS
Estimated Construction Period	Up to 5 years
Array Area ($km^{2)}$	187
Distance of Array Area from the shore at the closest point (km)	38
Water Depths across the Array Area from Lowest Astronomical Tide (LAT) (m)	55 to 75
Number of Wind Turbines	Up to 67
Wind Turbine Rotor Diameter (m)	Up to 326
Wind Turbine Maximum Tip Height from LAT (m)	369.36

Parameter	MDS
Maximum number of OSPs	3
Maximum Number of Offshore Export Cables	4
Export Transmission System	High Voltage Alternating Current (HVAC)

3.5 Offshore Generation Assets

Wind Turbines

3.5.1 The Proposed Development will include up to 67 Wind Turbines located in the Array Area, with the final number and layout to be determined based on the generating capacity of the individual Wind Turbines along with the results of impact assessments, environmental and engineering surveys, turbine type availability and design and engineering activities. If a model of Wind Turbine with a higher capacity output is selected for the final design, fewer Wind Turbines may be required.

3.5.2 The final type, number and layout of the Wind Turbines will be confirmed by the detailed design stage (post-consent).

3.5.3 The maximum diameter of the individual Wind Turbines' rotor blades is expected to be 326 m, with a corresponding maximum upper blade tip height of 369.36 m above LAT. The lower blade tip height is expected to be a minimum of 25.36 m above LAT (which equates to 22 m above MHWS). The layout for the Wind Turbines within the Array Area is still to be determined and will be based on type(s) of turbines, available wind resources, seabed conditions, agreed buffers with Scottish and Southern Electricity Networks (SSEN) and National Grid for the Eastern Green Link (EGL) 2 High Voltage Direct Current (HVDC) cable (see Section 16: Infrastructure, and Other Sea Users), and the outcomes of impact assessments. However, it is expected that Wind Turbines will be spaced a minimum of 826 m apart.

3.5.4 A range of Wind Turbine options will be considered as part of the EIA, and the MDS will be assessed for the relevant topics and/or receptors. This may include consideration of maximum and minimum parameters such as rotor diameters, and consent will be sought for a range of options.

3.5.5 The maximum PDE for the key design parameters of the Wind Turbines is presented in Table 3.2 and an illustration of a typical offshore Wind Turbine, indicating the measurements detailed above, is illustrated in Figure 3.1.

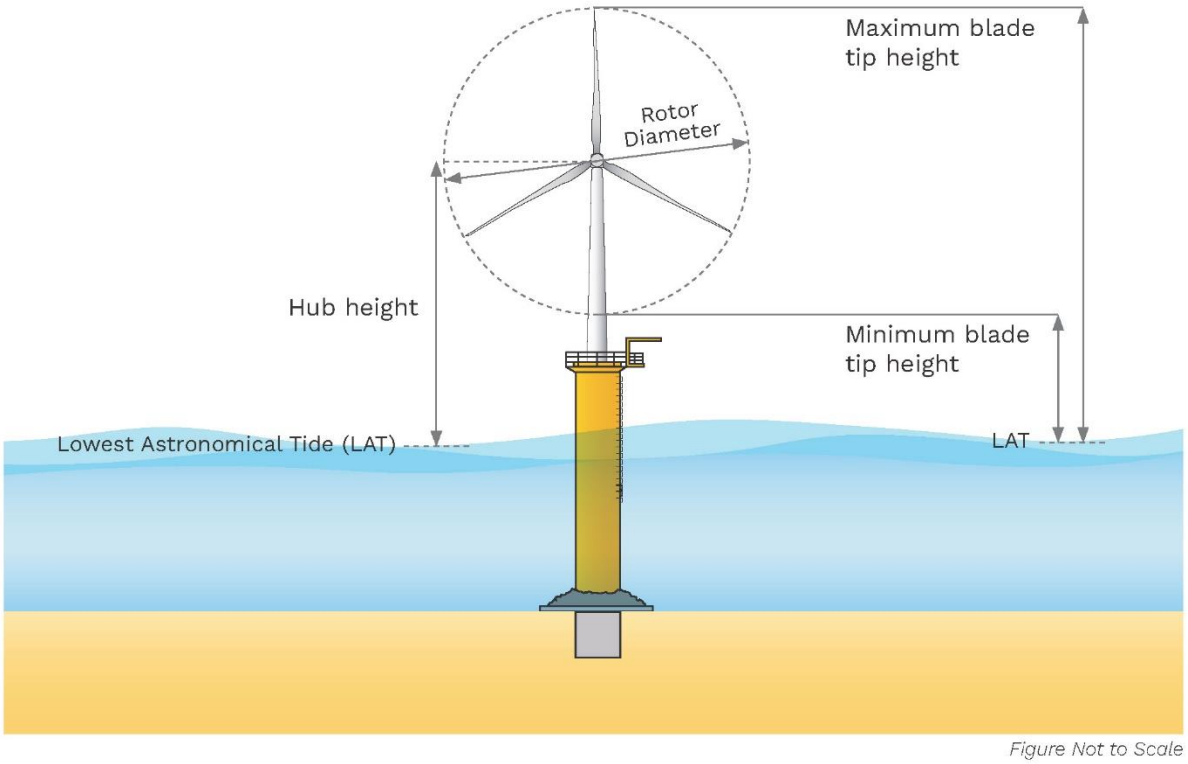


Figure 3.1: Illustration of a Typical Fixed Bottom Offshore Wind Turbine

Table 3.2: PDE for the Wind Turbines

Parameter	MDS
Maximum number of Wind Turbines	67
Maximum rotor diameter (m)	326
Maximum blade tip height (m above LAT)	369.36
Minimum blade tip height (m above LAT)	25.36
Maximum hub height (m above LAT)	206.36
Minimum turbine spacing (m)	826

Wind Turbine Foundations and Support Structures

3.5.6 The PDE presently incorporates options for both fixed or floating Wind Turbine foundations, with final design and foundation options to be refined throughout the EIA process. The PDE for the EIA will therefore reflect the design parameters for foundation options taken forward, as well as their respective support structures.

Fixed Foundations

3.5.7 Several foundation types are available for fixed Wind Turbines (i.e. Wind Turbines that are supported by fixed structures installed on the seabed) and the type selected for the Proposed Development's final design will be dependent on the type of Wind Turbine(s) used as well as the results of environmental and site investigation surveys. The three foundation types that will be considered for the Proposed Development are as follows:

- monopile foundations;
- piled or drilled jacket foundations (three or four legs); and
- suction bucket jacket foundations (three legs).

3.5.8 It is anticipated that any foundations will be fabricated onshore before specialist vessels are used to transport and install the foundations within the Array Area located within the Scoping Boundary.

3.5.9 The following sections provide an overview of the design parameters associated with each fixed foundation type being considered for the Wind Turbines as part of the Proposed Development.

Monopile Foundations

3.5.10 Monopile foundations are comprised of a solitary hollow tube design, usually constructed from steel, which is piled into the seabed at a singular point, hence the name 'mono'-pile. These foundation types are often accompanied by a Transition Piece, which covers part of the pile and acts to level the Wind Turbine and allows for the installation of additional substructures, such as ladders or boat landings (Figure 3.2).

3.5.11 The installation method for monopile foundations depends on factors such as ground conditions and the size of the monopile itself. Commonly employed techniques include hydraulic hammers, vibration, or drilling and grouting, which are usually conducted from either jack-up or floating vessels. Where drilling methods are utilised to aid the piling process (i.e. in areas of hard seabed), the drilling spoil will usually be deposited of adjacent to the drill site. The equipment needed to install the monopile foundations can operate above or below the sea surface. Foundations may be installed using a combination of the above mentioned methodologies including a drill and drive options for individual foundations.

3.5.12 The PDE for the Proposed Development is based on a maximum of 67 monopiles. At present, it is anticipated that up to two vessels may be utilised to install up to two monopiles concurrently with a maximum hammer energy of 6,000 kJ. However, this design element is subject to further development throughout the EIA process.

3.5.13 To mitigate potential acoustic impacts, which will be determined by the subsea noise impact assessment, a 'soft start' procedure would be implemented. This procedure involves beginning the process of piling with reduced hammer energy before slowly ramping up to the maximum hammer energy within an agreed timescale.

3.5.14 Table 3.3 outlines the maximum PDE for the key design parameters of monopile foundations within the Proposed Development, and an illustrative monopile foundation is shown in Figure 3.2.

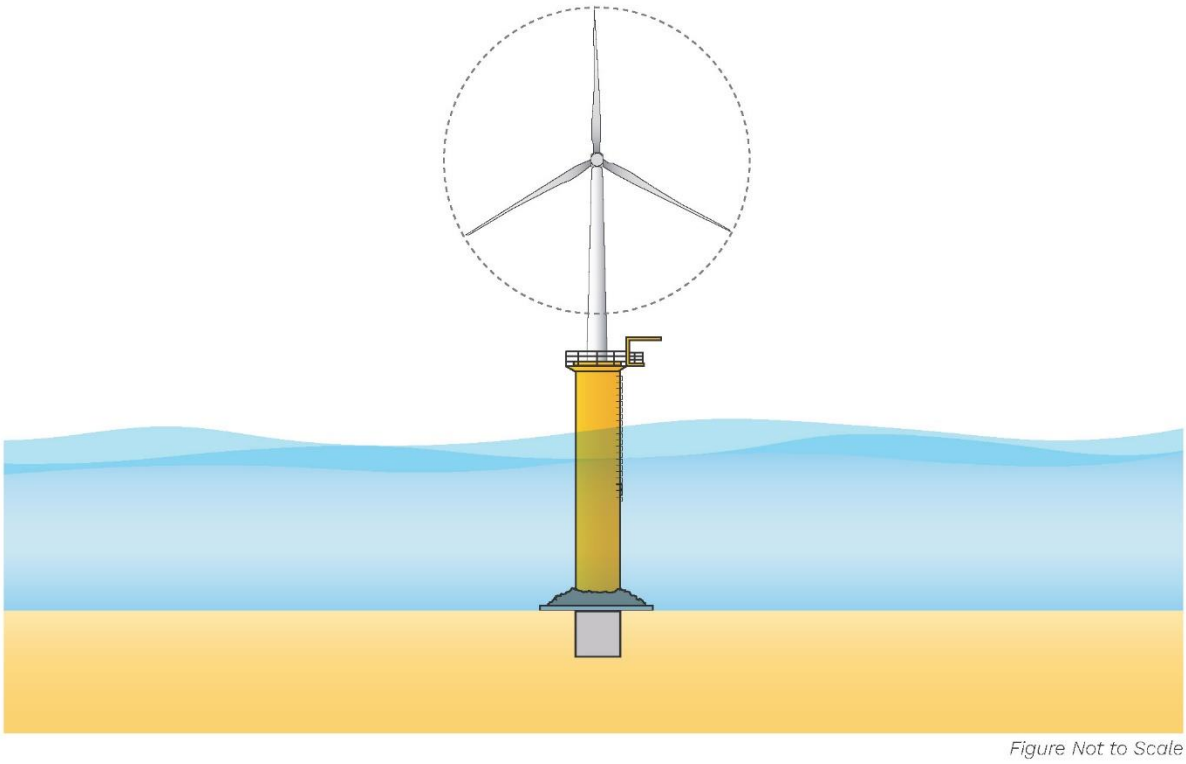


Figure 3.2: Monopile Foundation Design

Table 3.3: PDE for Monopile Foundations

Parameter	MDS
Maximum number of monopile foundations	67
Maximum pile diameter (m)	15
Maximum hammer energy (kJ)	6,000
Number of concurrent piling events	2
Indicative Seabed footprint per pile (m^2)	177
Scour protection material	Rock placement, rock bags and/or concrete mattressing

Parameter	MDS
Total indicative seabed footprint including scour protection (m^2) (per structure)	4,420

Piled or drilled Jacket Foundations

3.5.15 Jacket foundations consist of lattice-like structures, typically crafted from a network of steel tubular members welded together to form a geometrically sturdy framework with three or four legs. The structure is typically fixed to the seabed with driven and/or drilled piles or suction buckets. Both fixing options are considered within the PDE, however, this section of the Offshore Scoping Report concerns the piled version of the jacket foundations (Figure 3.3). The pin piles associated with piled jacket foundations are smaller in diameter than monopile foundations, however similar technology is utilised for their installation: hydraulic hammers, vibration, drilling into the seabed. A combination of piling and drilling, including drill and drive scenarios may be required.

3.5.16 The PDE for the Proposed Development is based on a maximum of 67 piled jacket foundations being required, with options for three or four legs per foundation, and one pile per leg (therefore a maximum of 201 or 268 piles required across the Proposed Development for three and four leg options respectively). It is expected that up to two vessels will be utilised to install pin piles concurrently, using a maximum hammer energy of 4,500 kJ.

3.5.17 The PDE for key parameters of piled jacket foundations installations for Wind Turbines within the Proposed Development is detailed in Table 3.4, which includes both three and four leg foundation options.

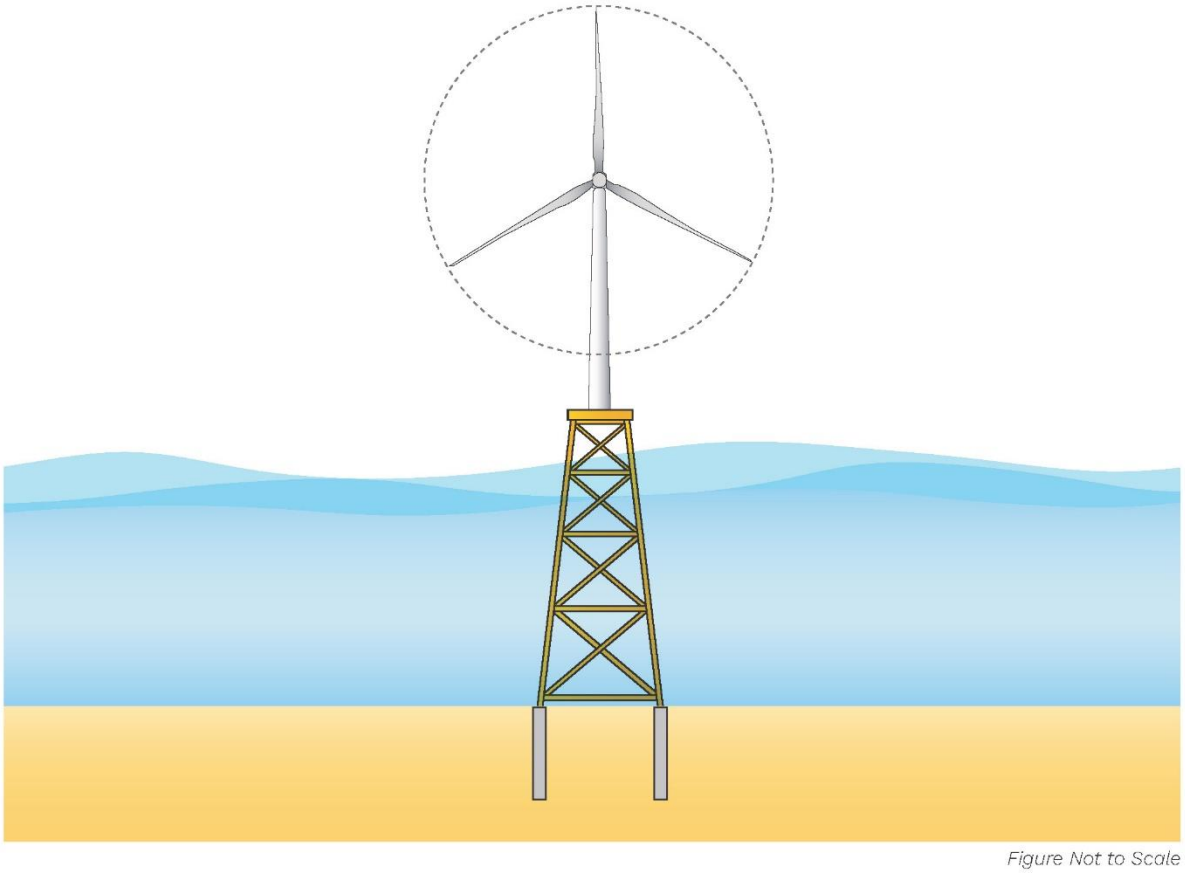


Figure 3.3: Pin Pile Foundation Design

Table 3.4: PDE for Wind Turbines with Pin Pile Jacket Foundations

Parameter	MDS (4-legged)	MDS (3-legged)
Maximum number of piled jacket foundations	67	67
Number of legs per foundation	4	3
Number of piles per leg	1	1
Maximum number of piles	268	201
Maximum diameter of jacket leg (m)	4	4.5
Maximum diameter of pin piles (m)	5.0	5.5
Concurrent piling events	2	2
Maximum hammer energy (kJ)	4,500	4,500

Parameter	MDS (4-legged)	MDS (3-legged)
Seabed footprint per jacket foundation (m^2)	2,105	1,155
Total seabed footprint including scour protection (m^2) (per foundation)	5,645	3,850
Scour protection material	Rock placement, rock bags, and/or concrete mattressing	Rock placement, rock bags, and/or concrete mattressing

Jacket Foundations with Suction Buckets

3.5.18 Jacket foundations with suction buckets consist of lattice-like structures, crafted from a network of steel tubular members welded together to form a geometrically sturdy framework with three or four legs. The end of each leg is attached to a suction bucket (typically a hollow, steel cylinder, capped on the upper end), which affixes the structure to the seabed (illustrated in Figure 3.4).

3.5.19 Suction bucket foundations do not require noisy installation measures, such as piling. Rather, after the foundations have been transported to the Array Area and lowered to the seabed via crane, water is pumped from each of the buckets, which creates a suction that pulls the foundation legs into the seabed. When the desired burial depth is reached, the void is filled with a thin layer of grout, which is injected under the top side of the bucket. This also ensures contact between the seabed substrate within the bucket and the top of the bucket itself.

3.5.20 The PDE is based on a maximum of 67 suction jacket foundations being required with three legs per foundation. The key parameters included in the PDE for the installation of suction bucket jacket foundations within the Proposed Development are detailed in Table 3.5.

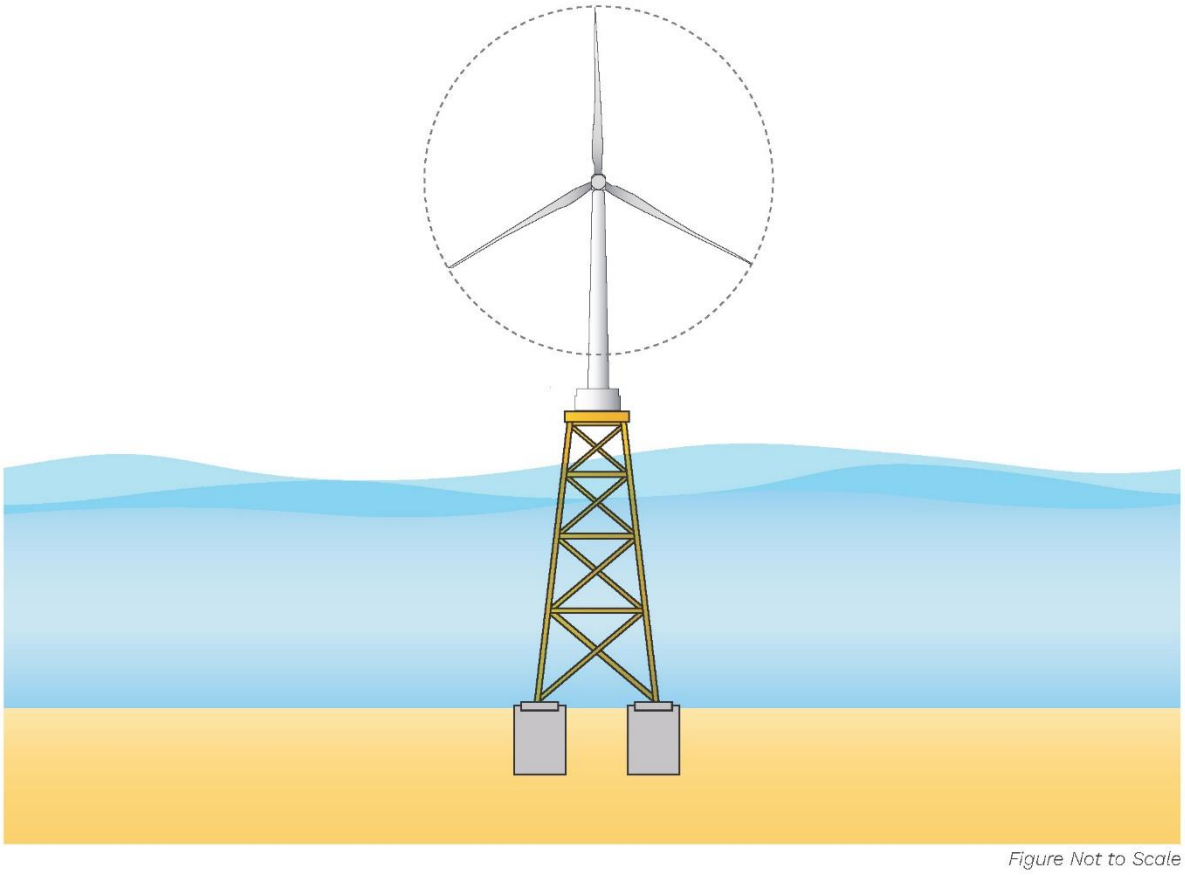


Figure 3.4: Typical Jacket with Suction Buckets Design

Table 3.5: PDE for Wind Turbines with Suction Bucket Jacket Foundations

Parameter	MDS
Maximum number of suction bucket jacket foundations	67
Maximum diameter of jacket leg (m)	4.5
Maximum suction bucket diameter (m)	19
Maximum expected bucket penetration depth (m)	19
Seabed footprint per jacket foundation (m^2)	2,436
Total seabed footprint including scour protection (m^2) (per foundation)	17, 858
Scour protection methods	Rock placement, rock bags, and/or concrete mattressing

Floating Foundations

3.5.21 The use of floating foundations, which require mooring and anchoring systems to keep the Wind Turbines in their desired locations, are also currently included in the PDE for the Proposed Development.

3.5.22 There are a number of floating foundation options currently being considered, however the preferred option is a semi-submersible foundation design.

3.5.23 Semi-submersible foundations are comprised of multiple buoyant steel columns or pontoons, which are partially submerged beneath the sea surface, and anchored to the seabed with semi-taut and catenary moorings (Figure 3.5). The Wind Turbine is affixed to the foundations via a sturdy deck that rests above the water level. The stability of the structure is maintained through the design's inherent buoyancy force and geometry, with the control of ballast within the columns. The design ensures that any wind pressures on one side of the structure are countered by the buoyancy on the other side of the structure, enabling the Wind Turbine to be kept relatively level, even in rough conditions.

3.5.24 The PDE for key parameters relating to the use of semi-submersible floating foundations is provided in Table 3.6.

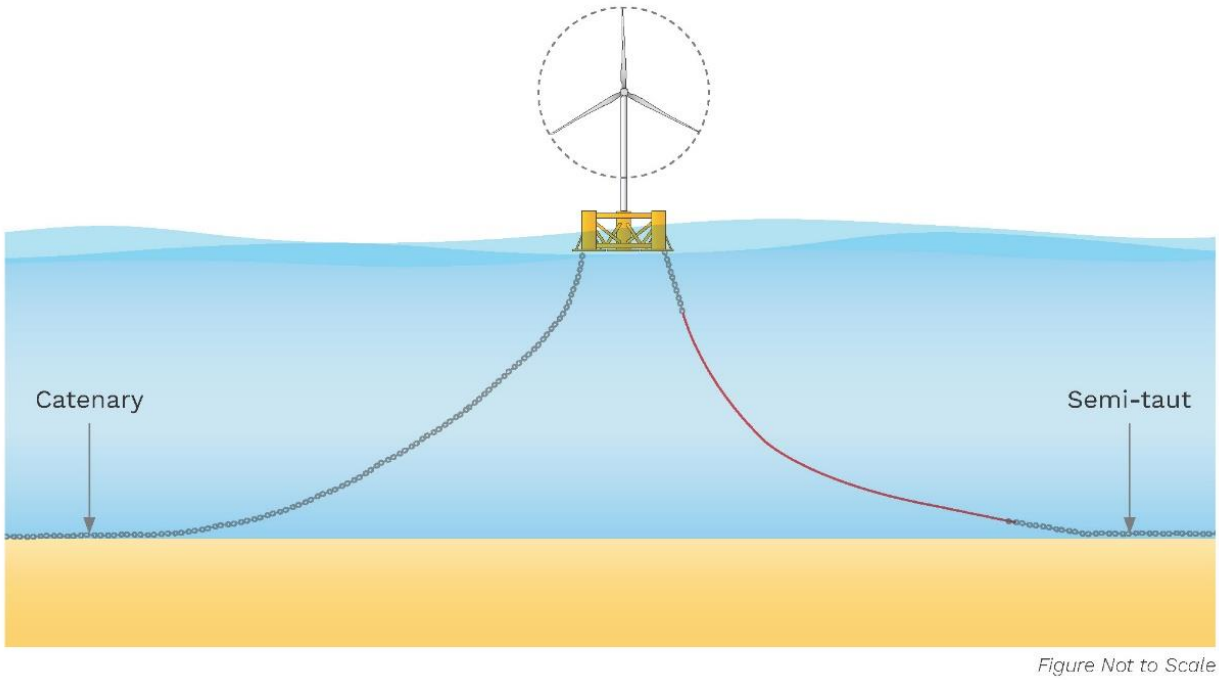


Figure 3.5: Floating Foundation Design

Table 3.6: PDE for Semi-Submersible Wind Turbine Foundations, Mooring Lines and Anchors

Parameter	MDS
Wind Turbine Foundations	
Foundation Maximum Length/Width of Foundation	156
Maximum height of foundation above the water from LAT (m)	30
Maximum draft of structure below LAT (m)	50
Horizontal excursion limit of foundation (m)	32
Mooring Lines	
Mooring line types considered	Semi-taut and catenary
Maximum number of mooring lines and anchors (per foundation)	6
Seabed Anchoring	
Anchor type	Drag Embedment Anchors (DEAs), suction piles, driven piles, drilled piles, Suction Embedded Plate Anchors (SEPLAs), Vertical Loading Anchors (VLAs) and gravity blocks
Driven Piling Characteristics (if required)	
Maximum number of driven piles per foundation	9
Maximum driven pile diameter (m)	4
Maximum hammer energy (kJ)	4,500

Moorings

3.5.25 As detailed in Table 3.6, two mooring line types are presently being considered for use with semi-submersible foundations within the PDE: semi-taut and catenary. The number of mooring lines will be dependent on the size of the floating structures, metocean conditions and water depths.

3.5.26 Semi-taut mooring lines are typically constructed from a mixture of materials, such as metal chain and synthetic rope, with buoyancy modules that ensure connection points are maintained off the seabed. Anchors and ancillary elements are used to affix the moorings to the seabed.

3.5.27 Catenary mooring lines are usually comprised of a mixture of materials, such as metal chains and synthetic rope, that are fixed to the seabed through the use of anchors and ancillary elements. Catenary mooring lines will, in-between the anchor and touch point, interact with the seabed with the majority of the mooring being free hanging.

3.5.28 An illustration of the differing mooring line types is provided in Figure 3.6.

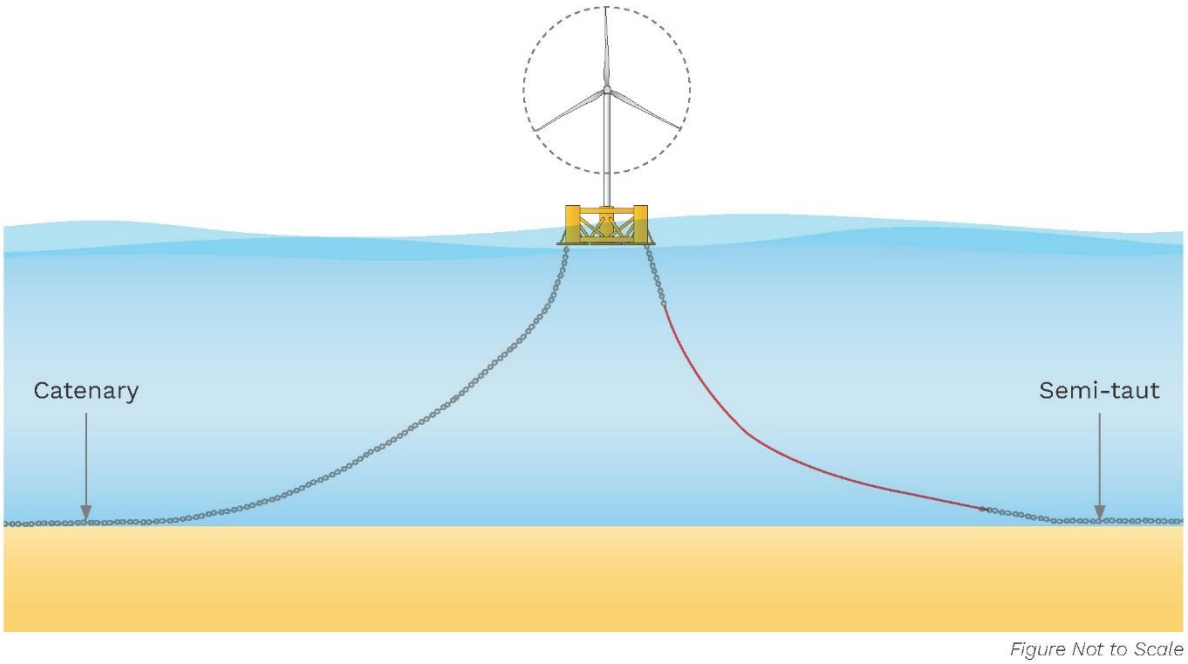


Figure 3.6: Schematic of Mooring System Options for Floating Wind Turbines

Anchors

3.5.29 In addition to different mooring types, the PDE includes consideration of several different anchoring types with up to six anchors per foundation (as specified in Table 3.6). The anchor types considered include: driven, drilled or suction piles, embedded anchors (e.g. Drag Embedment Anchors (DEA), or Suction Embedded Plate Anchors (SEPLA)), Vertical Loading Anchors (VLAs), drilled-and-grouted rock anchors, and gravity blocks. Illustrations of the anchoring solutions are presented in Figure 3.7 and a brief description of these anchoring types is presented in Table 3.7

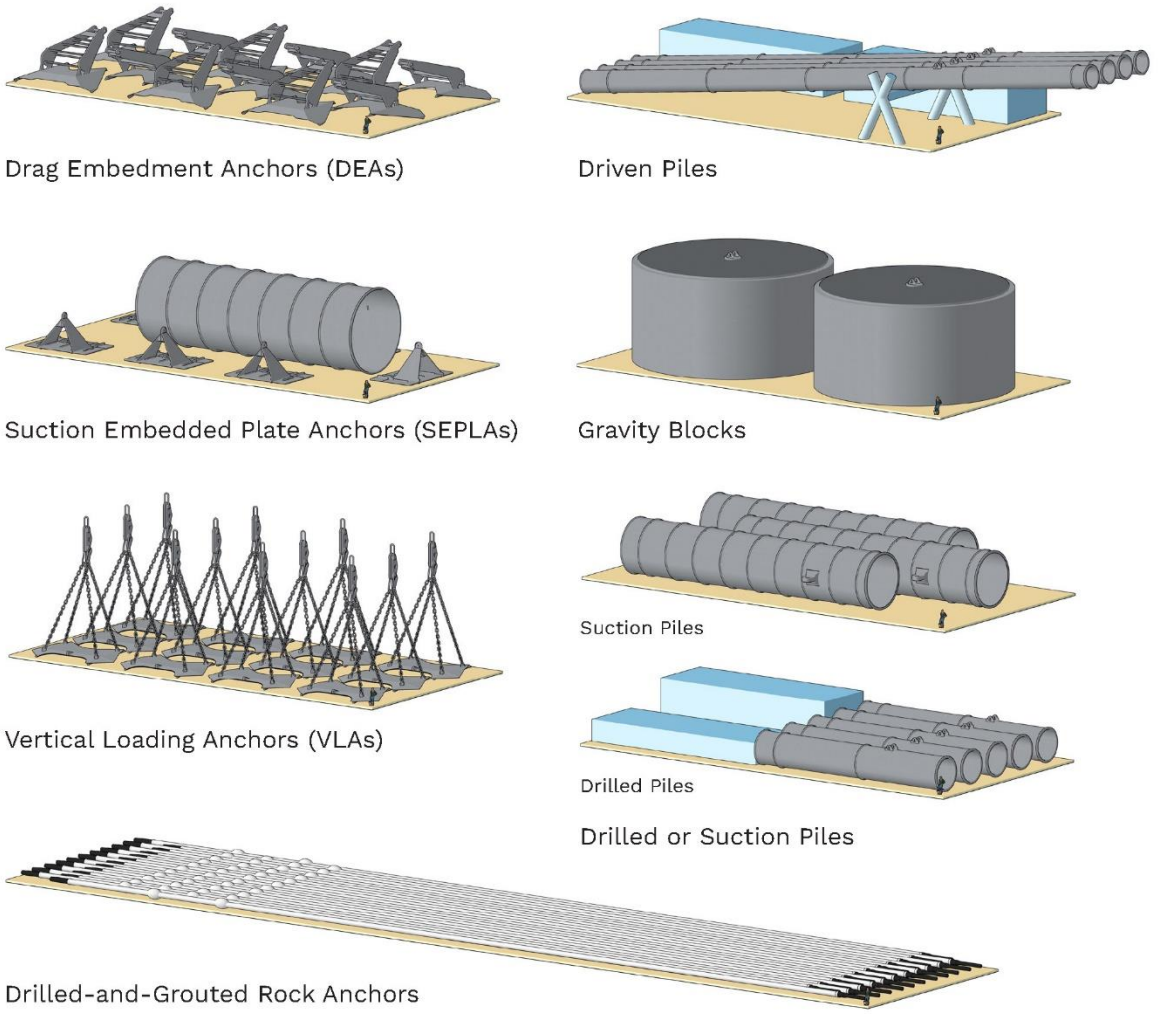


Figure 3.7: Illustration of Anchoring Options under Consideration

Table 3.7: Description of Anchoring Options Considered in the PDE

Anchor Type	MDS
DEAs	These anchors are dragged across the seabed until required depth and holding capacity is reached. These anchors are best suited for cohesive sediments and function best when they are fully submerged into the seabed.
Drilled-and-grouted rock anchors	These anchors are installed by drilling a hole below the sea floor and then inserting a grouted steel pipe. These are ideal in seabed materials with low friction properties, hard/dense soils and very deep waters.
Drilled plies	These piles are installed by drilling into the seabed and are sealed with grout.

Anchor Type	MDS
Driven piles	These foundations are driven into the seabed using a pile-driving hammer. Various factors influence the time and number of hammer strikes required to achieve the required penetration depth, including the type and size of hammer, pile size, and soil properties of the seabed.
Gravity blocks	These anchors are buried in the sediment with burial depth dependent upon various factors such as weight, geometry and soil characteristics and are most suitable for areas for hard ground or where seabed penetration by other anchor types is generally limited.
SEPLAs	These anchors are similar to VLAs; however, these are installed using a suction embedded method.
Suction piles	These piles are installed by pumping water out of a capped steel cylinder, resulting in this being sucked into the seabed. The use of these piles is best suited to sand and clay soils.
VLAs	These anchors are similar to DEAs and are installed by dragging the anchor across the seabed. The main difference between DEAs and VLAs is that VLAs can withstand both horizontal and vertical loading, whereas DEAs can only withstand horizontal loading.

3.5.30 It is possible that a mix of mooring and/or anchoring types may be required across the Proposed Development, with the final selection being determined following the acquisition of site-specific geotechnical information, environmental surveys, and further engineering and design studies. Where driven and/or drilled piles are to be used, it is expected that up to two vessels will be utilised to install pin piles concurrently. The Project Description section of the Offshore EIA Report will provide further detail on foundation parameters and anchoring.

3.5.31 Several types of connectors and ancillaries are considered for connecting mooring and anchoring systems, such as:

- Long Term Mooring connectors;
- clump weights;
- load reduction devices;
- buoys or buoyancy elements; and
- tensioners.

3.5.32 An illustration of these various mooring line connectors and ancillaries is presented in Figure 3.8.

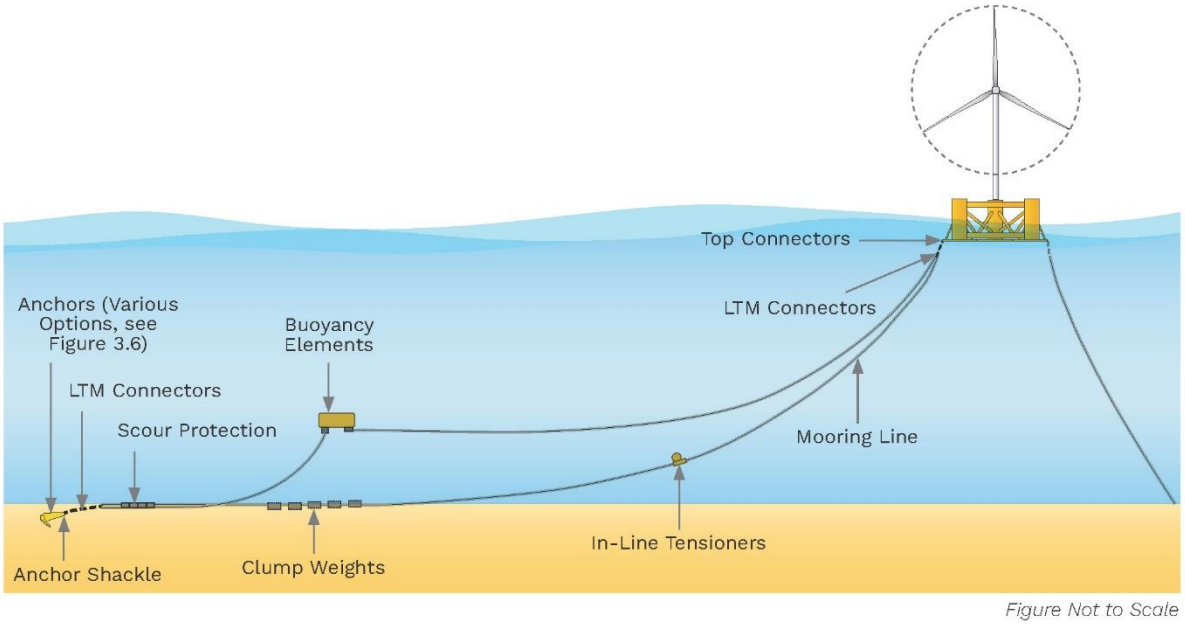


Figure 3.8: Illustration of Mooring Line Connectors and Ancillaries

Inter-Array Cables

3.5.33 The electrical current produced by the Wind Turbines will be carried to the OSPs via IACs. Typically, a number of Wind Turbines will be grouped together on the same cable 'string', which connects the Wind Turbines to an OSP. Multiple cable 'strings' will then connect back to each OSP.

3.5.34 There may also be an IAC backlink introduced to connect Wind Turbines at the end of two strings, which will allow for partial re-routing of power in case of cable failure. The exact location and lengths of the IACs, along with the possible backlink will be dependent on the final design of the Proposed Development and will be considered in parallel to the final Wind Turbine layout.

3.5.35 The Proposed Development design envelope currently considers the use of both static and dynamic IACs. Static IACs are laid directly on the seafloor between the Wind Turbines and OSPs. In contrast, dynamic IACs arch in the water column to create a 'lazy s' shape, due to the use of buoyancy modules, before they reach the seabed.

3.5.36 Dynamic IACs will only be used for floating turbine foundation design options, and are required to enhance cable durability, especially in challenging conditions where the cables may experience significant stress, because of motion resulting from Wind Turbines being fixed to floating foundations. For visual reference, an illustration of the dynamic IAC design is provided in Figure 3.10.

3.5.37 Where possible, the IACs will be buried to an appropriate target burial depth. Cable burial depths will be informed by a Cable Burial Risk

Assessment (CBRA) but based on current information it is anticipated that target burial depths will be between 1 m and 3 m (subject to further design), with greater burial depths targeted in specific areas as informed by the CBRA. In cases where such burial is not feasible (e.g. the foundation entry points, or where the cable is expected to cross areas of bedrock, pipelines, or other existing cables), alternative protection methods will be employed, such as Polyurethane (PU), Polyethylene (PE), steel, or iron Cable Protection Systems (CPS), rock protection, grout bags, concrete mattresses, and/or protective sleeves.

3.5.38 Installation of IACs may be undertaken using pre-lay plough, plough, trenching, cutting and/or jetting techniques. Fundamentally, these techniques all involve the displacement of sediments (either by mechanical tools or water jets) on or above the seabed. This creates a trench into which the cable(s) may be lowered.

3.5.39 The PDE for the key parameters associated with IACs within the Proposed Development is shown in Table 3.8.

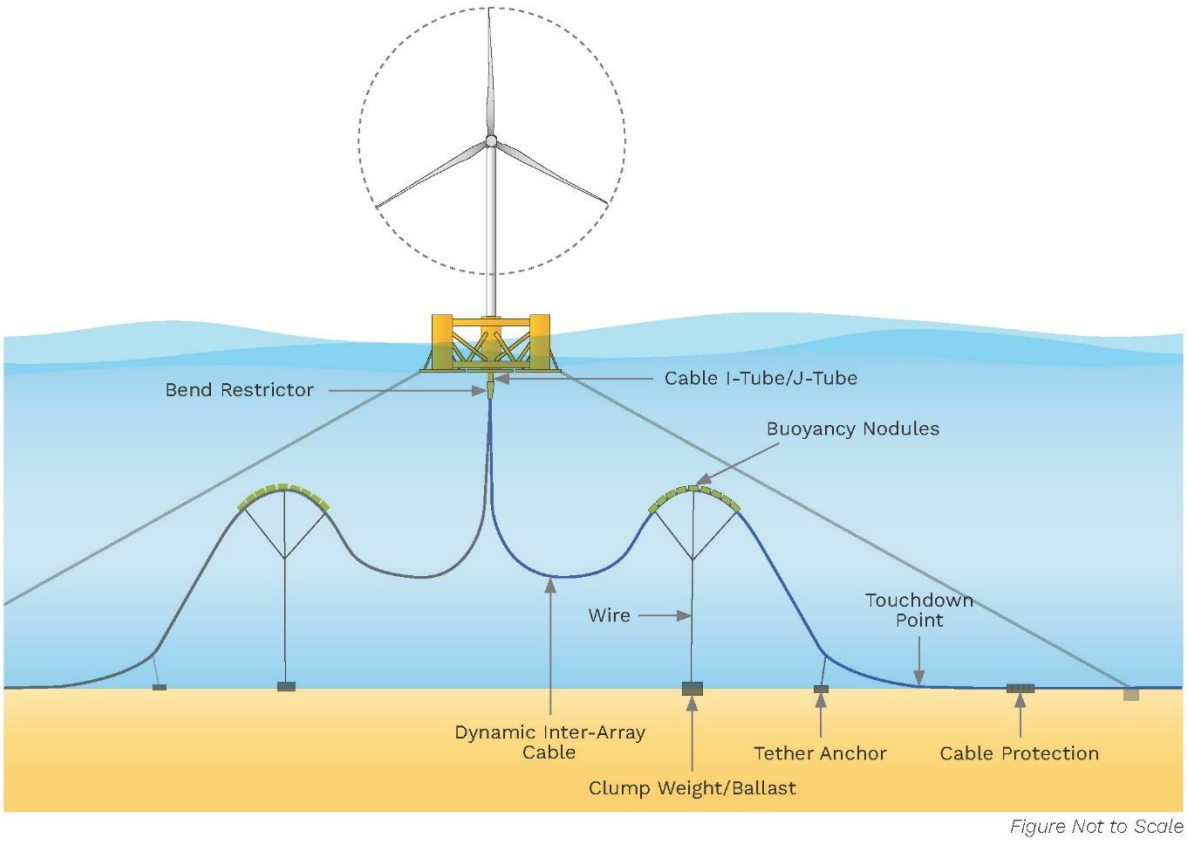


Figure 3.9: Illustrative Design for Dynamic IACs

Table 3.8: PDE for IACs

Parameter	MDS
Total IAC length (km)	156
Target burial depth (m)	Between 1 and 3
Width of seabed corridor (disturbance from installation tool (m)	25
Trench width (m)	6
Cable protection material (type)	CPS (PU/PE/Steel/Iron), rock placement, grout or rock bags, rock berms, concrete mattresses, protective sleeves

Interconnector Cables

3.5.40 Each of the OSPs will be connected to the other OSPs within the Array Area using Interconnector Cables. Where possible the cables will be buried to an appropriate target burial depth. Cable burial depths will be informed by a CBRA, but based upon current knowledge the target burial depths will be between 1 m and 3 m (subject to further design), with greater burial depths targeted in specific areas, i.e. in areas of increased shipping density. In cases where such burial is not feasible (e.g. the foundation entry points, or where the cable is expected to cross areas of bedrock, pipelines, or other existing cables), alternative protection methods will be employed, such as PU, PE, steel, or iron CPS, rock placement, rock/grout bags, concrete mattresses, and/or protective sleeves.

3.5.41 The Interconnector Cables will be installed by the same methodologies proposed for IACs, with final methodology determined during the Proposed Development's final design phase. The PDE for Interconnector Cables is provided in Table 3.9.

Table 3.9: PDE for Interconnector Cables

Parameter	MDS
Number of inter-connector cables within Array Area	3
Total length of Interconnector Cables (km)	35
Target burial depth (m)	Between 1 and 3
Trench width (m)	6
Width of seabed corridor (disturbance) from installation tool (m)	25

Subsea Collectors

3.5.42 An alternative solution for connecting dynamic IACs using SCs is also being considered. SCs would be used to connect Wind Turbines in clusters to the OSP, i.e. several Wind Turbines are hooked up in a star pattern with individual IAC linking to the SC. Each IAC from the Wind Turbine will have a dynamic section changing into a stabilised (by CPS) section closer to the SC, where it will connect with a wet mate connector (detachable). From the SC to the OSP, a fixed cable system will then be used. The maximum footprint area of the SC is 25 m X 25 m. Depending on the seabed conditions, the SC may be installed on the seabed through gravity or by using pin piles or anchoring systems.

3.5.43 Seabed preparation may be required over an estimated area of 30 m X 30 m per SC. Dredging, grapnel runs, sweeping, rock placement, and mattress laying may be used during seabed preparation work. The height of a SC is estimated at 6 m from the seabed. The number of SCs required would be typically equivalent to the number of strings required if Wind Turbines are daisy chained like in more traditional IAC layouts. For the Proposed Development this would be between 16 to 20 SCs.

3.6 Offshore Transmission Assets

Offshore Substation Platforms

3.6.1 OSPs are required to collect power generated by the Wind Turbines and transform it to a higher voltage to allow the power to be transmitted efficiently to shore. The Proposed Development may require up to three OSPs which will be located within the Array Area of the Scoping Boundary.

3.6.2 The Proposed Development will use High Voltage Alternating Current (HVAC) transmission technology. The final electrical layout for the Proposed Development will determine the final number, location(s) and specifications of each OSP, and will be determined during the Proposed Development detailed design phase. All OSPs will be appropriately marked for aviation and navigation purposes, for example using necessary lighting and paint finish. An illustration detailing a typical OSP design is provided in Figure 3.10.

3.6.3 The dimension of the topsides of the OSPs will be of up to 100 m x 100 m, with the main OSP structure being a minimum of 25 m above LAT. The parameters of the OSPs are summarised in Table 3.10.

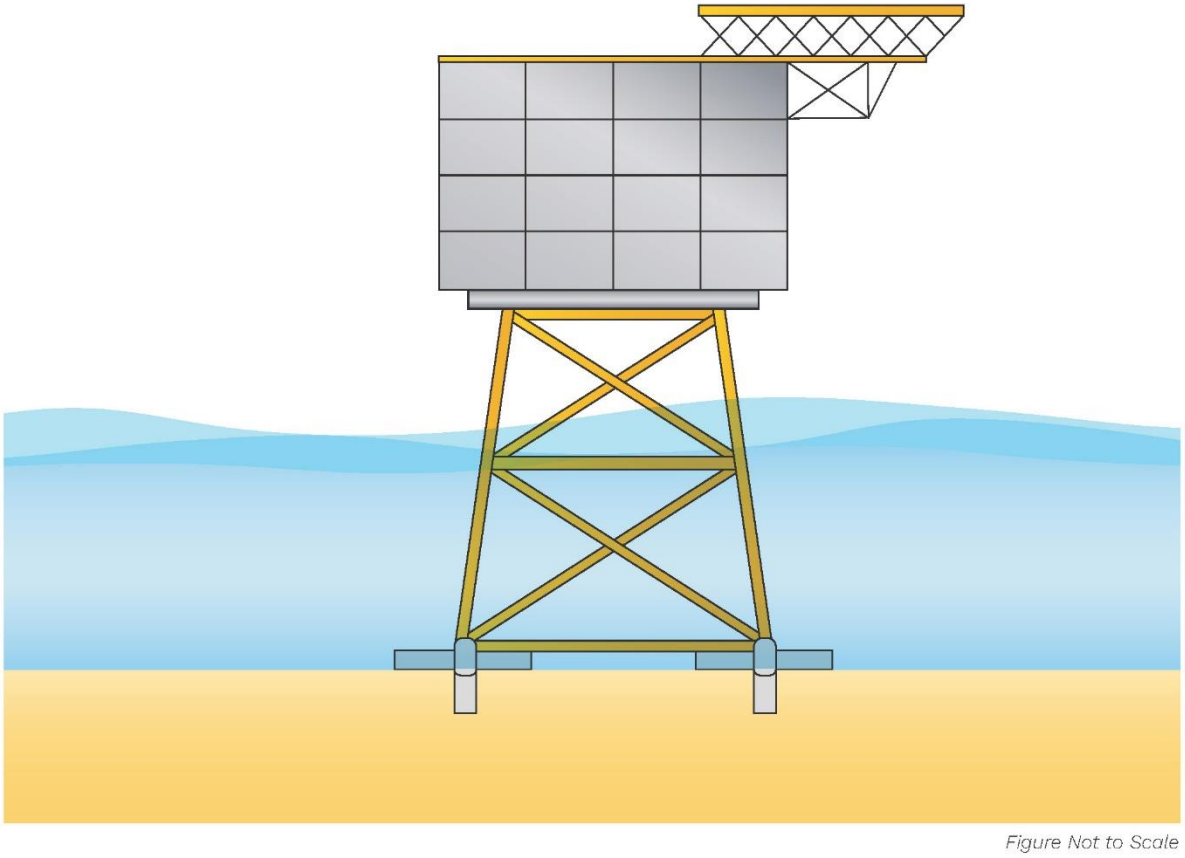


Figure 3.10: Illustrative OSP on a Typical Jacket Foundation

Table 3.10: PDE for OSPs

Parameter	MDS
Maximum number of Platforms (OSPs)	3
Minimum height of the main structure above LAT (m)	25
Topside maximum length (m)	100
Topside maximum width (m)	100

OSP Foundations and Support Structures

3.6.4 Each OSP will sit on a fixed base foundation. The Applicant proposes to use piled jacket foundations, with up to eightlegs, for the OSPs. It is anticipated that foundations will be constructed onshore before specialist vessels are used to transport and install the foundations within the Array Area.

3.6.5 As referenced in paragraph 3.5.15, jacket foundations consist of lattice-like structures, crafted from a network of steel tubular members welded together to form a geometrically sturdy framework

with a number of legs that are secured to the seabed by pin piles. The pin piles associated with piled jacket foundations are smaller in diameter than monopile foundations, however similar technology may be utilised for their installation: hydraulic hammers, vibration, drilling into the seabed.

3.6.6 The PDE for the Proposed Development is based on a maximum of three piled jacket foundations being required, with eight legs per foundation, and three piles per leg (therefore a maximum of 24 piles required per foundation). It is expected that up to two vessels will be utilised to install pin piles concurrently, using a maximum hammer energy of 4,500 kJ. Drilling or a combination of drilling and piling maybe required to install the OSP foundations.

3.6.7 The PDE for key parameters associated with the installation of piled jacket foundations for OSPs is provided in Table 3.11

Table 3.11: PDE for Eight-Legged Jacket Foundations for OSPs

Parameter	MDS
Maximum number of piled jacket foundations	3
Maximum number of legs per foundation	8
Maximum number of piles per leg	3
Diameter of piled jacket leg (m)	3.5
Diameter of pin piles (m)	4.5
Number of concurrent piling events	2
Maximum Hammer energy (kJ)	4, 500
Seabed footprint per piled jacket foundation (m^2)	5,200
Total seabed footprint including scour protection and mud mats (m^2) (per piled jacket foundation)	8,200
Scour protection material	Rock placement, rock or grout bags, and/or concrete mattressing

Offshore Export Cables

3.6.8 To transfer the energy from the OSPs located in the Array Area to Landfall (and subsequent Onshore Transmission Assets), up to four HVAC cables may be laid within the Export Cable Corridor with a maximum (indicative) cable length of 80 km each.

3.6.9 As with the IACs and Interconnector Cables, where possible the Offshore Export Cables will be buried to an appropriate target burial

depth to ensure they are protected, to reduce the need for cable protection and to minimise interaction with other sea users.

3.6.10 The ability to bury cables will to a large extent be dependent on sediment types and ground conditions. Cable burial depths will be informed by a CBRA, but based upon current understanding, they will be installed to a target burial depth of between 1 m and 3 m (subject to further design), with greater burial depths targeted in specific areas, i.e. in areas of increased commercial fisheries and shipping density.

3.6.11 Installation of the Offshore Export Cables may be through a range of methods including pre-lay plough, plough, trenching, cutting and/or jetting techniques. 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/rock bags) may be required. The PDE for the key parameters of the Offshore Export Cables is provided in Table 3.12.

3.6.12 The cable installation and protection methodology will be defined within the final PDE presented as part of the Offshore EIA Report.

Table 3.12: PDE for Offshore Export Cables

Parameter	MDS
Number of Offshore Export Cables within Array Area	4
Total length of Offshore Export Cables, per cable (km)	80
Target burial depth (m)	Between 1 m and 3 m
Trench width (m)	6
Width of seabed corridor (disturbance) from installation tool (m)	25

Landfall Infrastructure

3.6.13 In order to bring power generated at the Array Area to shore and to connect to the Onshore Transmission Assets, the Offshore Export Cables need to pass through the Intertidal Area to the Transition Joint Bays (TJBs) (which are located above MHWS).

3.6.14 Two main methods are currently being considered as part of the PDE: open trenching and trenchless technology (i.e. Horizontal Directional Drilling (HDD), pipe-jacking or micro-tunnelling). Further site investigations and engineering design work is required to further refine these options and further detail will be provided within the PDE within the Offshore EIA Report.

3.6.15 Infrastructure and associated activities located above MHWS are outside the scope of this Offshore Scoping Report, and the subsequent Offshore EIA Report. This will be detailed within the Onshore Scoping Report to be submitted to Aberdeenshire Council and will be assessed as part of the onshore EIA.

3.7 Seabed Preparation

3.7.1 Prior to the installation of Offshore Infrastructure, it is likely that seabed preparation will be required, including pre-sweeping, seabed-levelling, boulder clearance, pre-cut trenching and the removal of debris (e.g. fishing nets, out of service utilities, lost anchors, or Unexploded Ordnance (UXO)). Excavation may also be required to allow access and removal where debris is found to be present below the seabed surface. Furthermore, pre- and post-installation of rock berms, concrete bridges, mattresses and other CPS (steel/rubber/PE/PU sleeves or tubes) may be needed in different configurations for installation of cable systems in locations where the cable(s) routing cannot avoid steep slopes or need to cross channels or ravines in the Array Area or Export Cable Corridors.

3.7.2 The risk posed by UXO is to be reduced through a dedicated UXO survey and risk strategy. Where potential UXO are identified, they may either be avoided (e.g. through re-routing or micro-siting) or cleared using dedicated removal methodologies.

3.7.3 Certain removal methods (e.g. UXO clearance or detonation) have the potential to create underwater noise, which may lead to the impacts on marine receptors. Therefore, the possible clearance of UXOs will be considered as part of the Proposed Development and included in the Offshore EIA Report. The location, number, and sizes of UXOs will not be known at the time of submission of the Offshore Application. Therefore, estimates of these parameters using geophysical data and desk-based studies will be made to inform the assessment.

3.8 Scour Protection

3.8.1 The hydrodynamic processes and associated sedimentary movements within the Proposed Development Scoping Boundary may result in seabed erosion and the formation of 'scour holes' around the Wind Turbine/OSP foundations, mooring and anchor systems. A number of factors influence the development of scour, including the shape of structures on the seabed, seabed sedimentology, and site specific metocean conditions (e.g. storms, waves, and currents).

3.8.2 Scour protection methods may be utilised to mitigate the likelihood of scour developing, which is likely to include graded rock, although other options including mattressing, and rock bags are included in the PDE. The specific requirements for scour protection will vary

according to seabed conditions and foundation types considered, and therefore final parameters will be determined following the finalisation of foundation structures.

3.8.3 In addition, cable or pipeline crossings may be required including where Proposed Development cables (IACs, Interconnector and Offshore Export Cables) need to cross third party assets. Cable crossings may also be needed for Proposed Development assets, where for example, IACs cross Interconnector Cables. Possible options for crossings include the use of graded rock berms, rock bags and/or concrete mattressing. Further detailed design work is required to understand the number and design of possible crossings required and further detail will be included in the Offshore EIA Report.

3.9 Wet Storage

3.9.1 Due to the early stage of the Proposed Development, details on the assembly and the need for possible wet storage of infrastructure is not known at this stage. There is, however, potential that wet storage may be needed to facilitate construction of the Proposed Development, by the Applicant or ports and/or technology providers. Wet storage options may include:

- following manufacture, substructures may be stored within the marine environment until ready to install; and
- installation of Wind Turbines on substructures may take place adjacent to a specified construction ports and may require transport of the substructures from their storage location.

3.9.2 These wet storage options would typically precede the completed units being towed to the Array Area and installed. The requirements for, and locations of wet storage of substructures are not known and relevant details may not be known with greater certainty until the post-consent stage. It is considered that relevant ports, harbours or other storage facilities will secure the necessary consents required as part of their operating consents and will undertake the associated assessments, and the Offshore EIA Report for the Proposed Development will consider these activities as part of the CEA to the extent possible known at the time of the Offshore Application submission.

3.9.3 The placement/wet storage of moorings, anchors and IACs within the Array Area during construction may be required.

3.10 Construction

3.10.1 It is anticipated that the Proposed Development will be constructed over a period of up to five years. The timing of commencement of construction is dependent on several factors including the award of necessary consents, securing of project finance (e.g. CfD), progression of the associated Onshore Transmission Assets to

facilitate the connection to the National Grid, and completion of procurement and contracting for the Project. However, it is anticipated that construction may commence from 2029.

3.10.2 The specific details of the construction process including timing, duration and sequencing is not known currently, however the expected major construction activities are detailed in Table 3.13. Furthermore, the construction port or harbour locations are not currently known.

Table 3.13: Indicative Construction Activities for the Proposed Development

Activity	Description
Pre-construction surveys	Geotechnical and geophysical surveys, boulder and UXO surveys
Seabed preparation activities	Seabed preparation activities (e.g. boulder clearance, sand wave levelling and clearance (pre-lay plough/dredging), Pre-Lay Grapnel Run (PLGR), UXO clearance, and removal of third party or out of service cables) to aid installation of Wind Turbine and OSP foundations, moorings, and anchors, IACs, Interconnector and Offshore Export Cables.
Foundations, moorings and anchors installation	Installation of Wind Turbine and OSP foundations, moorings and anchors.
OSP installation and commissioning	Installation of OSPs and associated equipment required for this infrastructure, including commissioning.
Interconnector Cables installation	Installation of Interconnector Cables, connecting OSPs to OSPs.
IACs installation	Installation of IACs, connecting Wind Turbines to Wind Turbines or to OSPs within the Array Area.
Subsea Collectors	Installation of SC through gravity or by using pin piles or anchoring systems. Seabed preparation activities (e.g. Dredging, grapnel runs, sweeping, rock placement, and/or mattress laying). Connecting of IACs.
Offshore Export Cable Installation	Installation of Offshore Export Cables including Landfall.
Wind Turbine installation and commissioning	Installation and commissioning of the Wind Turbines which may include towing

Activity	Description
	of Wind Turbines/floating structures to the Array Area.
Post-construction as-built surveys	Surveys to document what has been constructed.

3.10.3 The construction phase of the Proposed Development will require support from various construction vessels, including but not limited to main installation and support vessels; tug/anchor handlers; heavy lift vessels; supply vessels; jack-up vessels; guard vessels; survey vessels; crew transfer vessels; seabed preparation vessels; cable lay installation and support vessels; scour protection installation vessels; and cable protection installation vessels.

3.10.4 It is anticipated that Wind Turbines, foundations, and offshore structures will be constructed and assembled at a to be determined port(s) before being transported to the Array Area via specialist installation vessels for installation and commissioning.

3.11 Operation and Maintenance

3.11.1 Following the completion of the construction phase of the Proposed Development, the Project will enter the O&M phase. A combination of routine and non-routine O&M works will be carried out throughout the lifetime of the Proposed Development.

3.11.2 Routine maintenance encompasses activities such as inspections, removal of marine growth, minor repairs, cable burial surveys, cleaning, replacement of moorings, and the replacement of consumables and corrosion protection systems.

3.11.3 Non-routine major maintenance includes more significant tasks such as:

- replacing components or infrastructure and equipment (e.g. Wind Turbine blades, gearboxes, Interconnector Cables and IACs, and access ladders). Replacement could take place offshore or in port by towing the floating foundations back to port;
- replenishing or replacing scour and cable protection;
- cable reburial, repair and replacement;
- painting and other coating works; and
- geophysical surveys.

3.11.4 The O&M phase is likely to utilise crew transfer vessels, jack-up vessels, cable repair vessels, service operation vessels, excavators or backhoe dredgers, and other similar vessels. There is also a potential for helicopters to be used to transport personnel and equipment,

and drones to be used for inspections and/or equipment transportation.

3.11.5 The details of estimated annual and total O&M vessel trips will be specified within the Project Description section of the Offshore EIA Report.

3.12 Decommissioning and Repowering

3.12.1 In accordance with Section 105 of the Energy Act 2004 (as amended), developers of offshore renewable energy projects are required to prepare a decommissioning programme which requires approval from Scottish Ministers. A Section 105 notice is issued to developers following the granting of consent/licences, and subsequently the offshore renewable energy developer is required to provide a comprehensive plan of decommissioning works. This plan should include an overview of the expected cost and financial securities. This plan should adhere to good industry practice, relevant guidance and decommissioning-related legislation in effect at that time. The plan will undergo a consultation process involving an approved set of stakeholders and will be made publicly available.

3.12.2 Specific details on the decommissioning activities are not known at this stage but are anticipated to generally be a reverse of the installation process. Decommissioning activities are likely to include removal of Wind Turbines, OSPs, and associated Offshore Infrastructure. The Offshore EIA Report will present an overview of the anticipated decommissioning events, including an assessment of the potential significant environmental effects this phase may present to receptors.

3.12.3 There is the possibility of extending the lifetime of the Proposed Development's generation assets through repowering, subject to compliance with the relevant consenting and licensing requirements prevailing at that time.

3.13 Embedded Mitigation

3.13.1 A table of Embedded Mitigation measures and commitments is provided in Appendix A: Draft Schedule of Mitigation and Commitments, and are detailed in the relevant topic sections of this Offshore Scoping Report. These measures may include those developed as part of the Proposed Development design, industry standard measures committed to by the Applicant, or measures mandated by legal requirements.

4 EIA Methodology

4.1 Introduction

4.1.1 This section explains the methodology that will be followed throughout the EIA process for identifying potential environmental impacts resulting from the Proposed Development and the significance of the resulting effects on the physical, biological and human environment. This includes direct and indirect effects along with inter-related, cumulative and transboundary effects. The EIA process can be categorised into several defined stages as detailed below:

- **EIA Screening**: Screening involves determining if an EIA is required for the Proposed Development. Under Schedule 2 of the Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017, an EIA is required for the Proposed Development due to its size, nature and scale.
- **EIA Scoping:** An Offshore Scoping Report is produced for submission to MD-LOT in order to receive a Scoping Opinion on behalf of Scottish Ministers.
- **Stakeholder Consultation:** Communicating with public bodies, consultees and interested parties to see advice during pre-application.
- **Offshore EIA Report Preparation:** Drafting the Offshore EIA Report that provides a detailed assessment of any likely significant environmental effects of the Proposed Development.
- **Application:** Submission of the Offshore EIA Report (as part of the Offshore Application) to MD.
- **Determination:** MD will examine the information provided in the Offshore EIA Report and the consultation responses received and determine the significance of the environmental effects associated with the Proposed Development.
- **Decision:** Scottish Ministers will notify the public and consultees of their decision taking into account consultees advice and must issue a notice summarising the reasoned conclusions on the significant environmental effects of the Proposed Development.

4.2 Policy, Legislation and Guidance

4.2.1 When applying for the relevant offshore consents as part of the Offshore Application (i.e. Section 36 Consent and Marine Licences) to construct and operate an OWF, an EIA Report is required in order to comply with the following Regulations (hereby referred to as the 'EIA Regulations'):

- Electricity Works (Environmental Impact Assessment) (Scotland) Regulations 2017;

- Marine Works (Environmental Impact Assessment) (Scotland) Regulations 2017; and
- Marine Works (Environmental Impact Assessment) Regulations 2007.

4.2.2 The key EIA policy and guidance that apply to EIAs are detailed within Section 2: Policy and Legislation. Additionally, there is specific legislation, policy and guidance that applies to various topics these are detailed within the relevant technical sections of this Offshore Scoping Report. Other relevant guidance and good practice documents which will be considered as part of the EIA include:

- Marine Scotland Consenting and Licensing Guidance: For Offshore Wind, Wave and Tidal Energy Applications (Marine Scotland, 2018)[4];
- Scottish Government EIA Guidelines[5];
- A Handbook on EIA, Version 5 (Scottish Natural Heritage, 2018);
- Institute of Environmental Management and Assessment (IEMA) EIA Guide to Shaping Quality Development (IEMA, 2015a);
- IEMA, Delivering Proportionate EIA. A Collaborative Strategy for Enhancing UK EIA Practice (IEMA, 2017);
- EIA of Projects Guidance on the preparation of the EIA Report. (Office for Official Publications of the EC 2017 (European Commission, 2017);
- Guidelines for Ecological Impact Assessment (EcIA) in the UK and Ireland: Terrestrial, Freshwater, and Coastal (CIEEM, 2018); and
- Guiding Principles for Cumulative Impacts Assessment in OWFs (RenewableUK, 2013).

4.3 Scoping

4.3.1 The EIA process systematically identifies the potential impacts a project may have on the environment. As part of the EIA process, the Offshore Scoping Report identifies which topics and associated impacts could give rise to likely significant environmental effects as a result of the Proposed Development and should, therefore, be assessed and evaluated in the Offshore EIA Report. Scoping considers relevant Embedded Mitigation already included as part of the Proposed Development design or included to adhere to industry good practice or other legislative requirements.

4.3.2 In order to inform the scoping process, the Proposed Development project description is presented in the form of a PDE as detailed in

[4] Noted that this guidance is currently being updated.

[5] Environmental Impact Assessment (EIA) - Environmental assessment - gov.scot (www.gov.scot)

Section 3: Project Description. The PDE, along with a description of the current understanding of the baseline environments presented in relevant topic sections, are used to understand potential interactions with the Proposed Development and associated impact pathways.

4.3.3 This Offshore Scoping Report identifies the potential impacts to be assessed as part of the EIA and provides an overview of baseline data, including any surveys undertaken to date and any further actions to develop the baseline as required, along with the approach and methods for assessing likely significant environmental effects resulting from the Proposed Development. Topics that are determined not to require an assessment within the EIA, due to the lack of likely significant environmental effects (i.e. scoped out), are also detailed within the topic sections of this Offshore Scoping Report.

4.4 Key Principles of the Assessment

Overview

4.4.1 The EIA will assess the potential for impacts that may arise from the construction, O&M and decommissioning phases of the Proposed Development. The topics listed in Section 1: Introduction will be assessed through each topic section within the Offshore EIA Report.

4.4.2 For each environmental topic, the following will be considered:

- identification and explanation of the study area which will be utilised for each of the specific topic assessments;
- a description of the relevant policy, legislation and guidance;
- presentation of environmental baseline and future baseline conditions;
- a summary of any consultations undertaken relevant to the topic, including comments provided as part of the Scoping Opinion, and how they have been considered by the Applicant;
- presentation of the impact assessment, including:
  - identification of the MDS for each impact assessment;
  - Embedded Mitigation measures adopted to minimise or mitigate likely environmental effects which are relevant to the impacts being assessed;
  - consideration of impacts and assessment of significance of resultant effects;
  - identification of any secondary mitigation measures required to reduce the likely significant environmental effects and the consideration of any residual effects;
  - identification of any future monitoring that may be required;
  - identification of potential cumulative effects with other projects;
  - evaluation of any transboundary effects; and

- identification of inter-related effects.

Proportionate EIA

4.4.3 An important objective of the scoping process and the resulting Offshore EIA Report is to provide a concise, proportionate but robust assessment of the likely significant environmental effects associated with a development (IEMA, 2017). A detailed but proportionate EIA helps inform decision making, although the level of detail provided as part of the EIA is a matter of professional judgement. The process used to ensure any likely significant environmental effects are identified and addressed appropriately is shown in Figure 4.1.

4.4.4 The Applicant understands that the EIA needs to be considered from an early stage in project planning and design and will use the following tools to ensure the EIA is robust and proportionate:

- use of existing data and evidence, including publicly available sources, in order to develop a strong understanding of the environmental baseline and to allow 'scoping out' of impacts, where justified;
- implementation of Embedded Mitigation measures at an early stage, including adoption of good practice and project design measures; and
- incorporation of early advice and the addressing of concerns from consultees and stakeholders so appropriate measures can be developed.

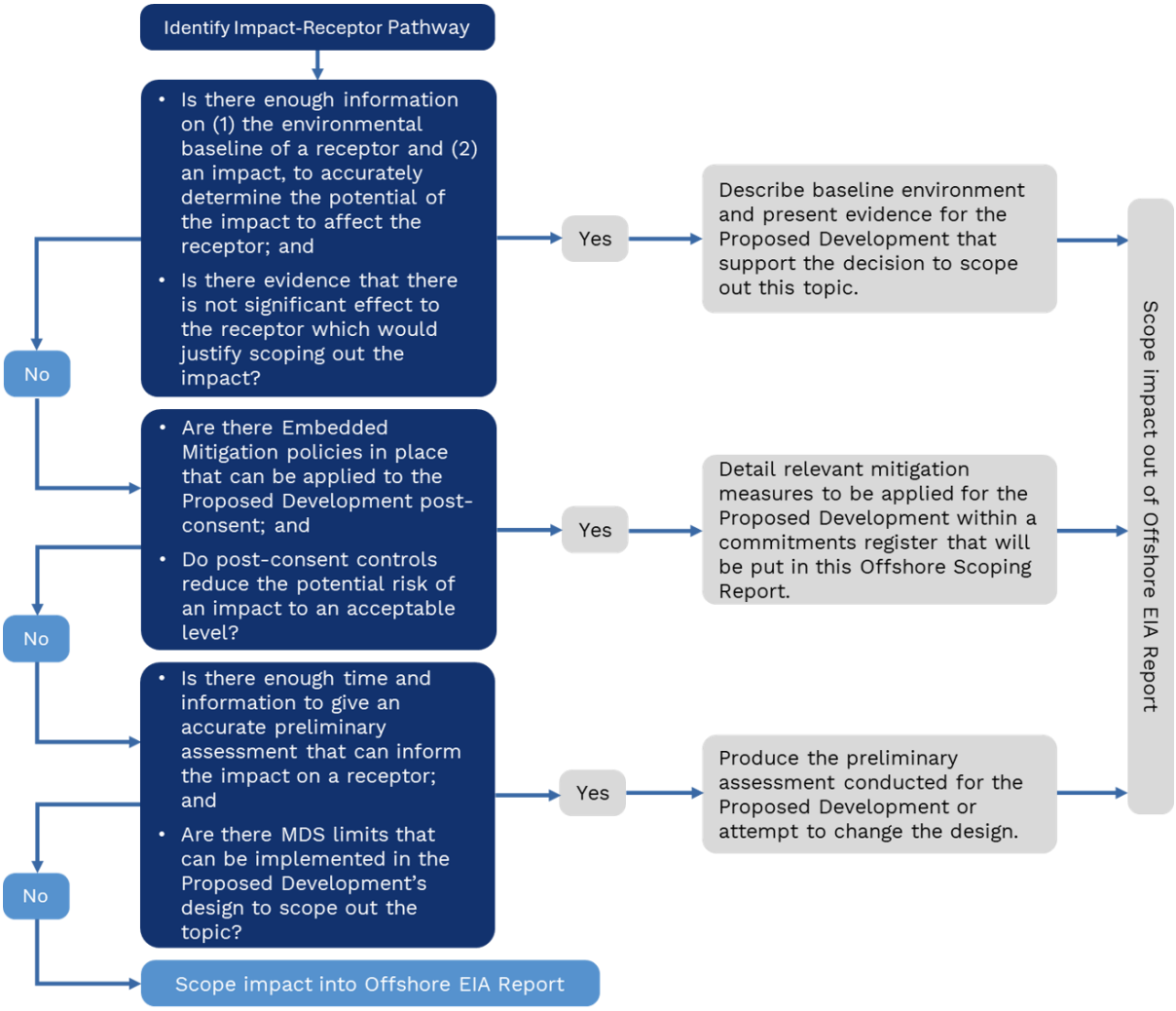


Figure 4.1: Proportionate EIA Process

Addressing Uncertainty

4.4.5 Within the EIA process, there is some uncertainty regarding future evolution and amendments to the PDE. Also, there is uncertainty involving future baseline conditions, from for example climate change (see Section 4.5).

4.4.6 Taking these uncertainties into account, assessment methodologies and use of modelling tools will be appropriately selected based on good practice and guidance specific to the relevant topic, as well as any feedback received from stakeholders.

4.4.7 Any uncertainty, including data limitations and assumptions relating to specific topics or assessments, will be detailed in the Offshore EIA Report. This includes identifying uncertainty, steps taken to reduce uncertainty, and how uncertainty has been considered within the assessment.

Maximum Design Scenarios Approach

4.4.8 As described in Section 3: Project Description, the Proposed Development will use a PDE to develop MDSs. This approach allows the impacts of the Proposed Development to be assessed according to the maximum design parameters, which provides the flexibility for the Applicant to consider multiple designs whilst adequately considering the likely significant environmental effects arising from the Proposed Development within the Offshore EIA Report. Since offshore wind technology is continually innovating, it is important for this assessment to cover potential future designs. PDE parameters therefore will include a range of potential values or design options, which will be reflected in the MDSs and will be detailed for each impact assessed within the relevant topic chapters of the Offshore EIA Report.

4.4.9 The PDE approach is utilised for the EIA because detailed design will not be undertaken until later in the Project timeline (i.e. post application submission). The design of the Proposed Development will likely go through multiple design iterations in order to take account of environmental constraints and stakeholder feedback received during the EIA process, and as a result of outputs from site investigations, as well as engineering and design studies.

4.4.10 The MDS will consider the design option that has the potential to cause the greatest environmental effect on a particular receptor. The MDS is derived from the range in designs provided in the PDE and is applied to each of the topics. As an example, the Proposed Development will have a range of potential options for the seabed area covered by Wind Turbines, dependant on their size, layout and foundation type(s). The assessment will be carried out on the design option which has the potential to result in the greatest impact for a particular receptor. In this example, this will be the maximum number of Wind Turbines and the foundation design with the largest seabed footprint. If it is shown that no likely significant environmental effect is anticipated for this design option, then it can then be assumed that any parameters which are equal to or less than those assessed in the MDS will have the same level of, or less, environmental effects than the parameters assessed.

4.4.11 This approach allows for future project design iterations which may be required as a result of advancements in technology, or as a result of design changes to account for greater understanding of the site conditions. The Offshore EIA Report will include the Project Description for the Proposed Development detailing the PDE, and topic sections will outline the MDSs to be used in the impact assessment along with relevant justification.

4.5 EIA Assessment Process

Baseline and Future Baseline Characterisation

4.5.1 The EIA process requires the identification of baseline conditions for the current and future environment, against which potential impacts and likely significant environmental effects can be assessed, and future changes can be monitored (where necessary). Baselines will be established for clearly defined study area(s) on a topic-by-topic basis.

4.5.2 A desktop data review will initially be used to collect environmental baseline data for the Offshore EIA Report. An initial review of publicly available data has been included in this Offshore Scoping Report and is presented within the relevant topic sections.

4.5.3 If there is insufficient publicly available data to conduct a robust assessment, then site-specific data collection may be required, which may include carrying out environmental surveys. Any additional data collection will be targeted to fill identified data gaps, and/or answer clearly defined questions. A thorough review of all information gathered will be undertaken to ensure confidence in the characterisation of the environmental baseline at an appropriate level of detail.

4.5.4 As part of the EIA, potential changes to environmental conditions will be considered between the time of surveys and the Proposed Development's construction phase. Any changes to the environmental baseline that would occur without the Proposed Development will be considered for each topic.

4.5.5 Planned developments are commonly considered via the assessment of cumulative effects, whilst operational projects are normally part of the environmental baseline. Further detail on the approach to the CEA is provided in Section 4.7, with further detail provided on a topic-by-topic basis in the relevant section of the Offshore Scoping Report.

4.5.6 The potential effects of climate change will also be included within the assessment of future baseline conditions. Whilst there is some uncertainty to the scale of impacts arising from climate change, the topic will still be considered within environmental baseline conditions. Due to the uncertainty, different methodologies will be presented and the impacts on future baselines will be detailed. For example, the UK Climate Change Risk Assessment 2022 (HM Government, 2022) and the United Kingdom Climate Projections project (UKCP18) provide data for the potential changes caused by climate change specifically within the UK (Environment Agency and Met Office, 2018). Published research papers will also be included in this assessment to provide data and relevant conclusions.

Assessment of Impacts

4.5.7 This Offshore Scoping Report sets out environmental impacts that could give rise to likely significant environmental effects associated with the Proposed Development, and also identifies elements proposed to be scoped into or out of the EIA. Scoping considers Embedded Mitigation measures that are built into the Proposed Development either through design or implementation of industry good practice. For potential impacts scoped into the EIA, the Offshore EIA Report will describe the level of significance of any effect expected to result from the Proposed Development.

4.5.8 The assessment process will consider the potential magnitude of the change to baseline conditions arising from the Proposed Development and the sensitivity of the receptor under consideration. There is the potential for the Proposed Development to result in both adverse and beneficial effects on the environment and this will be considered during impact identification and assessment. The assessment process will then consider the significance of any resulting effect on the environment, and the need to implement Additional Mitigation measures following evaluation of residual effects.

Definitions of Impact and Effect

4.5.9 Within the Offshore Scoping Report and the subsequent Offshore EIA Report, 'impact' is defined as a change caused by an action that occurs during a project's lifetime. This includes changing the environment through either project actions or the presence of the Proposed Development. Impacts are categorised through various characteristics as shown in Table 4.1.

Table 4.1: Descriptions of Categories Related to EIA Impacts

Impact Categories	Description
Direct or Indirect	Direct impacts occur at the same time as an action and occur within the same area, as opposed to indirect impacts which still result from an action but arise later or in a different area.
Adverse or Beneficial	Adverse impacts have a detrimental effect on the environment while beneficial impacts have a positive effect on the environment.
Reversible or Irreversible	Reversible impacts are temporary, with natural recovery possible, unlike irreversible impacts, where natural recovery is not possible.
Cumulative	Impacts that arise from a combination of the Proposed Development and other projects.
Transboundary	When an impact has an effect on an area that falls within the boundary of another European Economic Area (EEA).

Impact Categories	Description
Inter-related	The potential effects of multiple impacts from the construction, O&M and decommissioning of the Proposed Development, affecting one receptor.

4.5.10 'Effect' is defined as the term used to express the consequence of an impact. For example, the installation of subsea cables (action) results in disturbance of the seabed (impact), which may cause a loss of benthic habitat (effect). Effects fall into the same groups as the categories for impacts previously listed in Table 4.1.

4.5.11 When determining the overall significance of an effect, the magnitude of the impact and the sensitivity of the receptor will be considered for each topic.

Defining Magnitude of Impact

4.5.12 For each topic involved with the Proposed Development, the magnitude of potential impacts will be assessed. This will include the duration, reversibility, spatial extent and frequency involved with each impact. The definition and determination of the magnitude of impact may vary for specific pathways, receptors and individual technical assessments. However, the magnitude of the impacts will be categorised within the scale below:

- negligible;
- low;
- medium; and
- high.

4.5.13 The definitions of these categories will be detailed within each topic section of the Offshore EIA Report, based on specialist knowledge and relevant guidance, and will be supported by clear justification.

Defining Sensitivity of Receptor

4.5.14 Receptors include natural resources or human groups that have the potential to be affected by the potential impacts of the Proposed Development. Receptors will be identified through available data and baseline studies completed before the submission of the Offshore EIA Report.

4.5.15 A receptor's recoverability, value/importance, and vulnerability will all be considered when determining the sensitivity of each receptor. The sensitivity of the impacts will be categorised within the scale below:

- negligible;
- low;

- medium;
- high; and
- very high.

4.5.16 The specific scale of sensitivity for a receptor is dependent on the EIA topic or receptor in question and detail will be provided in the relevant topic section of the Offshore EIA Report. The ability of a receptor to adapt to change, tolerate and/or recover from potential impacts will be key in assessing sensitivity to impacts. The definitions of these categories will be detailed within each topic section of the Offshore EIA Report, and will be based on specialist knowledge, expert judgement and topic-relevant guidance. Justification and explanation will be provided in relevant sections of the Offshore EIA Report where applicable.

Evaluation of Significance of Effect

4.5.17 Both the magnitude of an impact and the sensitivity of its receptor will be considered when determining the significance of an effect. This may be using qualitative or quantitative methods and will be informed by expert judgement and supported by clear rational. Table 4.2 shows how the magnitude of impact and the sensitivity of the receptor are combined to provide an assessment of significance of effect, Table 4.3 defines the levels of significance.

Table 4.2: Assessment of Significance, Showing the Combinations of Receptor Sensitivity and Magnitude of Impact

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

Table 4.3: Definition of Significance

Impact	Justification
Negligible	No effects or those that are beneath levels of perception, within normal bounds of variation, or within the margin of forecasting error.
Minor	These beneficial or adverse effects are generally, but not exclusively, raised as local factors. They are unlikely to be critical in the decision-making process but are important in enhancing the subsequent design of the Proposed Development.
Moderate	These beneficial or adverse effects have the potential to be important and may influence the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse or beneficial effect on a particular resource or receptor.
Major	These beneficial or adverse effects are very important and are likely to be material in the decision-making process. These effects are generally, but not exclusively, associated with sites or features of international, national, or regional importance. However, a major change in a site or feature of local importance may also enter this category.

4.5.18 In order to determine whether or not a significant effect may result from the Proposed Development, significance categories are utilised to provide a threshold. Significant effects are defined in EIA terms as Moderate or Major effects.

4.5.19 As per Table 4.2, some levels of significance will be defined as a range such as 'Minor to Moderate'. Where 'Minor to Moderate' significance is concluded, professional judgement will be used to determine if the effect either is Minor, or Moderate and therefore significant in EIA terms. Where specific assessment methodologies or alternative approaches to the determination of significance are used these will be clearly detailed and explained in the relevant topic sections.

Mitigation Measures

4.5.20 As a part of the EIA process, mitigation measures are used to avoid, reduce or offset potential impacts, reducing the potential for significant effects to occur. Where the Offshore EIA Report identifies that the Proposed Development is likely to result in a significant adverse environmental effect, Additional Mitigation (in addition to Embedded Mitigation measures already considered) will be identified and incorporated into the assessment in order to reduce effects.

4.5.21 Mitigation within the EIA process is categorised into the following:

- Primary mitigation relates to the design of the Proposed Development, with mitigation implemented through adjusting the project design (Section 3: Project Description).
- Secondary mitigation refers to Additional Measures put in place to prevent, reduce or offset effects where they are considered to be significant and likely to arise throughout the Proposed Development's lifetime. They are commonly implemented where Embedded Mitigation measures are not able to prevent significant adverse environmental effects.
- Tertiary mitigation often includes measures required to ensure compliance with existing legislative requirements or those that are industry standard or best practice and often address potential impacts that aren't specific to any one topic, such as production and adherence to Marine Pollution Plans.

4.5.22 For the purpose of the EIA, both primary and tertiary measures will be referred to as 'Embedded Mitigation' while secondary mitigation will be referred to as 'Additional Mitigation'. Embedded Mitigation measures currently included as part of the Proposed Development will be detailed within each relevant topic section of the Offshore Scoping Report and in Appendix A: Draft Schedule of Mitigation and Commitments.

4.6 Inter-Related Effects

4.6.1 The EIA Regulations require a consideration of the interactions or inter-relationships between EIA topics that may lack significance alone but have a higher significance in combination. For example, the separate impacts of underwater sound and habitat loss may together influence a single receptor, such as marine mammals.

4.6.2 The approach to the assessment of inter-related effects will consider two levels of potential effect:

- project lifetime effects: effects that occur throughout more than one phase of the Proposed Development (e.g. construction, O&M, decommissioning); and
- receptor led effects: effects that interact spatially and/or temporally resulting in inter-related effects upon a single receptor during a single phase of the Proposed Development.

4.6.3 The assessment of inter-related effects will be undertaken with specific reference to the potential for such effects to arise in relation to receptor groups (i.e. the proposed approach assessment will, in the main, not assess every individual receptor assessed at the EIA stage, but rather, potentially sensitive groups of receptors).

4.7 Cumulative Effects Assessment

4.7.1 In addition to considering the impacts of the Proposed Development alone, the EIA Regulations require that any potential impacts that could occur cumulatively with other existing and/or approved developments are considered as part of this assessment. This section provides detail of the planned approach to the CEA for the Proposed Development.

4.7.2 Cumulative effects are those that result from changes caused by other past, present or reasonably foreseeable actions of other projects together with the Proposed Development. These impacts include any that may arise through the Proposed Development's lifetime. As a part of the CEA, determining which projects have the potential to interact with the Proposed Development to create cumulative effects is an important step at the beginning of the assessment. Within the CEA process, there is a screening stage and an assessment stage.

Cumulative Effects Assessment - Screening Stage

4.7.3 An initial list of projects and activities which have the potential to act cumulatively with the Proposed Development will be produced. This 'long list' will be based on the maximum Zone of Influence (ZoI) for the Proposed Development in order to identify all possible developments which may act cumulatively.

4.7.4 Screening will then be undertaken for each topic and relevant impact in order to refine the long list based upon:

- **Conceptual overlap**: for a conceptual overlap to occur it must be established that such an impact has the potential to affect the receptor(s) in question, directly or indirectly. In EIA terms this is described as an impact-receptor pathway and is defined here as a conceptual overlap.
- **Physical overlap**: a physical overlap refers to the ability for impacts arising from the Proposed Development to overlap with those from other projects on a receptor basis. This means that, in most examples, an overlap of the physical extents of the impacts arising from two (or more) projects must be established for a cumulative effect to arise. Exceptions to this exist for certain mobile receptors, such as marine mammals and ornithology receptors, that may move between, and therefore be subject to, two or more separate physical extents of impact from two or more projects.
- **Temporal overlap**: a temporal overlap refers to the overlapping of development phases (i.e. construction, O&M, or decommissioning) of two or more projects. In order for a cumulative effect to arise from two or more projects, a temporal overlap of effects arising from each must be

established. It should be noted that some impacts are active only during certain phases of development, such as piling noise during construction. In these cases, it is important to establish the extent to which an overlap may occur between the specific phase of the Proposed Development and other projects. The absence of a strict overlap, however, may not necessarily preclude a cumulative effect as receptors may become further affected by additional, non-temporally overlapping project phases.

4.7.5 Where there is no potential for spatial or temporal overlap, or due to the nature and scale of other projects, a cumulative effect cannot arise, these will be screened out from a detailed CEA assessment.

Cumulative Effects Assessment - Assessment Stage

4.7.6 A tiered approach will be used when undertaking the CEA (as advised in Marine Scotland Licensing Guidance, 2018) as this provides a framework for placing relative weight upon each project based on the level of maturity of the project(s). It will inform whether adequate detail is available to undertake a meaningful assessment, and if so whether a qualitative or quantitative assessment can be undertaken.

4.7.7 In devising the approach for the CEA, the Planning Inspectorate (PINS) Advice Note Seventeen: CEA relevant to nationally significant infrastructure projects (PINS, 2019) has been considered, as is common practice, including with regards to the tiering system. Although this advice note is for English and Welsh projects, the process outlined is relevant for Scottish projects. Projects will be assessed using the following:

- Tier 1 – The onshore elements of the Project;
- Tier 2 – Projects that have an application submitted, are consented, under construction or operational to the extent not already captured with the baseline;
- Tier 3 – Projects which have submitted a scoping report and/or have received a Scoping Opinion; and
- Tier 4 – Reasonably foreseeable projects including those with CES option or lease agreements.

4.7.8 Projects that are screened through the CEA screening assessment will be categorised into these tiers and will have the potential for cumulative effects assessed. Where applicable, the impacts determined by the CEA will follow the methodology set out in Section 4.7. This will allow the EIA to maintain consistency within its assessments.

4.7.9 Where likely significant environmental effects (Section 4.5) for the Proposed Development are assessed as negligible, or where an impact is predicted to be highly localised (with no spatial or temporal overlap), these will not be considered within the CEA, as it is

considered that there would be no potential for cumulative effects with other projects.

4.7.10 Advice will be sought from key consultees to seek agreement on relevant existing and/or approved projects to be included as part of the CEA. For each relevant existing and/or approved development, the most up to date publicly available project parameters will be used to inform the CEA where appropriate. It is proposed that, in order to allow finalisation of the Offshore EIA Report, a minimum six month cut off period to submission of the Offshore EIA Report is used for the inclusion of cumulative projects to be assessed quantitatively, and a minimum of three month cut off period prior to submission used for the inclusion of cumulative projects to be assessed qualitatively, after which no new or updated information will be considered as part of the CEA.

4.7.11 If available and practicable to do so, the Cumulative Effects Framework (CEF), produced by MD-LOT (2022), may be used for the marine mammal and ornithology CEA (see Sections 11.8 and 12.9).

4.8 Transboundary Effects

4.8.1 Transboundary effects arise when impacts from a development has the potential to affect the environment in the jurisdictions of more than one EEA State. The EIA Directive, which has been transposed into Scottish law through the EIA Regulations, requires the assessment of transboundary effects (Section 2: Policy and Legislation). This Offshore Scoping Report will identify relevant topics where the potential for transboundary effects and will be considered in more detail within the Offshore EIA Report or state if no impacts are anticipated to result in any transboundary effects. Appendix B: Transboundary Screening provides information on the transboundary screening.

5 Consultation and Engagement

5.1 Consultation to Date

5.1.1 Consultation and engagement with stakeholders is a fundamental part of the EIA process. Consultation has and will continue to be undertaken throughout the preparation of the Offshore EIA Report and the consenting process. Consultation allows stakeholders, including members of the public, to raise possible issues related to the Proposed Development. The Applicant will then determine how these can be considered as part of the EIA process and project design phase, and to mitigate impacts where reasonably practicable.

5.1.2 This section provides an overview of the consultation undertaken to date by the Applicant for the Proposed Development with Statutory Consultees and stakeholders. The consultations carried out to date have been to aid in the EIA scoping process with the purpose of:

- gathering background information to assist with the EIA process;
- determining survey scopes and collate pre-existing data to advise on design;
- communicating with other organisations involved with relevant developments for the EIA process;
- assessing consultation options for the Proposed Development; and
- reach an agreement with consultees on potential impacts to be scoped out of the Offshore EIA Report.

5.1.3 Consultation conducted to date applicable to the Offshore Scoping Report is summarised in Table 5.1. Notable consultation includes:

- quarterly meetings with MD-LOT and NatureScot to support a wide range of strategic as well as project-specific issues;
- survey specification consultation to seek advice on geophysical, Digital Aerial Surveys (DAS), Light Detection and Ranging (LiDAR) and environmental survey methodologies and determination of licences;
- survey equipment consultation to seek advice on suitable locations to deploy long-term static survey equipment to acquire metocean data whilst minimising impacts to other sea users e.g. fishers and commercial shipping; and
- a Scoping Workshop to gain feedback from consultees which was used to inform the production of this Offshore Scoping Report.

5.1.4 Throughout the EIA process, the Applicant will continue to consult relevant stakeholders. This Offshore Scoping Report is issued for feedback on future consultation during the EIA process. The Offshore

EIA Report will account for any stakeholder consultation up to the point of submission.

Table 5.1: Record of Consultation Undertaken to Date for the Proposed Development

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
Advice for POAs E1 and E2	Ornithology Working Group (OWG)	04 March 2022 Conference Call	OWG discussed species and associated SPAs impacted by E1 and E2 POAs. Recommendations on monitoring and surveys provided.
ScotWind Introductory Meeting	MD-LOT NatureScot	11 March 2022 Conference Call	Introductions to the Applicant, MD-LOT and NatureScot along with discussing project designs and assessment methodologies.
Technical Surveys – Interface Discussion	Scottish Fishermen's Federation (SFF) Scottish White Fish Producers Association (SWFPA) Orkney Fisheries Association (OFA) North Channel and Approaches (NCA) Northen Lighthouse Vessels (NLV)	21 March 2022 Conference Call	Discussion to clarify the need for technical surveys (geophysical, geotechnical, and metocean) for the EIA.
Ornithology	North-East and Eastern ScotWind Developer Groups	March 2022 – ongoing Conference Call	Collaboration via the North-East Ornithology Group developing targeted surveys and desk-based research to address the evidence gaps in the Ornithology Roadmap. Active collaboration between North-East Ornithology Group and the Eastern Ornithology.

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
			Group to financially contribute to and support scope of works for regional SPA. Colony counts being undertaken by Royal Society for the Protection of Birds (RSPB) in 2023 and 2024.
E3 Quarterly Catch up	MD-LOT NatureScot	18 July 2022 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
Ornithology Research Meeting	Marine Directorate-Science, Evidence, Data and Digital (MD-SEDD)	20 January 2023 Conference Call	Discussion about the modelling and assessment required for the Proposed Development.
Applicant Project introductions	RSPB	14 February 2023 Conference Call	Introducing the Project.
Applicant Project introduction meeting	SFF SWFPA Orkney Fisherman's Association	22 February 2023 Face to face – Aberdeen	Introducing the Project.
Monthly Stakeholder Engagement	Peterhead Developers Forum	24 February 2023 – ongoing Conference Call	General coordination of engagement regarding consultations, surveys and fisheries agreements/clearances to minimise impacts/stakeholder fatigue in the Peterhead onshore and offshore areas as well as adjacent waters.
E3 Quarterly Catch up	MD-LOT NatureScot	03 March 2023 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
EPS Licensing	MD-LOT	06 March 2023	Consultation regarding EPS licensing for geophysical surveys.

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
	NatureScot	Email	
Ad-hoc meetings with Regulators, Licencing Authorities and Associations regarding fisheries interactions	SFF SWPA East Coast Regional Inshore Fishing Group (RIFG) Maritime & Coastguard Agency (MCA) Northern Lighthouse Board (NLB) MD-LOT MD – Marine & Fisheries	05 May 2023 – SFF/SWPA/East Coast RIFG 18 May 2023 – MCA/NLB 22 May 2023 – MD-LOT – Marine & Fisheries 01 September 2023 – MCA/NLB	Various ad-hoc meetings to discuss fisheries interactions impacting Thistle Wind Power Limited's (TWPs) Geophysical survey campaigns across the Ayre and Bowdun projects.
Shipping and Navigation Approach	MCA; NLB	23 May 2023 Conference Call	Discussion on the approach to the shipping and navigation assessment. Specifically held discussions about the dataset to be used and agreed, marine traffic survey methodology and future stakeholder engagement. As there will be no surface piercing structures in the Export Cable Corridor it was explained that there was no plan to survey the export cable routes.
E3 Quarterly Catch up	MD-LOT NatureScot	12 June 2023 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
Monthly Shipping and Navigation Collaboration	Eastern Developers Group	08 August 2023 – ongoing Conference Call	Developer group to discuss holistic baseline compilation for assessing multiple developers' impacts on shipping and navigation in Eastern Scotland.

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
Scottish Offshore Wind Energy Council (SOWEC) – Barriers to Deployment – Enabling Meetings	SOWEC + Stakeholders	10 August 2023 - ongoing Conference Call	Discussions involving Offshore Wind Developers and a variety of stakeholders regarding the barriers currently being experienced by OWF project regarding deployment primarily in relation to consent and policy and priority risk areas for developers, with a view to mitigate those risks through coordinated discussion and action.
SOWEC – Barriers to Deployment - Co-existence	SOWEC + Stakeholders	16 August 2023 - ongoing Conference Call	Discussions involving Offshore Wind Developers and a variety of stakeholders regarding the barriers currently being experienced by OWF project regarding deployment and coexistence with other marine and onshore stakeholders, and the possible measures that could be implemented to mitigate those impacts through coordinated discussion and action.
E3 Quarterly Catch up	MD-LOT NatureScot	11 September 2023 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
E3 Quarterly Catch up	MD-LOT NatureScot	12 December 2023 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
Benthic Subtidal Surveys – Sampling and Analysis Plan (SAP)	MD-LOT NatureScot	15 December 2023 E-mail	Confirmation that the proposed SAP is a suitable approach for characterising the baseline environment.

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
EPS Licensing	MD-LOT NatureScot	13 February 2024 E-mail	Confirmation that an EPS license variation to include benthic survey is not required.
E3 Quarterly Catch up	MD-LOT NatureScot	11 March 2024 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
Scoping Workshop: Environmental Topics	MD-LOT MD-SEDD NatureScot RSPB	25 April 2024 All day remote workshop	Discussion on Benthic Ecology, Physical Processes, Fish and Shellfish, Subsea Noise, Marine Mammals and Ornithology technical topics, and approach to HRA. More information in Section 5.2.
Scoping Workshop: Socio-Economic Topics	Aberdeen City Council Historic Environmental Scotland (HES) MCA MD-LOT MD-SEDD NatureScot NLB Scottish Government: Marine Analytical Unit (MAU) SFF Scottish Pelagic Fisherman's Association (SPFA) UK Chamber of Shipping	25 April 2024 All day remote workshop	Discussion on Commercial Fisheries, Shipping and Navigation, Seascape, Landscape and Visual Impact Assessment, Cultural Heritage and Socio-Economics technical topics. More information in Section 5.2.

Topic	Stakeholder(s)	Date(s) and method of consultation	Purpose of engagement
E3 Quarterly Catch up	MD-LOT NatureScot	10 June 2024 Conference Call	Quarterly catchup to enable updates on project, teams, timelines and requirements.
Wind Turbine Layouts Marine Guidance Note – Lines of Orientation	MCA NLB	15 August 2024 - Conference Call	Discussion on Wind Turbine layout.

5.2 Scoping Workshop

5.2.1 On 25 April 2024, a Scoping Workshop was held to discuss a range of technical topics noted at Table 5.1 and summarised at Table 5.2. The purpose of this Scoping Workshop was to allow the Applicant to consult with Statutory Consultees and certain key technical stakeholders on the details of the Scoping process and any assessment completed to date.

5.2.2 Before the Scoping Workshop, the Applicant provided relevant data and scoping details to Statutory Consultees and relevant stakeholders. This included the presentation slides used during the Scoping Workshop and any relevant technical reports. This enabled Statutory Consultees and relevant stakeholders to provide informed feedback and encouraged questions to be raised. Minutes and updated slides were provided post Scoping Workshop.

5.2.3 The discussions and feedback have further informed the Offshore Scoping Report and the EIA process. The topics discussed, Statutory Consultees and stakeholders present, and a brief summary of key discussions on each topic are provided in Table 5.2.

Table 5.2: Summary of the Scoping Workshop

Receptor Topic	Consultees Present	Summary of Key Points
Physical Processes	MD-LOT and NatureScot	Confirmation of study area, project design, survey methodology, data sources, guidance documents and topics scoped in or out. Confirmation that the risk of cable exposure at landfall will be considered the assessment. Confirmation that an assessment of impact significance will be undertaken for Physical Processes receptors and that where potential changes to pathways are described, the reader will be signposted to other topic chapters which make use of the findings in their assessments of impact significance. NatureScot stated that further feedback on Physical Processes would be provided, as not all invitees could be present at the workshop. Agreed that a technical note would be provided regarding numerical modelling to be reviewed by Statutory Consultees and stakeholders.
Subsea Noise	NatureScot	Confirmation of data sources and assessment methodology. The assessment will include reference to the Offshore Renewables Joint Industry Programme (ORJIP) report on range dependence for impulsive noise if the report is available. NatureScot marine ecologist was present at the Scoping Workshop but no acoustician attended. NatureScot stated that further guidance will be provided on underwater noise. Post-workshop advice included reference to ORJIP and Range dependent nature of impulsive noise (RaDIN) reports for inclusion within the chapter.

Receptor Topic	Consultees Present	Summary of Key Points
Benthic Ecology	MD-LOT and NatureScot	Confirmation of regional study area, proposed benthic ecology assessment methodology, impacts to be scoped in/out, and use of Marine Evidence Based Sensitivity Assessment (MarESA) and Feature Activity Sensitivity Tool (FeAST) tools. NatureScot recommended to use Centre for Environment, Fisheries and Aquaculture Science (Cefas) benthic data. NatureScot advised that some impacts should be assessed cumulatively. This includes a qualitative assessment for Electromagnetic Field (EMF) effects which should be considered for mobile invertebrates that won't be covered in the fish and shellfish assessment.
Fish and Shellfish	MD-LOT and NatureScot	Confirmation of study area, data sources, survey methodology, baseline characterisation, impact assessment methodology and impacts to be scoped in/out. NatureScot queried if basking sharks would be included in the fish and shellfish assessment. Presenter confirmed that basking sharks would be included. NatureScot commented that the impacts proposed to be scoped in were sufficient as long as the Proposed Development uses only fixed foundation turbines. Added that since floating turbines are also being considered, impacts such as aggregation and secondary entanglement should be included. NatureScot recommended more data sets to be used in impact assessment. Post-workshop advice included clarification on: inclusion or exclusion of the River Spey SAC from the EIA and HRA; Data available on Marine Scotland National Marine Plan Interactive (NMPi); additional impacts for inclusion in the CEA; and LSE screening criteria for diadromous fish.

Receptor Topic	Consultees Present	Summary of Key Points
Marine Mammals	NatureScot and MD-LOT	Confirmation of study areas, modelling, data sources, scoped-in species, EIA approach, cumulative effects, Embedded Mitigation and topics scoped in/out. NatureScot recommended considering common and Risso's dolphins. NatureScot recommended using peak sound levels as cumulative sound levels are known to be an overestimate. Post-workshop advice included clarification on: inclusion or exclusion of the River Spey SAC from the EIA and HRA; Data available on Marine Scotland National Marine Plan Interactive (NMPi); additional impacts for inclusion in the CEA; and LSE screening criteria for diadromous fish.
Ornithology	NatureScot, RSPB and MD-LOT	Clarification by NatureScot and RSPB on the impact assessment and provided recommendations on the ornithological approach. Multiple studies and updated guidance were provided for clarification. Clarified discrepancy between ornithological data sets. Confirmation of approach to CEA and study area. NatureScot noted that post-construction monitoring has been adopted for recent projects. Post-workshop advice included clarification on: connectivity in the breeding season, using straight-line distance for foraging ranges; guidance on population viability analysis; how avoidance rates and flight heights are interlinked; and available tools for collision risk modelling.
Commercial Fisheries	Scottish Fishermen's Federation (SFF), Scottish Pelagic Fisherman's Association (SPFA), MCA and MD-LOT	Confirmation of study area and baseline data used. Recommendation to expand the area for the cumulative assessment to include Morven and Ossian wind farms. SFF added the pre-Brexit data should be considered.

Receptor Topic	Consultees Present	Summary of Key Points
Shipping and Navigation	MCA, UK Chamber of Shipping, MD-LOT, NLB, SFF and SPFA	Confirmed survey procedures and results, assessment methodology, baseline environment, study area, and anticipated Embedded Mitigation measures. SFF commented that not all vessels would be included in Automatic Identification System (AIS) data and provided more data to better represent marine traffic. MCA and NLB noted that once it is decided whether the Wind Turbines will be fixed or floating, it should be communicated to determine consultation going forward. MCA suggested several offshore projects be considered in the CEA, particularly Morven and Ossian. Also, that the Port of Aberdeen is to be consulted. MD-LOT confirmed that guidance will be provided on wet storage with TWP, MCA and NLB requesting more information.
Socio-Economics	MD-LOT and Scottish Government	Confirmation of data sources, study areas, methodologies, Embedded Mitigation and consultation. Scottish Government encouraged the use of primary social research, adding that the Scottish Offshore Wind Energy Council (SOWEC) study can be complimentary to primary research, and suggested that the Applicant conduct their own research. Applicant confirmed that SOWEC study would be sufficient as it was made to decrease the burden on stakeholders. Scottish Government suggested communicating with social researchers moving forward.

Receptor Topic	Consultees Present	Summary of Key Points
Seascape, Landscape and Visual Impact Assessment (SLVIA)	NatureScot, HES, MD-LOT and Aberdeen City Council	Confirmed study area, baseline environment, data sources, Landscape Character Types (LCTs), designated areas, Embedded Mitigation, receptors, potential impacts, and assessment methodology. NatureScot confirmed that a landscape architect would provide feedback on viewpoints. NatureScot suggested that viewpoints for the Proposed Development be compared to the viewpoints for other OWF projects (e.g. Kincardine, Aberdeen Bay and Hywind). Aberdeen City Council provided more viewpoints that should be considered within the assessment.
Cultural Heritage	HES, Aberdeen City Council, MD-LOT	Confirmed assessment approach, study areas, data sources, methodologies, Embedded Mitigation and consultation. HES and Aberdeen City Council provided feedback on the suggested receptors.

5.3 Scoping Opinion

5.3.1 Upon receipt of the request for a Scoping Opinion, MD-LOT will consult with the consultation bodies as defined in the EIA Regulations (Scottish Government, 2022b). MD-LOT will produce a Scoping Opinion to be adopted by the Scottish Ministers that will confirm the assessment approach including topics and impacts that may be scoped in or out. The Scoping Opinion will enable future consultation where there is uncertainty in the approach to the assessment.

5.4 Pre-Application Consultation Event

5.4.1 The Marine Licensing (Pre-Application Consultation (PAC)) (Scotland) Regulations 2013 (hereafter referred to as the PAC Regulations) apply where activity is planned within Scottish Territorial Waters (0 nm to 12 nm) (Scottish Government, 2013). For the Proposed Development this includes the Export Cable Corridor (Figure 1.1, Section 1: Introduction). There is no similar provision for PAC in the MCAA 2009, so the requirements do not apply in respect of relevant applications in the Scottish Offshore Waters (12 nm to 200 nm). Though not covered in the MCAA, the Applicant will undertake PAC for the Proposed Development, which includes all aspects of the Proposed Development, including beyond 12 nm.

5.4.2 The Applicant will organise and manage at least one public consultation event where interested parties, including regulators, Statutory Nature Conservation Bodies (SNCBs), Non-Governmental Organisations (NGOs), and local communities, may consider and comment upon a prospective application for a 'prescribed class' of activity as defined in the PAC Regulations and the Marine (Scotland) Act 2010. The Applicant will notify any relevant delegate appointed under the Marine (Scotland) Act 2010, up to six weeks prior to a public consultation event, that an application for a Marine Licence is to be submitted to MD-LOT. Notifications will include information relating to the application and the time and location of the public consultation event. The Applicant will also publish a notice in at least one local newspaper(s) six weeks prior to any public consultation event which will include the following information:

- a description, including location, of the marine licensable activity;
- details as to where further details concerning the activity may be obtained;
- the date and place of the PAC event;
- a statement explaining how persons wishing to provide comments may do so and the date by which this must be done; and

- a statement clarifying that comments are made to the Applicant and not to MD-LOT and that there will be an opportunity for representations to be made to MD-LOT on the application.

5.4.3 Although there are no statutory requirements for consultation during the pre-application stage for Section 36 Consent applications, the Applicant will follow the principles of the PAC Regulations for all offshore components of the projects (beyond 12 nm). It is anticipated that the Applicant will hold a public consultation for the Onshore and Offshore Infrastructure of the Project at the same events to give attendees a full understanding of the entirety of the Project. However, due to the proposed staggered submission dates for the onshore and offshore elements, there may be the potential requirement to hold separate onshore and offshore public events. In this case, there will still remain a presentation of the Project as a whole at each event, so attendees will fully understand the entirety of the Project. Though the Project will be presented at public events, events will be focused to support either the onshore consenting process or the offshore consenting process and feedback sought will be reflective of the event.

5.4.4 The Applicant will submit a PAC Report along with the Offshore Application which will detail how the consultation responses provided as part of the PAC have been considered by the Applicant.

5.5 Future Consultation and Engagement

5.5.1 In addition to ongoing engagement with MD-LOT through quarterly meetings, and the statutory PAC event(s), further engagement will be undertaken during the pre-application stage for the Proposed Development. Further details of topic specific engagement where required as part of, or to inform EIA methodology are detailed in the relevant topic sections. Specific topic-based consultation is also anticipated for a broader range of topics. The approach to stakeholder engagement and consultation is iterative and will be refined throughout the pre-application process. Future consultation and engagement will be informed by a range of factors including:

- advice received as part of the Scoping Opinion;
- results of offshore survey campaigns;
- feedback from engagement with direct consultation with the stakeholders including as a result of public and community consultation;
- outputs of engineering and design studies; and
- initial results from environmental assessments.

5.5.2 The Applicant is also planning to hold two rounds of in-person consultation events at appropriate locations associated with the

Onshore Infrastructure, including the Landfall, to inform and gain feedback from local communities.

6 Site Selection and Consideration of Reasonable Alternatives

6.1 Introduction

6.1.1 As part of the ScotWind Leasing Round, which concluded in January 2022, TWP were awarded development rights by CES for an OWF in the ScotWind E3 POA. This section provides a summary of the site selection and alternatives considered by Bowdun Offshore Wind Limited ('the Applicant') for the Proposed Development to date. Further information will be provided in the Offshore EIA Report submitted to support the Offshore Application, including any refinements to the Proposed Development boundary and the PDE including in response to consultation and stakeholder feedback, as well as the reasonable alternatives that have been considered.

6.2 Plan Option Area Selection

6.2.1 Following an announcement in November 2017, CES subsequently launched the first ScotWind Leasing Round for commercial scale offshore wind energy projects within Scottish Waters in June 2020 (Scottish Government, 2020b). The strategic framework for the ScotWind Leasing Round was largely informed by the SMP for Offshore Wind Energy, published by the Scottish Government in October 2020 (Scottish Government, 2020a), which established 15 POAs, across four regions (North, North-East, East, and West) for potential deployment of renewable energy generation with a realistic development scenario limit of 10 GW.

6.2.2 The POAs within the SMP were determined following an iterative process, informed through stakeholder engagement and evidence from the related social, economic, and environmental assessments (Scottish Government, 2020a).

6.2.3 In 2019, the draft SMP for consultation included 17 Draft Plan Options (DPOs) identified following a Sustainability Appraisal (SA), including:

- SEA (Scottish Government, 2019a);
- HRA (Scottish Government, 2019b);
- SEIA (Scottish Government, 2019c); and
- SMP: Regional Locational Guidance (Scottish Government, 2020a).

6.2.4 Consultation on the draft SMP and SA was undertaken from December 2019 to March 2020, which resulted in 15 POAs being included in the Adopted SMP (Scottish Government, 2020a). Figure 6.1 shows the final 15 POAs and E3's designation as a POA subject to 'high levels of ornithological constraint' based on available evidence at the time of the draft SMP production and adoption.

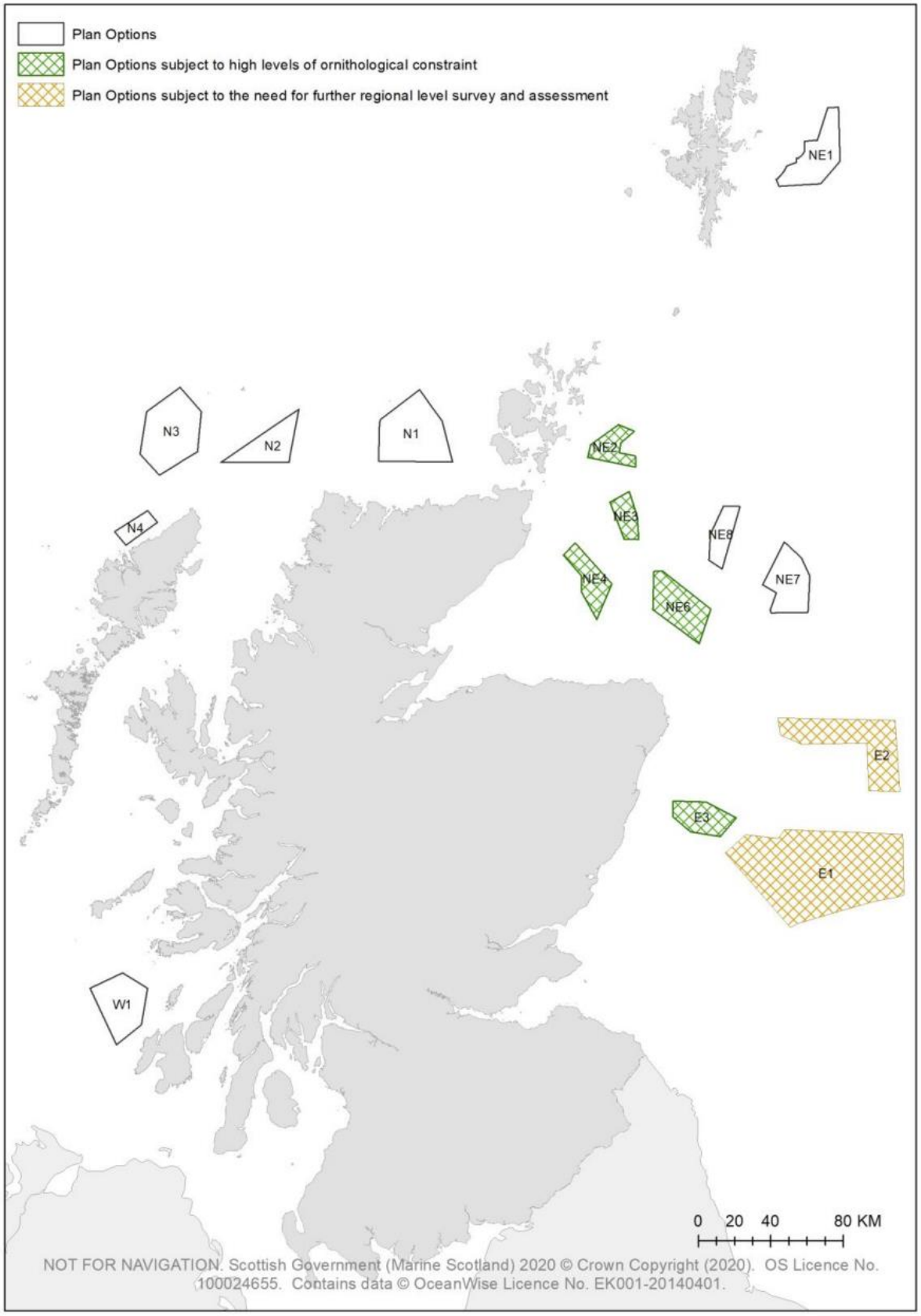


Figure 6.1: Final POAs and Including Those Subject to Plan-Level Ornithological Mitigation Measures (Scottish Government, 2020c)

6.2.5 The Applicant determined the E3 POA as a preferred ScotWind bid area following a comprehensive desktop analysis of all 15 POAs. The analysis encompassed heat mapping and detailed assessment of each POA in order to understand the development constraints, risks and opportunities to support a strong bid submission for a consentable and buildable project. The analysis considered:

- environmental impacts and 'consentability', and the consideration of the realistic development scenarios detailed in the of the SMP and supporting documentation;
- interactions with other marine users and existing infrastructure';
- metocean conditions (wind, wave and tidal);
- water depth and distance to shore;
- geotechnical information and seabed characterisation;
- foundation technology optioneering and feasibility;
- grid connection options and alternative route to markets;
- Annual Energy Production (AEP);
- minimising POA footprints and considering installed capacity density of 5 MW/km^2;
- construction workability (drawing upon the world leading capabilities of DEME Offshore in foundation EPCI); and
- Levelised Cost of Energy.

6.2.6 The E3 POA covered an area of 474 km^2 with the SMP concluding the 'realistic development scenario' in the POA as 1 GW with an area utilisation of 42% of the POA. As detailed within the SMP and accompanying documents, a number of key environmental and technical sensitivities were known to exist within and around the E3 including:

- potential socio-economic cost impacts on commercial fishing and power interconnector sectors;
- The POA may be important as a foraging area for kittiwake (*Rissa tridactyla*) from designated SPA sites and concerns regarding potential in-combination impacts on key seabird species resulting in E3 being classified as being 'subject to higher levels of ornithological constraint';
- potential impacts on important fish spawning grounds, including those for herring, cod, whiting, plaice and sandeel which may require project-level mitigation; and
- navigational safety, due to overlap with areas of high shipping density. There is potential to mitigate the effects on navigational safety at the project level through spatial planning, as there are areas of higher and lower density shipping within the POA.

6.2.7 As such, considering the strong technical background of the Applicant, the key driver for the choice of E3 POA and ultimately Array Area selection during the desktop analysis was the consentability of

the site aligning with the SMP maximum realistic development scenario.

6.3 Array Area Boundary Selection

6.3.1 The environmental constraints analysis undertaken by the Applicant to inform the refinement of the Array Area identified similar constraints as the SMP planning process including:

- Ornithology: The greatest consenting constraint due to the number of designated sites (i.e. SPAs with seabird Qualifying Features within foraging range of the Proposed Development). However, the constraint was found to decrease from west to east with increasing distance from designated sites.
- Fish and shellfish, including commercial fisheries: Constraints were identified as a result of spawning areas for species including herring, cod, whiting, plaice and sandeels, which were found to be slightly reduced in the south-eastern corner of the E3 POA.
- Shipping and navigation: The greatest consenting risk was identified in the western portion of the POA due to commercial vessels, passenger vessels, recreational vessels and fishing vessels.

6.3.2 Overall, the heat mapping and constraint analysis undertaken concluded the eastern part of the POA was the least environmentally constrained, with risk increasing in the western portion of the POA, which is in closer proximity to designated sites and shipping routes.

6.3.3 Considering the results of the environmental constraints analysis, the Applicant located the Array Area within the eastern section of the E3 POA. It is considered that this represents the optimum location for siting the Array Area in terms of environmental and technical constraints, to balance consentability and buildability to facilitate the construction and operation of the Proposed Development: a 1 GW project over circa 39% of the POA to align with the SMP scenario.

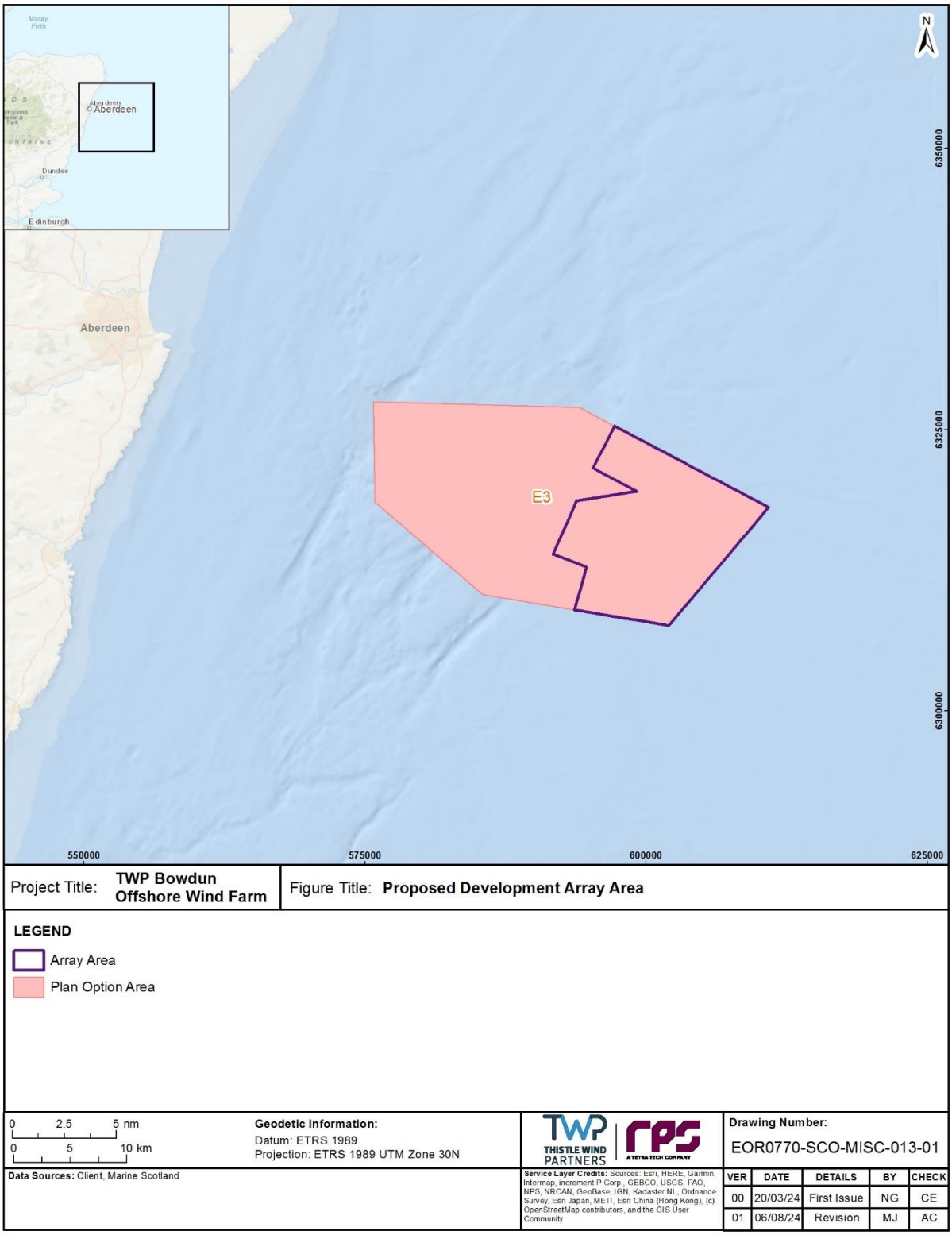


Figure 6.2: Proposed Development Array Area

6.4 Identification of the Offshore Export Cable Corridor

6.4.1 For the ScotWind leasing bid for the Bowdun OWF, a provisional export cable route was identified from the Array Area to land in Sandford Bay, Scotland. This route was determined following a desktop geotechnical and environmental constraints mapping and assessment exercise. In 2022, the Applicant continued the Offshore Export Cable route optioneering which commenced during the ScotWind bid preparations. This work included undertaking an updated, more detailed feasibility study to progress the identification of possible Export Cable Corridors from the Array Area to suitable GCP options. The GCPs were selected in anticipation of the range of possible outcomes from the Holistic Network Design Follow Up Exercise (HNDFUE) being undertaken by National Grid Electricity System Operator (ESO).

6.4.2 Initial screening identified 19 potential landfall locations, with six potential GCP locations, seven Export Cable Corridors to Landfall, and two Export Cable Corridors to offshore GCPs to prepare for a potential offshore GCP hub solution from the HNDFUE. All options were evaluated to consider potential environmental and engineering constraints.

6.4.3 Considering the HNDFUE options, there were two broad areas of search for the Export Cable Corridors:

- the offshore area between the Array Area and Landfall options located along the stretch of coastline between St Fergus and Newburgh and Stonehaven to Carnoustie; and
- for the hub connection, an area offshore from the Array Area to join up with possible offshore GCP options.

6.4.4 Potential Export Cable Corridors were identified based on the shortest route from the Array Area to the potential landfall site (or offshore hub area), avoiding known environmental and geotechnical constraints where possible. A holistic approach was taken with a full end-to-end connection assessment including onshore elements of the Project to inform a robust optioneering process. As the HNDFUE process progressed with National Grid ESO, the offshore hub solution was removed as a favourable option as part of the Options Appraisal Summary Tables with a radial connection being proposed by National Grid ESO to TWP for the transmission solution to an onshore GCP.

6.4.5 Through the optioneering process, which included both an environmental and technical appraisal, key constraints were identified and assessed as being capable of being avoided or mitigated. This included existing cable/pipeline infrastructure and commercial fisheries. The Offshore Export Cable Corridor optioneering exercise was a live process which was regularly updated as further information was known on the final GCP from the HNDFUE.

A robust shortlist of Landfall locations was produced and maintained to prepare for the HNDFUE outcome.

6.4.6 Following the optioneering process, consideration of the HNDFUE updates and outcomes from stakeholder engagement, a final preferred option for the Export Cable Corridor and Landfall location were identified. The final Landfall is situated in the Benholm area of Aberdeenshire and meets the technical and environmental criteria established by the Applicant including consentability, providing a Landfall as close as possible to the Array Area, with both open trenching and HDD installation options available.

6.4.7 The Export Cable Corridor along with the Array Area, form the Scoping Boundary on which this Offshore Scoping Report is based and a Scoping Opinion is requested.

6.5 Determination of Grid Connection Point

6.5.1 The determination of the GCP and subsequently the onshore scope has been driven by the HNDFUE. As per most recent information, the GCP for the Proposed Development is expected to be located at a new substation to be constructed by SSEN in the Fetteresso forest near the settlement of Stonehaven, known as Hurlie. SSEN has undertaken public consultation on its proposals for this new substation and is proceeding with obtaining the necessary planning permissions.

6.6 Consideration of Alternatives

6.6.1 As detailed in Sections 6.3 and 6.4 above, the Scoping Boundary has been informed by detailed optioneering exercises. The Offshore EIA Report will set out any further refinements to the Proposed Development, resulting from the EIA and HRA processes, site characterisation (from geophysical and geotechnical surveys), and in response to consultation and stakeholder feedback. It will describe the main alternatives that have been considered as part of this process and provide justification for the selected design options.

7 Physical Processes

7.1 Introduction

7.1.1 This section of the Offshore Scoping Report identifies the physical processes of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development.

7.1.2 'Physical processes' is a collective term for the following:

- hydrodynamics (water levels and currents);
- winds and waves;
- stratification and frontal systems;
- geology and seabed sediments (including sediment transport);
- seabed geomorphology; and
- coastal geomorphology.

7.1.3 Potential impacts arising from changes to physical processes on other receptors, such as water quality and marine ecology are covered in other sections in this Offshore Scoping Report.

7.2 Physical Processes Study Area

7.2.1 The Physical Processes Study Area is located off the Aberdeenshire coast (Figure 7.1). It has been defined on the basis of:

- the distance away from the Proposed Development by which suspended sediment plumes may be advected (and interact with potentially sensitive receptors). This has been defined by one spring Tidal Ellipse buffer around the Scoping Boundary (modelled as ranging from 6.22 km to 9.42 km around the Scoping Boundary);
- the distance up/down drift from the Landfall, that littoral processes could theoretically be impacted by Offshore Infrastructure associated with the Proposed Development, has been defined through consideration of coastal sub-cell information set out in Ramsay and Brampton (2000); and
- the distance from Array Area that wave blockage impacts could theoretically be detected has been informed by expert judgment, drawing upon (amongst other things), the evidence base from other projects (e.g. ABP Marine Environmental Research Ltd (ABPmer), 2018) and consideration of the prevailing wave directions.

7.2.2 The Physical Processes Study Area overlaps with a number of nationally and internationally designated nature conservation sites, some of which are designated on the basis of the geological and geomorphological features contained within them. Their locations are shown in Figure 7.1 and discussed in paragraph 7.4.20.

7.2.3 The Landfall for the export cable is expected to be located at Benholm, between Gourdon and Johnshaven, on the Aberdeenshire coast.

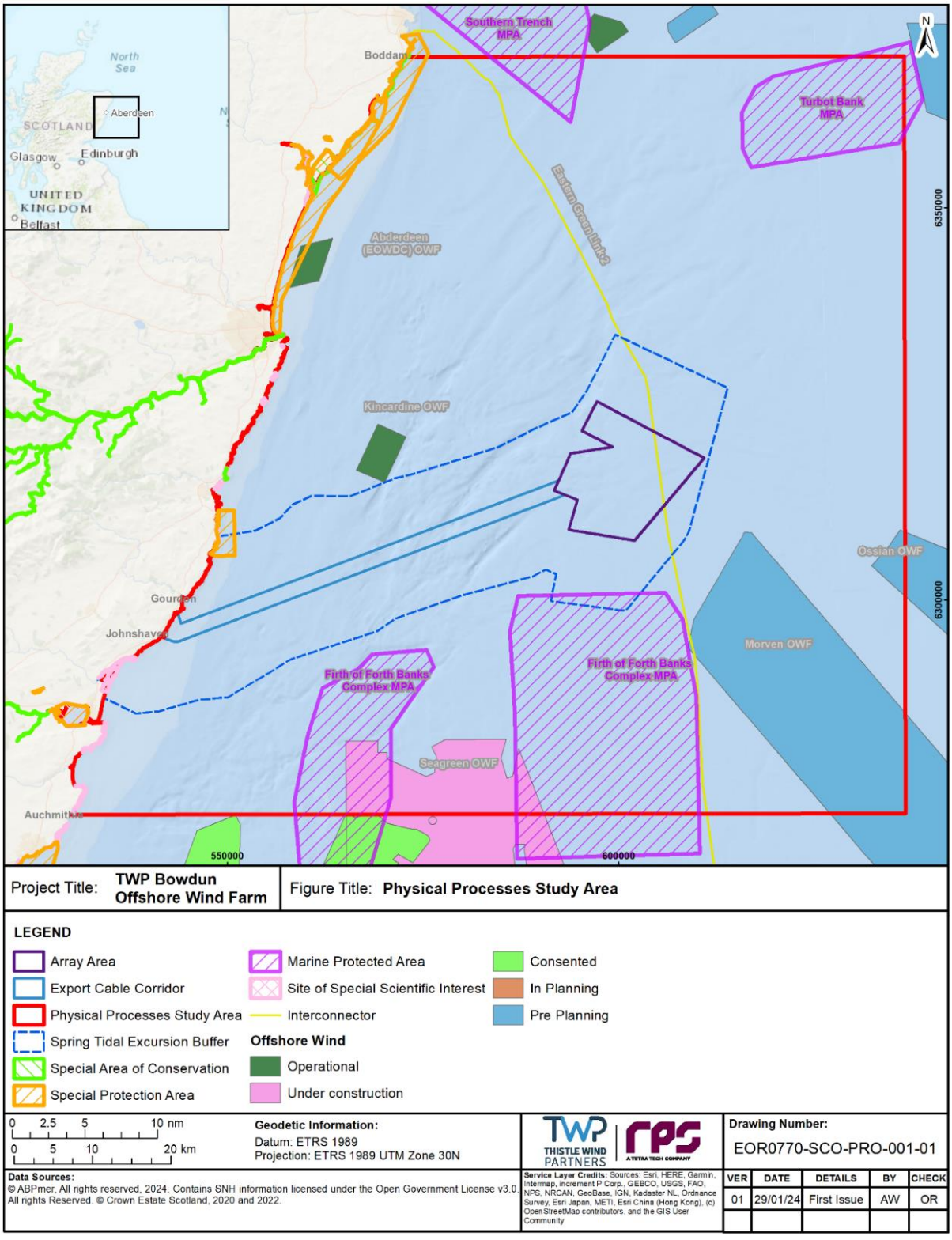


Figure 7.1: The Physical Processes Study Area

7.3 Data Sources

7.3.1 The main physical processes data sources which will be used to inform the assessment are summarised in Table 7.1.

Table 7.1: Key Sources of Information for Physical Processes

Source	Summary	Spatial coverage
TWP Geophysical Survey Data (in preparation)	Geophysical survey of the Array Area and Export Cable Corridor. Multibeam, Side-Scan Sonar, Sub-Bottom Profiler and Magnetometry data collected.	Full coverage of the Array Area and partial coverage of the Export Cable Corridor.
TWP Metocean Data (forthcoming)	Project specific metocean data (Anticipated to be mobilised in September 2024: all available data will be used to inform EIA).	Point location within the Array Area.
TWP Benthic Survey Data (in preparation)	Site-specific benthic survey.	Full coverage of the Array Area and Export Cable Corridor.
MD Data Portal (Marine Directorate, 2024)	Data layers of bathymetry, ocean climate, waves, sea level, seabed geology, surface and subtidal sediments.	Partial coverage of the Physical Processes Study Area.
Scottish Environment Protection Agency (SEPA) (SEPA, 2024)	A range of datasets related to the environment including flood risk management.	Partial coverage of the Physical Processes Study Area.
National Tide and Sea Level Facility (NTSLF) (NTLSF, 2024)	Tidal water levels from point locations within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.

Source	Summary	Spatial coverage
British Oceanographic Data Centre (BODC) (BODC, 2024)	Hydrodynamic data (including current speed and direction, Conductivity, Temperature, and Depth profile data) from point locations within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.
Centre for Environment, Fisheries and Aquaculture Science (Cefas) WaveNet data (Cefas, 2024a)	Wave records from point locations within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.
ABPmer SEASTATES (ABPmer, 2024)	Modelled hindcast wave and hydrodynamic data (1979 to 2023) from across the Physical Processes Study Area.	Full coverage of the Physical Processes Study Area.
Marine Renewables Atlas (ABPmer *et al.*, 2008)	Modelled hindcast wave and hydrodynamic data from across the Physical Processes Study Area.	Full coverage of the Physical Processes Study Area.
UKCP18 Palmer *et al.* (2018)	Climate change projections including sea level rise predictions for coastal locations within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.
Suspended Particulate Matter mapping Cefas (2016)	Monthly and seasonal Suspended Particulate Matter maps for the Physical Processes Study Area.	Full coverage of the Physical Processes Study Area.
Copernicus (Copernicus, 2024)	Atlantic - European North West Shelf - Ocean Physics Analysis and Forecast: 1.5 km horizontal resolution coupled hydrodynamic and wave model which can provide vertical profiles of temperature and salinity.	Full coverage of the Physical Processes Study Area.

Source	Summary	Spatial coverage
British Geological Survey (BGS) (BGS, 2024)	Seabed sediment maps (based on Folk classification) and borehole records from point locations within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.
SEA Data Portal (SEA, 2024)	Seabed mapping data collected on behalf of the Department of Trade and Industry (DTI) to support SEA in Project Area 5.	Partial coverage of the Physical Processes Study Area.
United Kingdom Hydrographic Office (UKHO) (UKHO, 2024)	Bathymetric data in the form of multibeam and single beam data, as well as Admiralty Charts.	Full coverage of the Physical Processes Study Area.
European Marine Observation and Data Network (EMODnet) (EMODnet, 2024)	Bathymetry data and seabed sediment maps.	Full coverage of the Physical Processes Study Area.
MPA Geodiversity Mapping (Brooks *et al.*, 2013)	Geographical Information System mapping of geodiversity interests within the Physical Processes Study Area.	Partial coverage of the Physical Processes Study Area.
Dynamic Coast (Hansom *et al.*, 2017)	The Dynamic Coast project aims to provide the strategic evidence base on the extent of coastal erosion in Scotland.	Partial coverage of the Physical Processes Study Area.
Coastal Cells in Scotland: Cell 2 (Fife Ness to Cairnbulg Point) (Ramsay and Brampton, 2000)	Description of sediment transport at the coast within the context of coastal cells and sub-cells.	Partial coverage of the Physical Processes Study Area.
Scottish Coastal Observatory (SCO) (SCO, 2024)	Monitoring data collected as part of the SCO, covering a range of marine environmental variables including temperature and salinity.	Partial coverage of the Physical Processes Study Area.

Source	Summary	Spatial coverage
Scottish Remote Sensing Portal (Scottish Government and Joint Nature Conservation Committee (JNCC), 2024)	LiDAR datasets to inform past coastal change.	Partial coverage of the Physical Processes Study Area.
(Key publications)	Public and grey literature considering coastal morphology and behaviour at sensitive coastal locations within the Physical Processes Study Area e.g. Hansom *et al.* (2017); Hansom *et al.* (2004) and Baxter *et al.* (2011).	Partial coverage of the Physical Processes Study Area.

7.4 Baseline Environment

7.4.1 This section provides a high-level summary of the existing environment across the Physical Processes Study Area, with consideration given to bathymetry, water levels, currents, waves, stratification, seabed sediments and geomorphology.

Hydrodynamic Regime

7.4.2 The Physical Processes Study Area is located within a semi-diurnal tidal environment with tidal range increasing from east to west. Within the Array Area, the spring tidal range is typically around 2.7 to 3.0 m, with a neap range of approximately half this (ABPmer *et al.*, 2008). At the Landfall, the spring tidal range is approximately 3.9 m with a neap range of approximately 1.9 m.

7.4.3 Within the Physical Processes Study Area, tidal currents are relatively weak, with mean spring peak current speeds less than 1 m/s in most areas. Within the Array Area and along the Export Cable Corridor, mean spring peak current speeds are relatively uniform and are typically between 0.6 and 0.7 m/s. However, they approach 1 m/s in some nearshore areas of the Export Cable Corridor. Tidal flow is relatively rectilinear throughout the Physical Processes Study Area, with a north-north-east to south-south-west flow axis.

Wind and Wave Regime

7.4.4 The wave climate within the Physical Processes Study Area is controlled by a combination of the local wind regime and the relative position within the wider North Sea basin.

7.4.5 Winds in the region most frequently come from the south-west (approximately 30% of the time) with stronger winds tending to come from this direction (Figure 7.2).

7.4.6 Waves within the Physical Processes Study Area are a combination of locally generated wind waves and waves generated elsewhere in the North Sea. Within the Array Area waves predominantly come from the north and north-north-easterly directions (circa 20 to 25% of the time) and south-south-easterly to south-westerly directions (circa approximately 35% of the time) (Figure 7.2).

7.4.7 Wave heights across the Physical Processes Study Area tend to reduce with proximity to the coast, owing to decreasing water depth, decreasing fetch length in the predominant wind direction, and generally greater protection from waves generated elsewhere in the North Sea. The associated local predominant wave direction also varies accordingly.

7.4.8 All available metocean data collected during the project-specific metocean survey campaign will be considered alongside existing long-term records (including both observational and hindcast datasets) to provide robust characterisation of baseline conditions. This data will also be used in conjunction with existing observational records from the Physical Processes Study Area to validate the numerical hydrodynamic and wave models which will underpin the impact assessment.

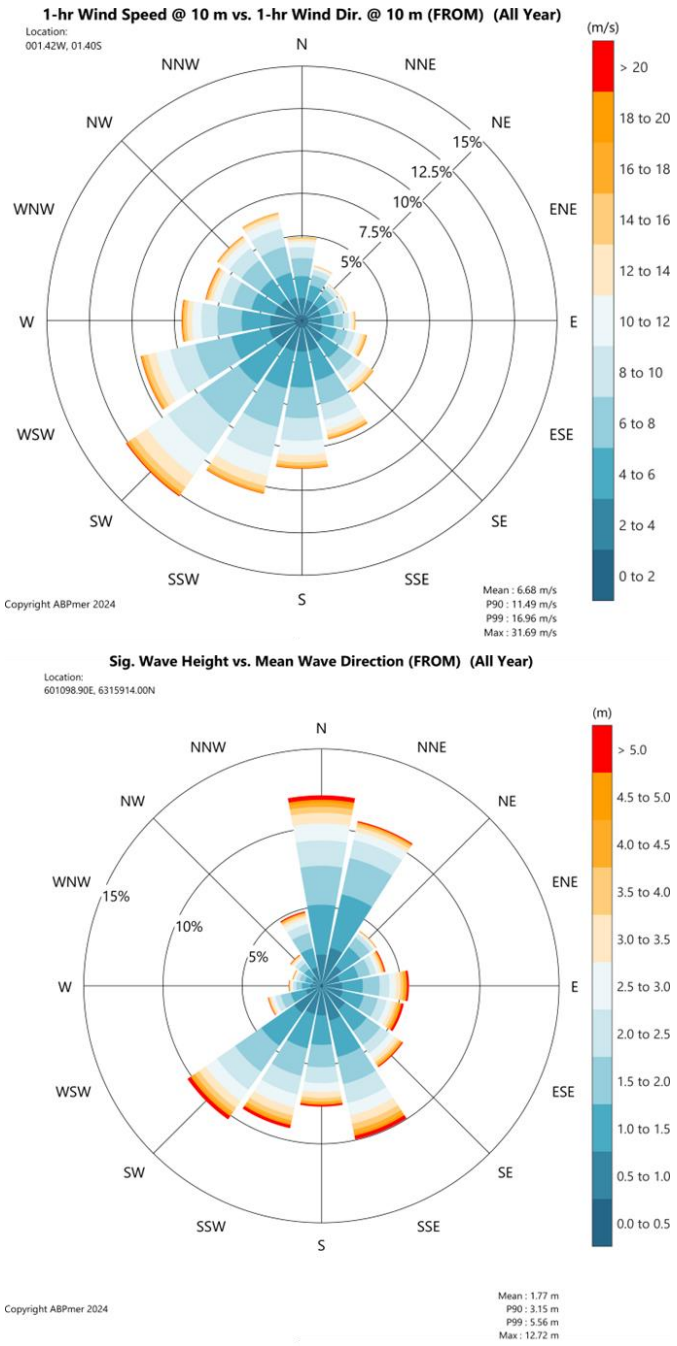


Figure 7.2: Rose Plots of Wind for the Period 1979 to 2022 (Top) and Significant Wave Height for the Period 1979 to 2023 (Bottom) for the Array Area (ABPmer, 2024)

Stratification and Frontal Systems

7.4.9 Stratification is a naturally occurring seasonal hydrodynamic feature related to the vertical and horizontal distribution of sea water temperature and salinity, which influences the availability of nutrients, and the distribution and growth rates of pelagic flora and fauna. In the North Sea during the summer, increased heat input from

solar irradiation and higher air temperatures preferentially warms the upper part of the water column. Temperature differences of up to 10°C between the warmer (and so more buoyant) surface waters and colder (denser) bottom waters can be established, with a relatively steep vertical gradient in temperature between the two layers.

7.4.10 A stratification front is the transition between areas of vertically stratified and non-stratified water. Fronts are relatively widespread features within the North Sea and (at certain times during the year) may extend for a distance of several hundred kilometres (Hill *et al.*, 1993; 2005). The characteristics of stratification and frontal systems within the Physical Processes Study Area will be analysed in detail within the Offshore EIA Report using temperature and salinity data extracted from a high-resolution 3D ocean model covering the European North-West Shelf, available through the Copernicus data portal (Copernicus, 2024).

Geology and Seabed Sediments

7.4.11 The geological structure of the bedrock that underlies the seabed in the Central North Sea (CNS) region is characterised by a complex pattern of down-faulted basins separated by platforms (the latter being relatively uplifted areas). The Physical Processes Study Area is located within the Forth Approaches Basin which was formed during the Carboniferous era (360 to 290 million years ago) along south-west-aligned structure (Holmes *et al.*, 2004).

7.4.12 Seabed sediments across the Physical Processes Study Area are dominated by sand, with varying contributions of gravel. Very little fine grained (muddy) material is present. Close to the coast, including at the Landfall at Benholm, exposed rock is encountered. The seabed sediments overlie extensive Quaternary sequences, deposited during glacial episodes over the past 2.6 million years.

7.4.13 In general, there is net northerly tidally driven sediment transport across the Physical Processes Study Area although localised departures from this generalised pattern occur especially close to the coast, where local wave processes have greater influence (Kenyon and Cooper, 2005).

7.4.14 Sediment transport at the coast is described within the context of coastal cells and sub-cells in Ramsay and Brampton (2000). The Physical Processes Study Area is within Cell 2 (Fife Ness to Cairnbulg Point). Within Cell 2, net littoral drift is low in many areas, owing to the rocky nature of the coastline with limited sediment available for transport. Where sediment is more abundant (such as at the sandy beaches north of Aberdeen and to the south of the Landfall at Benholm), net transport is typically in a northerly direction.

Seabed Geomorphology

7.4.15 Bathymetry within the Physical Processes Study Area is highly variable, with water depths generally between -20 and -80 m below LAT (Figure 7.3). Within the Array Area, water depths are typically in the range -55 m to -75 m LAT, with the deepest areas found in the north-west of the Array Area. Depths along the Export Cable Corridor locally exceed -100 m LAT, where it crosses a series of north-east to south-west trending deeps.

7.4.16 A range of active and relict (i.e. no longer active) bedforms and geomorphological features are present within the Physical Processes Study Area, reflecting contemporary seabed processes and past glacial and geological activity.

7.4.17 Tunnel valleys and glacial meltwater channels have previously been mapped throughout this region (Bradwell *et al.*, 2008), with the elongated deeps present to the west of the Array Area and overlapping with the Export Cable Corridor potentially examples of these features (Figure 7.3). Extensive moraine complexes have also been mapped within the Physical Processes Study Area, including Wee Bankie which likely marked an ice limit at some stage during ice retreat from the Last Glacial Maximum (LGM) (Brooks *et al.*, 2013; Clark *et al.*, 2018).

7.4.18 In many areas, active bedforms comprising mobile Holocene sediments are found superimposed upon these relict glacial features. These include sand wave fields which are understood to be present in several parts of the Array Area (BGS, 1984).

Coastal Geomorphology

7.4.19 The coastline within the Physical Processes Study Area extends from Auchmithie (in the south) to Boddam (in the north). Large stretches are characterised by the presence of erosion resistant rock although beaches with dune systems are also present (Figure 7.3). In several areas where these softer, erodible sediments front urban areas (such as Montrose and Aberdeen), coastal defences are present. The coastline at the Landfall is characterised by the presence of a raised beach with rocky foreshore.

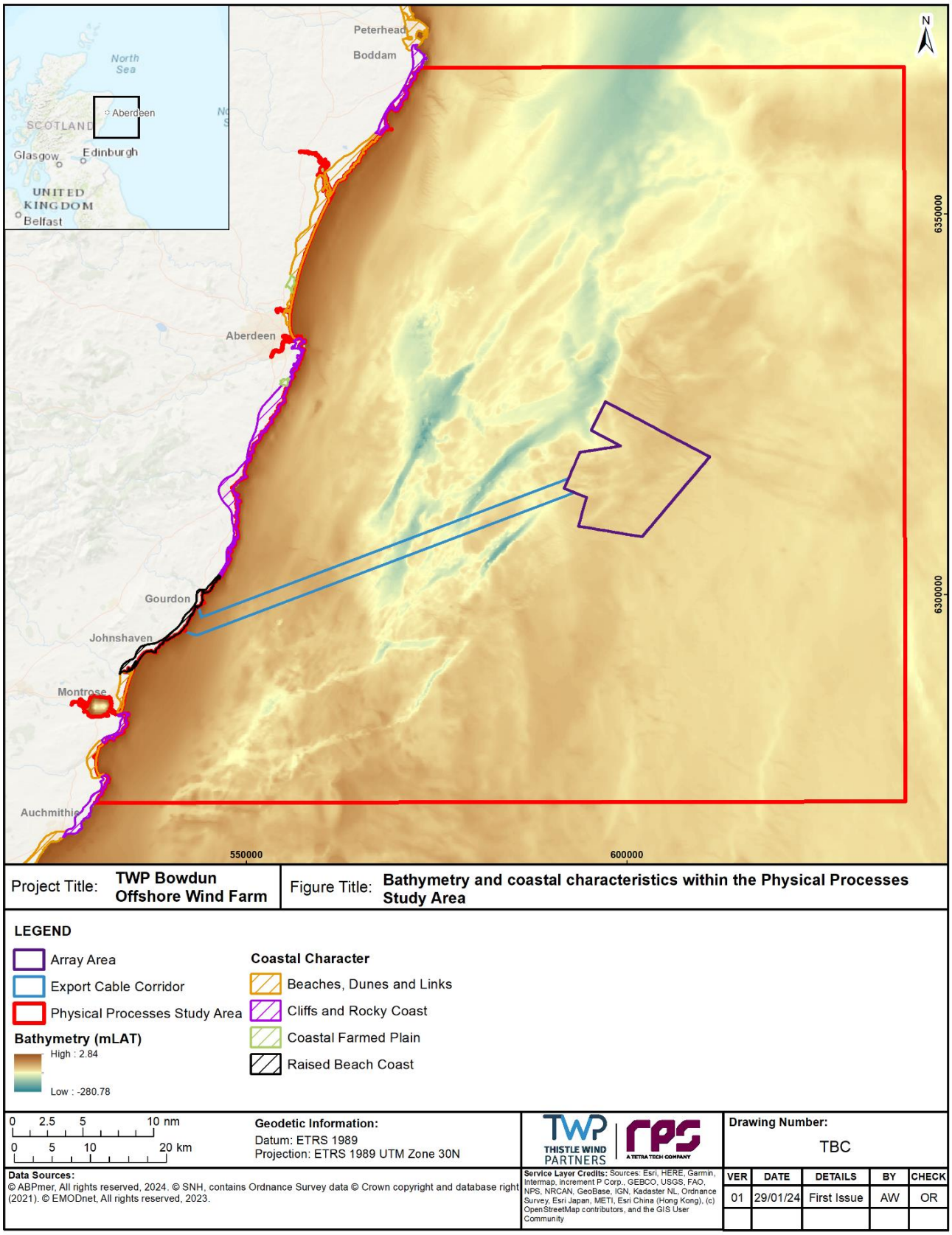


Figure 7.3: Bathymetry and Coastal Characteristics Within the Physical Processes Study Area

Designated Sites

7.4.20 The Physical Processes Study Area contains several nationally and internationally designated sites although none overlap with the Array Area or Export Cable Corridor (Figure 7.1). The sites are designated for the habitats they contain as well as (in some instances) for the presence of geological and geomorphological features. This is the case with the Firth of Forth Banks Complex MPA which is located circa 7 km to the south of the Array Area and contains moraines considered to be representative of the Wee Bankie Key Geodiversity Area (JNCC, 2021). At all sites, changes to the physical characteristics of these sites have the potential to impact the habitats they support and, therefore, consideration is given to them in the marine physical processes assessment.

7.5 Embedded Mitigation

7.5.1 The following Embedded Mitigation is relevant to physical processes. The Embedded Mitigation will evolve over the development process as the EIA progresses:

- Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent.
- Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.
- Development of, and adherence to a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).
- All relevant Health and Safety Executive (HSE) procedures will be followed.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

7.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

7.6 Potential Proposed Development Impacts

7.6.1 A range of potential impacts on physical processes have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

7.6.2 The impacts that have been scoped into the assessment are outlined in Table 7.2 together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

7.6.3 Based on the baseline environment information currently available and the Project Description (Section 3), no impacts to physical processes receptors or pathways have been fully scoped out at this stage. This is principally due to the potential for pathway changes to impact on other topic receptors and the requirement to inform those assessments (paragraph 7.7.2).

Table 7.2: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Physical Processes

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Potential changes to suspended sediment concentrations, bed levels and sediment type	✓	×	✓	There is potential for increased Suspended Sediment Concentrations (SSC) and associated deposition associated with seabed preparation activities, foundation installation activities and cable installation activities.	Data collected during the site-specific geophysical survey campaign will provide data to support the development of the physical processes' numerical modelling and desk-based analyses. If available, site-specific metocean data may also be utilised to validate desktop sources. This data will be augmented by existing publicly available data covering (amongst other things) bathymetry, seabed	Numerical modelling will be conducted to quantitatively describe the advection, dispersion and settling of sediment plumes.
Potential impacts to seabed morphology	✓	✓	✓	Cable installation, as well as the installation (and subsequent presence) of cable protection measures, Wind Turbine foundations, OSPs and anchoring structures all have the potential to impact seabed morphology. Some levelling of sand waves may be necessary during the construction phase, which has the potential to alter the local seabed morphology		The spatial footprint of potential morphological change to the seabed associated with the installation of Offshore Infrastructure will be characterised using MDS assumptions, which will be outlined in the Offshore EIA Report. Where sand wave levelling is required, the potential recovery of sand wave crests will be assessed using a semi-quantitative

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				within the Array Area and Export Cable Corridor.	sediments, geology, metocean and coastal characteristics which are available from the Physical Processes. Study Area (Figure 7.1)	desktop exercise. The assessment will determine the local sediment transport potential and the dimensions of sand waves, also referring to a range of existing evidence that has been developed in relation to assessments of this nature, undertaken over the last five years for other OWF projects.
Potential impacts to landfall morphology	✓	×	✓	Where the Offshore Export Cables make Landfall, they must transition through the intertidal zone. Both HDD and open cut trenching may physically disturb or disrupt the present intertidal morphology (although this would occur to a lesser degree with HDD than trenching.) Ancillary Offshore Infrastructure (including coffer dams and cable		The short-term physical impacts of cable installation and removal will be assessed using desktop analysis, with reference to the wider evidence base from analogous projects. The potential impact on beach morphology, hydrodynamics and sediment transport will be assessed by an

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				protection) may also influence patterns of sediment transport with potential for localised morphological change. This assessment will consider the potential impacts on the coast at the Landfall.		experienced coastal geomorphologist in the context of the baseline environment of the Landfall setting.
Potential changes to the tidal regime	×	✓	×	The presence of Offshore Infrastructure both in the water column and at the seabed has the potential to cause blockage of waves and tides, with associated changes to sediment transport and seabed morphology. This assessment will consider the potential morphological impacts on designated areas of seabed, as well as on frontal systems.		Numerical modelling will be conducted to provide an overview of the potential changes to the tidal and wave regimes. The MDS for blockage of currents and waves will be determined from the Project Description, with foundation structures parametrised and implemented into each model. Scenarios with the Proposed Development in-place will be compared against the baseline, with both relative and absolute
Potential changes to the wave regime	×	✓	×			

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						change in currents/waves reported in spatial plots.
Potential changes to the sediment transport regime	×	✓	×			Numerical modelling will be conducted to provide an overview of the potential changes to the sediment transport regime. This information will subsequently be used to determine the potential for direct and indirect changes to seabed morphology.
Potential changes to stratification and frontal systems	×	✓	×			Outputs from the hydrodynamic modelling will be used to undertake a semi-quantitative assessment of the potential for change in water column stratification and the strength/persistence and position of frontal systems.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Scour	×	✓	×			A desk-based assessment will be undertaken to describe the theoretical potential for scour development in the absence of scour protection measures. Conservative estimates of the theoretical maximum depth and extent of scour will be provided using empirical relationships described in Whitehouse (1998) for each foundation type within the design envelope.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

7.7 Proposed Assessment Methodology

7.7.1 Section 4: EIA Methodology describes the general approach to the assessment of potentially significant effects that may arise from the Proposed Development, setting out how judgments of impact magnitude and receptor sensitivity are combined to determine overall significance of effect on a receptor. The following guidance documents will also be considered:

- EIA for offshore renewable energy projects (British Standards Institution (BSI), 2015);
- review of environmental data associated with post-consent monitoring of licence conditions of OWFs. Marine Management Organisation (MMO) Project No: 1031 (Fugro Emu, 2014);
- review of post-consent OWF monitoring data associated with licence conditions. A report produced for the MMO Project No: 1031. MMO, Newcastle (MMO, 2014);
- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Cefas, 2012);
- further review of sediment monitoring data: ScourSed-09. COWRIE (ABPmer, *et al.,* 2010);
- Coastal Process Modelling for OWF EIA: Best Practice Guide (ABPmer and HR Wallingford, 2009);
- Review of Cabling Techniques and Environmental Effects applicable to the OWF Industry Technical Report. Department for Business Enterprise and Regulatory Reform in association with Department for Environment Food and Rural Affairs (DEFRA) (Department for Business, Enterprise and Regulatory Reform (BERR), 2008);
- guidelines in the use of metocean data through the lifecycle of a marine renewables development (Construction Industry Research and Information Association (CIRIA), 2008);
- review of Round 1 Sediment process monitoring data - lessons learnt: Sed01. ABPmer, Southampton (ABPmer, *et al*., 2007);
- dynamics of scour pits and scour protection - Synthesis report and recommendations: Sed02. HR Wallingford, Wallingford (HR Wallingford, 2007); and
- potential effects of offshore wind developments on coastal processes. Department of Trade and Industry (DTI), London (Cooper and Beiboer, 2002).

7.7.2 In most cases, physical processes are not in themselves receptors but are, instead, 'pathways' which have the potential to indirectly impact other environmental receptors (e.g. benthic ecology and fish ecology). Accordingly, whilst potential changes assessed in the physical processes section of the Offshore EIA Report may not themselves be significant, it may be the case that they have potential

to cause significant impacts to other EIA topic receptors. For example, changes to water column stratification and the location of frontal systems (which will be considered in the physical processes assessment) could theoretically result in a change in primary production and associated marine ecosystem functioning (Dorrell *et al.*, 2022). The topic sections relevant to marine physical processes are:

- Section 9: Benthic Ecology;
- Section 10: Fish and Shellfish Ecology;
- Section 12: Offshore Ornithology;
- Section 13: Commercial Fisheries;
- Section 16: Infrastructure and Other Users;
- Section 19: Marine Archaeology; and
- Section 23: Offshore Water Quality and Water Framework Directive.

7.7.3 Notwithstanding the above, a small number of physical process receptors have been identified which will be considered in the assessment. These are:

- the coast; and
- designated areas of seabed.

7.7.4 In order to assess the potential changes to physical processes, relative to the existing baseline, a combination of analytical methods will be used:

- numerical modelling of changes to waves, tides and sediment transport as well as sediment plume modelling;
- standard empirical equations describing (for example) the potential for scour development around vertical structures (e.g. foundation components and pile anchors), cables and berms (Whitehouse, 1998);
- analytical assessments of project-specific data; and
- evidence from analogous projects including other OWFs and subsea cables.

7.7.5 A method statement detailing the proposed assessment approach has been shared with MD-Lot and NatureScot, with feedback provided in July 2024. The final methodology will be tailored to reflect the received advice.

7.7.6 The assessment will be underpinned by a detailed understanding of the existing baseline environment and will consider likely naturally occurring variability in, or long-term changes to, physical processes within the lifetime of the Proposed Development due to natural cycles and/or climate change (i.e. sea level rise).

7.8 Potential Inter-Related Effects

7.8.1 The different physical processes which will be investigated in the assessment are already inter-related; in particular, sediment transport is dependent on currents and waves and therefore these linked processes will implicitly be considered within the assessment. In turn, this information on physical processes will be used to inform other EIA topics such as:

- Section 9: Benthic Ecology;
- Section 10: Fish and Shellfish Ecology;
- Section 12: Offshore Ornithology,;
- Section 13: Commercial Fisheries;
- Section 16: Infrastructure and Other Users;
- Section 19: Marine Archaeology; and
- Section 23: Offshore Water Quality and Water Framework Directive.

7.9 Potential Cumulative Effects

7.9.1 Cumulative effects on physical processes resulting from the effects of the Proposed Development and other projects will be assessed in accordance with the guidance and methodologies set out in Section 4: EIA Methodology and considering the other developments that have been screened in as part of the CEA screening exercise.

7.9.2 The following impacts from the Proposed Development have the potential to act cumulatively with impacts from other developments to contribute to cumulative effects:

- during construction, potential interaction of sediment plumes, resulting in cumulative increases in Suspended Sediment Concentration (SSC) and associated changes in bed level; and
- during operation, potential interaction with infrastructure associated with other projects resulting in cumulative changes to waves, tides and sediment transport. These could potentially result in morphological impacts to identified receptor groups including the coast and designated areas of seabed.

7.9.3 The projects which will be considered in the assessment are listed below and shown in Figure 7.1:

- other proposed OWFs (e.g. Morven, Ossian, Kincardine, Aberdeen and Seagreen); and
- Eastern Greenlink 2 interconnector.

7.10 Potential Transboundary Impacts

7.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon physical processes due limited extent of the predicted ZOI resulting from construction, O&M, and decommissioning impacts of the Proposed Development.

7.11 Summary

7.11.1 This section of the Offshore Scoping Report describes the physical processes of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development across the Physical Processes Study Area. This area has been informed by expert judgement, based on (amongst other things) regional scale process understanding including analysis of prevailing wave direction and the tidal excursion distance from the Array Area and Export Cable Corridor.

7.11.2 A summary of the proposed approach to each assessment has been set out and includes the use of numerical modelling and desk-based analyses. All assessments will be underpinned by a robust understanding of the baseline environment, informed by a range of project-specific and existing data.

7.11.3 The potential for cumulative effects on physical processes resulting from the effects of both the Proposed Development and other developments have been considered, with those other developments requiring consideration in the assessment listed. However, whilst there is the possibility of cumulative effects with other developments, it is considered that there is no potential for transboundary impacts upon physical processes due to either construction, O&M and/or decommissioning of the Proposed Development.

8 Subsea Noise

8.1 Introduction

8.1.1 This section of the Offshore Scoping Report identifies the relevant subsea noise aspects of the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development.

8.1.2 The subsea noise assessment will form a technical appendix to the Offshore EIA Report, which will be used to inform the impact assessment for the following receptor groups:

- Section 10: Fish and Shellfish Ecology; and
- Section 11: Marine Mammals.

8.1.3 Subsea noise and vibration sources during construction may include piling (impact hammering or drilling) for the Wind Turbine foundations and/or moorings and OSP foundations. Additional sources include the use of barges and vessels, heavy machinery and generators on the vessels.

8.1.4 Subsea noise during O&M could include noise transmitted into the water from aerodynamic noise, from Wind Turbine blades passing through the air via the air to water interface, and structure borne mechanical noise from the gearbox and generators of the Wind Turbines.

8.2 Subsea Noise Study Area

8.2.1 No dedicated Subsea Noise Study Area has been outlined as this is defined by the receptors and discussed within the relevant topics listed in Section 8.1. These Study Areas include the Fish and Shellfish Study Area (Figure 10.1) and the Marine Mammal Study Area (Figure 11.1).

8.3 Data Sources

8.3.1 No site-specific ambient noise surveys are proposed as part of the assessment of subsea noise, as ambient/background noise is not used in the subsea noise assessment, as described in Section 8.4.

8.3.2 The sources of data to be used for the subsea noise model are listed in Table 8.1.

Table 8.1: Data Sources to Be Used for the Assessment of Subsea Noise Impacts

Dataset	Notes
General Bathymetric Chart of the Oceans (GEBCO) Grid (GEBCO, 2024)	Seabed bathymetry. Provides global terrain model for ocean and land, providing elevation data, in metres, on a 15 arcsecond interval grid.
Deep Sea Drilling Project (DSDP) (DSDP, 2024)	Seabed sediment and geological condition data.
British Geological Survey (BGS, 2024b)	Seabed sediment and geological condition data.

8.4 Baseline Environment

8.4.1 Background or 'ambient' subsea noise is created by several natural sources (e.g. rain, breaking waves, wind at the surface), seismic sound, biological sound (including marine mammal vocalisations) and thermal sound. The sound can be either impulsive (pulsed) such as impact piling, or non-impulsive (continuous) such as ship engines, and the magnitude of the impact on marine life will depend heavily on these characteristics. Anthropogenic sources of sound in the marine environment include commercial shipping and fishing, marine construction noise, seismic surveys and leisure activities, all of which add to ambient background sound. Anthropogenic sound within the vicinity of the Proposed Development will arise primarily from shipping, the offshore oil and gas industry, subsea geophysical and geotechnical surveys and the offshore renewables industry.

8.4.2 The available numerical criteria for assessing the effects of noise on marine mammals, fish and shellfish, tend to be based on the absolute noise criteria, rather than the difference between the baseline noise level and the noise being assessed (Southall *et al.*, 2019), as this has historically been the area of research focus. This is the approach that will be utilised for the assessment.

8.4.3 Baseline noise levels vary significantly depending on multiple factors, such as seasonal variations and different sea states. Although there are some limited studies in relation to baseline ambient sound in UK waters (for example Merchant *et al.*, 2016), lack of long-term measurements/sound data is a widely recognised gap in knowledge in relation to general soundscape and potential effects of anthropogenic activities on marine life.

8.4.4 A quantitative assessment of the magnitude and significance of the impact of underwater noise on marine mammals is based on noise modelling which utilises various data to predict sound propagation. The general approach to underwater noise modelling used to inform marine mammal impact assessments for OWF EIAs is to obtain historic data from publicly available data sources, as described in

Section 8.7. For example, given that marine mammals are highly mobile and wide-ranging species, utilising historic bathymetry data that covers a much larger area is likely to be more representative of the soundscape individuals are experiencing than using site-specific data that covers only a small portion of the animal's range.

8.4.5 Based on the information presented in paragraphs 8.4.2 to 8.4.4, existing and published noise data (where available) will be used to characterise the baseline environment where necessary. Site-specific subsea noise data collection is not proposed.

8.5 Embedded Mitigation

8.5.1 The following Embedded Mitigation is relevant to subsea noise. Embedded Mitigation will evolve over the development process as the Offshore EIA Report progresses. Measures adopted as part of the Proposed Development are discussed within each of the relevant sections of the Offshore Scoping Report for which subsea noise is considered relevant due to the potential impacts on certain receptors.

- Piling will likely include a combination of slow start, soft start, ramp up or Acoustic Deterrent Devices (ADDs).
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- Where possible, the use of low order disposal of UXOs will be implemented (i.e. deflagration).

8.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

8.6 Potential Proposed Development Impacts

8.6.1 A range of potential impacts resulting from subsea noise have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development.

8.6.2 The impacts that have been scoped into the assessment are outlined in Table 8.2 together with a description of any additional data collection or modelling that will be required to enable a full assessment of the impacts.

8.6.3 Potential impacts scoped out of the assessment are presented in Table 8.3, with justification. Specific details relating to the approach to modelling is included in a separate Underwater Noise Modelling Method Statement (Appendix C: Subsea Noise Modelling Method Statement).

Table 8.2: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Subsea Noise

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Clearance of UXO	✓	×	×	There is potential for injury or disturbance during the pre-construction phase due to the clearance or detonation of UXO, depending on the occurrence, size and techniques used. It is therefore proposed to include these activities in the assessment.	No data collection proposed for this activity.	Modelling will be undertaken to estimate injury ranges for marine mammals and fish (paragraph 8.7.2 onwards).
Geophysical and geotechnical surveys	✓	✓	✓	There is potential for injury or disturbance from use of subsea survey equipment during all phases.		Modelling will be undertaken to estimate injury and disturbance ranges for marine mammals and fish (paragraph 8.7.2 onwards).
Driven and drilled pile installations for the OSP foundations, fixed Wind Turbine foundations, and floating Wind Turbine moorings	✓	×	×	Due to the potentially high source levels involved and impulsive nature of the sound, modelling and assessment of the proposed piling activities will be undertaken.		Modelling will be undertaken to estimate injury and disturbance ranges for marine mammals and fish (paragraph 8.7.2 onwards).

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Vessel movements	✓	✓	✓	Although noise from these sources will be relatively low in level (e.g. compared to impact piling) and continuous in nature (rather than impulsive) there is still some residual potential for disturbance due to long term increased traffic and use of rigs etc. The assessment of vessel noise also includes the assessment of any activities for which the noise generated by specific machinery cannot be separated from the noise of the vessel itself in the measurement data, for example cable laying.		Modelling will be undertaken to estimate injury and disturbance ranges for marine mammals and fish (paragraph 8.7.2 onwards).
Wind Turbine operation (including mooring lines)	×	✓	×	There is potential for disturbance due to noise from the Wind Turbine during the O&M phase, the magnitude of which will depend on the Wind Turbines constructed and the type of foundations/mooring. The subsea noise impact of very		A qualitative assessment will be included for the noise from operational Wind Turbines, including a review of available information in relation to potential sound generated by mooring lines.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				large or floating Wind Turbines during operation is not well researched.		
Decommissioning activities	×	×	✓	There in a potential for impacts due to noise from decommissioning activities other than vessel movements, for example cutting of foundations.		Modelling will be undertaken to estimate injury and disturbance ranges for marine mammals and fish (paragraph 8.7.2 onwards).

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 8.3: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Subsea Noise

Impact	Justification
Effects of the particle motion element of underwater noise on marine mammals	There is insufficient evidence that particle motion has any effect on marine mammals therefore this impact is scoped out of the marine mammals Offshore EIA Report section.

8.7 Proposed Assessment Methodology

8.7.1 The following guidance documents will be considered when preparing the Subsea Noise Technical Report:

- Good Practice Guide to Underwater Noise Measurement (National Physical Laboratory (NPL), 2014);
- Review of Underwater Acoustic Propagation Models (Wang *et al.*, 2014);
- National Oceanographic and Atmospheric Administration Technical Guidance for Assessing the Effects of Anthropogenic Sound on Marine Mammal Hearing (National Marine Fisheries Service (NMFS), 2016);
- Underwater Acoustic Thresholds for Onset of Permanent and Temporary Threshold Shifts (TTS) (NMFS, 2018);
- Marine Mammal Noise Exposure Criteria: Updated Scientific Recommendations for Residual Hearing Effects (Southall *et al.*, 2019);
- Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al.*, 2014);
- Statutory Nature Conservation Agency Protocol for Minimising the Risk of Injury to Marine Mammals from Piling Noise (Joint Nature Conservation Committee (JNCC), 2010a);
- JNCC Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys (JNCC, 2017);
- Guidance on Noise Management in Harbour Porpoise *Phocoena phocoena* SACs (JNCC, 2020a);
- The EU Marine Strategy Framework Directive (MSFD) (Directive 2008/56/EC). This seeks to achieve Good Ecological Status (GES) in Europe's seas by 2020. The qualitative descriptors for determining GES include 'Introduction of energy, including underwater noise, is at levels that do not adversely affect the marine environment.' This Directive was transposed into UK law by the Marine Strategy Regulations 2010 and remains applicable in the UK subject to amendments to provide for EU Exit;
- Department for Business, Energy and Industrial Strategy (BEIS) Policy Statement - Marine Environment: UXO Clearance Joint Interim Position Statement (BEIS, 2022);

- The Carbon Trust in collaboration with the Offshore Renewables Joint Industry Programme (ORJIP) 'Reducing Uncertainty in Underwater Noise Assessments (ReCon)' (ORJIP, 2023); and
- MD commissioned report 'Energy Conversion Factors in Underwater Radiated Sound from Marine Piling: Review of the Method and Recommendations' (Wood *et al.*, 2023).

8.7.2 The impact criteria will be based on the most recent and up-to-date scientific research and guidance, such as that included in Southall *et al*. (2019) and NMFS (2018), while utilising a precautionary approach. Potential impacts arising from subsea noise on marine mammals and fish (including turtles) will be assessed with respect to the potential for injury and behavioural disturbance. Source noise levels will be based on a combination of theoretical and empirical predictions, and detailed source level modelling where appropriate. The associated source levels of other types of subsea noise associated with the Proposed Development, such as vessels, will be based on published data and established prediction methodologies.

8.7.3 Source sound levels for piling will be determined using the method established by von Pein *et al*. (2022). A broadband source level value is evaluated for the noise emitted during impact pile driving operations in each operational window.

8.7.4 If the proposed piling involves submersible hammers, a correction will be applied through the piling sequence to account for the pile penetration, based on Lippert *et al.* (2017) which demonstrates that when a pile is below the water surface, the fall-off in acoustic energy is ~2.5 dB per halving of exposed pile length above the seabed.

8.7.5 Subsea noise modelling is planned to assess the potential impact of construction noise using a robust, peer reviewed model. In accordance with NPL guidance (NPL, 2014), the choice of model will depend upon many factors which will be determined during the post-scoping consultation and will depend on site-specific circumstances (such as bathymetry). Following the recent release of MD's review of energy conversion factors (Wood *et al.*, 2023), it was highlighted that the sound field from impact piling features a Mach cone wavefront for which the propagation from a line source, which can lead to different rates of energy loss if a point source model is used.

8.7.6 Underwater acoustic propagation modelling for the Proposed Development will be undertaken using a combined distributed line-source array normal mode or parabolic equation model for low frequencies (<1 kHz) complimented by a line-source energy flux model for high frequencies (>1 kHz). This approach will be further defined within a separate Underwater Noise Modelling Method Statement.

8.7.7 Currently, there is a lack of robust operational data available to be able to carry out any operational noise modelling. Thus, in the

absence of operational data it is proposed that operational noise will be assessed qualitatively, and no modelling will be carried out as part of the EIA.

8.7.8 The exact scope, specification and methodology of the noise propagation modelling will be discussed and agreed with SNCBs, Marine Directorate-Science, Evidence, Data and Digital (MD-SEDD), MD-LOT, during Scoping consultation, and detailed in a separate Underwater Noise Modelling Method Statement. The assessment will consider the bathymetry and other characteristics of the area, including the geo-acoustic properties of the seabed, as well as other factors such as the sound source characteristics and frequency range of interest. It is anticipated that the subsea noise assessment will include:

- A review of the publicly available literature and studies on the impact of impulsive subsea noise on marine mammal and fish species, including an assessment of the sensitivity of fish and marine mammals to subsea noise, and derivation of criteria for estimating the impact, to be agreed with the SNCBs.
- Estimation of the MDS for source level noise for impact piling operations for the Proposed Development.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of piling during construction for the Proposed Development.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of the O&M phase (excluding operational Wind Turbine noise) and decommissioning phases for the Proposed Development.
- Noise propagation modelling to estimate potential impact ranges for injury and behaviour to marine mammals and fish as a result of any concurrent piling operations within the Proposed Development.

8.7.9 The model will be used to estimate the unweighted and hearing group weighted Sound Exposure Level (SEL), Root Mean Square (rms) (T90) sound pressure level and peak (peak-to-peak) pressure level parameters, as recommended by Southall *et al*. (2019), NMFS (2018), Southall *et al*. (2007), Acoustic Society of America Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al*., 2014) and other guidance. The model will also incorporate swim speeds of marine mammals and fish to calculate cumulative SELs, which will be agreed with stakeholders during post-Scoping consultation.

8.7.10 The combined effect of multiple events/operations will also be assessed/modelled and will consider the likely exposure times of species, allowing for safe distances and reaction ranges to be determined. Modelling scenarios will be undertaken for concurrent

piling scenarios, including both typical (most likely) and maximum piling parameters within the PDE. Further, modelling will be undertaken with the consideration of mitigation, for example ADDs, comparing otherwise identical scenarios with and without ADDs.

8.7.11 The results of the noise modelling will be presented in a Subsea Noise Technical Report that will support the Offshore EIA Report.

8.8 Potential Inter-Related Effects

8.8.1 The Subsea Noise Technical Report will present the outcome of subsea noise modelling, which will be used to inform the impact assessment for the relevant receptor groups. The inter-related effects of subsea noise will, therefore, be assessed within topic-specific sections of the Offshore EIA Report where appropriate.

8.9 Potential Cumulative Effects

8.9.1 The Subsea Noise Technical Report will present the outcome of the subsea noise modelling, which will be used to inform the impact assessment for the relevant receptor groups. The cumulative effects of subsea noise will, therefore, be assessed within topic-specific sections of the Offshore EIA Report where appropriate.

8.10 Potential Transboundary Impacts

8.10.1 The Subsea Noise Technical Report will present the outcome of subsea noise modelling, which will be used to inform the impact assessment for the relevant receptor groups. The transboundary impacts will, therefore, be assessed within topic-specific sections of the Offshore EIA Report where appropriate.

8.11 Summary

8.11.1 Various noise generating activities are proposed to be undertaken during the lifetime of the Proposed Development, ranging from UXO clearance and impact piling to vessel movements, including those from the site-specific surveys, such as geophysical and geotechnical data collection. Noise source levels will be derived from appropriate sources and used to inform the noise propagation model. Injury and disturbance ranges will be derived for marine mammal and fish species, which will be used to inform the assessment of significance of effect within the receptors' topic-specific sections of the Offshore EIA Report.

9 Benthic Ecology

9.1 Introduction

9.1.1 This section of the Offshore Scoping Report identifies the benthic subtidal and intertidal ecology of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development. For brevity, benthic subtidal and intertidal ecology in general is referred to as 'benthic ecology' throughout.

9.1.2 The scope of this benthic ecology section encompasses the entire Scoping Boundary, which includes the Array Area and the Export Cable Corridor (Figure 9.1). Thus, the scope of this section extends from MHWS to the offshore waters in which the Proposed Development will be located.

9.1.3 This section is relevant to and should be read alongside the following sections:

- Section 7: Physical Processes;
- Section 10: Fish and Shellfish Ecology; and
- Section 23: Offshore Water Quality and Water Framework Directive.

9.2 Benthic Ecology Study Area

9.2.1 Two Benthic Ecology Study Areas have been defined to inform the baseline characterisation for benthic ecology (Figure 9.1):

- The Local Benthic Ecology Study Area, which is defined as the area encompassed by the Scoping Boundary and a buffer of one spring Tidal Ellipse (modelled as ranging from 6.22 km to 9.42 km around the Scoping Boundary (see Section 7: Physical Processes). The buffer of one Tidal Ellipse ensures the Local Benthic Ecology Study Area is large enough to account for the ZoI of impacts to benthic ecology, which may extend beyond the Scoping Boundary, such as through increased SSCs and changes in physical processes.
- The Regional Benthic Ecology Study Area, which is defined as the area encompassing the Scoping Boundary and extending further into the Northern North Sea (NNS). The Regional Benthic Ecology Study Area has been informed by the SMP East Region (Scottish Government, 2020a). It also encompasses other OWF projects and regional datasets which can help characterise the baseline. The Regional Benthic Ecology Study Area has been defined to ensure a comprehensive baseline is provided, and to provide wider context to the Local Benthic Ecology Study Area.

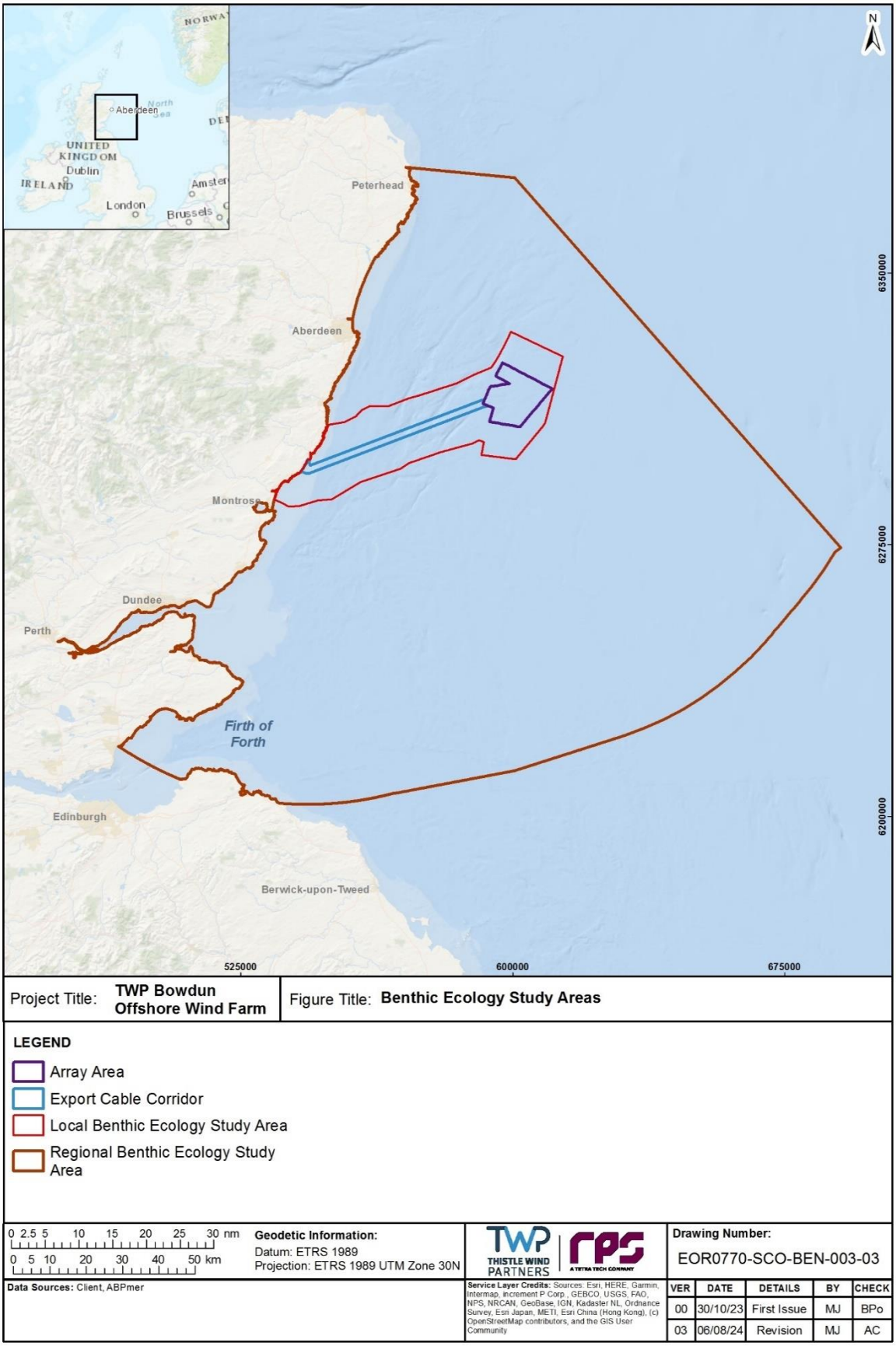


Figure 9.1: Benthic Ecology Study Areas

9.3 Data Sources

9.3.1 An initial desktop review of key literature and data sources has been undertaken to inform the benthic ecology baseline (Table 9.1). The benthic ecology baseline presented here in the Offshore Scoping Report provides context to the site-specific subtidal benthic ecology data for the Local Benthic Ecology Study Area that were collected during the subtidal survey campaign in spring 2024. A Phase 1 intertidal walkover survey of the landfall location at Benholm beach was conducted in September 2023 (Appendix E: Intertidal Survey). The results of the Phase 1 survey are included within the baseline characterisation in this Offshore Scoping Report and will be used to inform the benthic ecology assessment in the Offshore EIA Report. The full report for the Phase 1 intertidal walkover survey will be appended to the Offshore EIA Report, and a summary is provided in paragraph 9.4.4. A full benthic ecology baseline will be provided in the Benthic Ecology Technical Report of the Offshore EIA Report.

Table 9.1: Summary of Key Desktop Datasets and Materials

Title	Source	Reference
Marine Scotland National Marine Plan Interactive (NMPi) Maps	Marine Scotland	NMPi (2024)
One Benthic Platform	Centre for Environment, Fisheries, and Aquaculture Science (Cefas)	Cefas (2024b)
Ossian Array EIA Scoping Report	Ossian OWF Limited	Ossian OWFL (2023)
Morven Offshore Wind Array Project EIA Scoping Report	Morven Offshore Wind Limited	Morven Offshore Wind Limited (2023)
Berwick Bank Wind Farm Offshore EIA Report, Chapter 8 Benthic Subtidal and Intertidal Ecology	SSE Renewables (SSER)	SSE Renewables (2022b)
MPA Mapper	JNCC	JNCC (2023a)
European Marine Observation and Data Network (EMODnet) broadscale seabed habitat map for Europe (EUSeaMap)	EMODnet – Seabed Habitats	EMODnet (2023)
Annex I Reefs in UK Waters (Open Data)	JNCC	JNCC (2021b)

Title	Source	Reference
The Status of *Sabellaria spinulosa* Reef off the Moray Firth and Aberdeenshire Coasts and Guidance for Conservation of the Species off the Scottish East Coast	Marine Scotland Science (now Marine Directorate – Science, Evidence, Data and Digital)	Pearce and Kimber (2020)
Annex I Sandbanks in the UK – Public Polygons	JNCC	JNCC (2019a)
NNG OWF Environmental Statement (ES), Chapter 14 – Benthic Ecology	NNG OWF	Mainstream Renewable Power (2019)
Inch Cape OWF Offshore ES, Volume 1B: Biological Environment, Chapter 12 Benthic Ecology	Inch Cape OWF	Inch Cape Offshore Limited (2018)
A big data approach to macrofaunal baseline assessment, monitoring and sustainable exploration of the seabed	Cefas	Cooper and Barry (2017)
Kincardine Offshore Windfarm ES	Kincardine Offshore Windfarm Limited	Kincardine OWF Limited (2016)
Descriptions of Scottish PMFs	Scottish Natural Heritage (now NatureScot)	Tyler-Walters *et al.* (2016)
Hywind Scotland Pilot Park: ES	Hywind Scotland	Statoil (2015)
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of MPAs in Scottish Waters – Phase 2	JNCC	Sotheran and Crawford-Avis (2014)
Analysis of seabed imagery from the 2011 survey of the Firth of Forth Banks Complex, the 2011 International Bottom Trawl Survey (IBTS) and additional deep-water sites from Marine Scotland Science surveys (2012)	JNCC	Axelsson *et al.* (2014)
Mapping habitats and biotopes from acoustic datasets to strengthen the information base of MPAs in Scottish Waters	JNCC	Sotheran and Crawford-Avis (2013)

Title	Source	Reference
Biotope assignment of grab samples from four surveys undertaken in 2011 across Scotland's seas (2012)	JNCC	Pearce *et al.* (2014)
Seagreen Environmental Impact Statement, Volume 1, Chapter 11 Benthic Ecology and Intertidal Ecology	Seagreen Alpha and Bravo OWFs (have since been renamed to Seagreen 1 and Seagreen 1A)	Seagreen Wind Energy Limited (2012a)
European Offshore Wind Deployment Centre: Request for an EIA Scoping Opinion	Aberdeen OWF Limited (also referred to as the European Offshore Wind Deployment Centre)	Aberdeen OWF Limited (2010)

9.4 Baseline Environment

9.4.1 This section provides a high-level overview of the baseline environment for benthic ecology based on an initial review of desktop data sources. A full benthic ecology baseline will be provided in the Benthic Ecology Technical Report of the Offshore EIA Report.

Seabed Sediments

9.4.2 The EUSeaMap data (European Marine Observation and Data Network (EMODnet) (EMODnet, 2023) provides broad-scale seabed sediment classifications in European waters, including the 2007 European Nature Information System (EUNIS) classification. These EUSeaMap data illustrate that seabed sediments within the Regional Benthic Ecology Study Area largely comprise deep circalittoral sand (EUNIS 2007 classification: A5.27) and deep circalittoral coarse sediment (A5.15). The following seabed classifications are present further inshore: circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), deep circalittoral mud (A5.37), circalittoral coarse sediment (A5.14), and Atlantic and Mediterranean moderate energy circalittoral rock (A4.2) (Figure 9.2). The Local Benthic Ecology Study Area is dominated by deep circalittoral sand (A5.27), with an area of deep circalittoral coarse sediment (A5.15) along the northern edge (Figure 9.2). The Export Cable Corridor passes through both these habitats before it intersects with circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), and another area of deep circalittoral coarse sediment (A5.15) at the landfall (Figure 9.2).

9.4.3 Similarly, Sotheran and Crawford-Avis (2014) mapped habitats and biotopes in the eastern approaches to the Firth of Forth and recorded the following sediment classifications in the south of the Regional

Benthic Ecology Study Area: circalittoral coarse sediment (A5.14), circalittoral muddy sand (A5.26), and deep circalittoral sand (A5.27).

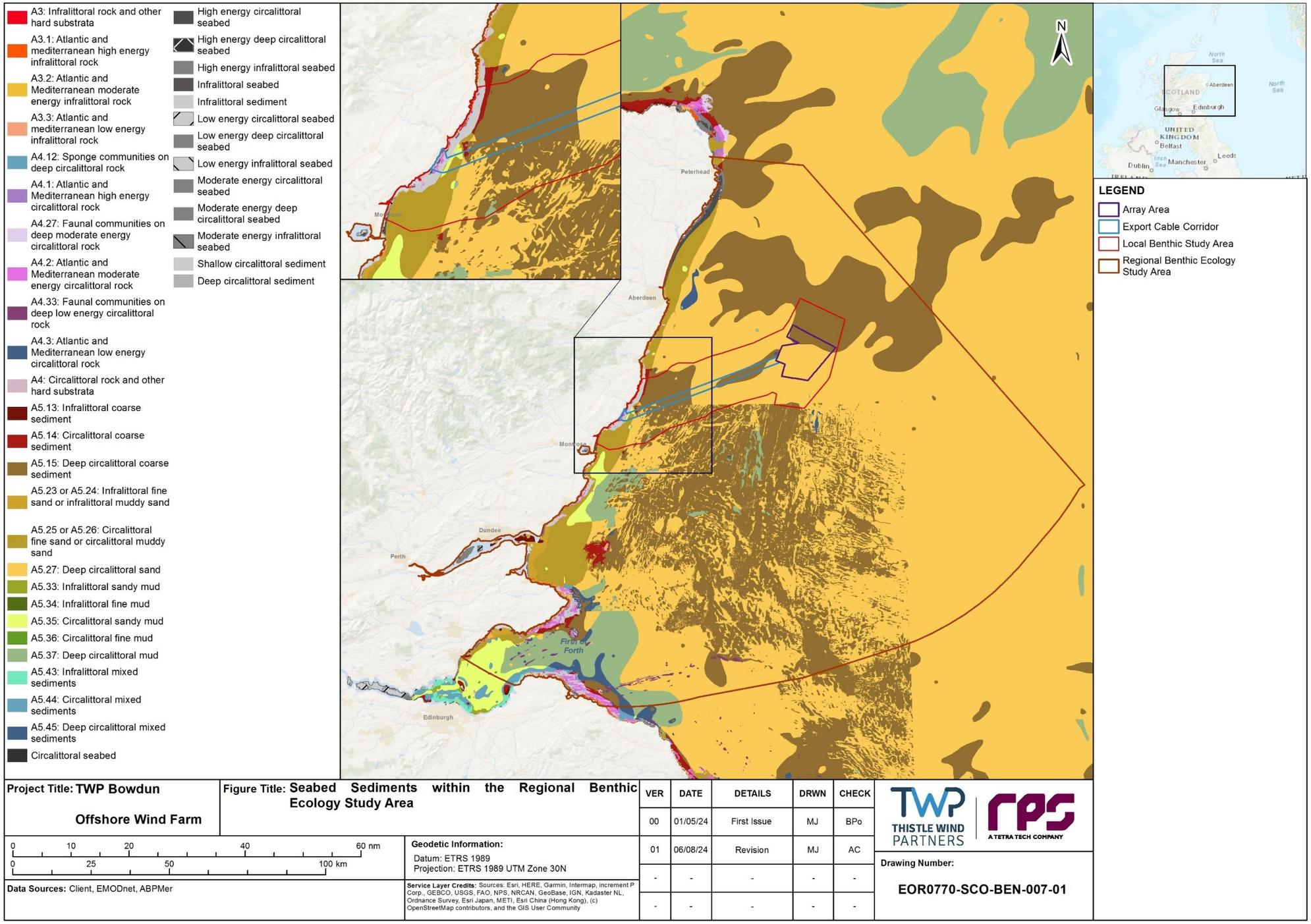


Figure 9.2: Seabed Sediments within the Regional Benthic Ecology Study Area

Subtidal Benthic Communities

9.4.4 Cooper and Barry (2017) describe the results of a baseline assessment of the UK's macrobenthic infauna. Although the study focussed on the aggregates industry, data was collated from various industries, including OWF, oil and gas, nuclear, and port and harbour sectors. Thus, these findings are useful to characterise the Regional Benthic Ecology Study Area. Cooper and Barry (2017) categorised benthic macrofaunal communities into broad groups, based on similarities in their community composition. Within the Regional Benthic Ecology Study Area, data were largely characterised by polychaete communities (Spionidae, Glyceridae, Terebellidae, Capitellidae and Phyllodocidae).

9.4.5 Seabed habitat mapping was undertaken in the approaches to the Firth of Forth by Sotheran and Crawford-Avis (2013), which lies in the south-east of the Regional Benthic Ecology Study Area. The following JNCC biotopes were recorded:

- kelp with cushion fauna and/or foliose red seaweeds (Foliose red seaweeds with dense *Dictyota dichotoma* and/or *Dictyopteris polypodioides* on exposed lower infralittoral rock (JNCC, 2015) (code: IR.HIR.KFaR.FoR.Dic and *Laminaria hyperborea* and red seaweeds on exposed vertical rock (IR.HIR.KFaR.LhypRVt));
- mixed faunal turf communities on circalittoral rock (*Flustra foliacea* and colonial ascidians on tide-swept exposed circalittoral mixed substrata (CR.HCR.XFa.FluCoAs.X), *F. foliacea,* small solitary and colonial ascidians on tide-swept circalittoral bedrock or boulders (CR.HCR.Xfa.FluCoAs.SmAs) and *F. foliacea* and colonial ascidians on tide-swept moderately wave-exposed circalittoral rock (CR.HCR.Xfa.FluCoAs));
- circalittoral coarse sediment (tubeworm *Spirobranchus triqueter* with barnacles and bryozoan crusts on unstable circalittoral cobbles and pebbles (SS.SCS.CCS.SpiB));
- deep circalittoral coarse sediment (offshore circalittoral coarse sediment (SS.SCS.OCS), SS.SCS.OCS(PoGintBy) and SS.SCS.OCS(Sbom));
- circalittoral muddy sand (*Abra alba* and *Nucula nitidosa* in circalittoral muddy sand or slightly mixed sediment (SS.SSa.CmuSa.AalbNuc) and SS.Ssa.CmuSa));
- deep circalittoral sand (SS.SSa.OSa/SS.SSa.OSa.(Sbom));
- circalittoral mixed sediments (*Ophiothrix fragilis* and/or *Ophiocomina nigra* brittlestar beds on sublittoral mixed sediment (SS.SMx.CMx.OphMx), *F. foliacea* and *Hydrallmania falcata* on tide-swept circalittoral mixed sediment (SS.SMx.CMx.(FluHyd)), *Kurtiella bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment (SS.SMx.CMx.KurThyMx) and

Sabellaria spinulosa on stable circalittoral mixed sediment (SS.SBR.PoR.SspiMx));
- deep circalittoral mixed sediments (Polychaete-rich *Galathea* community with encrusting bryozoans and other epifauna on offshore circalittoral mixed sediment (SS.SMx.OMx.(PoGintBy));
- *Modiolus modiolus* beds on open coast circalittoral mixed sediment (SS.SBR.SMus.ModMx);
- *Alcyonium digitatum, S. triqueter*, algal and bryozoan crusts on wave-exposed circalittoral rock (CR.MCR.EcCr.FaAlCr.Adig) and *F. foliacea* on slightly scoured silty circalittoral rock (CR.MCR.EcCr.FaAlCr.Flu); and
- seapens and burrowing megafauna in circalittoral fine mud (SS.Smu.CfiMu.SpnMeg) (Sotheran and Crawford-Avis, 2013).

9.4.6 Pearce *et al.* (2014) identified two broad faunal assemblage groups within the Firth of Forth Complex Banks MPA, which is a designated site within the Regional Benthic Ecology Study Area (see Designated Sites and Protected Features for further information on this MPA). One faunal assemblage was aggregations of the polychaete *Spiophanes bombyx* in deep circalittoral sands and coarse sands. The second was mixed sands and gravels supporting a rich polychaete and epifaunal community (including the squat lobster *Galathea intermedia*). *S. spinulosa* reefs with sea squirt *Ascidella scabra* and *G. intermedia* on gravelly sand were also present (Pearce *et al.*, 2014).

9.4.7 Another seabed survey within the Firth of Forth Banks Complex MPA recorded 12 biotopes with the most common being a circalittoral muddy sand (SS.SSa.CMuSa) biotope complex (Axelsson *et al.*, 2014). This biotope complex was comprised of two biotopes, one dominated by the bivalves *A. alba* and *N. nitidosa*, and the other by the brittlestar *Acrocnida brachiata* and sea star *Astropecten irregularis* (Axelsson *et al.*, 2014). Brittlestars *O. fragilis* and *O. nigra,* the bryozoan *F. foliacea,* or *M. modiolus* typically dominated mixed sediment habitats. Finally, the soft coral *A. digitatum*, and ascidians were typically present in coarser sediments (Axelsson *et al.*, 2014).

9.4.8 There are several other OWF projects within the Regional Benthic Ecology Study Area which have data available from site-specific benthic surveys (as described in Table 9.2 and shown in Figure 9.3). The results of site-specific surveys conducted for these projects provide information to support the baseline. An overview of the subtidal benthic communities recorded in these surveys is presented in Table 9.2.

Table 9.2: Overview of Benthic Communities Identified from Other OWF Projects within the Regional Benthic Ecology Study Area (Those with an Asterisk (*) Are of Conservation Importance)

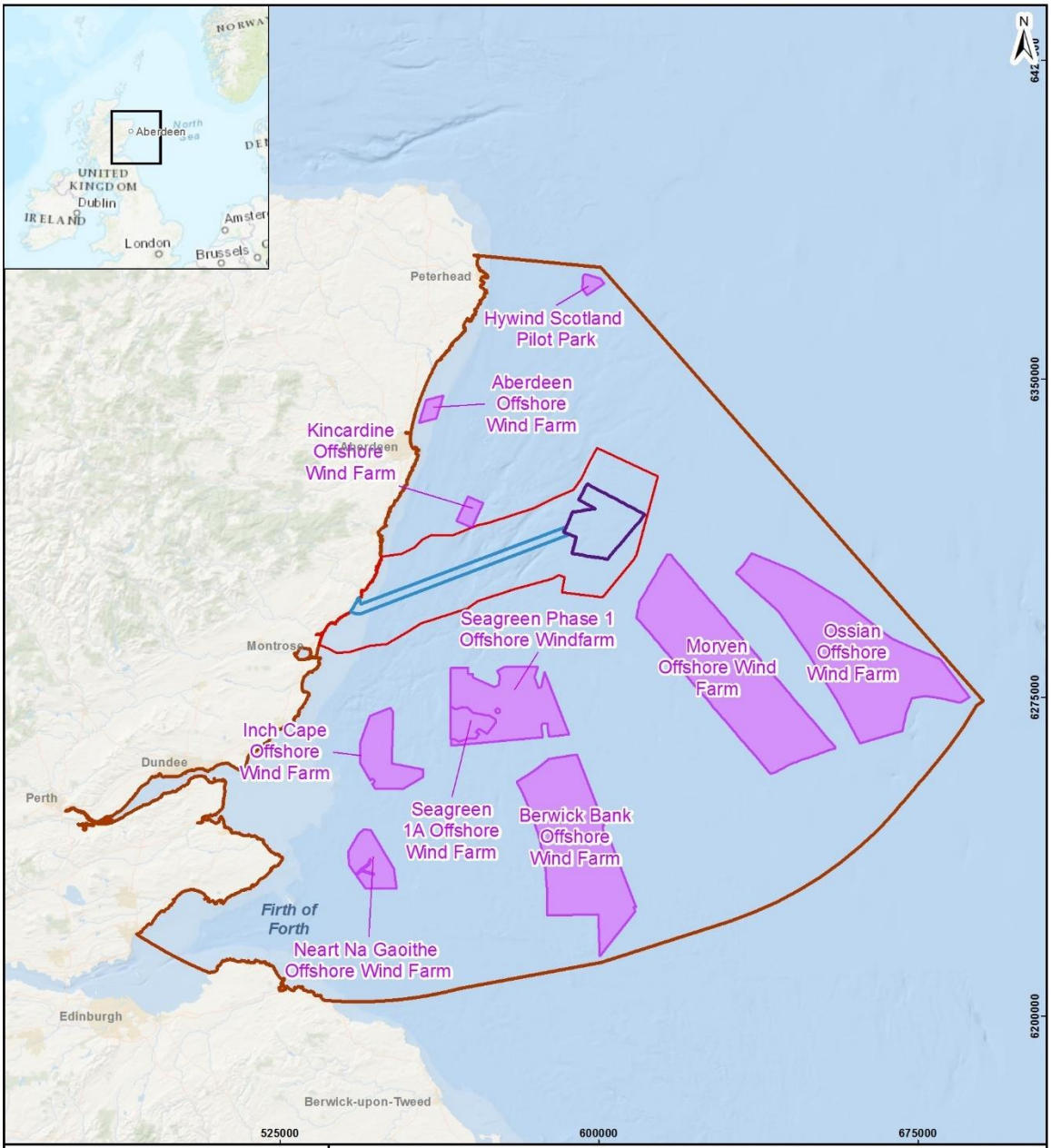
Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
Morven OWF	10.10	21.40	Site-specific Drop Down Video (DDV) and grab sampling were conducted in spring and summer 2022. Soft substrates were dominated by annelids (Polychaeta), arthropods (Malacostraca), cnidarians (Anthozoa), echinoderms (Asteroidea, Holothuroidea, Echinoidea, and Ophiuriodea), and bivalve and gastropod molluscs. Fewer species were recorded on coarser sediments, such as gravel, cobbles, and boulders. No habitats of conservation importance (such as *S. Spinulosa* or *M. modiolus* reefs) were identified. The scarce tube-dwelling anemone *Arachnathus sarsii* was recorded across eight sampling stations.	Morven Offshore Wind Limited (2023)
Ossian OWF	25.40	39.30	Site-specific epibenthic beam trawling, grab sampling, and DDV surveys were conducted in July 2022. Faunal composition was dominated by annelids, mainly the sand mason worm *Lanice conchilega,* and *S. bombyx.* Cnidarians and bryozoans dominated the colonial fauna recorded. There were four EUNIS habitats recorded: Faunal communities of Atlantic circalittoral sand (EUNIS 2017: MC521);	Ossian OWFL (2023)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
			Faunal communities of Atlantic circalittoral mixed sediment (EUNIS 2017: MC421); *Echinocyamus pusillus, Ophelia borealis* and *Abra prismatica* in circalittoral fine sand* (EUNIS 2019: A5.251); and *Abra prismatica, Bathyporeia elegans* and polychaetes in circalittoral fine sand* (EUNIS 2019: A5.252). No Annex I habitats or species were identified.	
Seagreen 1 and Seagreen 1A OWFs (were previously referred to as Seagreen Alpha and Bravo when the data were collected)	27.90	18.10	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in April 2011. The sabellid polychaete biotopes 'dense Chone' and 'sparse Chone' dominated the central and eastern regions of Seagreen Alpha. *Sabellaria* sp., sparse polychaetes and bivalves, and faunal turf (SS.SMX.CMx.FluHyd) were present in the west. 'Dense Chone' and Polychaete-rich communities (SS.SMx.Omx.PoVen*) were present in the eastern area of Seagreen Bravo; *Sabellaria* sp., rich polychaetes and bivalves, and epifauna with polychaetes were present in the west.	Seagreen Wind Energy Limited (2012a)
Berwick Bank OWF	46.50	46.40	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in 2020. Northern areas were dominated by *E. pusillus,* polychaete and bivalve communities and patches of super-abundant	SSER (2022)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
			brittlestar *Amphiura filiformis,* Bivalves dominated the central and eastern areas and a patch in the west and Polychaete-rich deep *Venus* spp. communities were present in the west.	
Kincardine OWF	20.10	6.30	Site-specific grab sampling and DDV surveys were conducted in summer 2013 and 2014. Offshore deep circalittoral habitats with fine sands or non-cohesive muddy sands were present throughout the Kincardine study area. Frequently observed species were *A. digitatum,* starfish *Asterias rubens,* and bryozoans (such as *F. foliacea*).	Kincardine OWF Limited (2016)
Hywind Scotland Pilot Park	44.40	53.80	Site-specific grab sampling and DDV were conducted in 2013. Fauna recorded were mainly associated with the biotope circalittoral fine sand (SS.Ssa.CfiSa) and were characterised by sparse hermit crabs and brittlestars *Ophiura* sp., as well as scattered anemones and hydroids. The main infaunal species were polychaetes, brittlestars and burrowing urchins. Occasional aggregations of *S. spinulosa* were recorded, however coverage was low, patchy, and small in extent.	Statoil (2015)
Inch Cape OWF	56.00	22.00	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in Spring 2012. Circalittoral sands and gravelly sands with areas of mixed sediments were recorded. Faunal assemblages	Inch Cape Offshore Limited (2018)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
			were typical of these substrates, including *A. digitatum, F. folicea, O. fragilis, A. rubens, H. falcata,* and *S. triqueter*. The dominating biotype was *K. bidentata* and *Thyasira* spp. in circalittoral muddy mixed sediment (SS.SMx.CMx.KurThyMx*) (65% of the area). Offshore circalittoral coarse sediment (SS.SCS.OCS) covered 31% and *Mediomastus fragilis, Lumbrineris* spp., with venerid bivalves in circalittoral coarse sand or gravel (SS.SCS.MedLumVen*) covered 4%. Several *Sabellaria* sp., were reported, but no evidence of Annex I reefs was observed.	
NNG OWF	80.50	49.50	Site-specific grab sampling, epibenthic beam trawls, and DDV surveys were conducted in 2009. The offshore area was characterised by circalittoral sandy mud (SS.Smu.CsaMu), with species such as seapens *Virgularia mirabilis*, brittlestars *A. filiformis*, polychaetes *S. bombyx*, and bivalves *K. bidentata, Abra* spp., and *Ennucula tenuis*. The biotype *A. Filiformis* and *E. tenuis* in circalittoral and offshore sandy mud (SS.Smu.CsaMu.AfilEten*) and mosaics of circalittoral coarse sediment (SS.SCS.CCS) and offshore circalittoral sand (SS.SSA.Osa) were also abundant.	Mainstream Renewable Power (2019a)

Project	Distance from the Array Area (km)	Distance to the Export Cable Corridor (km)	Overview of benthic communities recorded	Source
			Soft polychaete and *Chaetopterus* tubes, megafauna burrows, and seapens were observed over soft sediments, while *O. fragilis, A. digitatum,* and *Spirobranchus* spp., were observed over coarse mixed sediment.	
Aberdeen OWF	38.60	33.40	A site-specific environmental survey was conducted in 2007. Two main biotopes were identified: circalittoral coarse sediment (SS.SCS.CCS) and circalittoral muddy sand (SS.Ssa.CmuSa). The benthos was dominated by bivalves, polychaetes, and echinoderms such as *Ophiocten affinis* and *E. pusillus*.	Aberdeen OWF Limited (2010)



Project Title:	**TWP Bowdun Offshore Wind Farm**
Figure Title:	**Other OWF Projects within the Regional Benthic Ecology Study Area**

LEGEND

- Array Area
- Export Cable Corridor
- Regional Benthic Ecology Study Area
- Local Benthic Ecology Study Area
- Offshore Wind Farms

0 2.5 5 10 15 20 25 30 nm
0 5 10 20 30 40 50 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Drawing Number: EOR0770-SCO-BEN-005-04

Data Sources: Client, CES, ABPmer

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

VER	DATE	DETAILS	BY	CHECK
00	30/10/23	First Issue	MJ	BPo
04	06/08/24	Revision	MJ	AC

Figure 9.3: Other OWF Projects within the Regional Benthic Ecology Study Area

Intertidal Benthic Communities

9.4.9 A Phase 1 intertidal walkover of the Benholm beach landfall location was conducted in September 2023 (Appendix E: Intertidal Survey). Overall, there were two biotopes recorded in the strandline, six in the upper shore, eight in the mid shore, and seven in the lower shore, with two or three dominant biotopes per shore area (upper, mid and lower). The strandline predominantly consisted of talitrids on the upper shore and strandline (LS.Lsa.St.Tal), which represented 95% of the biotopes sampled in the strandline. In the upper shore, *Fucus spiralis* on sheltered upper eulittoral rock (LR.LLR.F.Fspi) and *Ulva* spp. on freshwater-influenced and/or stable upper eulittoral rock (LR.FLR.Eph.Ulv) were the dominant biotopes, accounting for 57.69% and 32.69% of the upper shore biotopes, respectively. In the mid shore, the dominant biotope was *Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (LR.LLR.Fves) (60%), followed by *F. spiralis* on sheltered upper eulittoral rock (LR.LLR.F.Fspi) (17.78%). Finally, in the lower shore, the dominant biotopes were *Fucus serratus* on sheltered lower eulittoral rock (LF.LLR.F.Fserr) (31.25%), *L. hyperborean* forest and foliose red seaweeds on moderately exposed upper infralittoral rock (IR.MIR,KR.Lhyp.Ft) (27.08%), and *F. serratus* on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser) (16.67%).

9.4.10 The mosaic of biotopes and species recorded was typical of a sheltered to moderately sheltered rocky shore environment. Spiral wrack *F. spiralis* was most common in the upper shore, with a transition to serrated wrack *F. serratus* and bladder wrack *F. vesiculosus* in the mid shore, which persisted into the lower shore. Kelp *L. hyperborea* began to occur in the lower shore and marked the transition to the infralittoral zone. Fauna recorded were typical of a rocky shore, including the common rock barnacle *Semibalanus balanoides*, common periwinkle *Littorina littorea*, dog whelk *Nucella lapillus*, limpets *Patella* spp., and the beadlet anemone *Actinia equina*.

Designated Sites and Protected Features

9.4.11 There are four designated sites with benthic features within the Regional Benthic Ecology Study Area (JNCC, 2023a). These include MPAs and SACs (Table 9.3 and Figure 9.4).

Table 9.3: Designated Sites with Relevant Benthic Protected Features within the Regional Benthic Ecology Study Area

Designated site	Distance from the Array Area (km)	Distance from the Export Cable Corridor (km)	Relevant protected benthic features
Firth of Forth Banks Complex MPA	7.50	8.60	Ocean quahog *Arctica islandica* (listed as a Scottish PMF and on the Oslo Paris [Convention] (OSPAR) List of Threatened and Declining Habitats and Species); Offshore subtidal sands and gravels (Scottish PMF); and Shelf banks and mounds (large scale feature).
Southern Trench MPA	35.90	44.90	Burrowed mud habitat (Scottish PMF and on the OSPAR List of Threatened and Declining Habitats and Species).
Firth of Tay and Eden Estuary SAC	89.10	40.40	Annex I Estuaries; Annex I Mudflats and sandflats not covered by seawater at low tide; and Annex I Sandbanks which are covered by sea water at all times.
Isle of May SAC	104.50	67.10	Annex I Reefs.

9.4.12 JNCC data has been used to assess the presence of Annex I Reefs and Sandbanks within the Regional Benthic Ecology Study Area (JNCC, 2019a, JNCC, 2021b). As illustrated in Figure 9.4, the Array Area does not intersect with either of these sensitive Annex I habitats, but there is an overlap between the Export Cable Corridor and an area of Annex I rocky reef at the landfall.

9.4.13 A review of the distribution of Scottish PMFs (Tyler-Walters *et al.*, 2016) reported that the following PMFs are known to occur within the Regional Benthic Ecology Study Area: blue mussel *Mytilus edulis* and *M. modiolus* beds, burrowed mud, sea pens and burrowing megafauna in circalittoral fine mud, intertidal mudflats, various PMF kelp habitats, ocean quahog aggregations, maerl or coarse shell gravel with burrowing sea cucumbers, seagrass beds, offshore subtidal sands and gravels, and offshore deep sea muds.

9.4.14 Dog whelk were recorded during the Phase 1 intertidal walkover survey (paragraph 9.4.9). This species is included on the OSPAR List of Threatened and Declining Species (OSPAR Commission, 2008a).

9.4.15 The Scottish Environment Protection Agency (SEPA) conducted baseline seagrass surveys in the Montrose Basin, which is located 12.9 km southwards of the Export Cable Corridor landfall and within the Regional Benthic Ecology Study Area (SEPA, 2018) (see Figure 9.4). They found that the total area of seagrass coverage in 2013 was 1,747,000 m^2 with an average coverage of 41.8% (SEPA, 2018). These surveys identified two species of seagrass, *Zostera noltii* and *Zostera angustifolia*. Seagrass beds are a PMF in Scotland as well as being a UK Biodiversity Action Plan habitat (Maddock, 2011, Tyler-Walters *et al.*, 2016).

9.4.16 Ross worm *Sabellaria spinulosa* is a tube-dwelling polychaete which can form extensive biogenic reefs, which are listed as Annex I habitats and on the OSPAR List of Threatened and/or Declining Habitats. Individual Ross worms have been recorded within the Regional Benthic Ecology Study Area, however records of reefs are limited to the Solway Firth and the North Sea off Rattray Head (Pearce and Kimber, 2020) and the Firth of Forth Banks Complex MPA (Pearce *et al.*, 2014). There are very few extant records of reefs within Scotland, particularly in the North Sea. This is thought to be due to low sampling efforts to date and, thus, it is expected that more records of species and reefs will be made as the offshore industry progresses in the region (Pearce and Kimber, 2020). Individuals were recorded during site-specific surveys for the Seagreen 1 OWF, Berwick Bank OWF, Inch Cape OWF, and the Hywind Scotland Pilot Park, but no reefs were observed (Inch Cape Offshore Limited, 2018, Seagreen Wind Energy Limited, 2012a, SSER, 2022, Statoil, 2015).

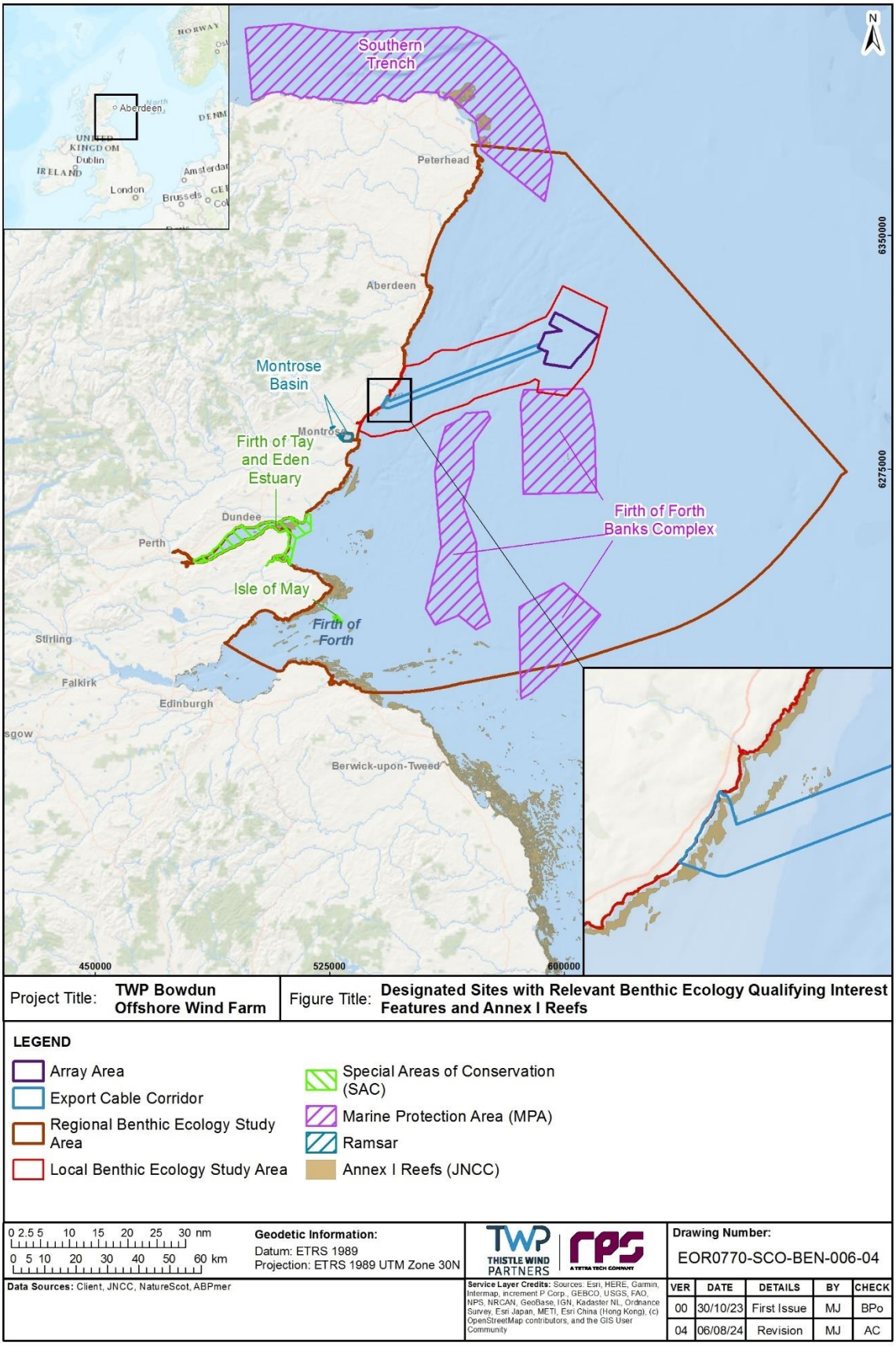


Figure 9.4: Designated Sites with Relevant Benthic Ecology Qualifying Interest Features and Annex I Reefs

9.5 Embedded Mitigation

9.5.1 The following Embedded Mitigation measures are relevant to benthic ecology. The Embedded Mitigation measures will evolve over the development process as the EIA progresses.

9.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process. The Embedded Mitigation measures include both primary and tertiary measures to reduce the potential for impact upon benthic ecology. The following primary Embedded Mitigation measures are proposed:

- Development and adherence to a CSIP post consent.
- Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.
- Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the CBRA and the Cable Burial Assessment (CBA). Results of these assessments, and commitments to post construction monitoring, will be provided in the Cable Plan (CaP).
- Development of and adherence to an Environmental Management Plan (EMP), which will include a Marine Pollution Contingency Plan (MPCP), Marine Mammal Mitigation Plan (MMMP), the commitments to environmental monitoring and actions to minimise Invasive Non-Native Species (INNS).
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

9.6 Potential Proposed Development Impacts

9.6.1 A range of potential impacts on benthic ecology have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

9.6.2 The impacts that have been scoped into the assessment are outlined in Table 9.4 together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

9.6.3 Potential impacts scoped out of the assessment are presented in Table 9.5, with justification.

Table 9.4: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Benthic Ecology

Impact	Proposed Development phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Temporary habitat loss and/or disturbance	✓	✓	✓	There is potential for temporary habitat loss and/or disturbance due to activities associated with all three phases. In the construction phase, these activities include seabed preparation (e.g. boulder and sand wave clearance), cable installation and the footprint of spud-can legs during jack-up vessel use. In the O&M phase, these activities include cable repair and reburial and the use of jack-up vessels for repair of other Offshore Infrastructure. Finally, in the decommissioning phase, these activities include removal of Offshore Infrastructure and the use of jack-up vessels for Offshore Infrastructure removal.	An intertidal survey was carried out in September 2023. Site-specific subtidal benthic surveys were undertaken across the Local Benthic Ecology Study Area in spring 2024. These survey data will be used to support the benthic characterisation within both the Local and Regional Benthic Ecology Study Areas.	There will be no specific modelling required to inform the assessment for this impact. The assessment will be quantitative in nature as it will be based on the maximum spatial scale of impact (which will be based on information provided in the PDE). In addition, the Feature Activity Sensitivity Tool (FeAST) and the Marine Evidence Based Sensitivity Assessment (MarESA) tool will be used to determine the sensitivity of benthic receptors to this impact.
Long term habitat loss	✓	✓	✓	In the construction phase, the installation of Offshore Infrastructure, scour protection,	As above for 'Temporary habitat	As above for 'Temporary habitat

Impact	Proposed Development phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				and cable protection on the seabed will result in long term habitat loss. This will persist into the O&M phase and continue over the lifecycle of the Proposed Development. In the decommissioning phase, permanent habitat loss will occur under any Offshore Infrastructure that is left *in situ,* such as cable and scour protection, although the decommissioning plan has not yet been refined.	loss and/or disturbance'.	loss and/or disturbance'.
Increased SSCs and associated deposition	✓	✓	✓	There is potential for increased SSCs and associated deposition as a result of activities in all three phases. In the construction phase, these include seabed preparation activities, foundation installation activities and cable installation activities. In the O&M phase, these include repair and reburial of cables. Finally, in the decommissioning phase, these activities include removal of Offshore Infrastructure.	Data collected during the site-specific geophysical campaign will provide data to support the development of the numerical modelling to be undertaken for the physical processes assessment. Site-specific metocean data may also be utilised to validate desktop sources.	Numerical modelling will be conducted to provide an overview of the SSCs and associated deposition as a result of activities associated with the Proposed Development. As above for 'Temporary habitat loss and/or disturbance' the FeAST and MarESA tools will be used to determine the sensitivity of

Impact	Proposed Development phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						benthic receptors to this impact.
Changes in physical processes	×	✓	✓	The presence of structures on or near the seabed (such as foundations, scour protection, cable protection, and dynamic cabling) may introduce localised changes to the tidal flow and wave climate. This could result in changes in sediment transport pathways, which could have associated effects on benthic ecology. This impact could persist into the decommissioning phase due to the presence of Offshore Infrastructure that is left *in situ*, such as cable and scour protection, although the decommissioning plan has not yet been refined.	As above for 'Increased SSCs and associated deposition'.	As above for 'Increased SSCs and associated deposition'.
Increased risk of introduction and spread of INNS	✓	✓	✓	There is potential for the increased risk of introduction and spread of INNS during all phases of development. This is due to vessel movements into the Proposed Development, which may act as vectors facilitating the spread of INNS. In addition, the	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.

Impact	Proposed Development phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent increased available habitat for INNS to colonise in the O&M phase. This impact could persist into the decommissioning phase due to the presence of Offshore Infrastructure that is left *in situ*, such as cable and scour protection, although the decommissioning plan has not yet been refined. Further, vessels associated with decommissioning activities would also represent vectors for the spread of INNS.		
Colonisation of hard structures	✓	✓	✓	Artificial, hard structures, such as foundations, scour protection, and cable protection, will be installed during the construction phase and persist throughout the O&M phase. These are expected to be colonised by a range of species, which may cause localised increases in biodiversity. This impact could persist into the decommissioning phase due to the presence of Offshore	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.

Impact	Proposed Development phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				Infrastructure that is left *in situ*, such as cable and scour protection, although the decommissioning plan has not yet been refined. These hard structures may also facilitate the spread of INNS, which is discussed above in 'Increased risk of introduction and spread of INNS'.		
Removal of hard substrates	×	×	✓	The removal of hard substrates during the decommissioning phase has the potential to result in habitat loss for any benthic species which have colonised them.	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.
Impacts to benthic ecology due to Electromagnetic Fields (EMF)	×	✓	×	The presence of unburied cables (such as dynamic cabling near the seabed) may emit EMFs. These additional EMFs could have an impact on benthic species.	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 9.5: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Benthic Ecology

Impact	Justification
Accidental pollution to the surrounding environment	There is a risk of accidental pollution from vessels and equipment during all three phases of development. However, this risk is mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP, which will include an MPCP. The EMP and MPCP will include planning for accidental spills, address all potential contaminants that could be released and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from OSPAR, International Maritime Organisation (IMO), and the International Convention for the Prevention of Pollution from Ships (MARPOL)). Thus, it is unlikely that accidental pollution will occur. In the unlikely event that it did, the magnitude will be minimised through measures such as the MPCP. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
Release of sediment-bound contaminants	Activities in all three phases of development could result in seabed disturbance and the remobilisation of sediment-bound contaminants. These contaminants could have adverse effects on benthic communities. However, sediment chemistry analyses from recent site-specific surveys of other OWFs in the Regional Benthic Ecology Study Area have recorded very low levels of contamination (Morven Offshore Wind Limited, 2023, Ossian OWFL, 2023). Sediment chemistry analysis for the Proposed Development is not currently available, however, it will be fully reviewed once available. This potential impact is proposed to be scoped out for further consideration, subject to the results of the site-specific sediment chemistry. If high sediment contamination levels are found during the site-specific survey, then this impact will be scoped in for the benthic ecology assessment in the Offshore EIA Report.
Impacts to benthic ecology due to heat from subsea electrical cables	Heat emitted from electrical cables may impact benthic receptors in the O&M phase. However, there is limited evidence that these cables can significantly change the temperature of the seabed and surrounding water. For example, a field study at the Nysted OWF in Denmark recorded an average temperature difference of 1°C between sediments at a power cable and those 25 cm away (Meißner *et al.*, 2006). Furthermore, this study at Nysted OWF also found a maximum temperature increase of 2°C in the top 30 cm of sediment (where the majority of benthic species live) above a high voltage cable of 132 kV (Meißner *et al.*, 2007). This is well within the thermal tolerance for most benthic species, which are typically subject to wide seasonal variations

Impact	Justification
	in temperature, particularly in the North Sea. More recently, a review by the Renewables Grid Initiative (2016) concluded that although there was a lack of field data on the thermal effects of subsea cabling, potential impacts to benthic ecology would only be possible within a few cm from the cable. A report on subsea power cables between Denmark and the UK concluded that only deep burrowing invertebrates could potentially be exposed to non-trivial thermal effects from cables, although the footprint of temperature increases would be very low (National Grid and Viking Link, 2017). Finally, a review by Taormina *et al. (2018)* concluded that heat generation from subsea cables would not significantly impact benthic species due to the small area associated with cable corridors and the weakness of thermal radiation. Subsea power cables have negligible capacity to heat the surrounding water column, due to the very high heat capacity of water *(Meißner et al.*, 2006). Heat produced by unburied cables (such as the dynamic cables that will be present near the seabed of the Offshore Project) is typically dissipated by the movements of the water (Taormina *et al.,* 2020). For example, studies in France at the Jersey-Cotentin cable connection and the Ushant and SEM-REV test sites showed no heating of the surface of the cables, and therefore the immediate water column (Taormina *et al.*, 2020). The authors concluded that the ecological impact would be negligible. Overall, it is unlikely that benthic ecology will be impacted by heat generated by buried or dynamic subsea electrical cables. Furthermore, the Embedded Mitigation of a CaP will include protection with concrete and/or rocks where cable burial is not possible, the density of which would reduce the already minimal heat conduction. Therefore, it is proposed that this impact be scoped out from further consideration within the Offshore EIA Report.

9.7 Proposed Assessment Methodology

9.7.1 The assessment on benthic ecology in the Offshore EIA Report will follow the methodology provided in Section 4: EIA Methodology. The following guidance documents will also be considered:

- Marine Evidence Based Sensitivity Assessment – A Guide (Tyler-Walters *et al.*, 2023);
- Guidelines for EcIA in the UK and Ireland (Chartered Institute for Ecology and Environmental Management (CIEEM) 2022);
- Advances in assessing *Sabellaria spinulosa* Reefs for Ongoing Monitoring (Jenkins *et al.*, 2018);

- Guidelines for Data Acquisition to Support Marine Environmental Assessments of Offshore Renewable Energy Projects (Judd, 2012);
- Guidance on Survey and Monitoring in Relation to Marine Renewables Deployments in Scotland – Volume 5: Benthic Habitats (Saunders *et al.*, 2011);
- Best Methods for Identifying and Evaluating *Sabellaria spinulosa* and Cobble Reef (Limpenny *et al.*, 2010);
- Identification of the Main Characteristics of Stony Reef Habitats under the Habitats Directive (Irving, 2009);
- Guidance on Environmental Considerations for OWF Development (OSPAR Commission, 2008b); and
- Defining and Managing *Sabellaria spinulosa* Reefs (Gubbay, 2007).

9.7.2 A Benthic Ecology Technical Report will be produced alongside the Offshore EIA Report. This will build upon the benthic ecology baseline summarised in Section 9.4 and include the results of the site-specific benthic survey, which are not available at the time of writing this Offshore Scoping Report. The Benthic Ecology Technical Report will also present a more comprehensive overview of relevant desktop data (including those outlined in Table 9.1). Benthic Important Ecological Features (IEFs) will be identified using the baseline presented within the Benthic Ecology Technical Report, which will be carried forward to the benthic ecology assessment in the Offshore EIA Report. The IEFs identified will be assessed against the impacts presented in Table 9.4 for all relevant stages of development (construction, O&M and decommissioning phases).

9.7.3 The impacts presented in Table 9.4 will be described in terms of magnitude of impact and correlated against the sensitivity of the IEFs, to produce an assessment of significance for each IEF. The sensitivities will be largely derived from the Marine Evidence Based Sensitivity Assessment (MarESA) (Tyler-Walters *et al.*, 2023) and the Feature Activity Sensitivity Tool (FeAST). The MarESA is a database produced by the Marine Life Information Network (MarLIN) and maintained by other organisations, such as the Marine Biological Association (MBA). The MarESA database comprises a detailed review of available evidence on the effects of pressures on marine species or habitats, a subsequent scoring of sensitivity against a standard list of pressures and their benchmark levels of effect. The evidence base presented in the MarESA is peer reviewed and represents the largest review undertaken to date on the effects of human activities and natural events on marine species and habitats. It is one of the best available sources of evidence relating to recovery of benthic species and habitats. FeAST allows users to investigate the sensitivity of marine features in Scotland's seas to pressures arising from human activities. Much of the evidence presented within FeAST has been derived from sensitivity assessments originally undertaken

by MarLIN and further developed by several Scottish organisations such as NatureScot, MD-SEDD, SEPA, and JNCC. The tool focuses on features of conservation interest such as protected features of MPAs and PMFs. Where sensitivity information is not available in the MarESA or FeAST, suitable data sources will be used for the assessment.

9.8 Potential Inter-Related Effects

9.8.1 The Offshore EIA Report will consider inter-related effects on benthic ecology that may arise from the construction, O&M and decommissioning of the Proposed Development. Inter-related effects refer to the effects arising from the Proposed Development either across their own phases (Proposed Development lifetime) or different effects on one receptor in one phase (receptor led). The Offshore EIA Report will consider inter-related effects of impacts from all three phases of the Proposed Development. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) from the Proposed Development. This will ensure that the Proposed Development is appropriately considered, as a whole, within the inter-related effects assessment.

9.8.2 Inter-related effects on benthic ecology may also impact the following receptors:

- Section 10: Fish and Shellfish Ecology;
- Section 11: Marine Mammals; and
- Section 12: Offshore Ornithology.

9.9 Potential Cumulative Effects

9.9.1 The effects of construction, O&M and decommissioning of the Proposed Development will be located within the Local Benthic Ecology Study Area. However, there is potential for cumulative effects to occur from other project, and activities within the Regional Benthic Ecology Study Area. The CEA will follow the approach outlined in Section 4: EIA Methodology and will be included in the benthic ecology section of the Offshore EIA Report. Projects and activities that will be considered in the CEA may include, but may not be limited to:

- other OWF projects;
- cable and interconnector projects;
- dredging activities; and
- disposal sites.

9.9.2 Potential impacts to be assessed in the CEA will be as defined for the Proposed Development alone, as set out in Table 9.4.

9.10 Potential Transboundary Impacts

9.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon benthic ecology to construction, O&M and decommissioning impacts of the Proposed Development.

9.11 Summary

9.11.1 In the absence of site-specific benthic subtidal data at the time of writing, the baseline environment for this Offshore Scoping Report has been characterised by available desktop datasets and reports.

9.11.2 The seabed sediments within the Regional Benthic Ecology Study Area mainly comprise deep circalittoral sand (EUNIS 2007 classification: A5.27) and deep circalittoral coarse sediment (A5.15). The following seabed classifications are present further inshore: circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), deep circalittoral mud (A5.37), circalittoral coarse sediment (A5.14), and Atlantic and Mediterranean moderate energy circalittoral rock (A4.2) (see Figure 9.2).

9.11.3 The Local Benthic Ecology Study Area is dominated by deep circalittoral sand (A5.27), with an area of deep circalittoral coarse sediment (A5.15) along the northern edge (Figure 9.2). The Export Cable Corridor passes through both these habitats before it intersects with circalittoral fine sand or circalittoral muddy sand (A5.25 or A5.26), circalittoral sandy mud (A5.35), and another area of deep circalittoral coarse sediment (A5.15) at the landfall (Figure 9.2).

9.11.4 Faunal communities are likely to be typical of the North Sea and may be similar to those identified in other nearby OWF projects (see Table 9.2), including polychaetes *L. conchilega*, *S. bombyx*, *S. triqueter*, *O. borealis*, and *B. elegans*, echinoderms *E. pusillus*, *Ophiura* sp., and *A. filiformis*, and bivalves, such as *A. prismatica*.

9.11.5 A Phase 1 intertidal walkover of the Benholm beach landfall location was conducted in September 2023. The mosaic of biotopes and species recorded was typical of a sheltered to moderately sheltered rocky shore environment. Spiral wrack was the most common alga in the upper shore, with a transition to serrated wrack and bladder wrack in the mid shore, which persisted into the lower shore. L. hyperborea was also found in the lower shore and marked the transition to the infralittoral zone. Fauna recorded were typical of a rocky shore, including the common rock barnacle, common periwinkle, dog whelk, limpets Patella spp., and beadlet anemone.

9.11.6 The Array Area and Export Cable Corridor do not overlap with any designated sites with benthic Qualifying Features, however the Firth

of Forth Banks Complex MPA does overlap with the Local Benthic Ecology Study Area (Figure 9.4).

9.11.7 Potential impacts to benthic ecology are presented and justified in Table 9.4. These include temporary and long-term habitat loss, increased SSCs, changes in physical processes, increased risk of INNS, introduction and removal of hard structures, and impacts due to Electromagnetic Field (EMF). Impacts proposed to be scoped out of the assessment are presented in Table 9.5, and include accidental pollution, release of sediment-bound contaminants, and impacts due to heat from subsea cables. Embedded Mitigation measures are presented in Section 9.5, which aim to reduce the magnitude of impact upon benthic receptors.

9.11.8 The proposed assessment methodology is provided in Section 9.7, with brief detail on the approach to the CEA and Inter-Related Effects Assessment presented in Sections 9.9 and 9.8, respectively. Finally, the potential for transboundary impacts has been presented in Section 9.10.

10 Fish and Shellfish Ecology

10.1 Introduction

10.1.1 This section of the Offshore Scoping Report identifies the fish and shellfish ecology of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development.

10.1.2 The scope of this fish and shellfish ecology section encompasses the entire Offshore Scoping Boundary (Figure 1.1, Section 1: Introduction), which includes the Array Area and the Export Cable Corridor (Figure 10.1). Thus, the scope of this section extends from MHWS seaward to the offshore waters in which the Proposed Development will be located. Although species such as the ocean quahog and horse mussel *Modiolus modiolus* are shellfish, these are considered to be non-commercial species, and are included under Section 9: Benthic Ecology.

10.1.3 This section is relevant to, and should be read alongside, the following sections:

- Section 7: Physical Processes;
- Section 9: Benthic Ecology;
- Section 11: Marine Mammals;
- Section 12: Offshore Ornithology; and
- Section 13: Commercial Fisheries.

10.2 Fish and Shellfish Ecology Study Area

10.1.4 A broad Fish and Shellfish Ecology Study Area has been defined for the purposes of the baseline characterisation. It was defined as a 100 km buffer around the Proposed Development, including the Export Cable Corridor, and includes the Firth of Forth and Firth of Tay (Figure 10.1). This was to encompass the large spatial and temporal variability of most fish and shellfish species. The defined Fish and Shellfish Ecology Study Area is therefore large enough to consider the ZoI of all direct and indirect impacts associated with the Proposed Development, such as impacts from subsea noise. It is also an adequate size to characterise the baseline, particularly in the absence of detailed, site-specific fish and shellfish studies within the immediate Array Area and Export Cable Corridor.

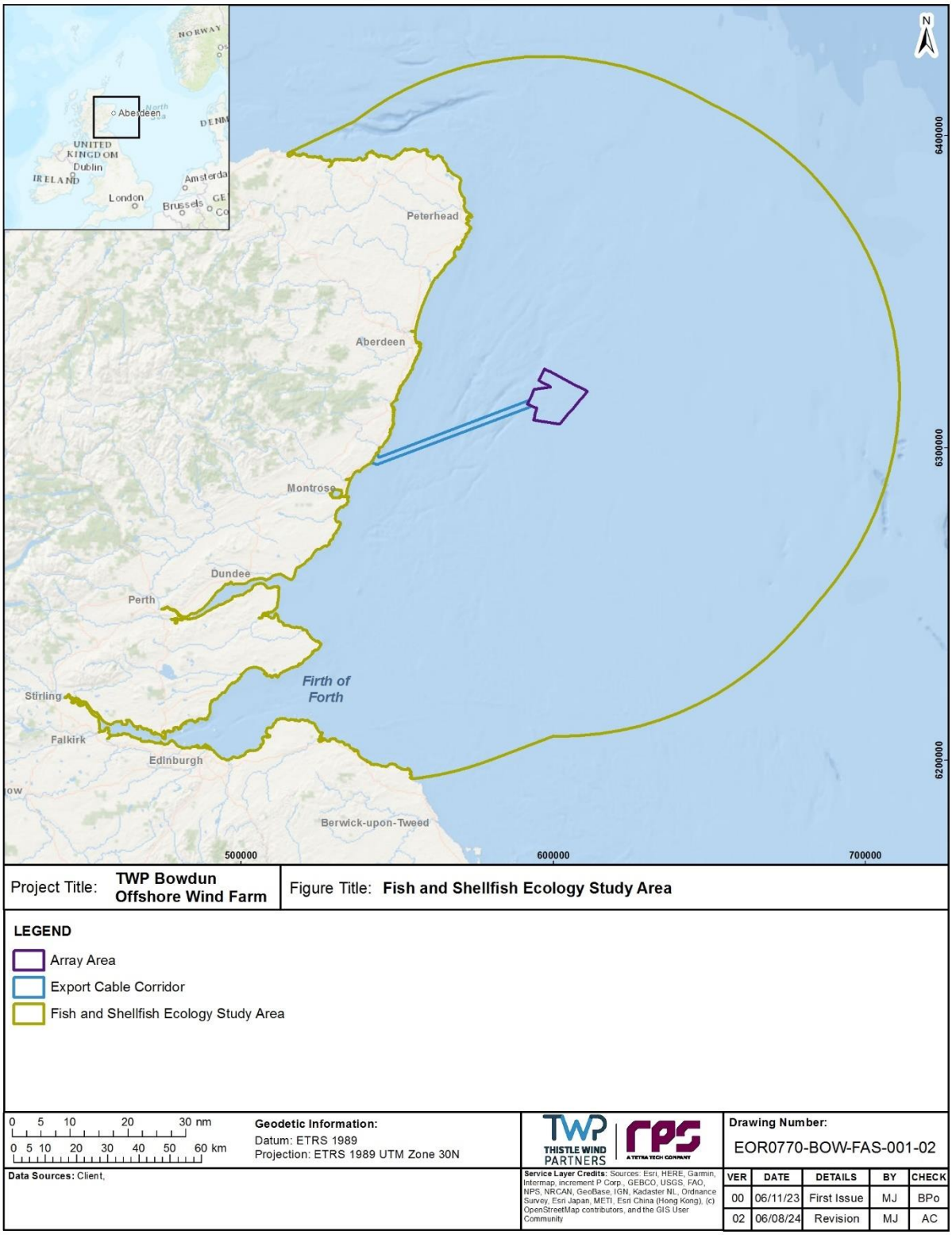


Figure 10.1: Fish and Shellfish Ecology Study Area

10.3 Data Sources

10.1.5 An initial desktop review of key literature and data sources has been undertaken to inform the fish and shellfish ecology baseline (Table 10.1). A full fish and shellfish ecology baseline will be provided in the Fish and Shellfish Ecology Technical Report of the Offshore EIA Report. Site-specific benthic subtidal ecology data were collected during spring 2024, the results of which will also be included in the Fish and Shellfish Ecology Technical Report, where relevant. For example, these results may include fish and shellfish species recorded during grab, trawl, and video surveying, Particle Size Analysis (PSA), which will be used to determine habitat suitability, and fish and shellfish species recorded during the Environmental Deoxyribonucleic Acid (eDNA) sampling. Similarly, any fish and shellfish species recorded during the DAS conducted for marine mammals and birds will be mentioned to help inform the baseline. The DAS were conducted monthly between March 2022 to February 2024.

Table 10.1: Summary of Key Desktop Datasets and Materials

Title	Source	Reference
MarLIN	MBA	MarLIN (2024)
FeAST	NatureScot	NatureScot (2023a)
North-East Scotland Salmon and Sea Trout Tracking Array	River Dee Trust and MD-SEDD	River Dee Trust and MSS (2023)
Ossian Array EIA Scoping Report	Ossian Offshore Windfarm Limited	Ossian OWFL (2023)
Morven Offshore Wind Array Project EIA Scoping Report	Morven Offshore Wind Limited	Morven Offshore Wind Limited (2023)
Developing essential fish habitat maps for fish and shellfish species in Scotland	MD-SEDD	Franco *et al.* (2023)
MPA Mapper	JNCC	JNCC (2023a)
UK sea fisheries annual statistics report 2022	MMO	MMO (2023a)
International Bottom Trawl Survey (IBTS) and International Herring Larvae Survey (IHLS) data	International Council for the Exploration of the Seas (ICES)	ICES (2023a), ICES (2023b)

Title	Source	Reference
Berwick Bank Windfarm Offshore EIA Report: Chapter 9 Fish and Shellfish Ecology	SSE Renewables	SSE Renewables (2022c)
A verified distribution model for the lesser sandeel	Marine Ecology Progress Series	Langton *et al.* (2021)
NNG OWF Environmental Statement (ES): Chapter 15 Fish and Shellfish Ecology	NNG OWF	Mainstream Renewable Power (2019b)
Spawning grounds of whiting (*Merlangius merlangus*)	ICES Journal of Marine Science	González-Irusta and Wright (2017)
Spawning grounds of Atlantic cod (*Gadus morhua*) in the North Sea	ICES Journal of Marine Science	González-Irusta and Wright (2016a)
Spawning grounds of haddock (*Melanogrammus aeglefinus*) in the North Sea and West of Scotland	ICES Journal of Marine Science	González-Irusta and Wright (2016b)
Kincardine OWF ES: Chapter 5 Fish and Shellfish	Kincardine OWF	Kincardine OWF Limited (2016)
Updating fisheries sensitivity maps in British waters	Marine Scotland	Aires *et al.* (2014)
Seagreen Environmental Impact Statement, Volume 1, Chapter 12 Natural Fish and Shellfish Resource	Seagreen Alpha and Bravo OWFs (have since been renamed to Seagreen 1 and Seagreen 1A)	Seagreen Wind Energy Limited (2012b)
Spawning and nursery grounds for selected fish species in UK waters	Centre for Environment, Fisheries, and Aquaculture Science (Cefas)	Ellis *et al.* (2012)
Inch Cape OWF Offshore ES, Volume 1B: Biological Environment, Chapter 13 Natural Fish and Shellfish	Inch Cape OWF	Inch Cape Offshore Limited (2018)

Title	Source	Reference
Review of migratory routes and behaviour of Atlantic salmon, sea trout and European eel in Scotland's coastal environment: Implications for the development of marine renewables	MD-SEDD	Malcolm *et al.* (2010)
North Sea Elasmobranchs: distribution, abundance, and biodiversity	ICES	Daan *et al.* (2005)
Fisheries sensitivity maps in British waters	Cefas	Coull *et al.* (1998)

10.4 Baseline Environment

10.1.6 This section provides an overview of the baseline environment for fish and shellfish ecology based on an initial review of desktop data sources. A comprehensive baseline will be provided in the Fish and Shellfish Ecology Technical Report that will support the Offshore EIA Report.

Fish and Shellfish Assemblages

10.1.7 The Fish and Shellfish Ecology Study Area is situated within the NNS, where a range of different fish and shellfish species are present. These include marine fish (e.g. teleost fish (bony fish) and elasmobranchs (sharks, skates and rays)), diadromous fish (i.e. those which migrate between freshwater and sea water) and shellfish (e.g. commercial crustaceans and molluscs). Commercial and non-commercial species are present within the Fish and Shellfish Ecology Study Area, with a full commercial fisheries baseline presented in Section 13: Commercial Fisheries. Although species such as ocean quahog and horse mussel are shellfish, these are considered to be non-commercial species, and are included under Section 9: Benthic Ecology.

Marine Fish

10.1.8 The teleost fish species in the Fish and Shellfish Ecology Study Area include both demersal and pelagic species. Typical demersal fish species include:

- Gadoids (e.g. blue whiting Micromesistius poutassou, cod Gadus morhua, European hake Merluccius merluccius, haddock Melanogrammus aeglefinus, ling Molva molva, Norway pout

Trisopterus esmarkii, saithe Pollachius virens and whiting Merlangius merlangus);
- Flatfish (e.g. common dab Limanda limanda, lemon sole Microstomus kitt, long rough dab Hippoglossoides platessoides and plaice Pleuronectes platessa);
- Sandeels (e.g. lesser sandeel *Ammodytes tobianus* and Raitt's sandeel *Ammodytes marinus*); and
- And other taxa, such as anglerfish *Lophius piscatorius*, gobies *Gobiidae* spp. and gurnards *Triglidae* spp. (Aires *et al.*, 2014, Coull *et al.*, 1998, Ellis *et al.*, 2012, Franco *et al.*, 2023).

10.1.9 Pelagic species present within the Fish and Shellfish Ecology Study Area include:

- Herring Clupea harengus;
- Horse mackerel Trachurus trachurus;
- Mackerel Scomber scrombrus; and
- Sprat *Sprattus sprattus* (Aires *et al.*, 2014, Coull *et al.*, 1998, Ellis *et al.*, 2012, Franco *et al.*, 2023).

10.1.10 Elasmobranch species include:

- Basking shark Cetorhinus maximus;
- Common skate *Dipturis batis*;
- Cuckoo ray *Leucoraja naevus*;
- Small spotted catshark *Scyliorhinus canicula*;
- Spotted ray *Raja montagui*;
- Spurdog Squalus acanthias;
- Thornback ray *Raja clavata*;
- Thorny skate *Amblyraja radiata*; and
- Tope shark *Galeorhinus galeus* (Coull *et al.*, 1998, Daan *et al.*, 2005, Ellis *et al.*, 2012).

Diadromous Fish

10.1.11 There are numerous rivers along the coast of Scotland within the Fish and Shellfish Ecology Study Area, such as the River Dee, River Tay and River South Esk (paragraph 10.1.13). Therefore, diadromous fish species may migrate to and from rivers within the Fish and Shellfish Ecology Study Area and through the Scoping Boundary throughout the year. Based on historical records in Scottish waters, the following diadromous species have the potential to be in the vicinity of the Scoping Boundary (Maitland and Lyle, 1996, Malcolm *et al.*, 2010, Malcolm *et al.*, 2015, Newton *et al.*, 2021, Newton *et al.*, 2017, River Dee Trust and MSS, 2023, Smith and Smith, 1997):

- Atlantic salmon *Salmo salar;*
- European eel Anguilla anguilla;
- European smelt (also referred to as 'sparling' in the literature) *Osmerus eperlanus*;

- River lamprey Lampetra fluviatilis;
- Sea lamprey Petromyzon marinus;
- Sea trout *Salmo trutta*; and
- Shads: Allis shad *Alosa alosa* and Twaite shad *Alosa fallax*.

10.1.12 Although it resides entirely in freshwater, and is thus out with the scope of the Offshore Scoping Report, the freshwater pearl mussel *Margaritifera margaritifera* shares a symbiotic life history with Atlantic salmon and sea trout (Taeubert and Geist, 2017). Therefore, freshwater pearl mussel populations may be indirectly affected if Atlantic salmon or sea trout are impacted by the Proposed Development. This species will therefore be considered within the assessment on diadromous fish in the Offshore EIA Report.

10.1.13 For the purposes of the Offshore Scoping Report, it is assumed that the aforementioned diadromous species could be present within the Scoping Boundary during migration. The potential for the Proposed Development to disrupt the migration of these species will be assessed within the fish and shellfish ecology assessment in the Offshore EIA Report. An overview of key migratory periods is presented in Table 10.2.

Table 10.2: Overview of Migration Periods for Diadromous Fish Species

Species	Timing of downstream migration	Time spent at sea before returning to freshwater	Timing of upstream migration	Source
Allis and twaite shad	Autumn	Spends 2 years in estuaries and marine areas and returns to freshwater when sexually mature	April to June	ABPMer (2019), Maitland and Hatton-Ellis (2003)
Atlantic salmon	April to June	1 to 4 years	All year, with a peak in late summer and autumn	ABPMer (2019), Malcolm et al. (2010), Malcolm et al. (2015), NatureScot (2023b)
European eel	June to November	May not return to freshwater, many do not	Varies spatially around Europe, however in Scotland they typically arrive in coastal waters in December and may migrate upstream until June	Malcolm et al. (2010)
European smelt	Migrates to estuaries only	Spends time in estuaries	February to April (to spawn in estuaries and large rivers)	NatureScot (2023d)
River lamprey	From late autumn	Spends 1 to 2 years in estuaries	Winter and spring when temperatures are <10°C	ABPMer (2019),

Species	Timing of downstream migration	Time spent at sea before returning to freshwater	Timing of upstream migration	Source
	onwards (to feed)			NatureScot (2023c)
Sea lamprey	From late autumn onwards (to open sea)	18 to 24 months	April to May (to spawn in May to June)	ABPMer (2019), NatureScot (2023c)
Sea trout	Spring	2 or more	April to June	Malcolm et al. (2010)

Shellfish Species

10.1.14 Information on shellfish distributions around the UK are largely derived from commercial fishing and landings data (Mesquita *et al.*, 2023). Fisheries landing data can be used to determine species likely to be present within the Fish and Shellfish Ecology Study Area. Landings are reported and published annually by the Government and have been used in this baseline characterisation. The Scoping Boundary overlaps with the following International Council for the Exploration of the Seas (ICES) rectangles: 42E7, 42E8, and 43E8 (Section 13: Commercial Fisheries). Between 2018 and 2022, the top three shellfish species in terms of landed weight were king scallop *Pecten maximus,* edible crab (also referred to as brown crab) *Cancer pagurus* and European lobster *Homarus gammarus* (MMO, 2023a). Other species landed from ICES rectangles 42E7, 42E8, and 43E8 were: common shore crab *Carcinus maenas,* common whelk *Buccinum undatum,* mixed squid and octopi, Nephrops, squid *Loligo* spp., surf clam *Spisula* spp. and velvet swimming crab *Necora puber* (MMO, 2023a).

10.1.15 The shellfish industry is important to the Scottish economy, with Norway lobster *Nephrops norvegicus*, hereafter referred to as 'Nephrops', the most valuable species (Marine Scotland, 2023). In 2022, Scottish vessels landed 19,302 tonnes of Nephrops, at a value of £83,000,000 throughout the UK (Marine Scotland, 2023). Further detail on landing statistics of fish and shellfish species in the Fish and Shellfish Ecology Study Area is presented in Section 13: Commercial Fisheries.

Species Records from the Proposed Development and Other Projects within the Fish and Shellfish Ecology Study Area

10.1.16 As stated in paragraph 10.1.5, DAS were conducted across the Array Area for marine mammals and birds between March 2022 and February 2024. Although these surveys were not primarily designed for fish and shellfish monitoring, there were several fish species recorded. The full 24 months of data available are available. Within this, there were five individual fish recorded:

- one blue shark *Prionace glauca* recorded in November 2022;
- one basking shark recorded in July 2023;
- one porbeagle shark *Lamna nasus* recorded in September 2023 and one in November 2023; and
- one Atlantic bluefin tuna *Thunnus thynnus* recorded in October 2023.

10.1.17 The results of site-specific benthic surveys for the Proposed Development are not available at the time of writing (see paragraph 10.1.5). However, there are several other OWF projects

within the Fish and Shellfish Ecology Study Area which have published site-specific survey data (Figure 10.2). Fish and shellfish species recorded during surveys for these OWF projects have been collated in Table 10.3, and can add further evidence for species present within the Fish and Shellfish Ecology Study Area. The species recorded largely correspond to those mentioned in paragraph 10.1.8 and include species typical of the North Sea (such as cod, flatfish, haddock, herring, mackerel, Norway pout, sandeel and whiting).

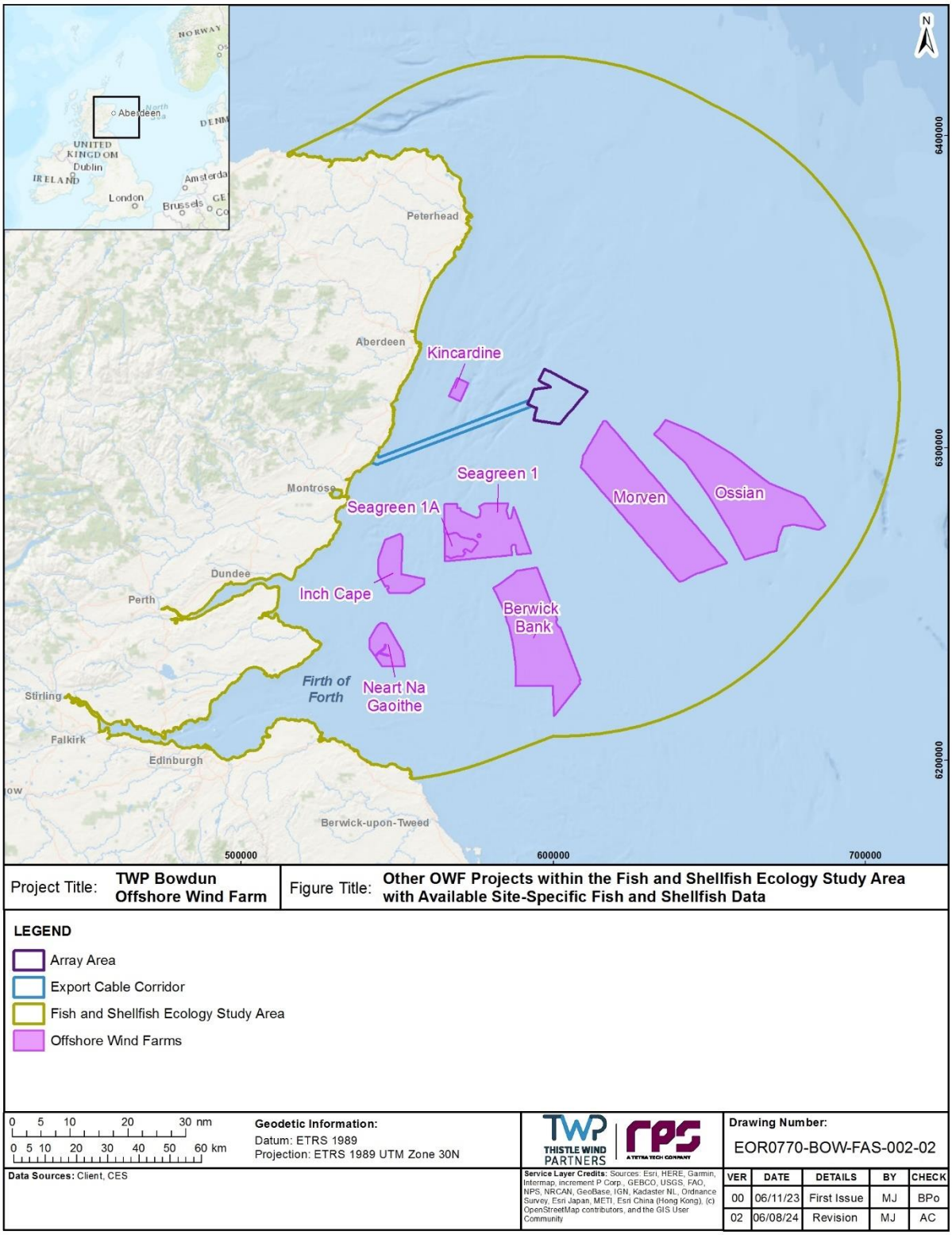


Figure 10.2: Other OWF Projects within the Fish and Shellfish Ecology Study Area with Available Site-Specific Fish and Shellfish Data

Table 10.3: Overview of Fish and Shellfish Species Identified from Other OWF Projects within the Fish and Shellfish Ecology Study Area

Project	Distance from the Array Area (km)	Distance to Export Cable Corridor (km)	Species Recorded	Source
Morven OWF	10.1	21.4	During a 2022 eDNA and grab survey, the following species were recorded: clupeids (herring and sprat), flatfish (common dab, lemon sole, long rough dab, plaice and witch *Glyptocephalus cynoglossus*), gadoids (cod, haddock, Norway pout and whiting), gobies (crystal goby *Crystallogobius linearis* and sand goby *Pomatoschistus minutus*), gurnard *Triglidae* spp., mackerel, Norwegian topknot *Phrynorhombus norvegicus*, sandeel and thornback.	Morven Offshore Wind Limited (2023)
Ossian OWF	25.4	39.3	16 species were recorded during a 2022 epifaunal trawl survey, with long rough dab being the most common. This was followed by plaice, common dab, Norway pout, Raitt's sandeel, lemon sole, and grey gurnard. Other species recorded in lower abundances were *pogge Agonus cataphractus,* poor cod *Trisopterus minutus*, haddock, cod, transparent goby *Aphia minuta,* sand goby, scaldfish *Arnoglossus laterna*, Lotidae spp. and Argentinidae spp.	Ossian OWFL (2023)

Project	Distance from the Array Area (km)	Distance to Export Cable Corridor (km)	Species Recorded	Source
Seagreen 1 and Seagreen 1A OWFs (were previously referred to as Seagreen Alpha and Bravo when the data were collected)	27.9	18.1	A 2011 benthic trawl survey recorded 3,211 fish and shellfish species. Pogge, common dab, goby *Pomatoschistus* spp., sandeel *Ammodytidae* spp., butterfish *Pholis gunnellus,* Norwegian topknot, reticulated dragonet *Callionymus reticulatus*, common dragonet *Callionymus lyra*, lemon sole and bull rout *Myoxocephalus scorpius* were all recorded in at least 50% of the trawls. Common dab, gobies, and sandeel were the most abundant species. Other species observed in lower abundances were cod, cuckoo ray, smooth sandeel *Gymnammodytes semisquamatus* and greater sandeel *Hyperoplus lanceolatus*, king and queen scallop, plaice, red gurnard *Chelidonichthys cuculus* and whiting.	Seagreen Wind Energy Limited (2012b
Berwick Bank OWF	46.5	46.4	553 teleost fish across 21 taxa were recorded during a 2021 survey (which included epifaunal trawls, grab samples, and DDV). The most abundant was common dab (n=167), followed by long rough dab, lesser sandeel, pogge, and goby *Pomatoschistus* spp. In addition, cod, lemon sole, plaice, anglerfish and bearded rockling *Enchelyopus cimbrius* were also recorded, but at very low abundances.	SSE Renewables (2022c)

Project	Distance from the Array Area (km)	Distance to Export Cable Corridor (km)	Species Recorded	Source
Kincardine OWF	20.1	6.3	Flatfish were recorded during DDV sampling for 2013 and 2014 benthic surveys; however, it was not possible to identify these flatfish to species level.	Kincardine Offshore Windfarm Limited (2016), Kincardine OWF Limited (2016)
Inch Cape OWF	56.0	22.0	Otter trawls in 2012 recorded 30 species, with sprat being the most abundant (n= 1,194), followed by herring (n = 161) and cod (n = 15).	Inch Cape Offshore Limited (2018)
NNG OWF	80.5	49.5	A 2009 benthic survey recorded cod and flatfish such as common dab, long rough dab and plaice. This survey comprised of grab sampling, DDV and epifaunal trawls.	Mainstream Renewable Power (2019b)

Spawning and Nursery Grounds

10.1.18 Spawning and nursery grounds for many different species are present within the Fish and Shellfish Ecology Study Area. Coull *et al.* (1998) reported the distribution of spawning and nursery grounds in British waters for a range of species. These were updated by Ellis *et al.* (2012) for some species, with added information on the intensity of the mapped spawning and nursery grounds. Species with spawning and/or nursery grounds within the Fish and Shellfish Ecology Study Area are illustrated in Figure 10.4 to Figure 10.13. Species with spawning and/or nursery grounds overlapping with the Scoping Boundary are presented in Table 10.4.

10.1.19 In particular, the Scoping Boundary overlaps with spawning grounds of herring and sandeel (Figure 10.5 and Figure 10.10). Whilst most fish and shellfish species release pelagic eggs that drift within the water column, herring and sandeel are demersal spawners and require specific sediment compositions to spawn successfully. These species are therefore considered substrate-specific and at higher risk to habitat disturbance. Herring require sediment comprised of less than 5% mud and greater than 10% gravel (Reach *et al.*, 2013). Sandeel habitation and spawning requires sediment comprised of less than 10% mud, greater than 50% sand, and less than 80% gravel, with a preference for less than 4% mud and greater than 70% sand (Latto *et al.*, 2013). As stated in Section 10.3, PSA data collected during the site-specific benthic survey will be used to assess spawning habitat suitability for herring and sandeel in the Offshore EIA report.

Table 10.4: Species with Spawning and Nursery Grounds Overlapping with the Scoping Boundary (adapted from Coull *et al.*, (1998) and Ellis et al., (2012)) (N/A = Not applicable)

Species	Spawning Grounds	Spawning Intensity	Nursey Grounds	Nursery Intensity
Teleost Fish				
Anglerfish	x	N/A	✓	Low
Blue whiting	x	N/A	✓	Low
Cod	✓	Low	✓	High
European hake	x	N/A	✓	Low
Haddock	x	N/A	✓	High
Herring	✓	Undetermined	✓	High

Species	Spawning Grounds	Spawning Intensity	Nursey Grounds	Nursery Intensity
Horse mackerel	x	N/A	✓	Undetermined
Lemon sole	✓	Undetermined	✓	Not specified
Ling	x	N/A	✓	Low
Mackerel	x	N/A	✓	High
Norway pout	✓	Low	✓	Not specified
Plaice	✓	Low	✓	Not specified
Saithe	x	N/A	✓	Not specified
Sandeel	✓	Low	✓	High
Sprat	✓	Undetermined	✓	Not specified
Whiting	✓	Low	✓	High
Elasmobranchs				
Common skate	x	N/A	✓	Low
Spotted ray	x	N/A	✓	Low
Spurdog	x	N/A	✓	Low
Tope shark	x	N/A	✓	Low
Shellfish				
Nephrops	✓	Undetermined	✓	Not specified

10.1.20 Aires *et al.* (2014) collated evidence of the distribution of '0-group' fish (i.e. those within their first year of life) and mapped the probability of abundance of 0-group fish for various species in UK waters. Aires *et al.* (2014) identified a low to medium probability of presence of 0-group fish within the Fish and Shellfish Ecology Study Area for:

- Cod;
- Haddock;
- Herring;
- Norway pout;
- Plaice; and
- Whiting.

10.1.21 More recently, Franco *et al.* (2023) modelled catch data from broadscale fish surveys (between 2010 to 2020) and the associated environmental conditions to map the UK-wide spatial distribution of essential fish habitats for a range of fish and shellfish species. The data and maps produced are intricately detailed and exceed the scope required to characterise the baseline for the Offshore Scoping Report. The Franco *et al.* (2023) report will be included fully within the Fish and Shellfish Ecology Technical Report and used to inform the assessment in the Offshore EIA Report.

10.1.22 Langton *et al.* (2021) presents distribution models for sandeel in the North Sea using substrate conditions to predict occurrence and density. These will be analysed in full within the Fish and Shellfish Ecology Technical Report and used to inform the assessment in the Offshore EIA Report. Similarly, the long running International Herring Larvae Survey (IHLS) and International Bottom Trawl Survey (IBTS) datasets from ICES will be analysed within the Fish and Shellfish Ecology Technical Report to inform herring larval distributions within the Fish and Shellfish Ecology Study Area.

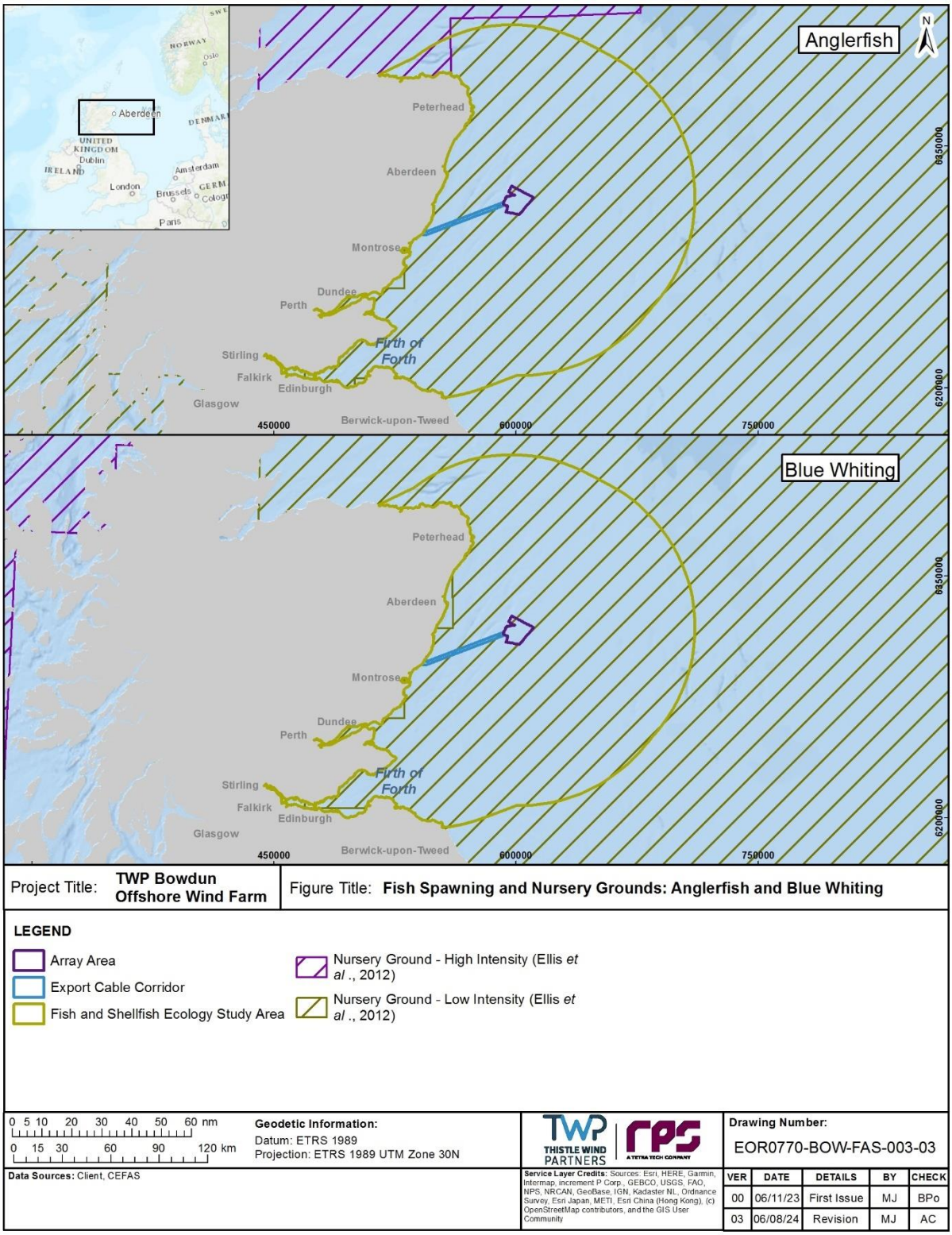


Figure 10.3: Fish Spawning and Nursery Grounds: Anglerfish and Blue Whiting

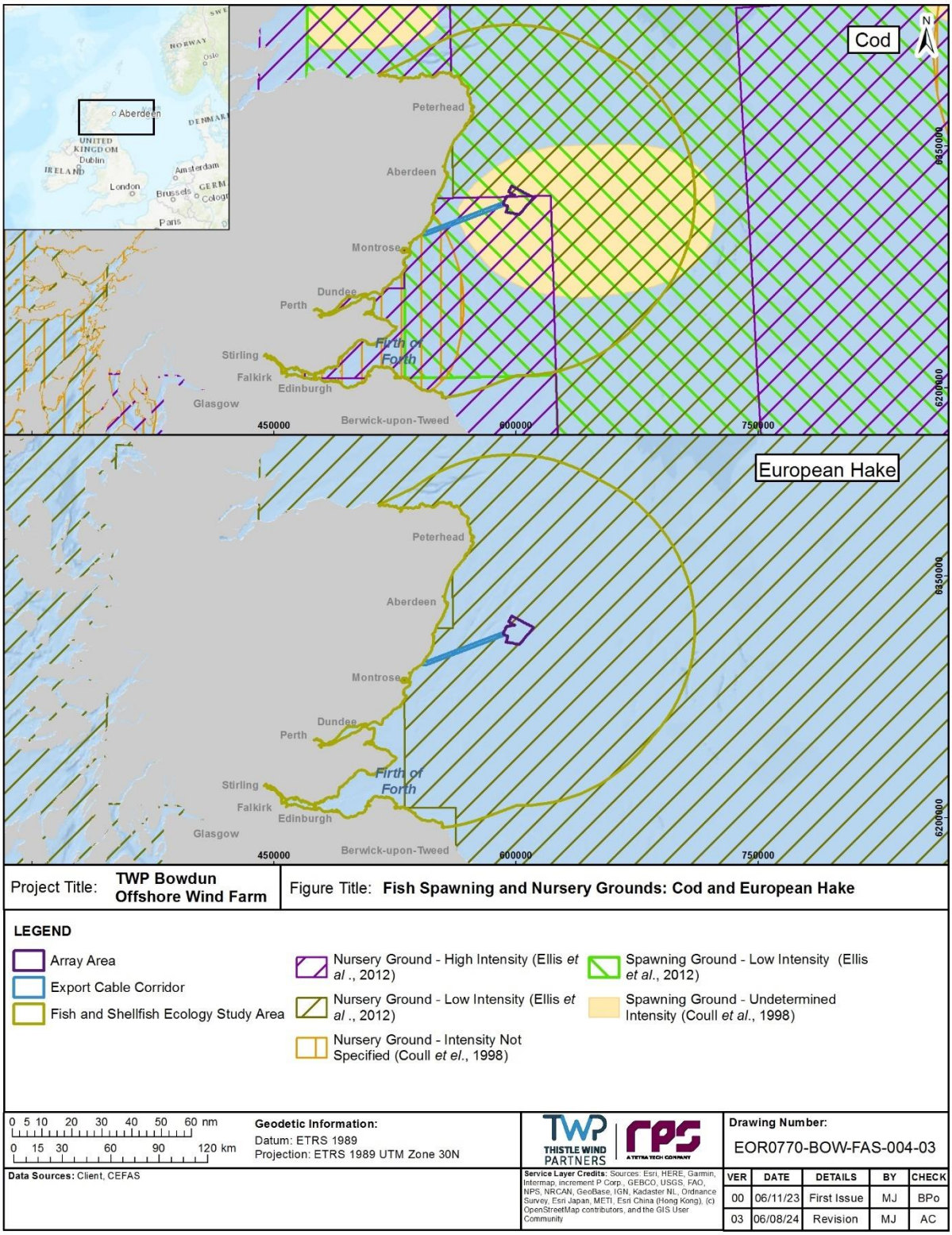


Figure 10.4: Fish Spawning and Nursery Grounds: Cod and European Hake

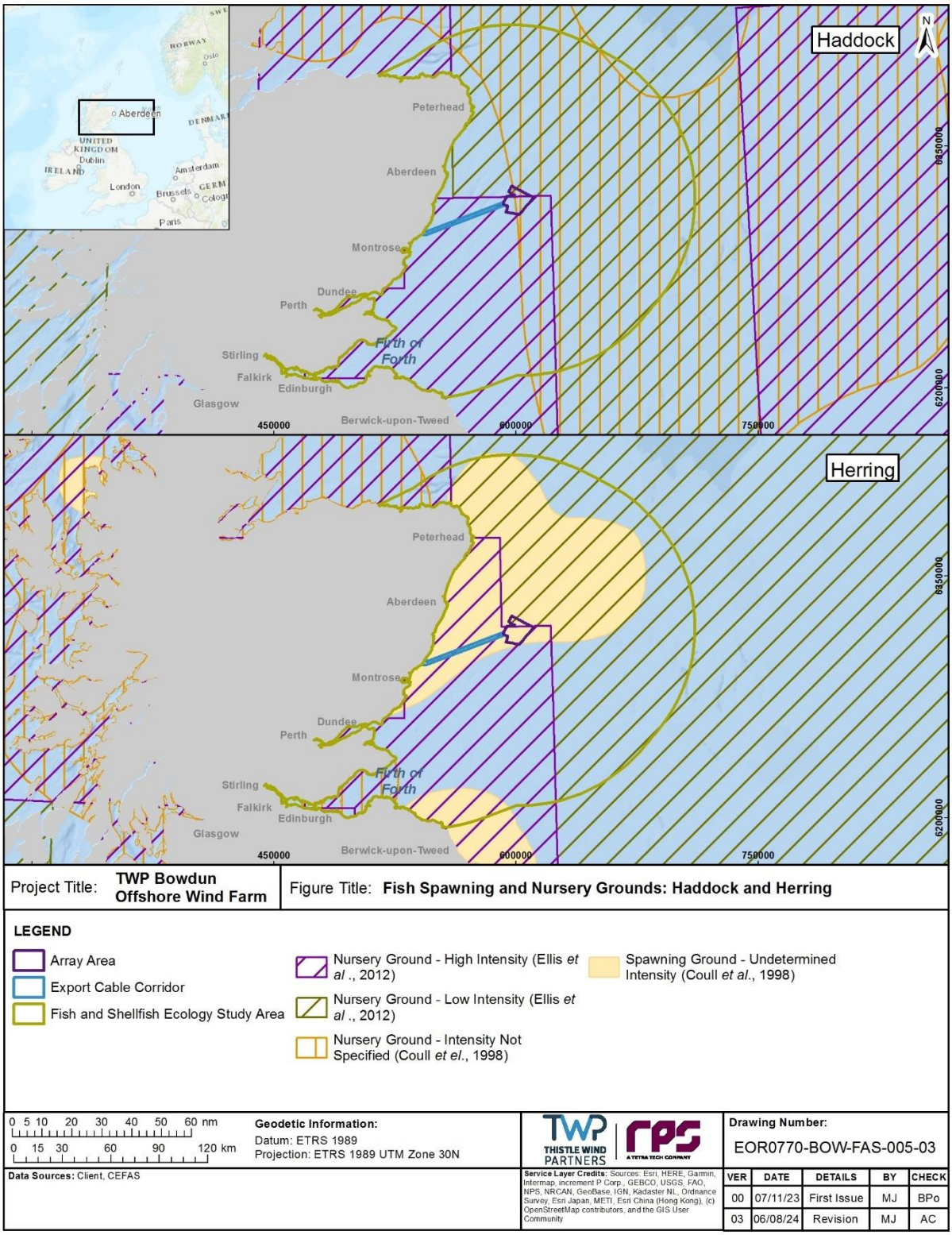


Figure 10.5: Fish Spawning and Nursery Grounds: Haddock and Herring

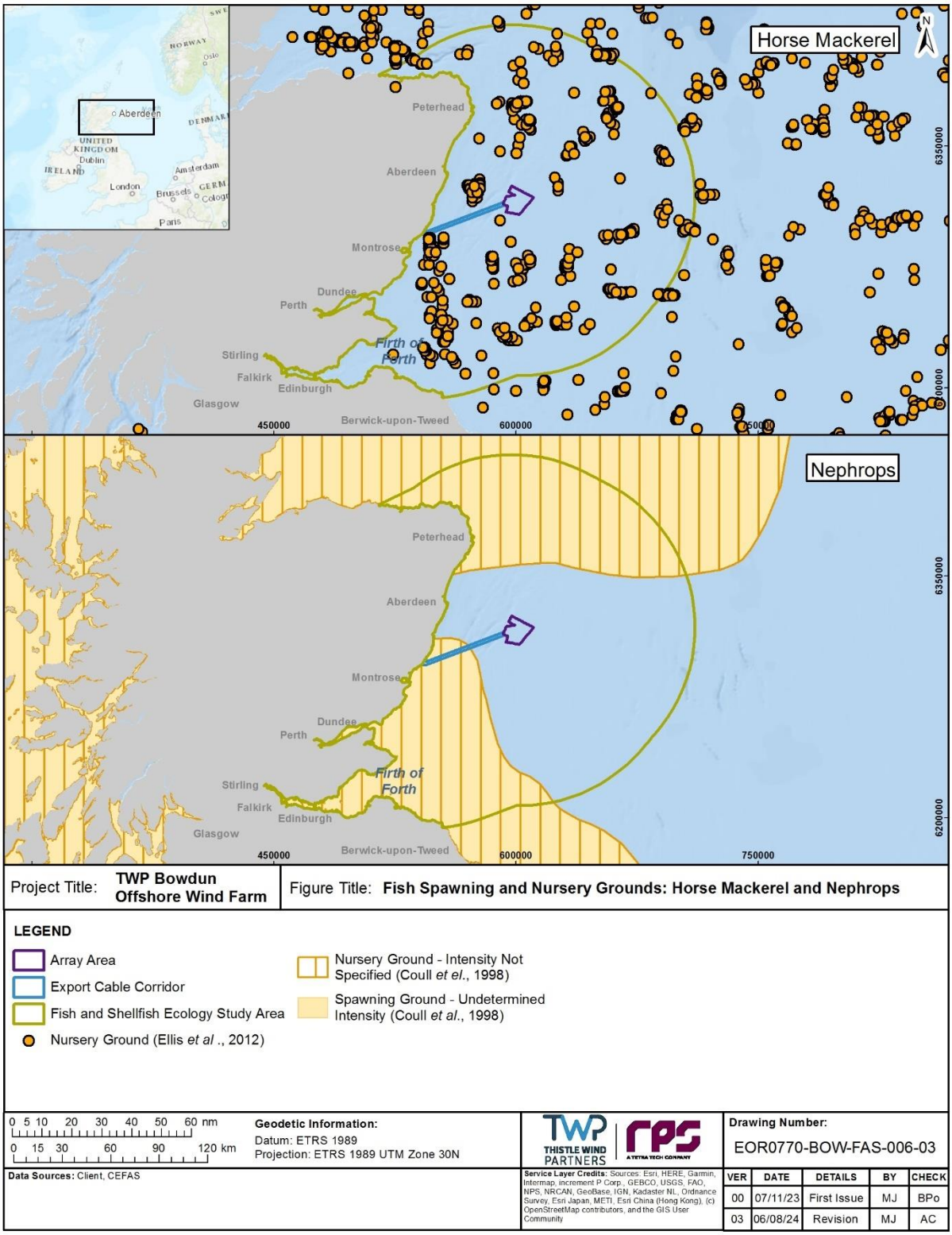


Figure 10.6: Fish Spawning and Nursey Grounds: Horse Mackerel and Nephrops

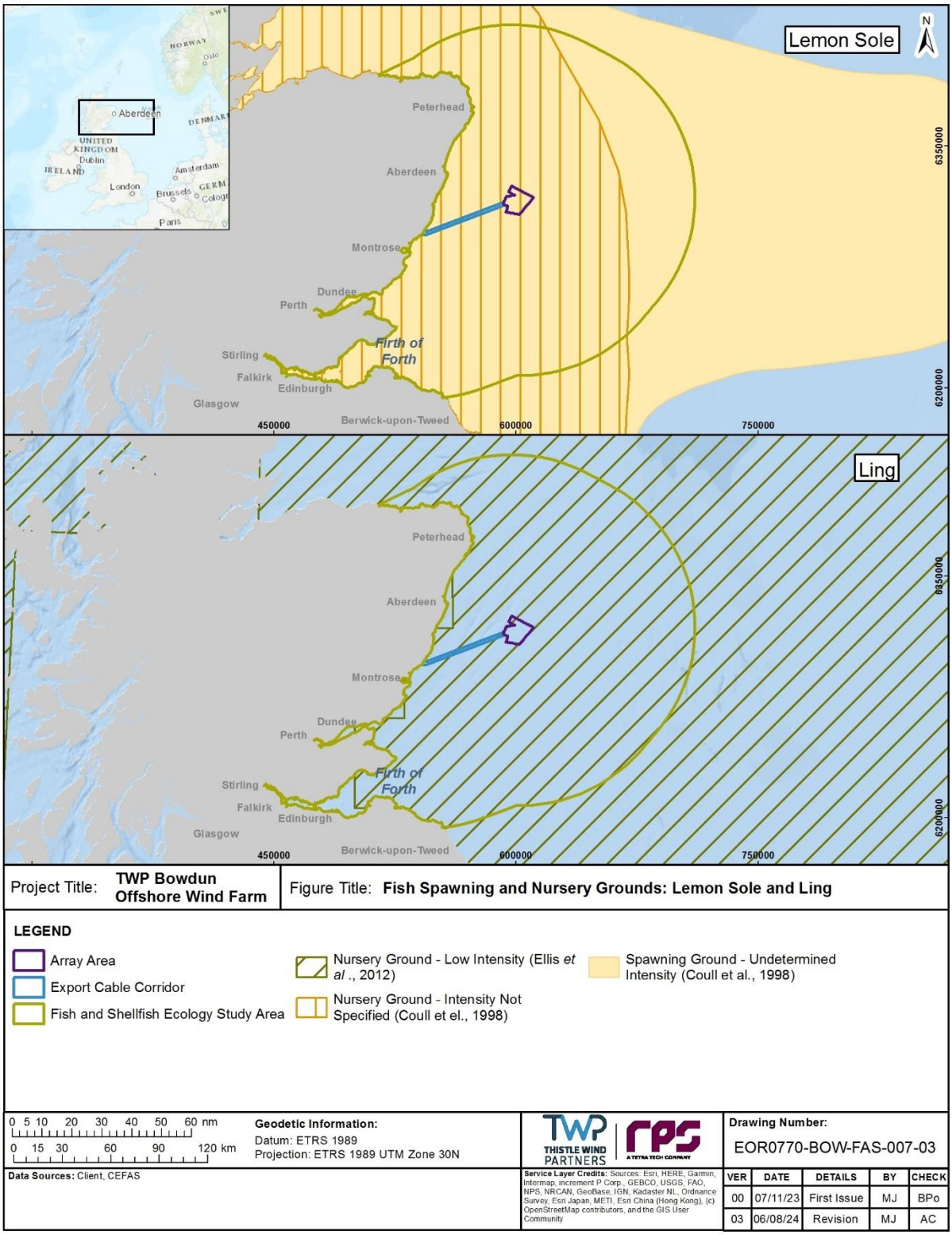


Figure 10.7: Fish Spawning and Nursey Grounds: Lemon Sole and Ling

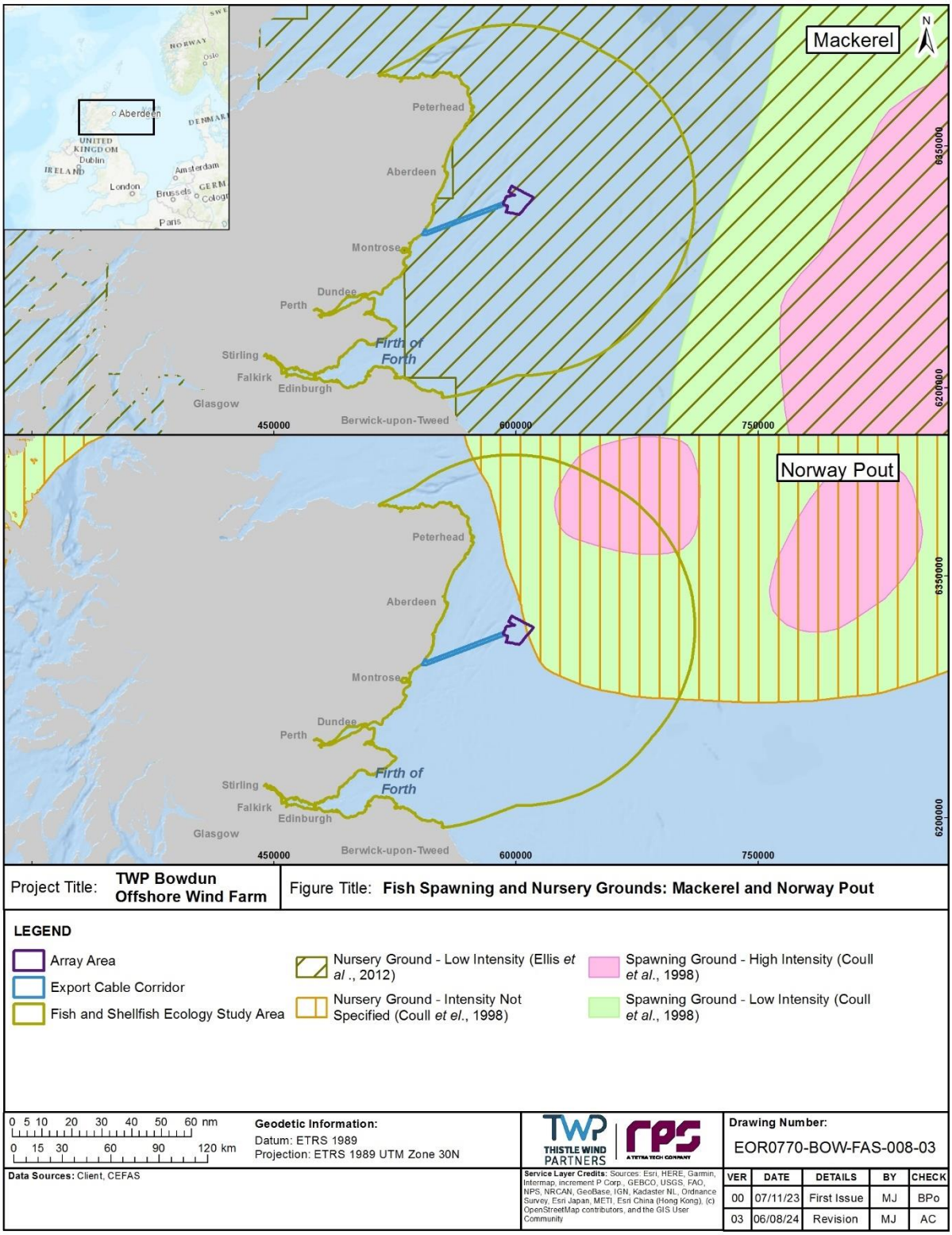


Figure 10.8: Fish Spawning and Nursery Grounds: Mackerel and Norway Pout

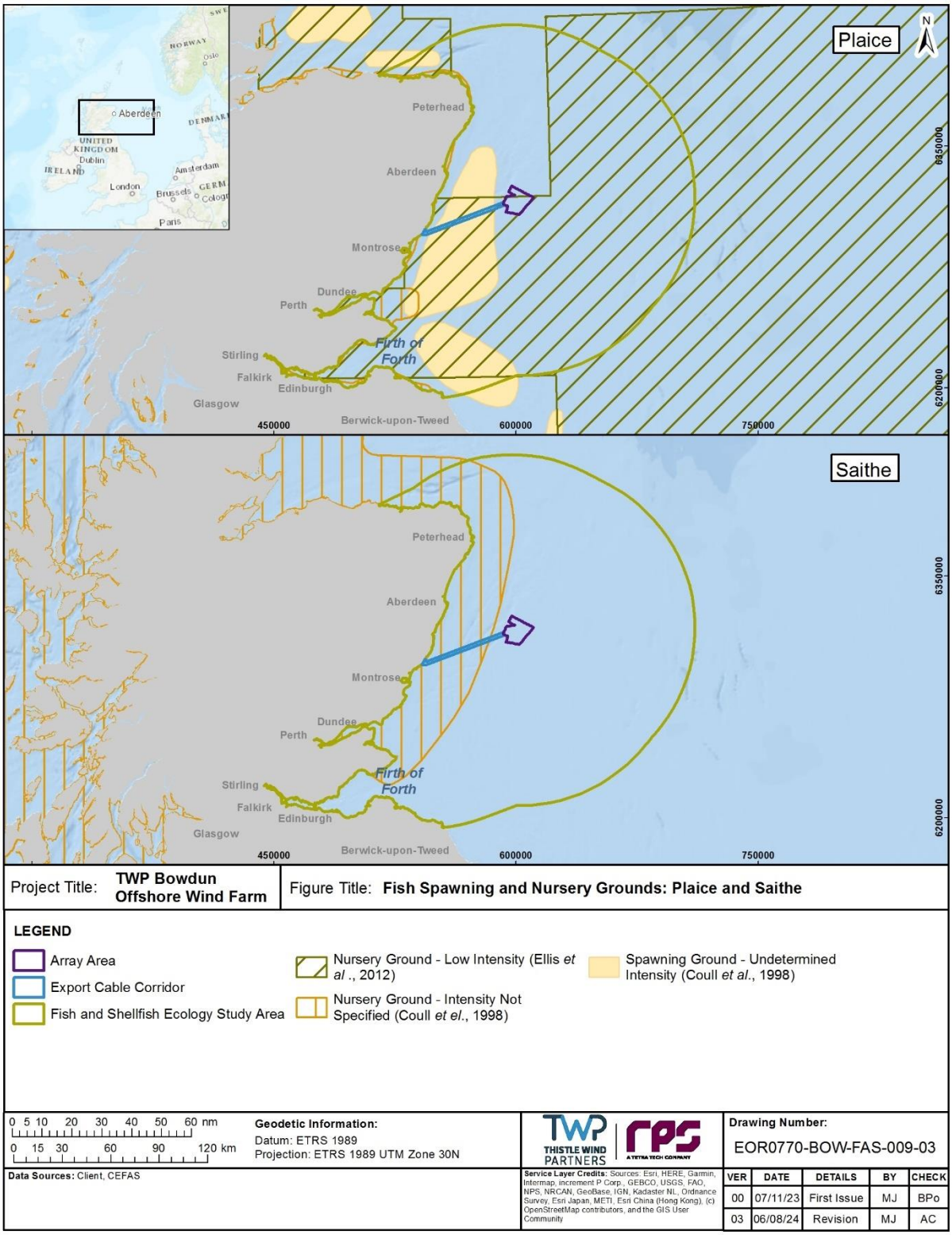


Figure 10.9: Fish Spawning and Nursery Grounds: Plaice and Saithe

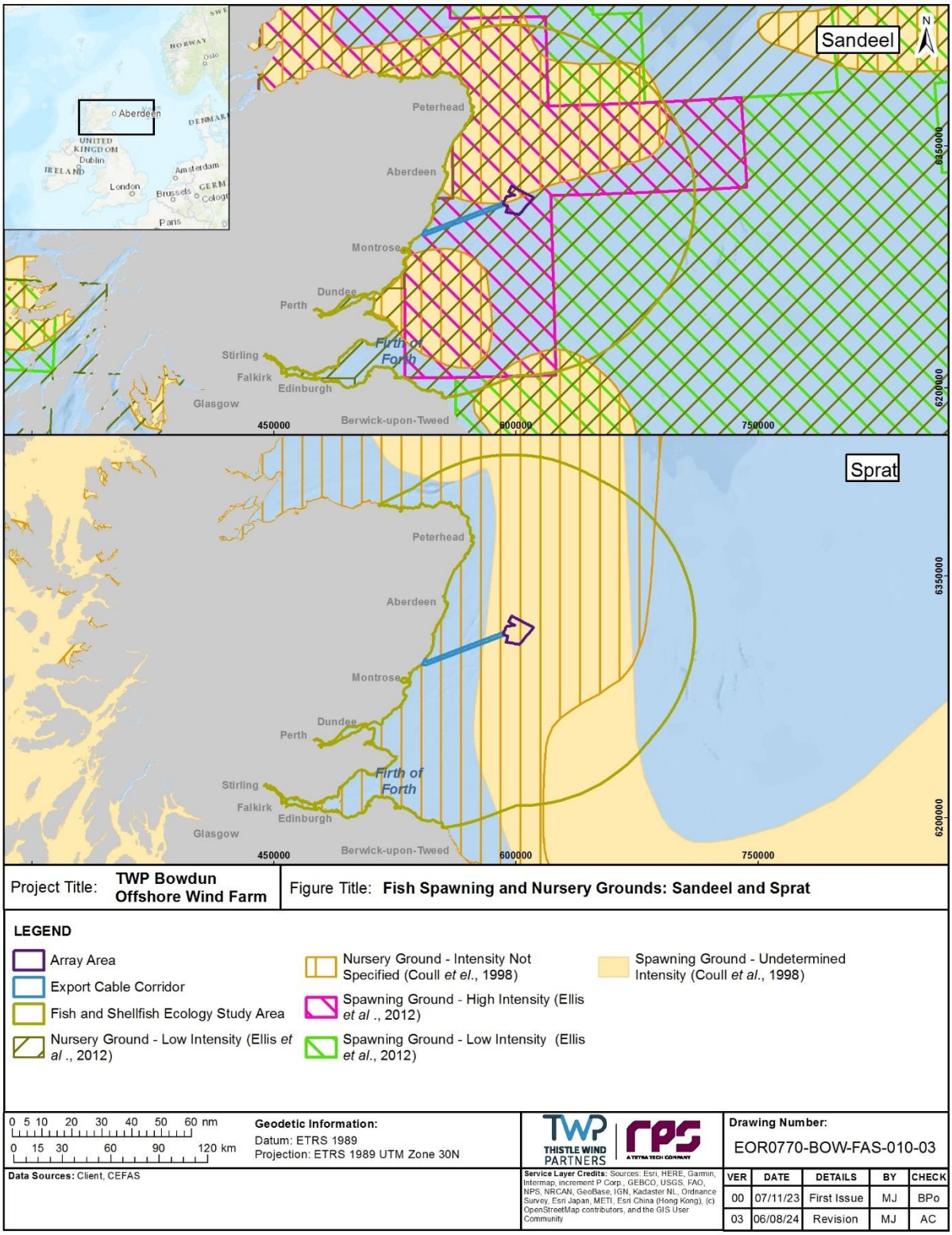


Figure 10.10: Fish Spawning and Nursery Grounds: Sandeel and Sprat

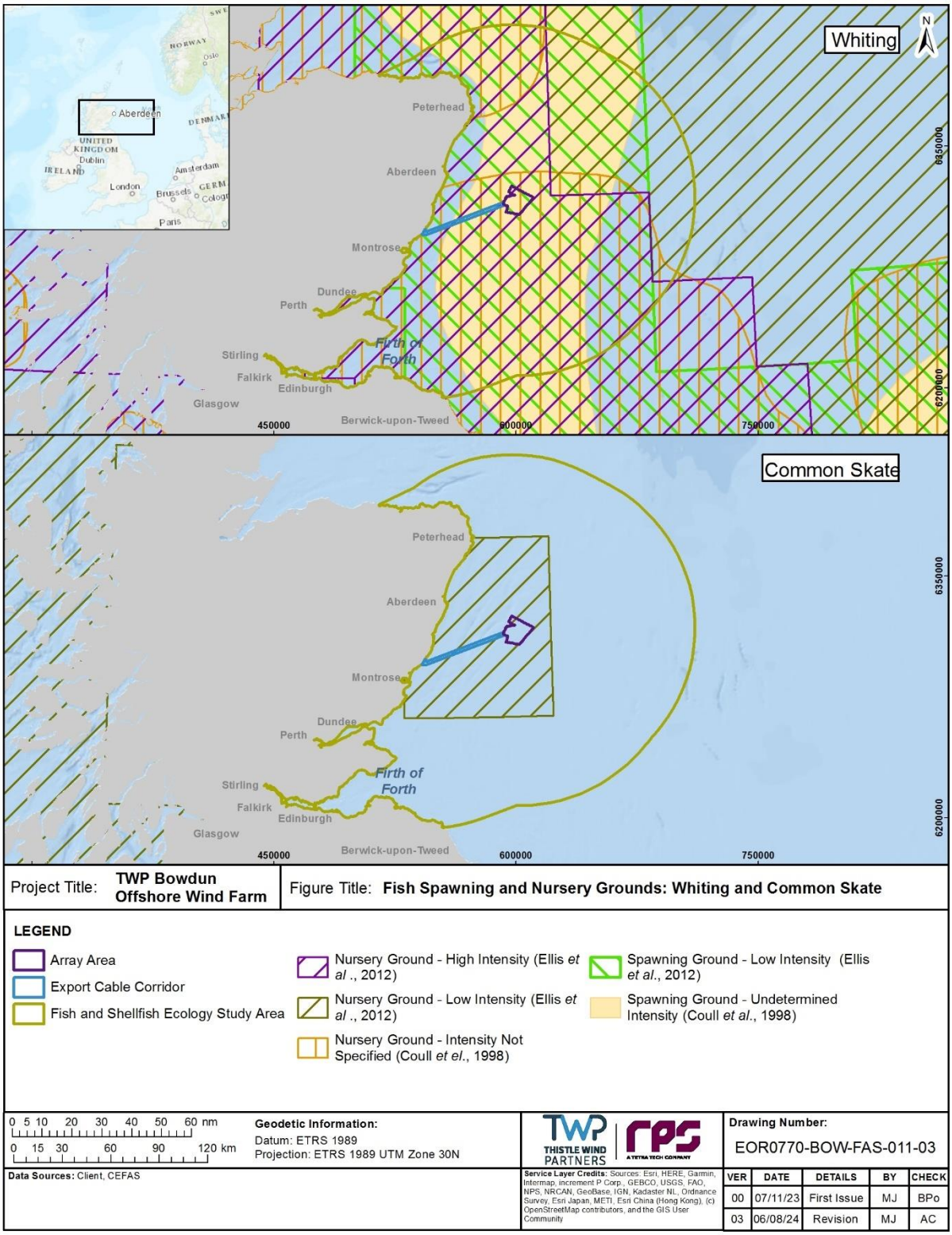


Figure 10.11: Fish Spawning and Nursery Grounds: Whiting and Common Skate

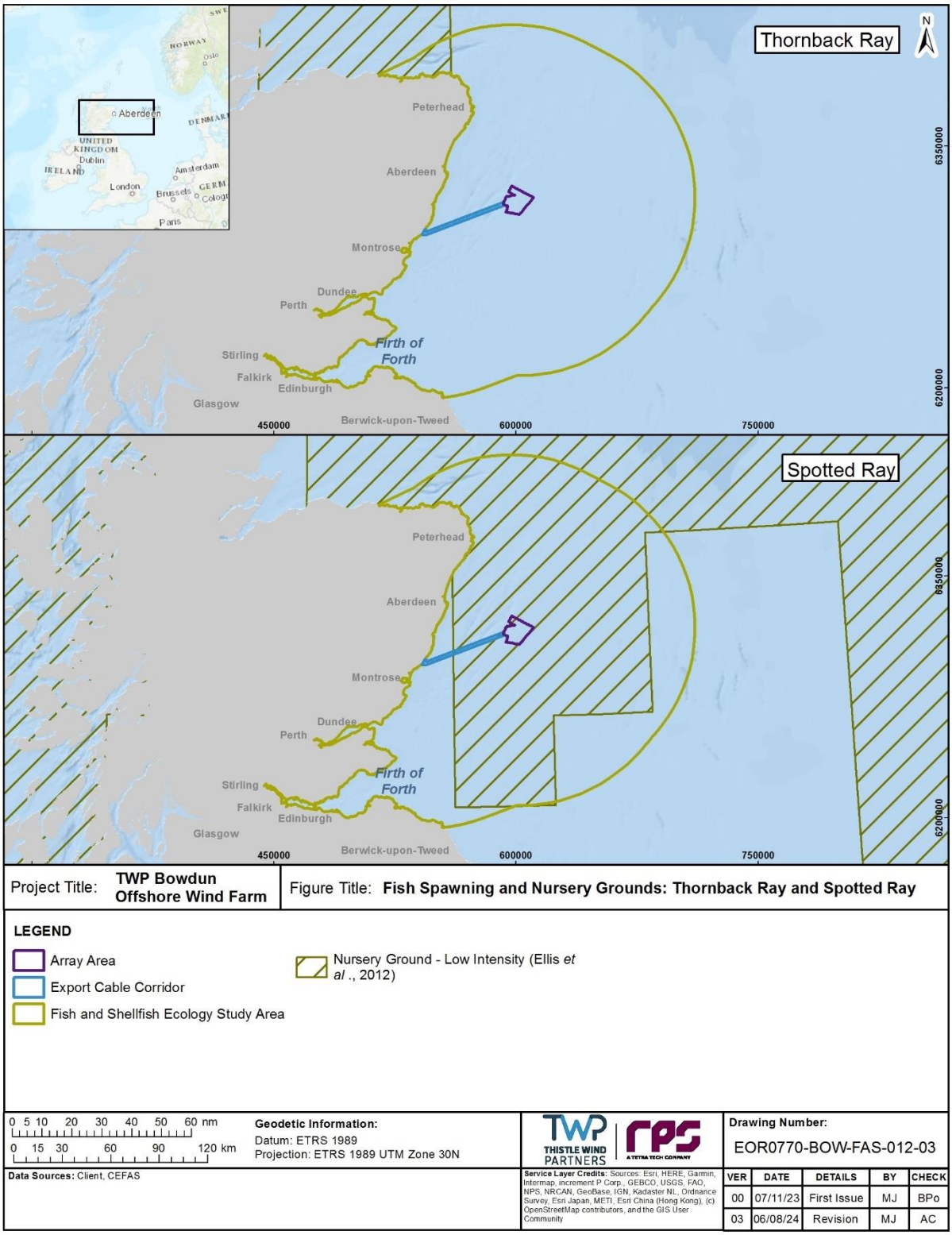


Figure 10.12: Fish Spawning and Nursery Grounds: Thornback Ray and Spotted Ray

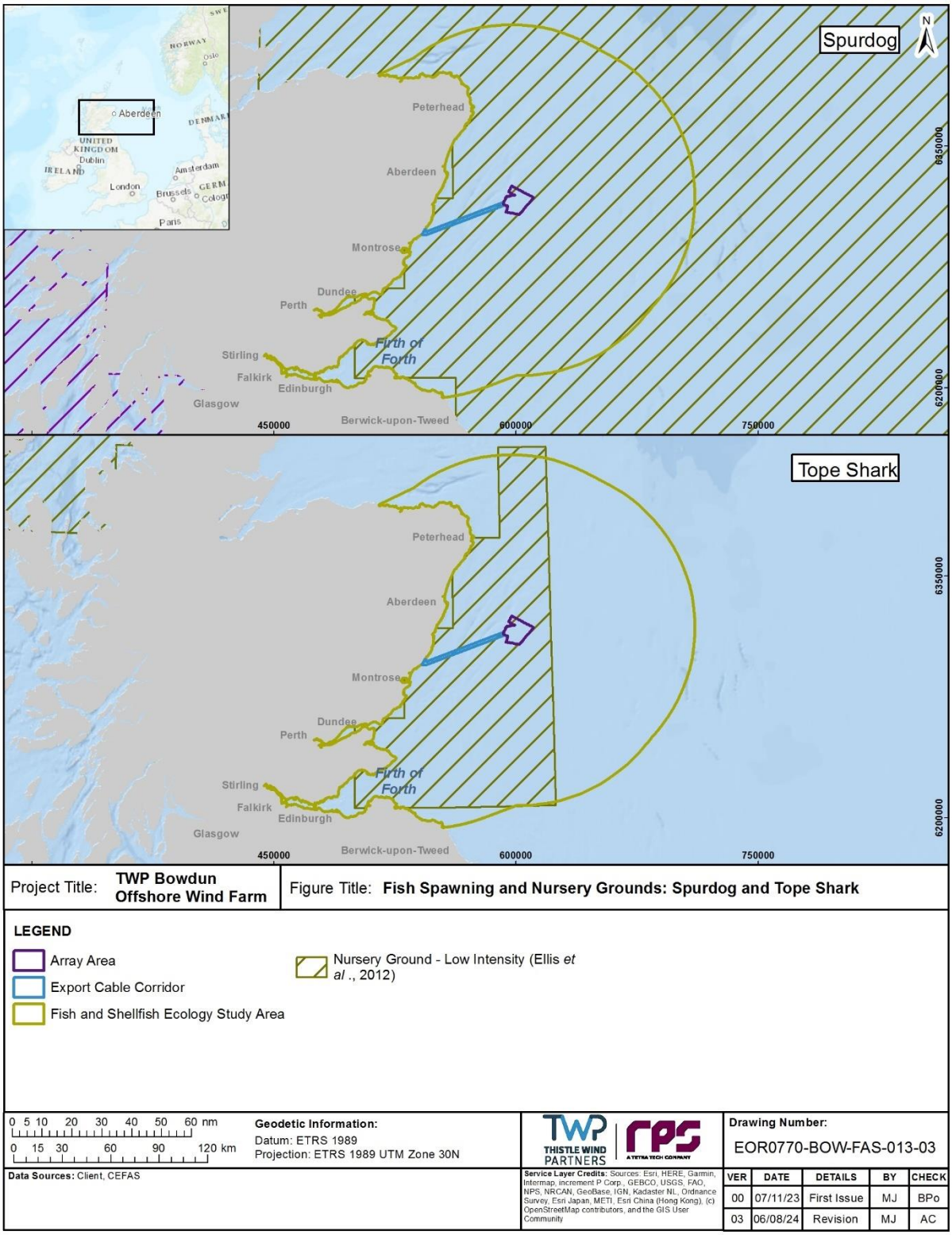


Figure 10.13: Fish Spawning and Nursery Grounds: Spurdog and Tope Shark

Designated Sites and Protected Species

10.1.23 There are five designated sites with fish and shellfish Qualifying Features within the Fish and Shellfish Ecology Study Area, although none overlap with the Scoping Boundary (Figure 10.14). These include an MPA and SACs (Table 10.5). Given the mobile nature of fish and shellfish species, connectivity between the Proposed Development and the designated sites within the Fish and Shellfish Ecology Study Area is still possible, particularly for diadromous species during migration. Further detail on the potential effects on relevant fish and shellfish features of MPAs will be presented in the MPA Screening Assessment (Appendix D: Marine Protected Area Screening). Potential impacts to SACs will be considered in the HRA Stage 1 LSE Screening Report.

10.1.24 Although not within the Fish and Shellfish Ecology Study Area, the River Tweed SAC and River Spey SAC (Figure 10.14) have also been included here based on consultation during the Scoping Workshop on the 25 April 2024. The River Tweed SAC is designated for Annex II Atlantic salmon, sea lamprey, and river lamprey, although has only been considered for Atlantic salmon, due to this species' potential for northward migration through the Fish and Shellfish Ecology Study Area (Table 10.5). The River Spey SAC is designated for Annex II Atlantic salmon, freshwater pearl mussel, and sea lamprey, and has been considered for Atlantic salmon (and freshwater pearl mussel due to their dependence on salmonids) due to this species' potential for eastward migration out of the Moray Firth and into the Fish and Shellfish Ecology Study Area.

10.1.25 Several of the species identified as potentially being present within the Fish and Shellfish Ecology Study Area are listed as PMFs in Scottish waters. These include Atlantic salmon, anglerfish, blue whiting, cod, European eel, European smelt, herring, horse mackerel, ling, mackerel, Norway pout, river lamprey, saithe, sandeel, sand goby, sea lamprey, sea trout, spurdog, and whiting (Tyler-Walters *et al.*, 2016). Further, Atlantic salmon, sea lamprey, river lamprey, and freshwater pearl mussel are all considered Annex II species under the Habitats Directive (Council Directive 92/43/EEC).

Table 10.5: Designated sites within the Fish and Shellfish Ecology Study Area with Relevant Qualifying Features

Designated Site	Distance from the Array Area (km)	Distance to Export Cable Corridor (km)	Relevant Protected Fish and Shellfish Feature
Turbot Bank MPA	35.8	46.0	Sandeel (Scottish PMF)

Designated Site	Distance from the Array Area (km)	Distance to Export Cable Corridor (km)	Relevant Protected Fish and Shellfish Feature
River Dee SAC	39.7	28.6	Annex II Atlantic salmon and freshwater pearl mussel
River South Esk SAC	71.2	18.4	Annex II Atlantic salmon and freshwater pearl mussel
River Tay SAC	131.2	84.4	Annex II Atlantic salmon, freshwater pearl mussel, and river lamprey
River Tweed SAC	136.8	120.8	Annex II Atlantic salmon
River Spey SAC	147.3	152.1	Annex II Atlantic salmon and freshwater pearl mussel
River Teith SAC	196.5	157.4	Annex II Atlantic salmon, sea lamprey, and river lamprey

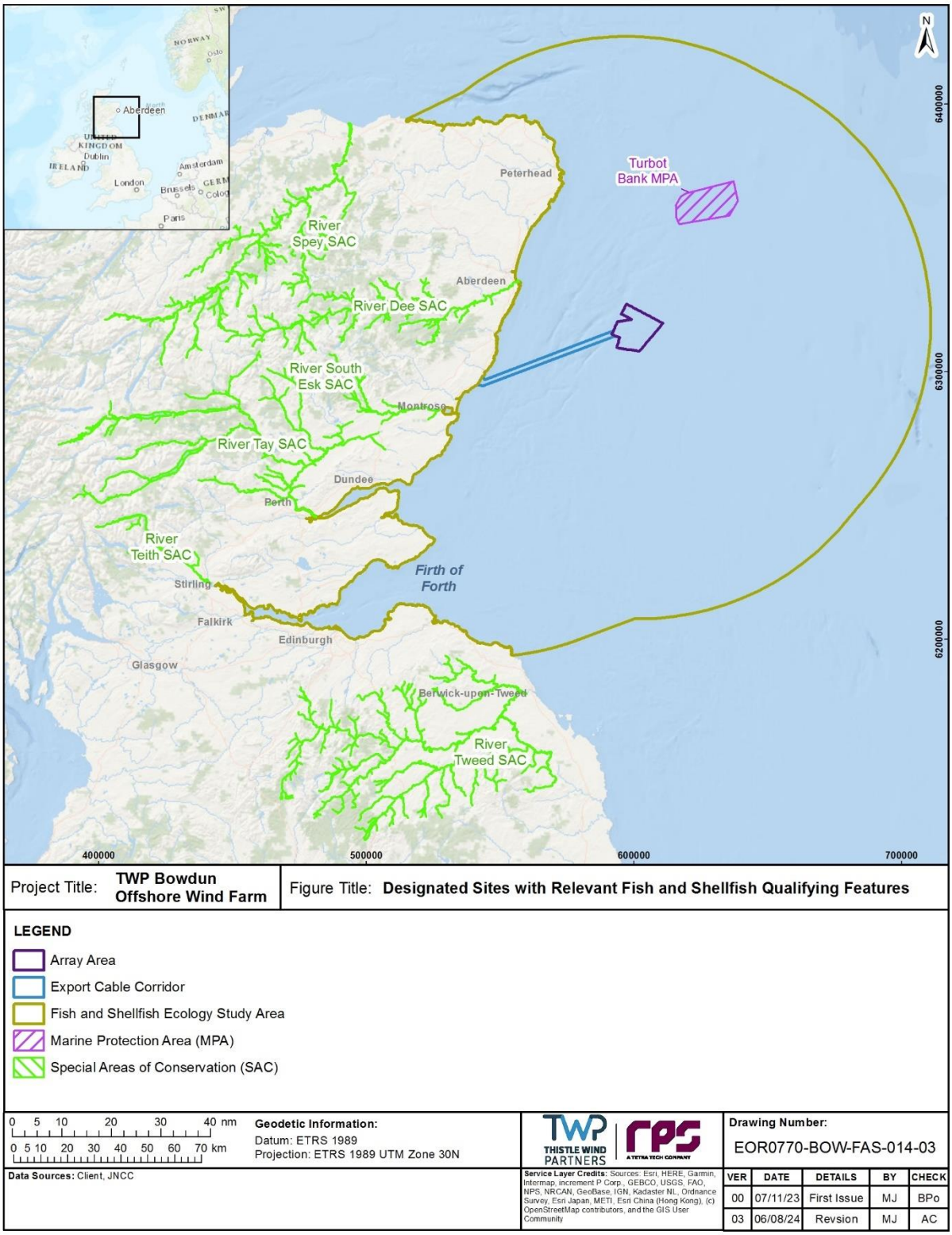


Figure 10.14: Designated Sites with Relevant Fish and Shellfish Qualifying Features

10.5 Embedded Mitigation

10.1.26 The following Embedded Mitigation measures are relevant to fish and shellfish ecology. The Embedded Mitigation measures will evolve over the development process as the EIA progresses.

- Development and adherence to a CSIP post consent.
- Piling will include a combination of a slow start, soft start, ramp up or ADDs. This will be detailed in the Piling Strategy.
- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- Where possible, the use of low order disposal of UXOs will be implemented (i.e. deflagration).

10.1.27 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

10.6 Potential Proposed Development Impacts

10.1.28 A range of potential impacts on fish and shellfish ecology have been identified that may occur during the construction, O&M and decommissioning phases of the Proposed Development.

10.1.29 The impacts that have been scoped into the assessment are outlined in Table 10.6 together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

10.1.30 Potential impacts scoped out of the assessment are presented in Table 10.7, with justification.

Table 10.6: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Fish and Shellfish Ecology

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Temporary habitat loss and/or disturbance	✓	✓	✓	There is potential for temporary habitat loss and/or disturbance due to activities associated with all three phases. In the construction phase, these activities include seabed preparation (i.e. boulder and sand wave clearance), cable installation and the footprint of spud-can legs during jack-up vessel use. In the O&M phase, these activities include cable repair and reburial and the use of jack-up vessels for repair of other Offshore Infrastructure. Finally, in the decommissioning phase, these activities include removal of Offshore Infrastructure and the use of jack-up vessels for Offshore Infrastructure removal.	No site-specific fish and shellfish surveys have been proposed due to the comprehensive desktop data available to characterise the Fish and Shellfish Ecology Study Area. However, any records of fish and shellfish species recorded during the site-specific benthic survey (conducted in spring 2024), and PSA data will be used to further characterise the baseline and identify IEFs.	There will be no specific modelling required to inform the assessment for this impact. The assessment will be quantitative in nature as it will be based on the maximum spatial scale of impact (which will be based on information provided in the PDE).

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Long term habitat loss	✓	✓	✓	In the construction phase, the installation of Offshore Infrastructure, scour protection, and cable protection on the seabed will result in long term habitat loss. This will persist into the O&M phase and continue over the lifecycle of the Proposed Development. In the decommissioning phase, permanent habitat loss will occur under any Offshore Infrastructure that is left *in situ*, such as cable and scour protection, although the decommissioning plan has not yet been refined.	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.
Increased SSCs and associated deposition	✓	✓	✓	There is potential for increased SSCs and associated deposition as a result of activities in all three phases. In the construction phase, these include seabed preparation, foundation installation, and cable installation activities. In the O&M phase, these	Data collected during the site-specific benthic ecology survey and geophysical survey campaign will provide data to support the development of the numerical modelling to be undertaken for the physical processes	Numerical modelling will be conducted to provide an overview of the SSCs and associated deposition as a result of activities associated with the Proposed Development.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				include cable repair and reburial. Finally, in the decommissioning phase, these activities include removal of Offshore Infrastructure.	assessment. Site-specific metocean data may also be used to validate desktop sources.	
Subsea noise impacting fish and shellfish	✓	✓	✓	Subsea noise produced during all three phases could cause behavioural disturbance, injury, or barriers to migrations for sensitive species. In the construction phase, noise sources include piling, UXO clearance, site-investigation surveys, and activities such as jack-up vessel use, cable laying, and cable cutting. In the O&M phase, subsea noise could be produced by Wind Turbine operation and 'snapping' of dynamic cables. The effects of subsea noise from operational OWFs is poorly researched in comparison to other noise sources (such as piling and UXO), however recent publications have	As above for 'Temporary habitat loss and/or disturbance'.	Subsea noise modelling will be undertaken as described in Section 8: Subsea Noise. Relevant noise modelling criteria will be used to assess the potential for disturbance, injury and barriers to migration (i.e. Popper *et al.* (2014)). The hearing ability of different species will be considered in the assessment, including sound pressure and particle motion.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				suggested that this impact should be considered within EIAs and CEA of offshore projects (Mooney *et al.*, 2020, Risch *et al.*, 2023, Stober and Thomsen, 2021, Svendsen *et al.*, 2022, Tougaard *et al.*, 2020). In the decommissioning phase, sources include jack-up vessel use and Offshore Infrastructure removal.		
Introduction of artificial hard substrata and subsequent colonisation of hard structures	×	✓	×	Artificial, hard structures, such as foundations, scour protection, and cable protection, will be installed during the construction phase and persist throughout the O&M phase. These are expected to be colonised by a range of species, which may cause localised increases in biodiversity. Fish and shellfish species may also aggregate around these hard structures, which would	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				represent a change in prey availability.		
Impacts to fish and shellfish due to EMFs	×	✓	×	The presence of unburied cables (such as dynamic cabling) may emit EMFs. These additional EMFs could have an impact on fish and shellfish species, such as impaired navigational ability.	As above for 'Temporary habitat loss and/or disturbance'.	As above for 'Temporary habitat loss and/or disturbance'.
Impacts to fish and shellfish species due to entanglement	×	✓	×	As the PDE for the Proposed Development involves floating Offshore Infrastructure, the presence of dynamic cables and anchor mooring lines may pose a risk of entanglement for mobile species. Further, animals may become entangled in lost and discarded fishing gear and marine debris if these snag on cables and mooring lines. Floating offshore technology is still in its infancy, so there are limited data available to assess this impact. Thus, this impact is	No further data collection or analysis is possible for this impact.	This impact will be assessed qualitatively in the Offshore EIA Report as desktop data sources emerge.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				proposed to be scoped in and will be assessed qualitatively.		

* Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 10.7: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Fish and Shellfish Ecology

Impact	Justification
Accidental pollution to the surrounding environment	There is a risk of accidental pollution from vessels and equipment during all three phases of development. However, this risk is mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP, which will include an MPCP. The EMP and MPCP will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from OSPAR, International Maritime Organisation (IMO), and the International Convention for the Prevention of Pollution from Ships (MARPOL)). Thus, it is unlikely that accidental pollution will occur. In the unlikely event that it did, the magnitude will be minimised through measures such as the MPCP. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
Release of sediment-bound contaminants	Activities in all three phases of development could result in seabed disturbance and the remobilisation of sediment-bound contaminants. These contaminants could have adverse effects on fish and shellfish species. However, sediment chemistry analyses from recent site-specific surveys of other OWFs in the Fish and Shellfish Ecology Study Area have recorded very low levels of contamination (Morven Offshore Wind Limited, 2023, Ossian OWFL, 2023). Sediment chemistry analysis for the Proposed Development is not currently available, however it will be full reviewed once available. This potential impact is proposed to be scoped out of further consideration, subject to the results of the site-specific sediment chemistry. If high sediment contamination levels are found during the site-specific survey, then this impact will be scoped in for the fish and shellfish ecology assessment in the Offshore EIA Report.
Subsea noise from vessels impacting fish and shellfish	The presence of vessels associated with all three phases of development is not likely to represent a significant change from the baseline vessel traffic in the Fish and Shellfish Ecology Study Area. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
INNS	There is potential for the increased risk of introduction and spread of INNS during all phases of development. This is due to vessel movement which may act as vectors

Impact	Justification
	facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent increased available habitat for INNS to colonise in the O&M phase. This impact has been scoped in for benthic ecology (see Section 9: Benthic Ecology). However, given the wider ranging nature and habitat use of fish and shellfish species in comparison to benthic species, this impact is not likely to represent significant impact to fish and shellfish ecology. This, in combination with the embedded mitigation of and INNS management plan has been deemed sufficiently rational to scope out this impact for fish and shellfish ecology.

10.7 Proposed Assessment Methodology

10.1.31 The assessment of fish and shellfish ecology in the Offshore EIA Report will follow the methodology provided in Section 4: EIA Methodology. The following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland (CIEEM, 2022);
- Marine Evidence Based Sensitivity Assessment – A Guide (Tyler-Walters *et al.*, 2018);
- Sound Exposure Guidelines for Fishes and Sea Turtles (Popper *et al.*, 2014);
- Screening Spatial Interactions between Marine Aggregate Application Areas and Atlantic Herring Potential Spawning Habitat (Reach *et al.*, 2013);
- Screening Spatial Interactions between Marine Aggregate Application Areas and Sandeel Habitat (Latto *et al.*, 2013); and
- Guidance on Environmental Considerations for OWF Development (OSPAR Commission, 2008b).

10.1.32 A Fish and Shellfish Ecology Technical Report will be produced alongside the Offshore EIA Report. This will build upon the baseline summarised in Section 10.4 and include the results of the site-specific benthic survey, which were not available at the time of writing this Offshore Scoping Report. This includes fish and shellfish species recorded during benthic sample collection and DDV, and through eDNA sample collection. The PSA data will be used to assess habitat suitability for herring spawning and sandeel, following the methodologies of Reach *et al.* (2013) and Latto *et al.* (2013) respectively. The Fish and Shellfish Ecology Technical Report will also present a more comprehensive overview of relevant desktop data (including those outlined in Table 10.1).

10.1.33 Fish and shellfish IEFs will be identified using the baseline presented within the Fish and Shellfish Ecology Technical Report, which will be carried forward to the assessment in the Offshore EIA Report. The IEFs identified will be assessed against the impacts presented in Table 10.6 for all relevant stages of development (construction, O&M, and decommissioning phases). The significance of these impacts will be assessed by correlating the magnitude of impact against the sensitivity of the IEFs. Where possible, sensitivities will be derived from the MarESA (Tyler-Walters *et al.*, 2018) and the FeAST. Detail on the MarESA and FeAST is provided in Section 9: Benthic Ecology and has not been repeated here. Where sensitivity information is not available in the MarESA or FeAST, suitable data sources will be used to support the assessment.

10.8 Potential Inter-Related Effects

10.1.34 The Offshore EIA Report will consider inter-related effects on fish and shellfish ecology which may arise from the construction, O&M, and decommissioning of the Proposed Development. Inter-related effects refer to the effects arising from the Proposed Development either across their own phases (Proposed Development lifetime) or different effects on one receptor in one phase (receptor led). The Offshore EIA Report will consider inter-related effects of impacts from all three phases of the Proposed Development. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) with the Proposed Development. This will ensure that the Proposed Development is appropriately considered, as a whole, within the inter-related effects assessment.

10.1.35 Inter-related effects on fish and shellfish ecology may also impact the following receptors:

- Section 9: Benthic Ecology;
- Section 11: Marine Mammals;
- Section 12: Offshore Ornithology; and
- Section 13: Commercial Fisheries.

10.9 Potential Cumulative Effects

10.1.36 The majority of the impacts of construction, O&M and decommissioning of the Proposed Development will be located within the Scoping Boundary (with the exception of the impact of subsea noise). However, there is potential for cumulative effects to occur from other projects and activities within the Fish and Shellfish Ecology Study Area. The CEA will follow the approach outlined in Section 4: EIA Methodology and will be included in the fish and shellfish ecology section of the Offshore EIA Report. Projects and

activities that will be considered in the CEA may include, but may not be limited to:

- other OWF projects;
- cable and interconnector projects;
- dredging and disposal activities; and
- other energy projects (e.g. CCS, oil and gas).

10.1.37 Potential impacts to be assessed in the CEA will be as defined for the Proposed Development alone, as set out in Table 10.6.

10.1.38 For the impact of subsea noise, a buffer of 100 km will be implemented to identify relevant projects and activities. This is standard practice, to account for the wider ranging ZoI for subsea noise, in comparison to all other potential impacts to fish and shellfish ecology. For all other impacts, a buffer of 50 km will be implemented, which is suitably precautionary given the localised nature of the impacts.

10.10 Potential Transboundary Impacts

10.1.39 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is potential for a transboundary impact upon fish and shellfish due to construction, O&M, and decommissioning impacts of the Proposed Development. These include:

- injury and disturbance from subsea noise generated during piling;
- injury and disturbance from subsea noise generated during UXO clearance;
- injury and disturbance from subsea noise generate during site investigation surveys;
- injury and disturbance from subsea noise generated by vessel use and other noise producing activities; and
- injury and disturbance from subsea noise generated by Wind Turbine operation.

10.1.40 However, due to the distance of the Proposed Development from the other EEAs (Appendix B: Transboundary Screening), and considering the migration ranges of the fish species in the study area, any potential transboundary impacts have been deemed negligible. Therefore, transboundary impacts for fish and shellfish have been scoped out of further assessment.

10.11 Summary

10.1.41 In the absence of site-specific data, the baseline environment for this Offshore Scoping Report has largely been characterised by available desktop datasets and reports.

10.1.42 Species assemblages are likely to be typical of the North Sea, including demersal species from the following groups: gadoids, flatfish, gobies, gurnards and sandeel. Pelagic species include herring, horse mackerel, mackerel and sprat. Various elasmobranchs may also be present, such as common skate, spotted ray, spurdog and thornback ray (among others). Further, there were three elasmobranch species recorded during DAS across the Array Area: blue shark, basking shark and porbeagle shark.

10.1.43 Diadromous species, including Atlantic salmon, sea trout, river lamprey, and sea lamprey, may also be present within the Fish and Shellfish Ecology Study Area, during their migrations to and from rivers along the east coast of Scotland.

10.1.44 Finally, a range of shellfish species are also likely to occur within the Fish and Shellfish Ecology Study Area, including common shore crab, common whelk, edible crab, European lobster, king scallop, Nephrops, squid, surf clam and velvet swimming crab.

10.1.45 The Array Area and Export Cable Corridor do not overlap with any designated sites with fish and shellfish Qualifying Features (Figure 10.14), however they do overlap with spawning and nursery grounds of various species (see paragraphs 10.1.18 to 10.1.22).

10.1.46 Potential impacts to fish and shellfish ecology are presented and justified in Table 10.6. These include temporary and long-term habitat loss, increased SSCs, introduction and colonisation of hard structures and impacts due to subsea noise and EMF. Impacts proposed to be scoped out of the assessment are presented in Table 10.7, and include accidental pollution, release of sediment-bound contaminants, and subsea noise from vessel operation. Embedded Mitigation measures are presented in Section 10.5, which aim to reduce the magnitude of impact upon fish and shellfish.

10.1.47 The proposed assessment methodology is provided in Section 10.7, with brief detail on the approach to Inter-Related Effects Assessment and the CEA presented in Sections 10.8 and 10.8, respectively. Finally, the potential for transboundary impacts has been scoped out, as presented in Section 10.10.

11 Marine Mammals

11.1 Introduction

11.1.1 This section of the Offshore Scoping Report identifies the marine mammals of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development.

11.1.2 The scope of this marine mammal section encompasses the Scoping Boundary (Figure 1.1, Section 1: Introduction) which includes the Array Area and the Export Cable Corridor (Figure 11.1).

11.1.3 This section is relevant to and should be read alongside the following sections:

- Section 8: Subsea Noise;
- Section 10: Fish and Shellfish Ecology; and
- Section 12: Offshore Ornithology.

11.2 Marine Mammal Study Area

11.2.1 Two Marine Mammal Study Areas have been defined to inform the baseline characterisation (Figure 11.1):

- The Local Marine Mammal Study Area, which is defined as the Scoping Boundary plus a 12 km buffer. DAS were conducted over a two year period (March 2022 to February 2024). These covered the entire POA, plus a 12 km buffer, the results of which will provide site-specific fine-scale abundance and density data.
- The Regional Marine Mammal Study Area, which is defined as the area encompassing the Scoping Boundary and extending further into the NNS towards Scandinavia. This was informed by Marine Mammal Management Units (MUs), namely the North Sea (MU) for harbour porpoise *Phocoena phocoena* and the Coastal East Scotland and Greater North Sea MU for bottlenose dolphin *Tursiops truncatus*. Further detail on MUs is provided in Section 11.4. Given the highly mobile nature of marine mammals, the Regional Marine Mammal Study Area provides wider context for the baseline. It will also be used to inform the assessment for impacts where the ZoI may extend beyond the Local Marine Mammal Study Area (i.e. subsea noise).

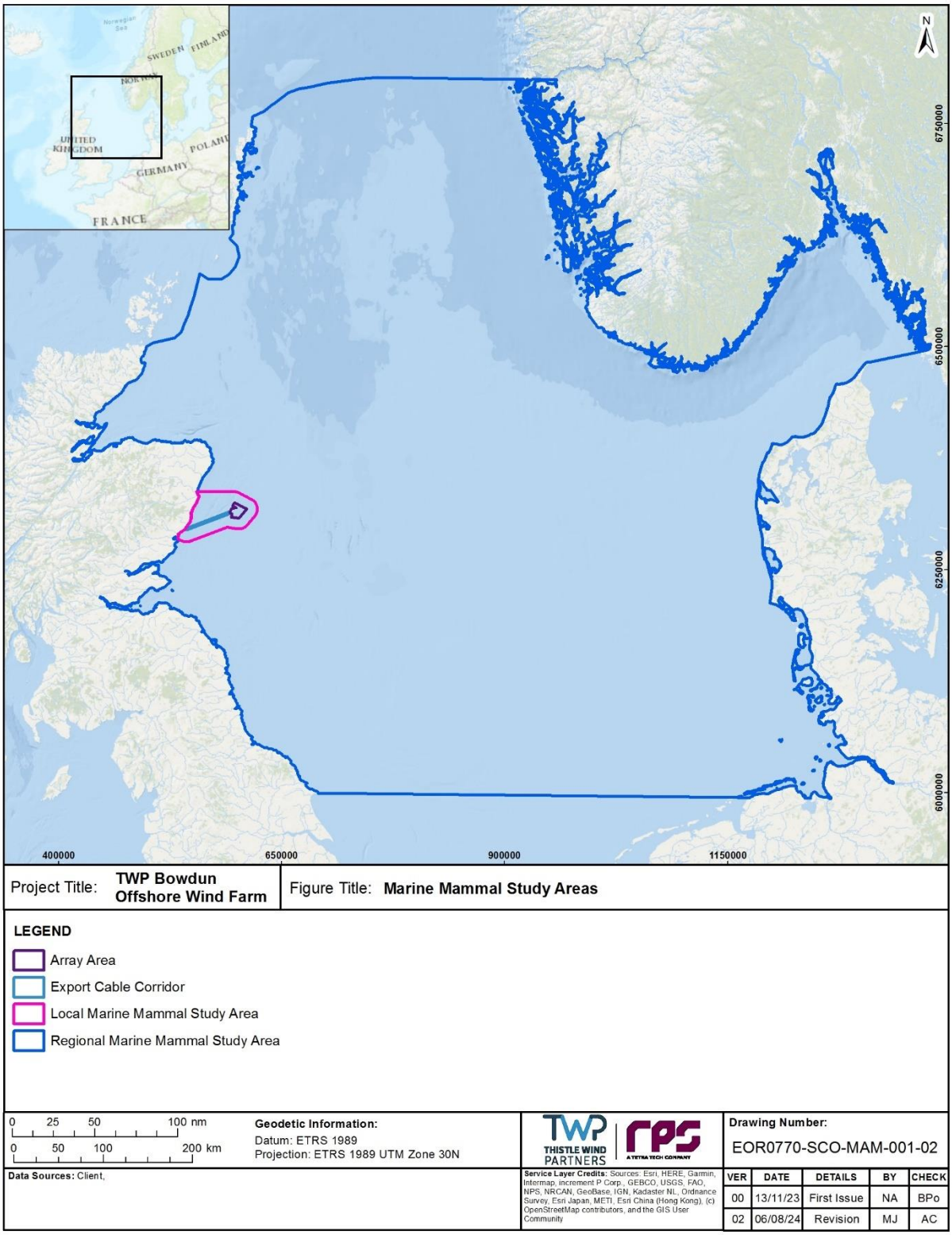


Figure 11.1: Marine Mammal Study Area

11.3 Data Sources

11.3.1 An initial desktop review of key literature and data sources has been undertaken to inform the marine mammal baseline (Table 11.1). The marine mammal baseline presented will provide context to the site-specific DAS data that have been collected monthly across the Local Marine Mammal Study Area between March 2022 and February 2024. The full results of which will be used to inform the marine mammal assessment in the Offshore EIA Report alongside an extensive literature review of all data sources relevant to the region. A comprehensive marine mammal baseline will be provided in the Marine Mammal Technical Report of the Offshore EIA Report.

Table 11.1: Summary of Key Desktop Datasets and Materials

Title	Source	Reference
Estimates of Cetacean Abundance in European Atlantic Waters in Summer 2022 from the Small Cetaceans in European Atlantic Aaters and the North Sea (SCANS) IV Aerial and Shipboard Surveys	SCANS-IV	Gilles *et al.* (2023)
Ossian Array EIA Scoping Report	Ossian OWF Limited	Ossian Offshore Wind Farm Limited (2023)
Morven Offshore Wind Array Project EIA Scoping Report	Morven Offshore Wind Limited	Morven Offshore Wind Limited (2023)
Scientific Advice on Matters Related to the Management of Seal Populations: 2022.	Special Committee on Seals (SCOS)	SCOS (2023)
Scientific Advice on Matters Related to the Management of Seal Populations: 2021.	SCOS	SCOS (2022)
Modelled Density Surfaces of Cetaceans in European Atlantic Waters in Summer 2016 from the SCANS-III Aerial and Shipboard Surveys	University of St Andrews	Lacey *et al.* (2022)
Production of Seabird and Marine Mammal Distribution Models for the East of Scotland	The Scottish Government	Paxton *et al.* (2022)

Title	Source	Reference
Sympatric Seals, Satellite Tracking and Protected Areas: Habitat-Based Distribution Estimates for Conservation and Management	Frontiers in Marine Science	Carter *et al.* (2022)
Berwick Bank Wind Farm Offshore EIA Report, Annex A: Marine Mammal Aerial Survey Data Analysis	SSE Renewables	SSE Renewables (2022d)
Berwick Bank Wind Farm Offshore EIA Report, Chapter 10 Marine Mammals	SSE Renewables	SSE Renewables (2022e)
Updated Abundance Estimates for Cetacean MUs in UK Waters	Inter-Agency Marine Mammal Working Group (IAMMWG)	IAMMWG (2022)
Estimates of Cetacean Abundance in European Atlantic Waters in Summer 2016 from the SCANS-III Aerial and Shipboard surveys. Revised June 2021.	SCANS-III	Hammond *et al.* (2021)
Improving Understanding of Bottlenose Dolphin Movements long the East Coast of Scotland	European Offshore Wind Development Centre	Arso Civil *et al.* (2021)
Regional Baselines for Marine Mammal Knowledge Across the North Sea and Atlantic Areas of Scottish Waters	The Scottish Government	Hague *et al.* (2020)
Distribution Maps of Cetacean and Seabird Populations in the North-East Atlantic	Journal of Applied Ecology	Waggitt *et al.* (2020)
NNG OWF Environmental Statement (ES), Chapter 13 Marine Mammals	NNG OWF	Mainstream Renewable Power (2019c)
The Identification of Discrete and Persistent Areas of Relatively High Harbour Porpoise Density in the Wider UK Marine Area	JNCC	Heinänen and Skov (2015)
Seagreen Firth of Forth Round 3 Zone Marine Mammal Surveys	Seagreen Alpha and Bravo OWFs (have since been renamed to Seagreen 1 and Seagreen 1A)	Sparling (2012)

Title	Source	Reference
Analysis of The Crown Estate (TCE) Aerial Survey Data for Marine Mammals for the Forth and Tay Offshore Wind Developers Group Region.	Sea Mammal Research Unit (SMRU)	Grellier and Lacey (2011)

11.4 Baseline Environment

11.4.1 This section provides a high-level overview of the baseline environment for marine mammals based on an initial review of desktop data sources and the first 22 months of site-specific DAS data that were available at the time of writing. When available, the full dataset will be used to inform the assessment within the Offshore EIA Report.

Site-Specific Survey Results

The Proposed Development

11.4.2 Site-specific DAS have been conducted monthly across the Local Marine Mammal Study Area between March 2022 and February 2024 (24 months). At the time of writing, all 24 months of marine mammal sightings are available and are summarised in Table 11.2 and Table 11.3. Between March 2022 to February 2024, the most commonly recorded species was harbour porpoise (n = 2,412), followed by grey seal *Halichoerus grypus* (n = 324), and white-beaked dolphin *Lagenorhynchus albirostris* (n = 291) (Table 11.2 and Table 11.3). There were 42 minke whale *Balaenoptera acutorostrata*, 12 bottlenose dolphin, 11 Risso's dolphin *Grampus griseus*, and three harbour seal *Phoca vitulina* also recorded. There were also 411 animals that could not be identified to species level, including a total of 41 unidentified marine mammals (this refers to records where the quality of the imagery and/or orientation of the animal prevented higher taxonomic identification). There were 317 unidentifiable seals, 51 animals only identifiable as a dolphin/porpoise, and two unidentified whales. Total sightings were highest between March to September (Table 11.2 and Table 11.3).

Table 11.2: Marine Mammal Sightings from the Site-Specific DAS from March 2022 to December 2022

Species	Total Sightings (individual animals) in 2022										Total in 2022
	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	
Harbour porpoise	269	117	290	64	61	37	50	103	43	8	**1,042**
Unidentified seal species	8	20	101	10	68	29	4	3	3	0	**246**
Grey seal	18	13	140	11	17	2	2	6	1	7	**217**
White-beaked dolphin	0	0	0	1	10	112	6	0	0	0	**129**
Dolphin or porpoise species	1	3	12	2	2	6	0	2	7	0	**35**
Minke whale	1	4	1	2	1	18	1	0	0	0	**28**
Unidentified marine mammal	2	5	6	3	0	0	4	0	1	2	**23**
Risso's dolphin	0	0	0	0	0	0	0	4	0	3	**7**
Bottlenose dolphin	0	6	0	0	0	0	0	0	0	0	**6**
Harbour seal	2	0	0	1	0	0	0	0	0	0	**3**
Unidentified whale species	0	0	1	0	0	0	0	0	0	0	**1**
Monthly total	**301**	**168**	**551**	**94**	**159**	**204**	**67**	**118**	**55**	**20**	**1,737**

Table 11.3: Marine Mammal Sightings from the Site-Specific DAS from January to December 2023

Species	Total Sightings (individual animals) in 2023												Total in 2023
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	
Harbour porpoise	4	41	50	540	104	49	20	157	253	64	32	6	**1,320**
White-beaked dolphin	0	0	5	0	0	29	12	48	63	0	0	5	**162**
Grey seal	0	10	4	31	10	9	4	16	8	9	5	1	**107**
Unidentified seal species	1	2	4	10	24	3	3	0	7	2	5	0	**61**
Unidentified marine mammal	0	1	4	4	0	1	2	0	2	0	0	2	**16**
Dolphin or porpoise species	0	0	8	0	0	0	0	0	6	0	0	0	**14**
Minke whale	0	0	0	5	2	3	0	2	2	0	0	0	**14**
Bottlenose dolphin	0	0	0	0	0	0	6	0	0	0	0	0	**6**
Risso's dolphin	1	0	0	0	0	0	0	1	0	0	0	2	**4**
Unidentified whale species	1	0	0	0	0	0	0	0	0	0	0	0	**1**
Monthly total	**7**	**54**	**75**	**590**	**140**	**94**	**47**	**224**	**341**	**75**	**42**	**16**	**1,705**

Table 11.4: Marine Mammal Sightings from the Site-Specific DAS from January and February 2024, together with the sum total over the surveyed period (March 2022 to February 2024)

Species	Total Sightings (individual animals) in 2024		Total in 2024	Total over 24 months of data
	Jan	Feb		
Harbour porpoise	27	23	**50**	**2,412**
Grey seal	5	3	**8**	**332**
Unidentified seal species	4	6	**10**	**317**
White-beaked dolphin	0	0	**0**	**291**
Dolphin or porpoise species	2	0	**2**	**51**
Minke whale	0	0	**0**	**42**
Unidentified marine mammal	0	2	**2**	**41**
Bottlenose dolphin	0	0	**0**	**12**
Risso's dolphin	0	0	**0**	**11**
Harbour seal	0	0	**0**	**3**
Unidentified whale species	0	0	**0**	**2**
Monthly total	**38**	**34**	**72**	**3,514**

Nearby Offshore Wind Farm Projects and Surveys within the Regional Marine Mammal Study Area

11.4.3 Results of site-specific surveys conducted for other OWF projects in the Regional Marine Mammal Study Area can also provide insight into species abundances. The locations of nearby OWF projects with available site-specific marine mammal data are shown in Figure 11.2. In addition, Paxton *et al.* (2022) present results of aerial surveys conducted across the east coast of Scotland, which overlap directly with the Local Marine Mammal Study Area. The results of these surveys are summarised in Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development.

11.4.4 Harbour porpoise, grey seal, white-beaked dolphin, minke whale, and harbour seal were recorded at Ossian OWF (25.4 km away), Berwick Bank OWF (46.4 km), Seagreen 1, Seagreen 1A and the Round 3 Zone within the Firths of Forth and Tay (18.1 km) and NNG OWF (49.5 km) (Figure 11.2) (Grellier and Lacey, 2011; Mainstream Renewable Power, 2019c; Ossian Offshore Wind Farm Limited, 2023; Sparling, 2012 and SSE Renewables, 2022d). As above for the Proposed Development, the most common species recorded in all five surveys was harbour porpoise (Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development). In addition to the aforementioned species, seven bottlenose dolphin were recorded at Berwick Bank OWF and four common dolphin *Delphinus delphis* were recorded at Ossian OWF (Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development). Five Risso's dolphin were recorded during the east coast of Scotland surveys (Paxton *et al.*, 2022). One killer whale *Orcinus orca* was recorded at both the NNG and the Round 3 Zone surveys, and one white-sided dolphin *Lagenorhynchus acutus* was recorded at Seagreen 1 and 1A (Grellier and Lacey, 2011; Mainstream Renewable Power, 2019c and Sparling, 2012).

11.4.5 Although species sighting counts were not provided in the Scoping Report for Morven OWF (10.1 km away), the following species were recorded: harbour porpoise, white-beaked dolphin, grey seal, and minke whale (Morven Offshore Wind Limited, 2023). Densities were highest during the summer months (Morven Offshore Wind Limited, 2023).

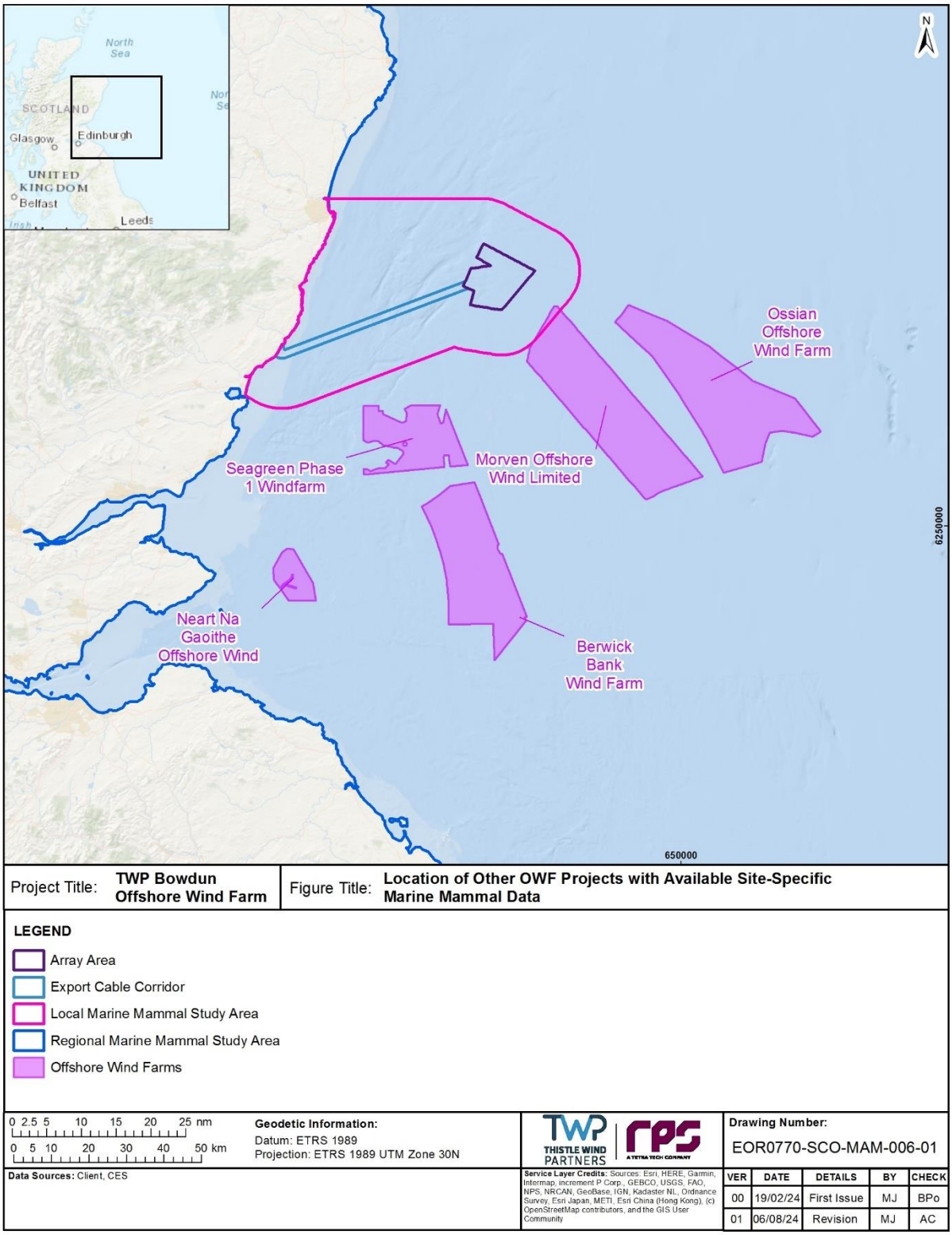


Figure 11.2: Location of Other OWF Projects with Available Site-Specific Marine Mammal Data

Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development

Project	Survey Period	Total Sightings (Individual Animals)								Reference
		Harbour Porpoise	Grey Seal	White-Beaked Dolphin	Minke Whale	Harbour Seal	Common Dolphin	Bottlenose Dolphin	Unidentified Marine Mammal	
Ossian OWF	Mar 2021 – Sept 2022	825	26	72	16	4	4	0	46	Ossian Offshore Wind Farm Limited (2023)
East coast of Scotland survey	Feb 2020 – Mar 2021	437	27	130	31	0	27	0	186	Paxton *et al.* (2022)
Berwick Bank OWF	Mar 2019 – Apr 2021	2,034	180	45	57	3	0	7	532	SSE Renewables (2022d)
Seagreen 1 and 1A	May 2010 – Nov 2011	112	901	69	57	24	0	0	117	Sparling (2012)
NNG OWF	Nov 2009 – Oct 2011	172	100	16	12	23	0	0	19	Mainstream Renewable Power (2019c)
Round 3 Zone	Summer 2009 and winter 2009, 2010	197	5	114	8	1	0	1	422	Grellier and Lacey (2011)

SCANS Surveys

11.4.6 Small Cetaceans in European Atlantic Waters in the North Sea (SCANS) reports cetacean densities and abundances in the North Sea and adjacent waters from aerial and shipboard surveys. The first SCANS survey was conducted in summer 1994 (Hammond *et al.*, 2002), the second in summer 2005 as SCANS-II (Hammond *et al.*, 2013) and the third in summer 2016 for SCANS-III (Hammond *et al.*, 2021). The most recent survey (SCANS-IV) was conducted in summer 2022 (Gilles *et al.*, 2023). The results of SCANS-III and SCANS-IV have been summarised in Table 11.6: Densities and Abundances of All Cetaceans Recorded within Block R (SCANS-III) and Block NS-D (SCANS-IV) (Gilles et al., 2023, Hammond et al., 2021) below. The Local Marine Mammal Study Area is located within survey block R in SCANS-III and block NS-D in SCANS-IV and it should be noted that there is no difference between the two blocks other than their names (Figure 11.3). Cetaceans recorded in both SCANS-III and SCANS-IV were: harbour porpoise, minke whale and white-beaked dolphin. Bottlenose dolphin and white-sided dolphin were both recorded in SCANS-III only, whilst fin whale *Balaenoptera physalus* were recorded in SCANS-IV only (Table 11.6: Densities and Abundances of All Cetaceans Recorded within Block R (SCANS-III) and Block NS-D (SCANS-IV) (Gilles et al., 2023, Hammond et al., 2021)) (Gilles *et al.*, 2023, Hammond *et al.*, 2021).

Table 11.6: Densities and Abundances of All Cetaceans Recorded within Block R (SCANS-III) and Block NS-D (SCANS-IV) (Gilles et al., 2023, Hammond et al., 2021)

Species	Survey	Density (animals per km^2) (CV = Coefficient of Variance)	Estimated Abundance (number of animals within SCANS block) (CL = 95% Confidence Limit)
Harbour porpoise	SCANS-IV	0.5985 (CV = 0.367)	38,577 (CL = 18,017 – 76,361)
	SCANS-III	0.599 (CV = 0.287)	38,646 (CL = 20,584 – 66,524)
Bottlenose dolphin	SCANS-IV	No sightings	-
	SCANS-III	0.0298 (CV = 0.861)	1,924 (CL = 0 – 5,048)
White-beaked dolphin	SCANS-IV	0.0799 (CV = 0.481)	5,149 (CL = 961 – 10,586)
	SCANS-III	0.243 (CV = 0.484)	15,694 (CL = 3,022 – 33,340)
White-sided dolphin	SCANS-IV	No sightings	-
	SCANS-III	0.0100 (CV = 0.994)	644 (CL = 0 – 2,069)
Minke whale	SCANS-IV	0.0419 (CV = 0.594)	2,702 (CL = 547 – 7,357)
	SCANS-III	0.0387 (CV = 0.614)	2,498 (CL = 604 – 6,791)

Species	Survey	Density (animals per km²) (CV = Coefficient of Variance)	Estimated Abundance (number of animals within SCANS block) (CL = 95% Confidence Limit)
Fin whale	SCANS-IV	0.0009 (CV = 947)	57 (CL = 10 – 332)
	SCANS-III	No sightings	-

Species Scoped In and Out of the Assessment

11.4.7 Based on the information presented in the preceding sections, the following marine mammal species are proposed to be scoped into the assessment: harbour porpoise, bottlenose dolphin, white-beaked dolphin, grey seal, harbour seal, minke whale, fin whale and humpback whale *Megaptera novaeangliae*, with the latter two being assessed qualitatively in the Offshore EIA Report. Further information on each species is presented in the following sections.

11.4.8 Low numbers of killer whale, common dolphin, Risso's dolphin, and white-sided dolphin have been recorded in the vicinity of the Proposed Development (paragraphs 11.4.4 to 11.4.6), with 11 Risso's dolphin recorded during the DAS for the Proposed Development (Table 11.2 and Table 11.3). These species are considered to be rare or occasional visitors in the Regional Marine Mammal Study Area and are therefore not considered further. For example, recent distribution maps of the North Sea and Northern Atlantic Ocean suggest that common dolphin densities are low within the North Sea, and the species is present in high abundance along the West coast of the UK, Ireland, France, and the Iberian Peninsula (Waggitt *et al.*, 2020). This is supported by the results of Paxton *et al.* (2022), who recorded a low number of encounters during aerial surveys on the east coast of Scotland (Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development). Finally, a comprehensive review by Hague *et al.* (2020) also concluded that common dolphin distribution is primarily within the Western UK, and there will be little overlap with the DPO areas on the East coast of Scotland. It should be noted that since the publication of Hague *et al.* (2020), some of these DPOs have been designated as POAs.

11.4.9 The Waggitt *et al.* (2020) distribution maps suggest that Risso's dolphin show a similar distribution to common dolphin, and are largely a West coast species. Hague *et al.* (2020) concluded that although Risso's dolphins may be present in the summer, they typically favour deep, offshore waters, and like common dolphin, there will be little overlap with the DPO areas on the East coast of Scotland (e.g. the Proposed Development, which is now POA area E3).

11.4.10 Killer whale and white-sided dolphin share a similar distribution, with highest abundance in Northern waters above Shetland and greater abundance on the West coast of the UK and Ireland in

comparison to the North Sea (Waggitt *et al.*, 2020). As above for common dolphin and Risso's dolphin, the extensive review by Paxton *et al.* (2022) concluded that killer whale and white-sided dolphin had the potential to be present in very low numbers and there would be little expected overlap with the DPO and POA sites. However, during the Scoping Workshop on the on 25 April 2024, NatureScot advised that the full DAS dataset and further data sources should be consulted to determine the exclusion of common dolphin, Risso's dolphin, or any other species from the Offshore EIA Report. Therefore, available data will be reviewed during the preparation of the Technical Report, and the potential for these species to occur within the Local Marine Mammal Study Area and wider potential will be identified, which will determine their inclusion/exclusion in the Offshore EIA Report.

Marine Mammal Management Units

11.4.11 Marine mammal MUs have been defined by Inter-Agency Marine Mammal Working Group (IAMMWG) (2022) for cetaceans and by Special Committee on Seals (SCOS) (2023) for seals. The cetacean MUs differ between species, and are available for harbour porpoise, bottlenose dolphin, white-beaked dolphin, and minke whale (IAMMWG, 2022). There are no MUs defined for fin whale or humpback whale. The relevant cetacean and Seal Management Units (SMUs) are presented in Figure 11.3, and estimated population sizes for each are presented in Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs.

Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs

Species	MU	Estimated Population Size (number of animals within MU) (CV)	95% Confidence Interval for Population Estimate	Source
Harbour porpoise	North Sea MU	346,601 (0.09)	289,498 – 419,967	IAMMWG (2022)
Bottlenose dolphin	Coastal East Scotland MU	224 (0.02)	214 – 234	
	Greater North Sea MU	1,885 (0.8)	476 – 7,461	
White-beaked dolphin	Celtic and Greater North	43,951 (0.22)	28,439 – 67,924	

Species	MU	Estimated Population Size (number of animals within MU) (CV)	95% Confidence Interval for Population Estimate	Source
Minke whale	Seas (CGNS) MU	20,118 (0.18)	14,061 – 28,786	
Grey seal	East Scotland SMU	10,784*	N/A	SCOS (2023)
Harbour seal		364	298 - 485	

*For grey seal, population estimates were not available for the relevant SMU, but they were derived from the most recent August counts at haul-out sites (SCOS, 2023). The most recent August count at the East Scotland SMU was 2,712 (SCOS, 2023). The estimated population size provided in this table was calculated using the latest scalar of 25.15% as provided in SCOS (2022).

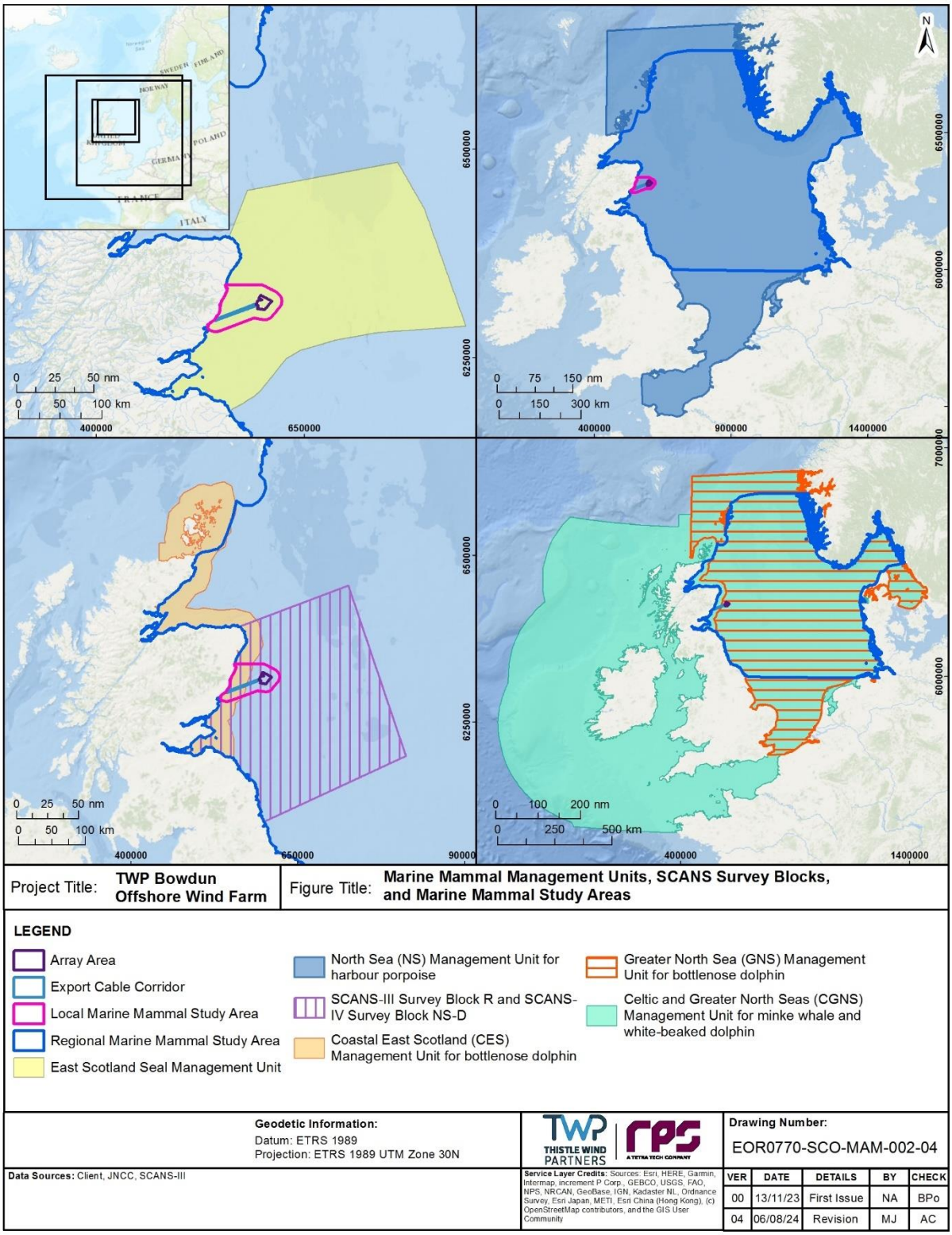


Figure 11.3: Marine Mammal Management Units, SCANS Survey Blocks, and Marine Mammal Study Areas

Species Accounts

11.4.12 The following sections present background information on the eight marine mammal species proposed to be scoped into the assessment. Marine mammals are protected under a range of national and international legislation, including Annex II (harbour porpoise, bottlenose dolphin, grey seal, and harbour seal) and Annex IV of the Habitats Directive (all other cetaceans). They are all also Scottish PMFs, which are habitats and species that are considered to be of conservation priority in Scottish waters (Tyler-Walters *et al.,* 2012).

Harbour Porpoise

11.4.13 Harbour porpoise are the most abundant cetacean in UK waters and are found throughout the North Sea and Regional Marine Mammal Study Area (Evans and Waggitt, 2020, Gilles *et al.*, 2023). Alongside being the most abundant cetacean in the UK, they are also one of the smallest, and therefore have a high body surface area to volume ratio (Kastelein *et al.*, 2019a). As a result, they have a high metabolic rate and must feed often to maintain a stable body temperature (Kastelein *et al.*, 1997, Rojano-Doñate *et al.*, 2018). Their high metabolic rate means that they are particularly sensitive to any disruption to foraging and are susceptible to starvation (Kastelein *et al.*, 2019b, Wisniewska *et al.*, 2016). Their diets are very diverse and vary regionally, but mainly consist of cephalopods and fish such as sandeels *Ammodytidae* and whiting *Merlangius merlangus* (Ransijn *et al.*, 2019, Santos and Pierce, 2003). Long term data from the Moray Firth showed that harbour porpoise were detected in shallow, sandy areas during the day and in deeper waters with muddy substrates at sunrise, sunset, and night (Williamson *et al.*, 2017). This suggests that access to multiple habitats is necessary for species success.

11.4.14 The SCANS-III and SCANS-IV data represent the most recent broadscale abundance data for harbour porpoise in the Regional Marine Mammal Study Area. The most recent population estimate for the SCANS-IV survey block NS-D overlapping the Local Marine Mammal Study Area is 38,577 animals, a slight decrease from the 38,646 estimated for block R in SCANS-III (Table 11.6) (Gilles *et al.*, 2023, Hammond *et al.*, 2021). The Local Marine Mammal Study Area and Regional Marine Mammal Study Area are situated within the North Sea MU for harbour porpoise (Section 11.4.11), which has an estimated population of 346,601 individuals (Table 11.5) (IAMMWG, 2022). This MU population estimate is based on SCAN-III data, and estimates based on the recent SCANS-IV data will be included in the Marine Mammal Technical Report (if available). Using the SCANS-III data, Lacey *et al.* (2022) have produced density hotspot maps for the harbour porpoise at a finer scale than the SCANS-III survey blocks. Within the Local Marine Mammal Study Area, the density of harbour

porpoise remodelled by Lacey *et al.* (2022) was between 0.25 to 0.75 animals per km^2. As above for the MU population estimates, these density data are not yet available for the SCANS-IV survey and will be included within the Marine Mammal Technical Report, if available at the time of writing.

11.4.15 It should be noted that the SCANS data only reflect summer distributions, where marine mammal abundance tends to be higher. Cetacean distribution maps produced by Waggitt *et al.* (2020) highlight higher harbour porpoise density within the Regional Marine Mammal Study Area in July in comparison to January. Similarly, harbour porpoise observations in the East coast of Scotland were higher between April to July in a 2020 to 2021 survey by Paxton *et al.* (2022). A comprehensive review by Hague *et al.* (2020) concludes that harbour porpoise are resident and abundant year-round in Scottish waters, with a distribution that overlaps with the Proposed Development.

11.4.16 An analysis of 18 years of data was conducted to identify persistent areas of harbour porpoise density in the UK (Heinänen and Skov, 2015). Within the Regional Marine Mammal Study Area, areas of persistently high harbour porpoise density were the Moray Firth and the Southern North Sea (Heinänen and Skov, 2015). As harbour porpoise are an Annex II species, the Southern North Sea has been designated as a SAC for their protection (see paragraphs 11.4.44 to 11.4.45).

11.4.17 Given the information presented in the preceding paragraphs and the preliminary results of the site-specific DAS for the Proposed Development and other projects within the Regional Marine Mammal Study Area, it is concluded that harbour porpoise are likely to occur year-round within the Local Marine Mammal Study Area and wider potential ZoIs.

Bottlenose Dolphin

11.4.18 Bottlenose dolphin are large odontocetes (i.e. toothed whales) with a worldwide distribution in temperate and tropical waters. They are highly flexible in their foraging behaviour and habitat use (Fernandez-Betelu *et al.*, 2019, Genov *et al.*, 2019) and typically feed on fish (Barros and Wells, 1998). In Scottish waters, there are two different ecotypes for bottlenose dolphin: the wide-ranging offshore ecotype and the resident coastal ecotype (Louis *et al.*, 2014). There is one resident coastal population in the Scottish Waters, in the Moray Firth, however, there is less certainty in the distribution and abundance of the offshore ecotype (Cheney *et al.*, 2018, Cheney *et al.*, 2013). The year-round Moray Firth resident population is the only one in the North Sea (and therefore the Regional Marine Mammal Study Area) (Robinson *et al.*, 2017). This population is thought to represent the species' northern range, and individuals here are typically very large,

at up to 4 m in length and weighing up to 500 kg (Scottish Wildlife Trust, 2024). This resident population is known to show high site fidelity to the Moray Firth, which is understood to be their core location (Cheney *et al.*, 2013, Fernandez-Betelu *et al.*, 2019). As above for harbour porpoise, bottlenose dolphin are an Annex II species, and the Moray Firth SAC was established to protect this population (see paragraphs 11.4.44 to 11.4.46).

11.4.19 The most recent population estimate for the SCANS-III survey block overlapping the Local Marine Mammal Study Area is 1,924 animals, with no sightings of bottlenose dolphin in SCANS-IV (Table 11.6: Densities and Abundances of All Cetaceans Recorded within Block R (SCANS-III) and Block NS-D (SCANS-IV) (Gilles et al., 2023, Hammond et al., 2021)) (Gilles *et al.*, 2023, Hammond *et al.*, 2021). Both the Coastal East Scotland MU and Greater North Sea MU for bottlenose dolphin intersect with the Local Marine Mammal Study Area and Regional Marine Mammal Study Area (Section 11.4.11). These MUs have estimated population sizes of 224 and 1,885 animals, respectively (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs) (IAMMWG, 2022). The most recent population estimate for coastal East Scotland, the area encompassing the Moray Firth, Tay Estuary, Firth of Forth and the coastal waters connecting them, is 213 animals (95% CI: 189 – 244) (Arso Civil *et al.*, 2021). Within the Local Marine Mammal Study Area, the density of bottlenose dolphin remodelled by Lacey *et al.* (2022) is up to 0.025 animals per km^2.

11.4.20 A comprehensive review by Hague *et al.* (2020) concludes that the bottlenose dolphin coastal ecotype are year-round residents in Scottish waters. They have a primarily coastal distribution, so have lower potential overlap with the Array Area, and are more likely to interact with the Export Cable Corridor. Given the information above, it is concluded that bottlenose dolphin are likely to occur year-round within the Local Marine Mammal Study Area and wider potential ZoIs.

White-Beaked Dolphin

11.4.21 White-beaked dolphin are the second most common cetacean in the North Sea after harbour porpoise (Schick *et al.*, 2020). They are typically found in waters between 50 to 100 m deep along the continental shelf (Hammond et al., 2013). White-beaked dolphin are mainly present within the North Sea, which, at the time of the study, was estimated in IJsseldijk *et al.* (2018) as having a population of approximately 36,000 individuals. Density hotspot maps by Waggitt *et al.* (2020) suggest highest abundances in the NNS, with some abundance in Western Scotland. They prey on fish, cephalopods, and crustaceans (Sea Watch Foundation, 2012), and a study on the stomach contents of 45 stranded individuals in the North Sea reported that whiting and cod *Gadus morhua* were the most common prey species (Jansen et al., 2010).

11.4.22 The most recent population estimate for the SCANS-IV survey block overlapping the Local Marine Mammal Study Area is 5,149 animals, a large decrease from the 15,694 estimated in SCANS-III (Table 11.6) (Gilles *et al.*, 2023, Hammond *et al.*, 2021). The Local Marine Mammal Study Area and Regional Marine Mammal Study Area are situated within the Celtic and Greater North Seas (CGNS) MU for white-beaked dolphin (paragraph 11.4.11), which has an estimated population of 43,951 individuals (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs) (IAMMWG, 2022). This MU population estimate is based on SCANS-III data, and estimates based on the recent SCANS-IV data will be included in the Marine Mammal Technical Report. Using the SCANS-III data, Lacey *et al.* (2022) have produced density hotspot maps for white-beaked dolphin at a finer scale than the SCANS-III survey blocks. Within the Local Marine Mammal Study Area, the density remodelled by Lacey *et al.* (2022) is between 0.05 to 0.3 animals per km^2. As above for the MU population estimates, these density data are not yet available for the SCANS-IV survey and will be included within the Marine Mammal Technical Report, if available.

11.4.23 It should be noted that the SCANS data only reflect summer distributions, where marine mammal abundance tends to be higher. Cetacean distribution maps produced by Waggitt *et al.* (2020) highlight similar white-beaked dolphin density within the Regional Marine Mammal Study Area in July in comparison to January. However, white-beaked dolphin observations on the East coast of Scotland were highest in June and July in a 2020 to 2021 survey by Paxton *et al.* (2022). Hague *et al.* (2020) conclude that white-beaked dolphin are resident and abundant year-round in Scottish waters, with a fairly widespread distribution that overlaps with the Proposed Development.

11.4.24 Given the information presented in the preceding paragraphs and the preliminary results of the site-specific DAS for the Proposed Development and other projects within the Regional Marine Mammal Study Area, it is concluded that white-beaked dolphin are likely to occur year-round within the Local Marine Mammal Study Area and wider potential ZoIs.

Minke Whale

11.4.25 Minke whale are the smallest and most common mysticete (e.g. baleen whale) observed in the UK (Evans and Waggitt, 2020, Robinson *et al.*, 2021). Within the Regional Marine Mammal Study Area, they are common along the Southern coast of the Moray Firth and more frequent in the Northern and CNS than in the South (Risch *et al.*, 2019). There is evidence that the species undergoes large, seasonal migrations between breeding and feeding grounds, however these grounds have not been conclusively identified in UK waters (Risch *et al.*, 2014; Risch *et al.*, 2019). Minke whale sightings are more common

in the summer months, when minke whales undertake seasonal movements for foraging (Robinson *et al.*, 2009; Tetley *et al.*, 2008). The highly productive waters along the Southern coast of the Moray Firth support rich feeding grounds of key prey species such as cod, herring, mackerel *Scomber scombrus* and sandeel (NatureScot, 2020a). Due to this, the Southern Trench MPA has been designated in this area for the protection of Annex IV minke whale (see paragraphs 11.4.44 to 11.4.46).

11.4.26 The most recent population estimate for the SCANS-IV survey block overlapping the Local Marine Mammal Study Area is 2,702 animals, a slight increase from the 2,498 estimated in SCANS-III (Table 11.6: Densities and Abundances of All Cetaceans Recorded within Block R (SCANS-III) and Block NS-D (SCANS-IV) (Gilles et al., 2023, Hammond et al., 2021)) (Gilles *et al.*, 2023, Hammond *et al.*, 2021). The Local Marine Mammal Study Area and Regional Marine Mammal Study Area are situated within the CGNS MU for minke whale (paragraph 11.4.1,), which has an estimated population of 20,118 individuals (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs) (IAMMWG, 2022). This MU population estimate is based on SCANS-III data, and estimates based on the recent SCANS-IV data will be included in the Marine Mammal Technical Report, if available at the time of writing. Using the SCANS-III data, Lacey *et al.* (2022) have produced density hotspot maps for minke whale at a finer scale than the SCANS-III survey blocks. Within the Local Marine Mammal Study Area, the density remodeled by Lacey *et al.* (2022) is between 0.01 to 0.05 animals per km^2. As above for the MU population estimates, these finer scale density data are not yet available for the SCANS-IV survey results and will be included within the Marine Mammal Technical Report, if available.

11.4.27 It should be noted that the SCANS data only reflect summer distributions, when minke whale abundance tends to be higher. Cetacean distribution maps produced by Waggitt *et al.* (2020) highlight increased minke whale density within the Regional Marine Mammal Study Area in July in comparison to January. In addition, minke whale observations on the East coast of Scotland were highest in June and July in a 2020 to 2021 survey by Paxton *et al.* (2022). Hague *et al.* (2020) conclude that minke whale are present within Scottish waters during the summer months, with some overlap with the DPO and PO areas, especially those near the Moray Firth.

11.4.28 Given the information presented in the preceding paragraphs and the preliminary results of the site-specific DAS for the Proposed Development and other projects within the Regional Marine Mammal Study Area, it is concluded that minke whale are likely to occur within the Local Marine Mammal Study Area and wider potential ZoIs during the summer months.

Fin Whale

11.4.29 Fin whale are large baleen whales which undertake lengthy seasonal migrations. The species is not typically recorded in high densities in the North Sea and European waters, however it may be present within the summer months (Edwards *et al.*, 2015). For example, there were 984 fin whale sightings in SCANS-III, although they were only recorded in the Bay of Biscay and Iberian Peninsula (Hammond *et al.*, 2021). Waggitt *et al.* (2020) presented higher summer densities of fin whale in these areas in July, in comparison to January. In the SCANS-IV survey, 263 fin whale sightings were recorded across all survey blocks, four of which were within the North Sea, with the remainder in the Bay of Biscay and Iberian Peninsula (Gilles *et al.*, 2023). Of these four sightings within the North Sea, one was located within block NS-D where the Local Marine Mammal Study Area is situated, and the remaining three were between North Shetland and Norway (Gilles *et al.*, 2023). This corresponds to high latitude feeding grounds for fin whale, which have been identified in the waters between mainland Norway and Svalbard (Løviknes *et al.*, 2021).

11.4.30 Records of fin whale strandings are increasing in the North Sea (Haelters *et al.*, 2018, Kinze *et al.*, 2018), suggesting that they are potentially distributed within this area. Berrow and Whooley (2022) present a review of stranding records from the East coast of the UK (from Edinburgh to Kent), Belgium, the Netherlands, Germany and Denmark (excluding the Baltic), identifying 31 strandings since 2000. There were 18 from the East coast of the UK, and 13 from Belgium, the Netherlands, Germany and Denmark (Berrow and Whooley, 2022).

11.4.31 Based on the results of the recent publications presented here, this species is also proposed to be included in the assessment for the Proposed Development. It is concluded that fin whale has the potential to occur within the Local Marine Mammal Study Area and wider potential ZoIs in the summer months and will be assessed qualitatively in the Offshore EIA Report.

Humpback Whale

11.4.32 Humpback whale are large baleen whales, with a worldwide distribution. However, abundances within the waters around the UK and North Sea are unknown. For example, there were no humpback whale records in any survey blocks in either SCANS-III or SCANS-IV. However, recent research by Berrow and Whooley (2022) present a continued increase in sightings and strandings of humpback whale in the Southern North Sea, and increased year on year sightings of the same individuals off the coast of Ireland. In Scotland, historical whaling records show that humpback whale were harvested from Northern Shetland and the West coast of Scotland (Ryan *et al.*, 2022). More recently, Leaper *et al.* (2022) estimated that up to six humpback whales were entangled in fishing gear per year in Scottish waters,

with records from the Moray Firth, Orkney and the West coast. Citizen science reports from the Firth of Forth confirmed the first movement of a humpback whale to Scottish waters from high latitude feeding grounds in the Norwegian Sea, with the authors suggesting that the area may represent a migratory stopover for humpback whale during their southbound migration (O'Neil *et al.*, 2019). Summer feeding grounds for humpback whale have been documented in the Norwegian Sea, in the high latitude waters between mainland Norway and Svalbard (Løviknes *et al.*, 2021). Furthermore, a solitary humpback whale was observed performing bubble net feeding behaviour within the Moray Firth during a dedicated minke whale boat survey in October 2021 (Marwood *et al.*, 2022).

11.4.33 This recent evidence informed scoping feedback from stakeholders and SNCBs for the Morven OWF Scoping Report (POA E1, 10.1 km from the Scoping Boundary) suggested that humpback whale should be included in the assessment within the Offshore EIA Report (Morven Offshore Wind Limited, 2023). Based on the results of the recent publications presented here, this species is also proposed to be included in the assessment for the Proposed Development. It is concluded that humpback whale has the potential to occur within the Local Marine Mammal Study Area and wider potential ZoIs and will be assessed qualitatively in the Offshore EIA Report.

Grey Seal

11.4.34 Grey seal are one of the two pinniped species that live and breed within the UK, with the other being harbour seal (see paragraph 11.4.39). Grey seal are distributed across the north Atlantic Ocean, North Sea, Barents Sea, and Baltic Sea, with their main concentrations in North-West Europe and the east coasts of Canada and the United States of America. They are larger than harbour seal, with males reaching over 300 kg (SCOS, 2023). They forage in the open sea and regularly return to land to haul out, rest, moult, and breed (SCOS, 2023). Foraging can occur over 100 km from haul out sites, with foraging trips lasting for up to 30 days at a time (Jones *et al.*, 2015). Prey species include gadoids, flatfish, and sandeel and vary spatially and seasonally. In the North Sea, diet is heavily dominated by sandeel (Hammond and Wilson, 2016).

11.4.35 Grey seal breeds in the autumn, with staggered pupping times throughout the UK. Approximately 35% of the world's grey seal breed in the UK, with 80% of this in Scotland. The most recent population estimate of grey seal in Scotland is 129,100 animals in 2022 (SCOS, 2023). The main breeding colonies are in the Outer Hebrides, Orkney, and the North Sea (Figure 11.4) (SCOS, 2023). The Local Marine Mammal Study Area is located within the East Scotland SMU (Figure 11.3) where the main haul out sites are in the Firth of Forth (Figure 11.4). The most recent pup production for the Firth of Forth was 7,261

pups in 2019, a 4.2% increase from the 6,426 estimated for 2016 (SCOS, 2023). The most recent grey seal count in the East Scotland SMU was 2,712 individuals in 2021, although a population estimate was not provided by SCOS (2023) (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs). An estimate of 10,784 individuals was calculated using the latest scalar of 25.15% as provided in SCOS (2022) (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs). Within the Regional Marine Mammal Study Area, there are other SMUs present, such as the Moray Firth, North Coase and Orkney, Shetland, and Northeast England.

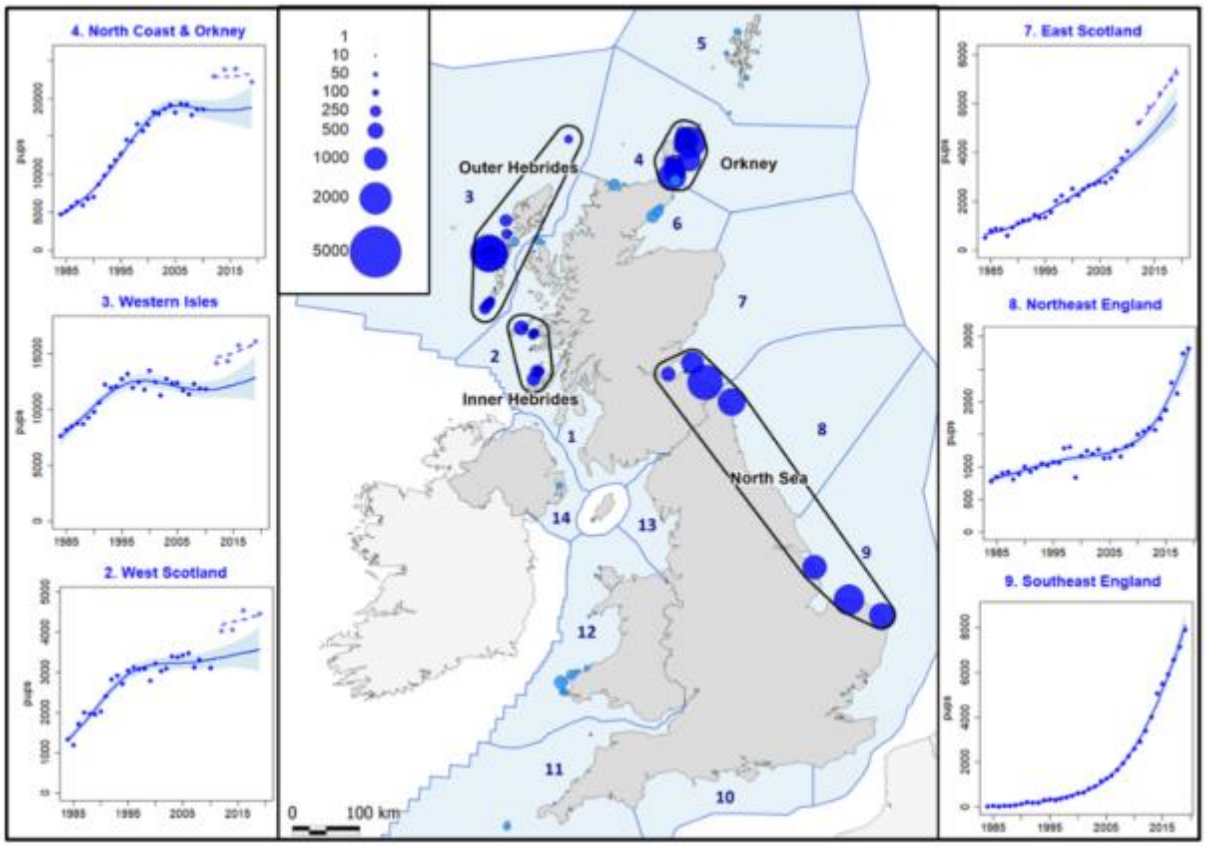


Figure 11.4: Estimated 2019 Pup Production of Grey Seal Colonies around the UK (from SCOS (2023))

11.4.36 At-sea distribution of grey seal derived from high-resolution tracking data is available for UK waters (Carter *et al.*, 2022) (Figure 11.5). These data indicate that grey seal density across the Local Marine Mammal Study Area ranges between less than one to 50 animals per 25 km^2 (Carter *et al.*, 2022) (Figure 11.5).

11.4.37 During the site-specific DAS, 332 grey seal were sighted, in addition to 317 unidentified seals (Table 11.2). Grey seal were also the second most sighted species (n = 1,239) in six marine mammal surveys in the Regional Marine Mammal Study Area presented in Table 11.5: Results

of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development.

11.4.38 Given the information presented above and the preliminary results of the site-specific DAS for the Proposed Development and other projects within the Regional Marine Mammal Study Area, it is concluded that grey seal are likely to occur year-round within the Local Marine Mammal Study Area and wider potential ZoIs.

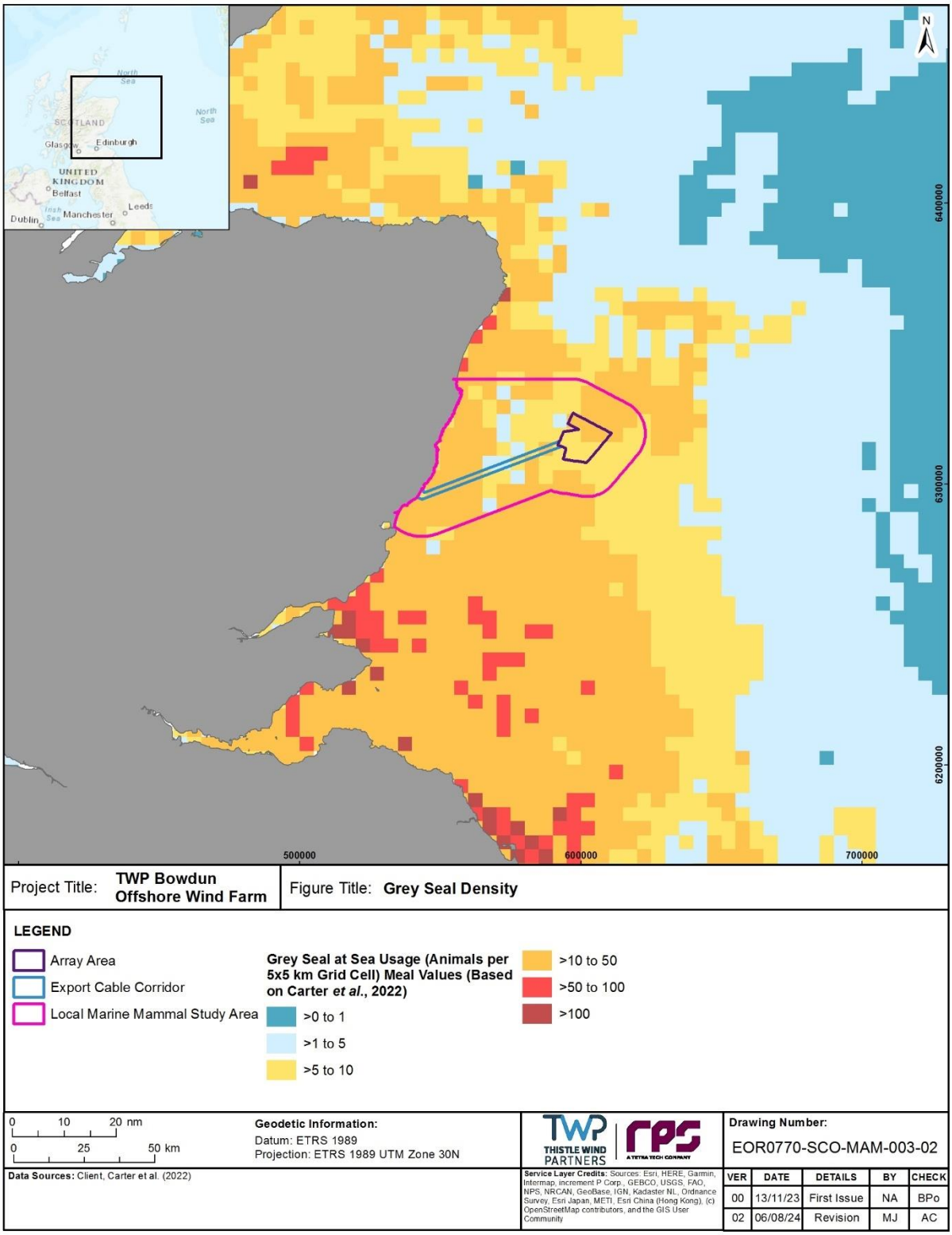


Figure 11.5: Grey Seal Density

Harbour Seal

11.4.39 Harbour seal are the smaller of the two seal species present in UK waters, with males weighing up to 100 kg. They have a circumpolar distribution in the Northern Hemisphere (SCOS, 2023). Scotland is home to approximately 85% of the UK harbour seal population, with the most recent Scottish population estimate at 36,600 animals (SCOS, 2023). In comparison to grey seal, harbour seal typically forage within 50 km from the coast (SCOS, 2022). Prey species include gadoids, flatfish, herring *Clupea harengus,* sprat *Sprattus sprattus,* sandeel, and cephalopods and vary spatially and seasonally. In South-East Scotland, their diet varies seasonally between flatfish, sandeel, and large gadoids, while in the Moray Firth, sandeel is a dominant prey source year round (Wilson and Hammond, 2016).

11.4.40 Harbour seal pups are born in June to July, with moulting occurring in August. The main breeding colonies are in Western Scotland, The Wash, and Shetland, with some smaller colonies present in the Moray Firth, Firth of Forth, and Orkney (Figure 11.6) (SCOS, 2023). The Local Marine Mammal Study Area is located within the East Scotland SMU (Figure 11.3) where the main haul out sites are in the Firth of Forth (Figure 11.6). The most recent harbour seal count in the East Scotland SMU was 262 individuals in 2021, which produced an estimated population size of 364 (Table 11.7: Estimated Population Sizes within Respective Marine Mammal MUs) (SCOS, 2023). Within the Regional Marine Mammal Study Area, there are other SMUs present, such as the Moray Firth, North Coast and Orkney, Shetland, and Northeast England (see Figure 11.6).

11.4.41 At-sea distribution of harbour seal derived from high-resolution tracking data is available for UK waters (Carter *et al.*, 2022) (Figure 11.7). These data indicate that harbour seal density across the Local Marine Mammal Study Area ranges between less than one to five animals per 25 km^2 (Carter *et al.*, 2022) (Figure 11.7).

11.4.42 During the site-specific DAS, three harbour seal were sighted, in addition to 317 unidentified seals (Table 11.2). There were 54 harbour seal recorded during the six marine mammal surveys in the Regional Marine Mammal Study Area presented in Table 11.5: Results of Site-Specific Surveys for Other Projects in the Vicinity of the Proposed Development.

11.4.43 Given the information presented in the preceding paragraphs and the preliminary results of the site-specific DAS for the Proposed Development and other projects within the Regional Marine Mammal Study Area, it is concluded that harbour seals have the potential to occur year round within the Local Marine Mammal Study Area and wider potential ZoIs. While densities are likely to be lower than that of grey seal, harbour seal is still proposed to be included in the assessment given that the Proposed Development includes an

Export Cable Corridor and will be closer to shore than other OWF projects within the Regional Marine Mammal Study Area.

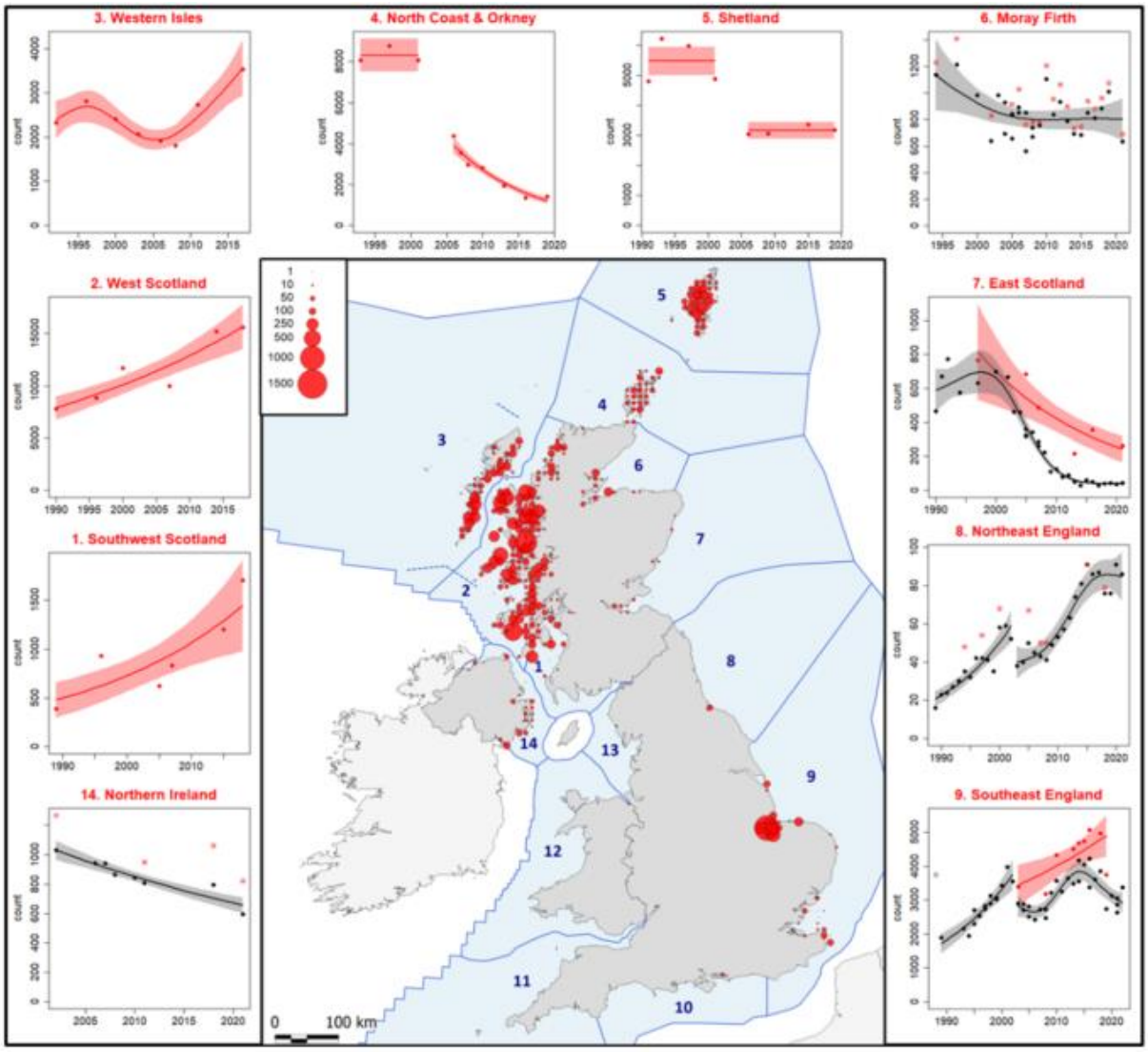


Figure 11.6: Estimated 2022 Pup Production of Harbour Seal Colonies Around the UK (from SCOS (2023))

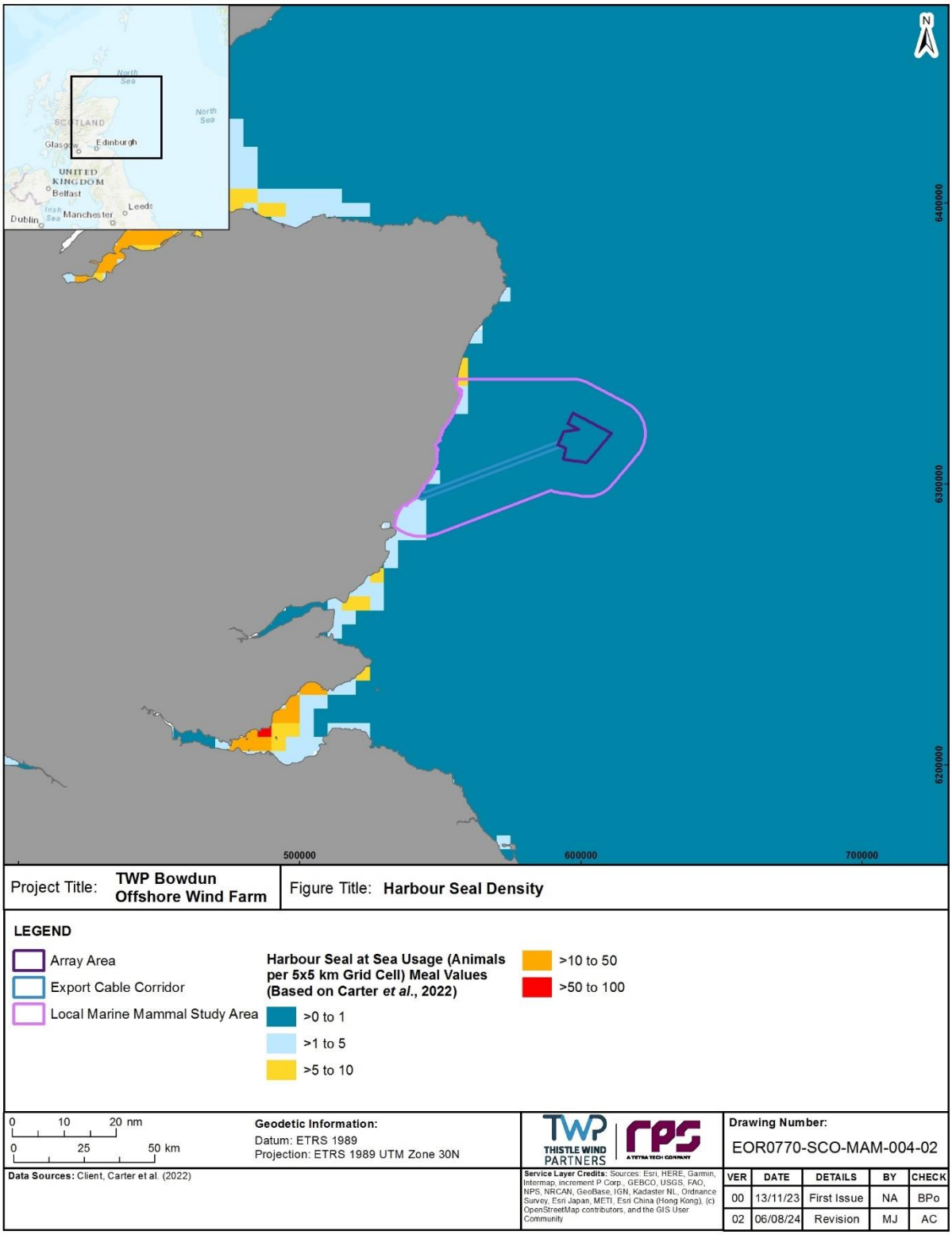


Figure 11.7: Harbour Seal Density

Designated Sites

11.4.44 Given the wide, multinational extent of the Regional Marine Mammal Study Area, there are a range of designated sites for marine mammals situated within it. For the purposes of the Offshore Scoping Report however, only those situated within UK waters have been discussed. As part of the HRA process, all UK and European designated sites for marine mammals within the Regional Marine Mammal Study Area will be considered in the LSE Screening. Where LSE cannot be ruled out, further assessment of the effect of the Proposed Development on the conservation objectives of these sites will be undertaken within the Report to Inform Appropriate Assessment (RIAA).

11.4.45 The Southern Trench Nature Conservation MPA (Figure 11.8) is designated under the Marine (Scotland) Act 2010 and the MCAA (2009) and, therefore, will not be included within the HRA Stage 1 LSE Screening Report. Where there is potential for an impact on the MPA, the site will be included in an MPA Assessment (Appendix D: Marine Protected Area Screening).

11.4.46 UK designated sites for marine mammals located within the Regional Marine Mammal Study Area are presented in Figure 11.8 and Table 11.8: Designated Sites within the UK Portion of the Regional Marine Mammal Study Area with Relevant Qualifying Features.

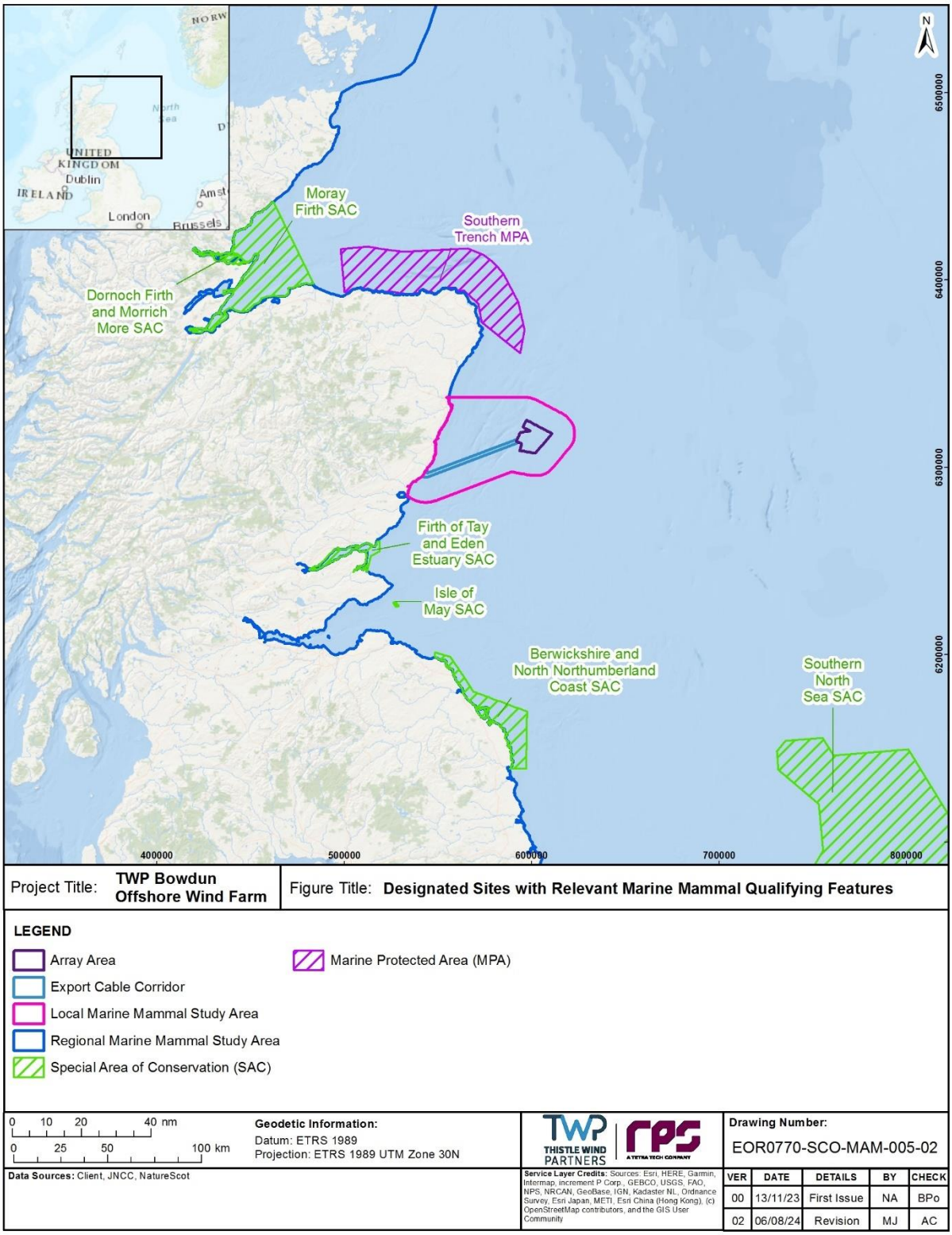


Figure 11.8: Designated Sites with Relevant Marine Mammal Qualifying Features

Table 11.8: Designated Sites within the UK Portion of the Regional Marine Mammal Study Area with Relevant Qualifying Features

Designated site	Distance to the Array Area (km)	Distance to Export Cable Corridor (km)	Relevant protected marine mammal features
Southern Trench MPA	35.9	44.9	Minke whale
Firth of Tay and Eden Estuary SAC	89.1	40.4	Harbour seal
Isle of May SAC	104.5	67.1	Grey seal
Berwickshire and North Northumberland Coast SAC	116.2	92.1	Grey seal
Moray Firth SAC	157.5	164.1	Bottlenose dolphin
Dornoch Firth and Morrich More SAC	195.4	201.7	Harbour seal
Southern North Sea SAC	203.4	212.7	Harbour porpoise

11.5 Embedded Mitigation

11.5.1 The following Embedded Mitigation measures are relevant to marine mammals. The Embedded Mitigation measures will evolve over the development process as the EIA progresses:

- Piling will include combination of a slow start, soft start, ramp up or ADDs. This will be detailed in the Piling Strategy.
- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a Vessel Management Plan (VMP) and Navigation Safety Plan (NSP).
- Drafting and implementation of a decommissioning programme.
- The development and adherence to an Entanglement Management Plan, or equivalent.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- Where possible, the use of low order disposal of UXOs will be implemented (i.e. deflagration).

- Adoption of JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, piling noise and use of explosives if and where required.

11.5.2 The requirement for and feasibility of any Embedded Mitigation measures will be consulted upon with statutory consultees throughout the EIA process as required.

11.6 Potential Proposed Development Impacts

11.6.1 A range of potential impacts on marine mammals have been identified that may occur during the construction, O&M and decommissioning phases of the Proposed Development.

11.6.2 The impacts that have been scoped into the assessment are outlined in Table 11.9: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Marine Mammals together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

11.6.3 Potential impacts scoped out of the assessment are presented in Table 11.10: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Marine Mammals, with justification.

Table 11.9: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Marine Mammals

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Injury and disturbance from subsea noise generated during piling	✓	×	×	Piling of foundations during the construction phase has the potential to cause auditory injury (Permanent Threshold Shift (PTS) or TTS) and/or behavioural disturbance (including barrier effects) in marine mammals.	Where possible, site-specific density estimates for each species will be calculated using the full 24-month site-specific DAS dataset. Where the data does not allow density estimates to be calculated, desktop density estimates will be used (such as those provided by SCANS IV).	Site-specific subsea noise modelling will be undertaken using the methodology set out in Section 8: Subsea Noise. Hammer energies provided in the PDE will be used to develop the MDS to inform the modelling. This modelling will be used to quantitatively assess the risk of auditory injury and behavioural disturbance. The frequency-specific injury thresholds will be based on those presented in Southall *et al.* (2019). The modelling will use a dual criteria approach: frequency weighted cumulative SEL (SEL_{cum}) and unweighted peak Sound Pressure Level (SPL_{peak}). The assessment will consider residual risk of injury after

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						implementation of the Embedded Mitigation measures set out in Section 11.5. If a residual risk is concluded to lead to a significant effect, Additional Mitigation measures will be outlined in the Offshore EIA Report. Subsea noise contours will be generated by the modelling and overlaid on species density surfaces or using a single conservative density estimate for the area of impact to predict the number of animals potentially affected. Barrier effects will also be investigated by considering where noise contours could lead to displacement from key habitat.
Injury and disturbance from subsea noise generated	✓	×	×	As above for piling, UXO clearance in the pre-construction phase has the potential to cause	As above for 'Injury and disturbance from subsea noise generated during piling'.	The approach presented above for 'Injury and disturbance from subsea noise generated during

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
during UXO clearance				auditory injury (PTS and TTS) and/or behavioural disturbance (including barrier effects) in marine mammals.		piling' is also applicable for injury associated with this impact. For disturbance, a threshold-based approach will be used (based on Southall *et al.* (2019)), rather than a dose-response approach For this impact, the subsea noise modelling will derive information such as UXO sizes and number of UXOs from the PDE which is subsequently used to define the MDS presented in the assessment.
Injury and disturbance from subsea noise generated during site investigation surveys	✓	✓	×	As above for piling, geophysical site-investigation surveys in the construction and O&M phases have the potential to cause auditory injury (PTS and TTS) and/or behavioural disturbance (including barrier effects) in marine mammals.	As above for 'Injury and disturbance from subsea noise generated during piling'.	The approach presented above for 'Injury and disturbance from subsea noise generated during piling' is also applicable for injury associated with this impact. For disturbance, a threshold-based approach will be used (based on Southall *et al.* (2019)), rather than a dose-response

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						approach. For this impact, the subsea noise modelling will derive information such as geophysical survey equipment, and survey frequency and duration from the PDE.
Injury and disturbance from subsea noise generated by vessel use and other noise producing activities	✓	✓	✓	As above for piling, vessel use and other activities in all phases of development have the potential to cause auditory injury (PTS and TTS) and/or behavioural disturbance (including barrier effects) in marine mammals. Noise producing activities include drilling, trenching, cable cutting, and rock placement.	As above for 'Injury and disturbance from subsea noise generated during piling'.	The approach presented above for 'Injury and disturbance from subsea noise generated during piling' is also applicable to this impact. For disturbance, a threshold-based approach will be used (based on Southall *et al.* (2019)), rather than a dose-response approach. For this impact, the subsea noise modelling will derive information such as maximum number of vessels, vessel type, and parameters surrounding the extent and intensity of other noise producing activities from the PDE

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						which is subsequently used to define the MDS presented in the assessment.
Injury and disturbance from subsea noise generated by Wind Turbine operation	×	✓	×	In the O&M phase, subsea noise could be produced by Wind Turbine operation and 'snapping' of dynamic cables and anchor mooring lines. The effects of subsea noise from operational OWFs is poorly researched in comparison to other noise sources (such as piling and UXO), however recent publications have suggested that this impact should be considered within EIAs and CEA of offshore projects (Mooney *et al.*, 2020, Risch *et al.*, 2023, Stober and Thomsen, 2021, Svendsen *et al.*, 2022, Tougaard *et al.*, 2020).	As above for 'Injury and disturbance from subsea noise generated during piling'.	The approach presented above for 'Injury and disturbance from subsea noise generated during piling' is also applicable for injury associated with this impact. For disturbance, a threshold-based approach will be used (based on Southall *et al.* (2019)), rather than a dose-response approach. For this impact, the subsea noise modelling will be based on data collected from the Hywind Project (Burns *et al.*, 2022, Martine *et al.*, 2011).
Injury to marine mammals due to entanglement	×	✓	×	As the PDE for the Proposed Development includes floating	No further data collection or analysis is possible for this impact.	This impact will be assessed qualitatively in the Offshore EIA Report

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				infrastructure, the presence of dynamic cables and anchor mooring lines may pose a risk of entanglement for marine mammals. This could be primary entanglement, whereby the animals are entangled in the cables and mooring lines themselves, or secondary entanglement, whereby they become entangled in lost and discarded fishing gear and marine debris which are stuck to the cables and mooring lines. Floating offshore technology is still in its infancy, so there are limited data available to assess this impact. Thus, both primary and secondary entanglement are proposed to be scoped in and will be assessed qualitatively.		as desktop data sources emerge.
Impact of EMFs from subsea cables	×	✓	×	It is uncertain if EMF related to marine renewable devices has any impact (beneficial or	No further data collection or analysis is possible for this impact.	This impact will be assessed qualitatively in the Offshore EIA Report

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				adverse) on marine mammals (Copping, 2018, Copping and Hemery, 2020), and there are also no regulatory thresholds or guidelines set out to define EMF emissions (Copping and Hemery, 2020). There is currently no evidence that seals can detect or respond to EMFs but some cetacean species may be able to detect variations in magnetic fields (Normandeau. *et al.*, 2011). Currently, the Guiana dolphin *Sotalia guianensis* is the only marine mammal known to show any response to EMF, as it possesses an electroreceptive system rostrum to detect electrical stimuli similar to those generated by small to medium sized fish (Czech-Damal *et al.*, 2013, Czech-Damal *et al.*, 2012). However, recent experimental evidence suggests that adult		as desktop data sources emerge.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				bottlenose dolphins use electroreception to detect benthic prey at short ranges and suggests that as this ability has now been observed in two dolphin species, it may be widespread within odontocetes (Hüttner *et al.*, 2022). Given that dynamic cables within the water column are included within the PDE, and the uncertainty on the effects of EMF on marine mammals, this impact is scoped in on a precautionary basis.		
Injury to marine mammals due to collision with vessels	✓	✓	✓	The increased presence of vessels associated with all three phases of development may increase the potential for collisions with marine mammals. Depending on a number of factors (e.g. vessel speed, vessel size, angle of impact), vessel collisions can be fatal or cause permanent disfiguration.	The full baseline characterisation presented in the Marine Mammal Technical Report will be used to characterise the baseline for this impact.	Increased risk of collision will be assessed semi-quantitively in the Offshore EIA Report. The MDS for this impact will use information about the types of vessels, maximum number on site at any one time, and total return trips from the PDE. These parameters will provide a quantitative

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						baseline against the existing vessel movements within the Local Marine Mammal Study Area, which will be informed by the Shipping and Navigation section of the Offshore EIA Report.
Effects on marine mammals due to changes in prey availability	✓	✓	✓	Prey species may be impacted by the Proposed Development during all phases of development (see Section 10: Fish and Shellfish Ecology). Changes in prey availability may impact marine mammal foraging and have impacts on their fitness.	As above for 'Injury to marine mammals due to collision with vessels'.	Section 10: Fish and Shellfish will inform the assessment of this impact. The assessment will follow a semi-quantitative approach, using the magnitude of effects on prey species (where possible) and consider the possible indirect effects on marine mammals in the context of their distribution throughout the Regional Marine Mammal Study Area. The 'ecosystem approach' will be considered, as this impact will assess the implications of altered fish and shellfish

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
						populations in the context of marine food webs.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 11.10: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Marine Mammals

Impact	Justification
Accidental pollution to the surrounding environment	There is a risk of accidental pollution from vessels and equipment during all three phases of development. However, this risk is mitigated by the implementation of measures set out in standard post-consent plans, such as an EMP, which will include an MPCP. The EMP and MPCP will include planning for accidental spills, address all potential contaminants that could be released, and include key emergency contact details. They will also set out good industry practice and relevant guidelines for preventing pollution at sea (such as those from OSPAR, International Maritime Organisation (IMO), and the International Convention for the Prevention of Pollution from Ships (MARPOL)). Thus, it is unlikely that accidental pollution will occur. In the unlikely event that it did, the magnitude will be minimised through measures outlined in plans such as the MPCP. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
Increased SSCs and associated deposition	Increases in SSCs and associated deposition could occur due to activities in all phases of development which result in disturbance of the seabed. This could have both direct and indirect impacts on marine mammals. As prey species could potentially be affected by this impact, marine mammals could be indirectly affected as a result. However, impacts on prey species is already scoped into the assessment. Direct impacts to marine mammals include reduced visibility and, thus, potentially reduced foraging ability. However, marine mammals are well known to forage in tidal areas where water conditions are turbid and visibility conditions poor. Many of the species scoped into the assessment (such as bottlenose dolphin, harbour porpoise, grey seal, and harbour seal) commonly frequent coastal areas, so would likely be tolerant of turbid and silty water. Harbour seal and harbour porpoise have been documented foraging in areas with high tidal flows (Hastie *et al.*, 2016, Pierpoint, 2008), therefore, low light levels and turbid waters associated with SSCs are unlikely to impair foraging success. Furthermore, marine mammals can navigate and forage using other mechanisms than just eyesight. For example, seals can detect water movements and hydrodynamic trails with their

Impact	Justification
	mystacial vibrissae (i.e. whiskers); while odontocetes primarily use echolocation to navigate and find food in darkness (Grant *et al.*, 2013, Marriott *et al.*, 2013, Schulte-Pelkum *et al.*, 2007). Although increased SSCs may arise during activities at the Proposed Development, the maximum impact range is expected to be highly localised, and sediments will rapidly dissipate over one tidal excursion. In addition to the large natural variability in SSCs within the Local Marine Mammal Study Area and the adaptations of marine mammals to silty, turbid water, it is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report for all species.

11.7 Proposed Assessment Methodology

11.7.1 The marine mammal assessment in the Offshore EIA Report will follow the methodology provided in Section 4: EIA Methodology. The following guidance documents will also be considered:

- Guidelines for EcIA in the UK and Ireland (CIEEM, 2022);
- Scaling laws for unmitigated pile driving: Dependence of underwater noise on strike energy, pile diameter, ram weight, and water depth (von Pein et al., 2022);
- Department for BEIS Policy Statement Marine environment: UXO clearance joint interim position statement (BEIS, 2022);
- Marine mammal sound exposure criteria (Southall et al., 2019, 2021);
- Guidelines for minimising the risk of disturbance and injury to marine mammals whilst using explosives (JNCC, 2010b, 2021c);
- Consultation report: harbour porpoise SACs noise guidance (JNCC, 2020a);
- The protection of Marine EPS from injury and disturbance. Guidance for Scottish Inshore Waters' (Marine Scotland, 2020);
- Guidelines for minimising the risk of injury to marine mammals from geophysical surveys (JNCC, 2017);
- Guidance on the Offence of Harassment at Seal Haul-out Site (Marine Scotland, 2014);
- Guidelines for minimising the risk of injury to marine mammals from piling sound (JNCC, 2010a); and
- Guidance on Environmental Considerations for OWF Development (OSPAR Commission, 2008b).

11.7.2 The marine mammal species carried forward to the assessment will be grouped into broad ecological receptor groups, called IEFs. The impacts associated with the construction, O&M and

decommissioning phases of the Proposed Development are set out in Table 11.9 and will be assessed for each IEF. Criteria defining the value of each IEF will be defined to reflect topic specific interests.

11.7.3 The impact criteria used in the assessment will be based on the most recent scientific research and guidance. Where relevant, impacts will be assessed with respect to the potential for injury and behavioural disturbance. Subsea noise modelling will be conducted following the approach set out in Section 8: Subsea Noise to produce a detailed quantitative assessment of both impulsive and continuous noise sources. The Subsea Noise Report will use marine mammal hearing groups as defined by Southall *et al.*, (2019) to predict the ZoI for injury and behavioural disturbance from the noise sources set out in Table 11.9. The potential for injury and/or behavioural disturbance to occur will be based on whether the received noise levels exceed published thresholds for the different marine mammal hearing groups.

11.7.4 Subsea noise contours for the various noise sources and hearing groups will be combined with species' densities in order to quantify the number of animals with the potential to experience injury and behavioural disturbance. The densities to be used in the assessment were discussed with stakeholders during the Scoping Workshop and will be agreed upon as the Offshore EIA Report develops. To investigate the potential for long term effects associated with subsea noise (particularly those associated with piling), Interim Population Consequences of Disturbance modelling will be undertaken. This will provide insight into population changes over time for an impacted and unimpacted population.

11.8 Potential Inter-Related Effects

11.8.1 The Offshore EIA Report will consider inter-related effects on marine mammals which may arise from the construction, O&M, and decommissioning of the Proposed Development (including those that interact with effects assessed across the Proposed Development, such the interactions of different types of activities generating subsea noise). Inter-related effects refer to the effects arising from the Proposed Development either across its own phases (Proposed Development lifetime) or different effects on one receptor in one phase (receptor led). The Offshore EIA Report will consider inter-related effects of impacts from all three phases of the Proposed Development. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) with the Proposed Development. This will ensure that the Proposed Development is appropriately considered, as a whole, within the inter-related effects assessment.

11.8.2 Inter-related effects on marine mammals may also impact the following receptors:

- Section 10: Fish and Shellfish Ecology; and
- Section 12: Offshore Ornithology.

11.9 Potential Cumulative Effects

11.9.1 There is potential for cumulative effects to occur from other projects and activities within the Regional Marine Mammal Study Area. The CEA will follow the approach outlined in Section 4: EIA Methodology, and will be included in the marine mammal section of the Offshore EIA Report.

11.9.2 Potential impacts to be assessed in the CEA will be as defined for the Proposed Development alone, as set out in Table 11.9. For the CEA, the Regional Marine Mammal Study Area will be used as a screening distance to identify relevant projects and activities. This is to ensure that the maximum ZoIs associated with impacts such as piling and UXO clearance are accounted for.

11.10 Potential Transboundary Impacts

11.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is potential for transboundary impacts upon marine mammals due to construction, O&M, and decommissioning impacts of the Proposed Development. These include:

- injury and disturbance from subsea noise generated during piling;
- injury and disturbance from subsea noise generated during UXO clearance;
- injury and disturbance from subsea noise generated during site investigation surveys;
- injury and disturbance from subsea noise generated by vessel use and other noise producing activities;
- injury and disturbance from subsea noise generated by Wind Turbine operation;
- injury to marine mammals due to collision with vessels; and
- effects on marine mammals due to changes in prey availability.

11.10.2 Due to the distance of the Proposed Development from the other EEAs (see Appendix B: Transboundary Screening), and considering migration ranges of marine mammals species in the study area, any potential transboundary impacts have been deemed negligible, and therefore transboundary impacts for marine mammals have been scoped out of further assessment.

11.11 Summary

11.11.1 Given the wide-ranging nature of large MUs for marine mammals, a wide Regional Marine Mammal Study Area was defined as part of this Offshore Scoping Report. A smaller scale Local Marine Mammal Study Area was defined as the Scoping Boundary plus a 12 km buffer. This includes where the site-specific DAS have been conducted (Figure 11.1).

11.11.2 The 24-month DAS data have been used to inform the marine mammal baseline, alongside published data from desktop sources (see Table 11.1). The most common species recorded in the DAS was harbour porpoise, followed by grey seal, white-beaked dolphin and minke whale. Bottlenose dolphin, Risso's dolphin and harbour seal were also recorded, but in lower numbers. Total sightings were highest between March to September (Table 11.2 and Table 11.3).

11.11.3 Based on the results of the DAS and the available literature, the following marine mammal species are proposed to be scoped into the assessment: harbour porpoise, bottlenose dolphin, white-beaked dolphin, grey seal, harbour seal, minke whale, fin whale and humpback whale, with the latter two being assessed qualitatively in the Offshore EIA Report, due to data and population density limitations.

11.11.4 Potential impacts to marine mammals that are proposed to be scoped in include those associated with subsea noise (such as piling, UXO clearance, site investigation surveys, vessel noise, and operational noise of Wind Turbines), increased risk of entanglement, EMFs, vessel collision, and changes in prey availability (Table 11.9). Impacts proposed to be scoped out of the assessment are accidental pollution and increased SSCs and associated deposition (Table 11.10). Embedded Mitigation measures are presented in Section 11.5, which aim to reduce the magnitude of impact upon marine mammals.

11.11.5 The proposed assessment methodology is provided in Section 11.7, with summary detail on the approach to the Inter-Related and CEA Effects Assessment presented in Sections 11.8 and 11.9, respectively. Finally, the screening of potential transboundary impacts has been presented in Section 11.10

12 Offshore Ornithology

12.1 Introduction

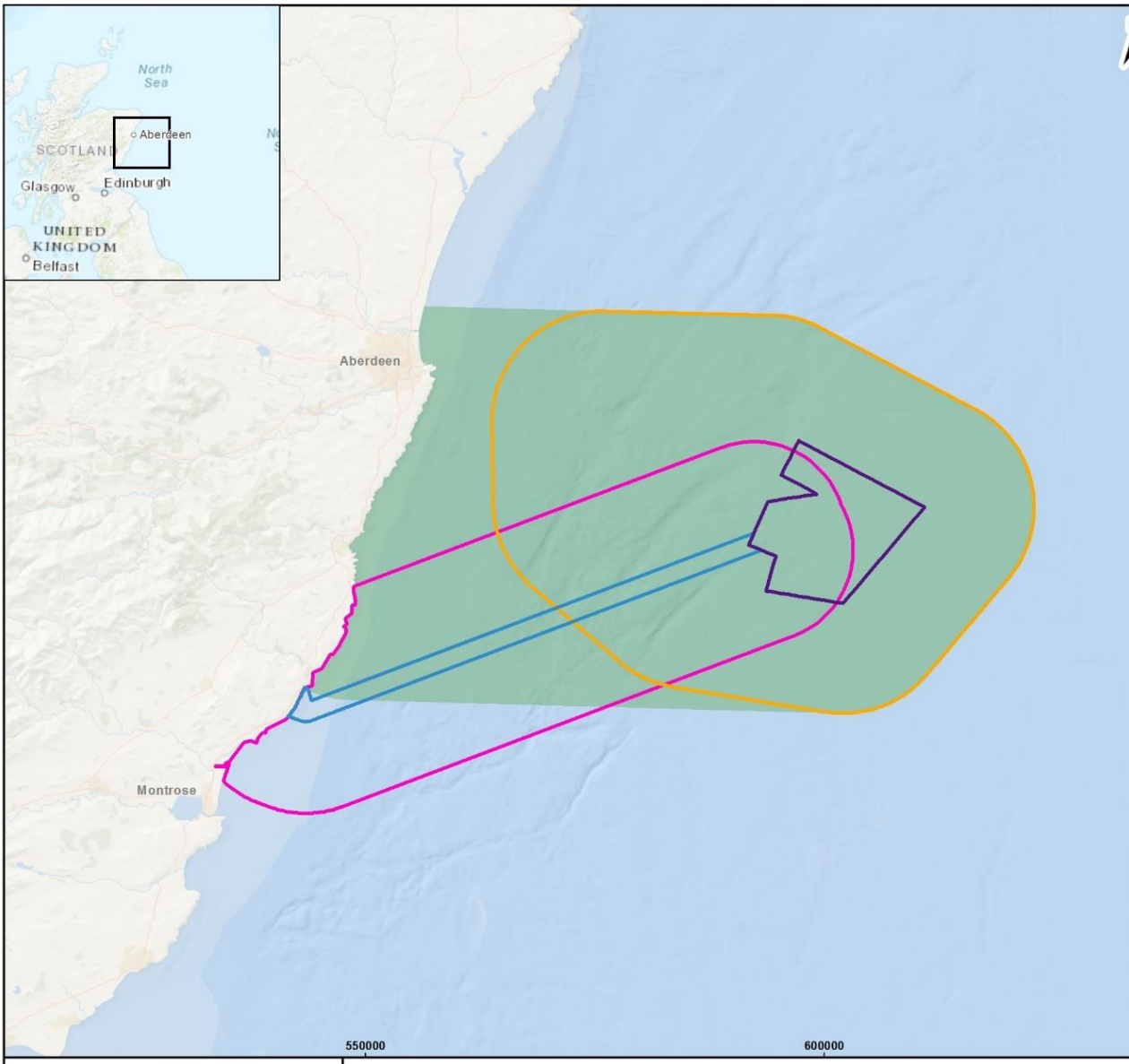
12.1.1 The offshore ornithology assessment in the Offshore EIA Report will assess the likely significant effects on bird species resulting from the construction, O&M, and decommissioning of the Proposed Development. This section of the Offshore Scoping Report provides an overview of the ornithology baseline conditions, the data sets to be used, the potential impacts to be considered and how these will be further assessed as part of the EIA.

12.1.2 Offshore ornithology intersects with various other topics, given that birds interact and engage with other habitats and species. Consequently, it is crucial to consider this section in conjunction with the following relevant sections:

- Section 7: Physical Processes;
- Section 9: Benthic Ecology; and
- Section 10: Fish and Shellfish Ecology.

12.2 Offshore Ornithology Study Areas

12.2.1 The Offshore Scoping Report and subsequent Offshore EIA Report will consider impacts to offshore ornithological features within the Offshore Ornithology Study Areas, shown in Figure 12.1



Project Title: **TWP Bowdun Offshore Wind Farm**

Figure Title: **Offshore Ornithology Study Area**

LEGEND

- Array Area
- Export Cable Corridor
- Array Area Study Area (winter)
- Array Area Study Area (summer)
- Export Cable Corridor Study Area

0 2.5 5 10 nm
0 5 10 20 km

Geodetic Information:
Datum: ETRS 1989
Projection: ETRS 1989 UTM Zone 30N

Drawing Number: EOR0770-BOW-ORN-001-

Data Sources: Client,

Service Layer Credits: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), (c) OpenStreetMap contributors, and the GIS User Community

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02	07/06/24	Revision	MJ	

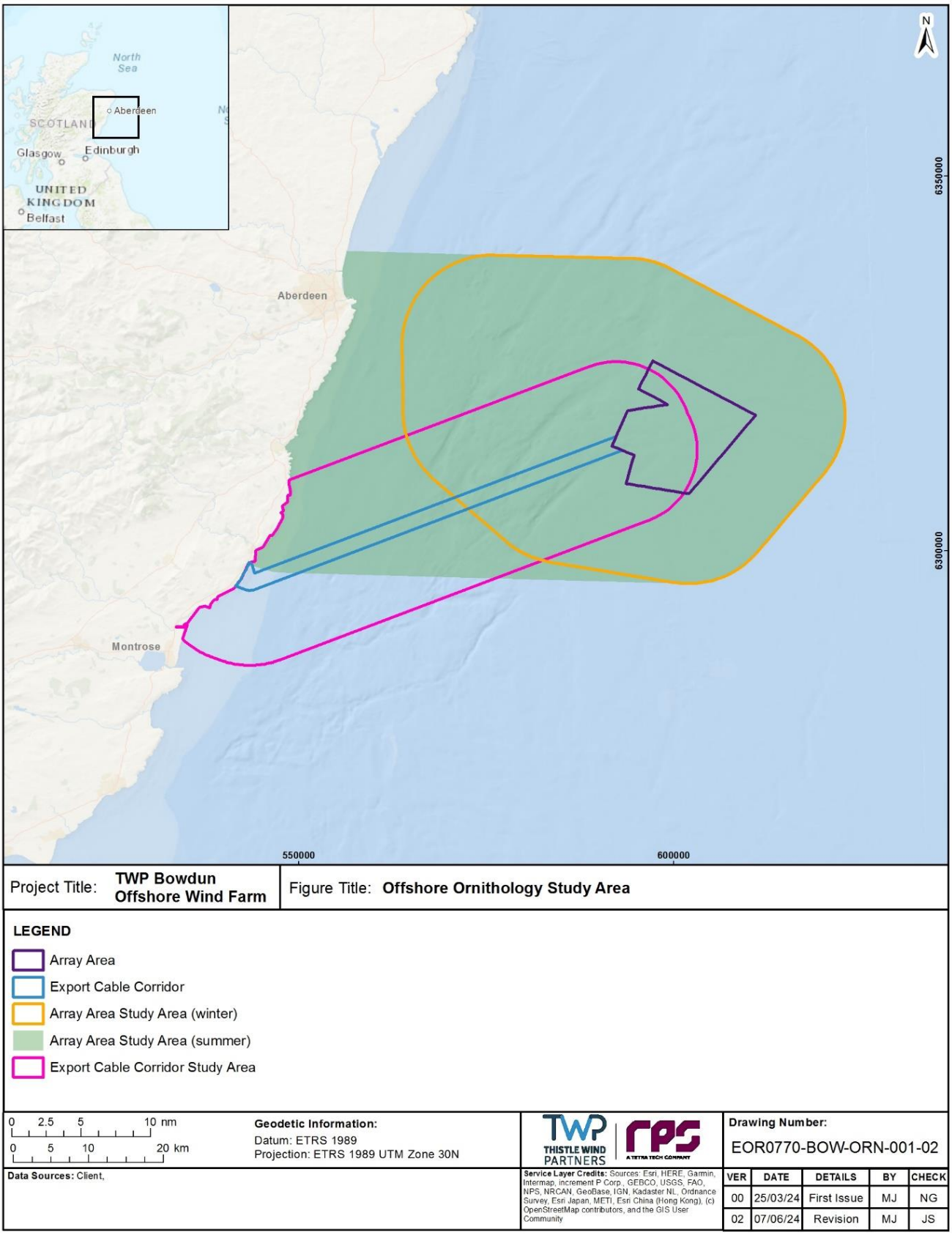


Figure 12.1: Offshore Ornithology Study Areas

12.2.2 The Offshore Ornithology Study Areas are broken down into two distinct study areas (also illustrated in Figure 12.1):

- The Array Area Study Area, consisting of the E3 POA, plus a 12 km buffer during winter and extending to the shore in summer; and
- The Export Cable Corridor Study Area, consisting of the Export Cable Corridor plus a 10 km buffer up to MHWS.

12.2.3 The Array Area Study Area is the area over which DAS were undertaken. Guidance outlined by JNCC (2022a) requires impacts from displacement to be assessed at a minimum distance of 2 km from OWFs. A larger 12 km buffer around the E3 POA was flown as part of the DAS to provide context of the Array Area, the E3 POA and the surrounding environment during winter months (September to March, inclusive). During the summer months (April to August, inclusive), the Array Area Study Area was extended to include up to the survey coast where breeding colonies are located (e.g. Fowlsheugh SPA).

12.2.4 The Export Cable Corridor Study Area spans the area between the Array Area and the coastal extent of the Export Cable Corridor up to MHWS plus a 10 km buffer. The 10 km buffer from the Export Cable Corridor was mostly covered by DAS during the summer months and partially covered during the winter months. Baseline data within the Export Cable Corridor Study Area will be obtained from the intertidal and nearshore surveys, DAS data and desk-based literature sources. The 10 km buffer will be considered due to some species present within this area (e.g. red-throated diver) being highly sensitive to vessel movement and displacement (JNCC, 2022b).

12.2.5 Consideration is given to designated SPAs situated outside the two Offshore Ornithology Study Areas due to the often-extensive foraging ranges of some seabird species.

12.2.6 In addition to breeding colony SPAs there are marine SPAs, which are designated to protect foraging or aggregation areas. Migratory species could interact with the Array Area and therefore potential impacts will also be accounted for. All identified sites will be fully assessed as part of the HRA for the Proposed Development, and full details of the SPAs and their Qualifying Features screened in for further consideration at the AA stage are provided in the HRA Stage 1 LSE Screening Report.

12.2.7 Consideration will also be given to other designated sites for birds, including Sites of Special Scientific Interest, MPAs – see Appendix D: Marine Protected Area Screening and Ramsar Sites.

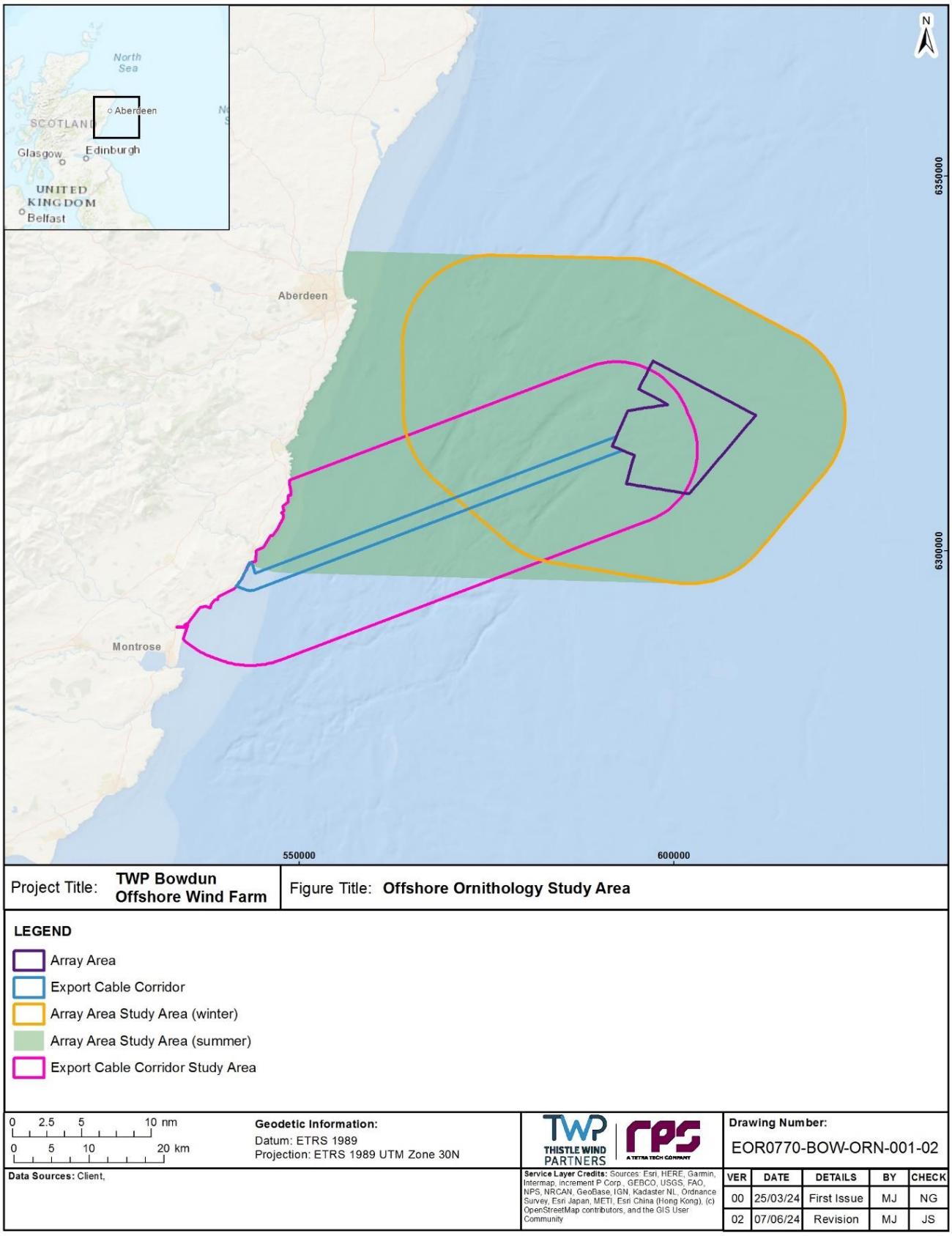


Figure 12.1: Offshore Ornithology Study Areas

12.3 Data Sources

Site-specific Surveys

12.3.1 The primary data source used to inform the Offshore EIA Report is the DAS collected across the Array Area Study Area and the intertidal and nearshore bird surveys at Haughs Bay, Gourdon.

12.3.2 The DAS were commissioned for 24 months and flown by APEM Ltd., from March 2022 to February 2024. The DAS consists of 17, 2 km, spaced strip transects, with a width of at least 250 m, conducted at approximately 400 m altitude and at a speed of approximately 120 kts (Figure 12.2). Data is collected at 1.5 cm Ground Sampling Distance with at least 25% coverage of the sea surface with a minimum of 12.5% analysed, though from the data received to date approximately 17.5% has been analysed. The same transect lines were flown on each survey and all lines were covered for the DAS to be considered complete.

12.3.3 The initial 12 months (March 2022 to February 2023) of DAS data has been analysed for the Offshore Scoping Report using design-based methods and the computer software R-studio (version 4.3.1). Kernel density modelling has been used to calculate abundance estimates for the Array Area Study Area. This analysis encompasses the attribution of birds to species levels, accounting for availability bias, particularly in the case of diving birds.

12.3.4 Additionally, LiDAR surveys were conducted within the Array Area to collect site-specific flight height data in July and September 2022 and April and July 2023. It is the intention that these site-specific flight heights are used to inform Collision Risk Modelling (CRM) required for the EIA (and HRA).

12.3.5 The intertidal and nearshore bird surveys have been undertaken at the Landfall within Haughs Bay, Gourdon between September 2023 and March 2024. These include surveying of overwintering densities of diver species off the coast of Haughs Bay in the immediate offshore area (located within the Export Cable Corridor Study Area). The results of these surveys will be analysed and inform the full assessment of all likely significant effects below MHWS in the Offshore EIA Report.

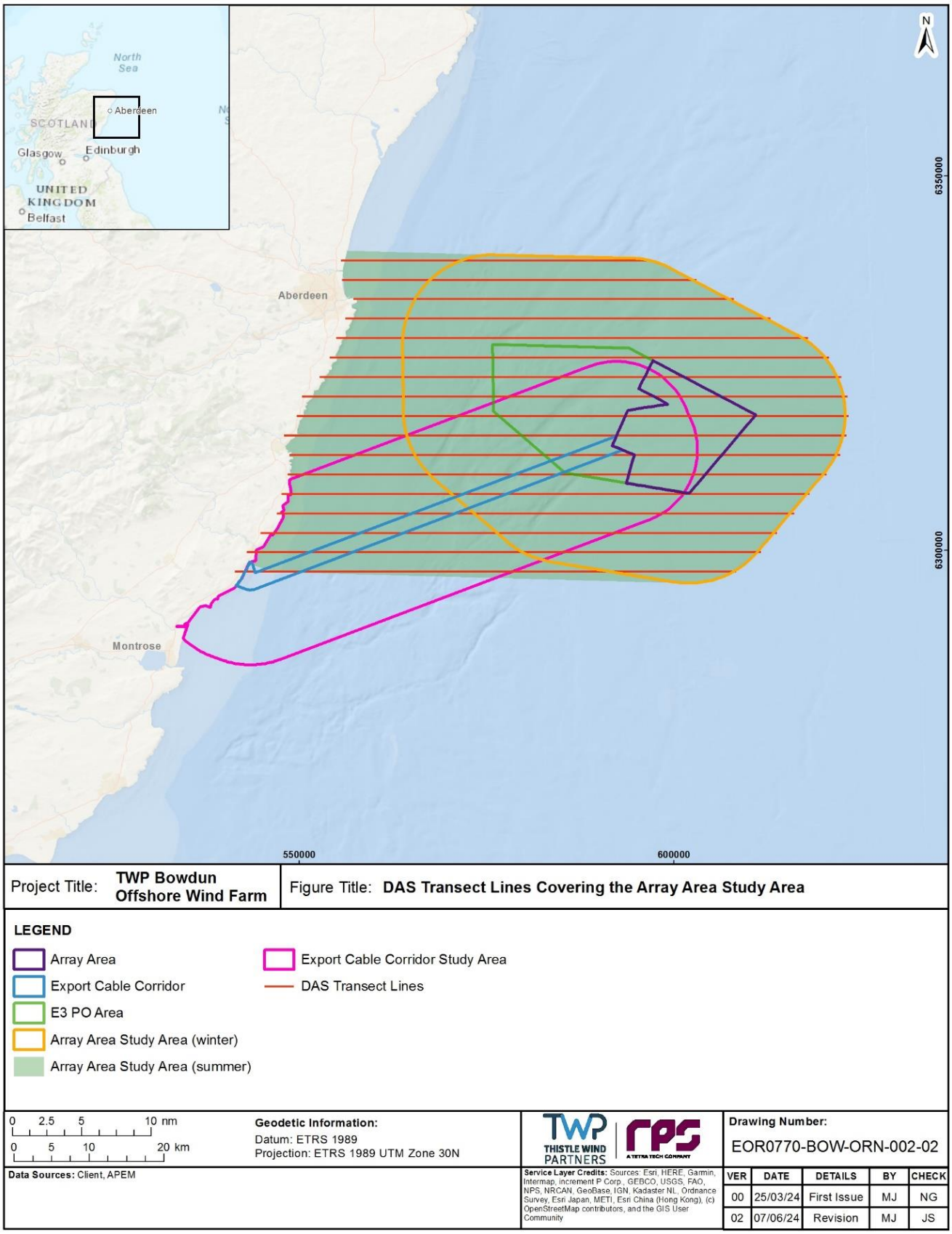


Figure 12.2 DAS Transect Lines Covering the Array Area Study Area

Desk-based Literature Review

12.3.6 Technical guidance, key data and information resources that will be utilised to inform the ornithology assessment within the Offshore EIA Report are presented in Table 12.1. This table of data sources is non-exhaustive due to the ever-changing evidence base of offshore ornithological interactions with OWF developments and therefore is highly likely to change. Outputs and findings from the desk-based literature review will be included as a Technical Report to support the Offshore Ornithology section of the Offshore EIA Report.

12.3.7 The Export Cable Corridor and 10 km buffer are predominately covered by the DAS during the summer months. During the winter months, estimates of the abundance and densities of marine ornithological features in areas not covered by DAS will be obtained from the Marine Ecosystems Research Programme (MERP) study of surveys across the North-East Atlantic (Waggitt *et al.*, 2019). The outputs of MERP data are 10 km resolution monthly distribution data of seabird populations in the North-East Atlantic. This dataset includes the Export Cable Corridor Study Area.

12.3.8 As mentioned above, the landfall surveys extend approximately 1 - 2 km offshore and, therefore, nearshore birds will be covered by the site-specific surveys which include a portion of the Export Cable Corridor Study Area.

Table 12.1 Relevant Data Sources

Topic and justification	Example Sources
Information on seabird species specification, environment, prey species, breeding and foraging movements, which will help inform the baseline environment	British Trust for Ornithology (BTO) (2024); Cleasby *et al.* (2015); Furness (2015); NatureScot (2020b); Stone *et al.* (1995); Wernham (2002); The International Council for the Exploration of the Sea (ICES) (2022); NatureScot (2023e)
Species demographics, which will help to inform population assessments	Furness (2015); Del Hoyo *et al.* (1992-2011); JNCC (2020); NatureScot (2023e)
Designated sites, which provide information on sites/species that may be connected to the Proposed Development	JNCC (2022a); Woodward *et al.* (2019)
Current or previous offshore wind projects and guidance notes, which provide relevant information pertaining to offshore ornithology	Kincardine (Atkins, 2014); Berwick Bank (SSE Renewables, 2022f); West of Orkney (Offshore Wind Farm Limited, 2023)

Topic and justification	Example Sources
Scientific research into potential impacts of OWFs on seabirds, which provides relevant information	Furness *et al.* (2013); Johnstone *et al.* (2013); King *et al.* (2009); NatureScot (2023e); JNCC (2022b); Bradbury *et al.* (2014); Cook (2014); Cook *et al.* (2018); Croll *et al.* (2022)
Abundance and density estimates of marine ornithological features in the Export Cable Corridor Study Area during the winter months.	Waggitt *et al.* (2019)

Colony Monitoring

12.3.9 Alongside the desk-based literature review of the seabird colony counts for sites that are close to the Array Area, TWP and the other developers within North-Eastern and Eastern Ornithology Group (NEEOG) have undertaken updated counts for important colonies close to the north-east region of developments. In 2023, a survey was undertaken of the North Caithness Cliffs SPA and assistance was provided to review survey imagery from the East Caithness Cliffs SPA. Both of these SPAs were surveyed fully in 2024 by TWP and other developers within NEEOG.

12.3.10 NEEOG developers have also provided funds to the British Trust for Ornithology (BTO) and the Royal Society for the Protection of Birds (RSPB) to undertake tracking studies of kittiwake, again, with the aim to reduce the uncertainty around impacts on birds within this regional area. These results of the work to date are not published, where it is the aim to include initial results in the Offshore EIA Report.

12.4 Consultation

12.4.1 A summary of the stakeholder consultations undertaken up to April 2024 is shown in Table 12.2. The Applicant is also actively involved with NEEOG to collectively address ornithology issues and reduce possible impacts associated with OWF developments in the region.

12.4.2 For consistency, the name of the stakeholders throughout Table 12.2 is the same, however it's noted that MD was previously called Marine Scotland prior to June 2023.

Table 12.2 Consultations Taken up to Date Relevant to Offshore Ornithology

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
11/03/2022	ScotWind Introductory Meeting	Conference call	Marine Directorate - Licensing Operations Team (MD-LOT) and NatureScot	Introductory meeting at which TWP provided an overview of the Proposed Development and proposed site characterisation surveys.	TWP to provide regular updates at the MD-LOT quarterly meetings.
18/07/2022	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	First quarterly meeting. TWP provided an overview of the Proposed Development and presented the DAS and LiDAR survey scope, and DAS surveys flown to-date, for regulator approval. MD-LOT acknowledged timings of DAS can be difficult due to poor weather. The DAS scope, timings and surveys to date were agreed to be appropriate and sufficient by MD-LOT and NatureScot. Clarification provided as to timeframe expectations which have been used by TWP in programme working. MD-LOT clarified that little engagement between	TWP will provide all interim reports to MD-LOT and NatureScot.

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
				Scoping and EIA, so pre-Scoping Workshops encouraged. MD-LOT requested early sight of any reports.	
08/11/2022	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT confirmed the Sectoral Marine Plan Iterative Plan Review (SMP IPR) is looking for developer input. MD-LOT provided an update on the CEF and strategic compensation measures. MD-LOT highlighted evidence gaps that Scottish Marine Energy Research (ScotMER) are looking to fill.	TWP to provide input to the SMP IPR and are willing to assist with the evidence gap filling of ScotMER.
20/01/2023	MD-SEDD - Strategic Ornithology Research Meeting	Conference call	MD-SEDD	MD-SEDD provided updates to the SMP scope of work and associated ScotMER projects. MD-SEDD will confirm how developers could assist in providing data to review some of the uncertainty for these projects.	Developers, as part of NEEOG, have strategically undertaken full surveys of potentially impacted colonies (North Caithness Cliffs SPA in 2023 and 2024 and East Caithness Cliffs SPA in 2024). Assisted NatureScot with colony counts analysis at East Caithness Cliffs SPA in

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
					2023 and undertook kittiwake tracking from Buchan Ness to Collieston SPA in 2023. The RSPB tracking work in 2024 has received support from the NEEOG and East Group developers.
03/03/2023	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT confirmed workshops will happen in March 2023. NatureScot provided an update on new guidance published in January 2023. NatureScot requested the LSE Screening Report is submitted alongside the Offshore Scoping Report.	TWP attended the workshops. The assessment presented within the Offshore EIA Report will use NatureScot's guidance.
12/06/2023	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT provided update to the new structure with ScotMER now under the Offshore Wind Directorate. Also an update on ScotMER projects. The migratory CRM update undertaken by Centre for	TWP to send first breeding season DAS bird results and initial LiDAR survey results. MD-LOT to send links mentioned in update. The migratory CRM tool provided by CEH will be

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
				Ecology and Hydrology (CEH) will be published soon. NatureScot provided an update on how best to undertake PAC.	used within the Offshore EIA Report.
11/09/2023	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT provided an update on the CEF that testing has started. MD-LOT confirmed the next ScotMER symposium would be in February 2024 with updates on specific projects undertaken. The SMP IPR is due to be adopted in 2024. Plan level derogation required in north-east Scotland.	TWP to send first breeding season DAS bird results and initial LiDAR survey results. TWP continue to work with other developers via NEEOG and East Group to provided additional data to aid MD and NatureScot to understand the derogation risk for the projects.
11/12/2023	MD-LOT - Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT provided updates on the cumulative effects framework, the streamlining team, ScotMER, strategic compensation, the Energy Bill, the SMP IPR, and resourcing. The pre-meeting questions were discussed. These included questions on scoping workshops, turbine	The Applicant sent ornithology questions to NatureScot, who were unable to attend the quarterly catch-up. Scoping workshop was arranged for April 2024.

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
				layout and ornithology assessment.	
11/03/2024	MD-LOT Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT provided an update on the CEF and mentioned that it will be completed in summer 2024. They also provided an update on: • the work of the streamlining team and the marine renewable licensing and consenting guidance; • ScotMER; • the Act and strategic compensation; • the NMP 2; and • the SMP Iterative Plan Review (IPR).	TWP gave a general project update
25/04/2024	Bowdun Offshore Scoping Workshop – Offshore Ornithology section	Conference call	MD-LOT, NatureScot and RSPB	Stakeholders did not provide specific updates but responded to questions presented by the Applicant. NatureScot confirmed that some of their guidance (NatureScot, 2023e) will be	The Applicant will use the latest available NatureScot guidance for the assessment. The Applicant will use the best available displacement analysis but was unable to commit to using SeaBORD.

Date	General theme	Engagement method	Stakeholder	Summary of stakeholder feedback	Applicant's response
				updated in the coming weeks/months. Stakeholders prefer using SeaBORD for displacement analysis, but they acknowledged its unavailability.	
10/06/2024	MD-LOT Quarterly Catch Up	Conference call	MD-LOT and NatureScot	MD-LOT provided an update on the CEF and mentioned that it will be completed in late summer 2024. They also provided an update on: • the work of the streamlining team and the marine renewable licensing and consenting guidance; • ScotMER; • the Energy Bill and strategic compensation; • the NMP 2; and • the SMP Iterative Plan Review (IPR). Specific advice on inclusion of sites for cumulative assessment and the requirement of a PVA.	TWP gave a general project update. TWP will following all of the latest guidance, including the PVA advice provided during the meeting.

12.5 Baseline Environment

12.5.1 This section provides a summary of the baseline environment and the key bird species expected within the North Sea as a whole and the Offshore Ornithology Study Areas. The summary derives primarily from species recorded during the site-specific surveys, the desk-based literature review and SPAs within foraging range.

North Sea

12.5.2 The Array Area is situated in the North Sea, the closest point to land is approximately 38 km east of the Aberdeenshire coast. The North Sea holds significance for seabirds throughout various seasons, serving as foraging grounds for those nesting in nearby coastal regions during the breeding season. It also accommodates seabirds from more distant colonies during the nonbreeding season and provides sustenance for sub-adult birds (pre-breeding age) throughout the year. More than 20 species of seabird breed on the coast of the region. The North Sea serves as a crucial wintering destination for migratory birds originating from the northern and eastern regions. In recent years, there has been a decline in the population of immigrant seabirds, possibly attributed to milder winters. This decline implies that the flocks that traditionally reached the area in winter are now staying closer to their breeding grounds (ICESa, 2022 and Woodward *et al.*, 2024).

12.5.3 Key impacts to seabird populations arise from climate change (Wanless *et al.*, 2007), fishing activities (involving bird bycatch and competition for prey items) (Žydelis *et al.*, 2013), disruptions caused by shipping, and adverse interactions with offshore renewables (including collisions with Wind Turbine blades and displacement) (Brabant *et al.*, 2015; Welcker and Nehls, 2016).

12.5.4 In the breeding season, seabirds will primarily comprise of species that breed in the region, namely the northern fulmar, northern gannet, Arctic tern *Sterna paradisaea*, black-legged kittiwake *Rissa tridactyla*, European herring gull *Larus argentatus*, common guillemot *Uria aalge*, razorbill *Alca torda*, Manx shearwater *Puffinus puffinus*, cormorant *Phalacrocorax carbo*, European shag *Phalacrocorax aristotelis*, lesser black-backed gull *Larus fuscus*, common tern *Sterna hirundo*, sandwich tern *Sterna sandvicensis* and Atlantic puffin *Fratercula arctica*. These species have large foraging ranges, from colonies to offshore feeding grounds. The individuals of all species using the offshore area in the breeding season may originate from colonies along east coast of Scotland, and the north-east coast of England.

12.5.5 Most of same species are present within the Offshore Ornithology Study Area outside of the breeding season, however many of the individuals are likely to originate from colonies further afield. Small

numbers of several gull species could also be present, although these tend to forage closer to the shore, including, common gull *Larus canus* and great black-backed gull *Larus marinus*.

12.5.6 Inshore and coastal waterbirds, such as red-throated diver *Gavia stellata*, common goldeneye *Bucephala clangula*, velvet scoter *Melanitta fusca*, long-tailed duck *Clangula hyemalis*, common scoter *Melanitta nigra*, common eider *Somateria mollissima* and Slavonian grebe *Podiceps auratus* may be present closer to shore along the coast.

Offshore Ornithology Study Area

12.5.7 At the time of preparing this Offshore Scoping Report, results from the initial 12 months of DAS (March 2022 to February 2023) were available for analysis. The raw counts of these surveys are presented in Table 12.3.

12.5.8 The first year of DAS of the Array Area Study Area indicated that the highest count per month was recorded towards the end of the breeding season, with a total of 49,470 birds (August 2022). This peak aligns with the fledging and post fledging period, recording the greatest abundance before dispersal.

12.5.9 Common guillemot was the most abundant species with a total 113,464 recorded in the first 12 months of DAS. Peak numbers were recorded in May and August with 24,651 and 24,784 respectively. The majority of common guillemot typically winter offshore before returning to their nesting sites to lay a single egg between April and May. Following approximately a month of incubation and three weeks of rearing, the chicks depart the nest.

12.5.10 The second most common species recorded was the black-legged kittiwake with 28,461 recorded in the first 12 months of DAS with the highest count in August with 9,700 individuals. Similar to common guillemot, black-legged kittiwake, can be seen in coastal areas, especially in the breeding season between April and August. They lay one to three eggs and incubation lasts approximately 27 days. Young leave the nest between August and September coinciding with the highest count recorded in August (Table 12.3).

12.5.11 The Array Area Study Area is located too far away from the coast and bathymetry is too deep to provide suitable foraging habitat for inshore marine birds to be present. However, these species may be present within the vicinity of Export Cable Corridor Study Area, spanning the area between the Export Cable Corridor Landfall and Array Area Study Area. Data from Waggitt *et al.* (2019) will be used to obtain monthly abundance and density estimates of ornithological features in this area.

12.5.12 As previously stated, the results from the intertidal and nearshore surveys have not been analysed at the point of writing and therefore

no results are present within this Offshore Scoping Report. All results will be provided as part of the Offshore EIA Report.

Table 12.3: Raw (Non-Modelled) Abundance of All Taxon Recorded During the First Year of DAS within the Array Area Study Area. *The Larger Array Area Study Area was Covered in these Months (Summer Months)

Taxon	2022										2023		Total
	Mar	Apr*	May*	Jun*	Jul*	Aug*	Sep	Oct	Nov	Dec	Jan	Feb	
Arctic skua *Stercorarius parasiticus*	-	-	-	-	1	-	-	-	-	-	-	-	1
Arctic tern	-	10	3	-	5	157	-	-	-	-	-	-	175
Atlantic puffin	59	146	84	118	95	651	682	6	7	8	5	80	1,941
Auk species	69	192	136	99	66	55	122	9	19	8	7	38	820
Auk/shearwater species	-	105	72	74	27	10	3	-	-	-	-	-	291
Black guillemot	1	3	-	-	-	-	-	1	-	-	-	-	5
Black-backed gull species	-	-	-	2	2	-	-	-	-	-	-	-	4
Black-headed gull *Chroicocephalus ridibundus*	-	-	3	15	8	138	-	-	-	-	-	-	164
Black-legged kittiwake	375	2,580	3,003	6,389	4,801	9,639	189	403	173	119	97	308	28,076
Commic tern (common/Arctic tern)	-	4	7	7	2	216	-	-	-	-	-	-	236
Common eider	-	76	36	82	61	50	-	-	-	-	-	-	314
Common guillemot	11,436	10,963	24,259	15,207	16,745	24,000	2,508	2,447	255	798	346	2,232	111,196
Common guillemot/razorbill	492	1,439	1,235	665	626	1,729	1,349	359	76	376	159	123	8,628
Common gull	-	32	18	16	9	228	2	8	-	-	-	2	315

Taxon	2022										2023		Total
	Mar	Apr*	May*	Jun*	Jul*	Aug*	Sep	Oct	Nov	Dec	Jan	Feb	
Common scoter *Melanitta nigra*	-	-	-	15	-	-	-	-	-	-	-	-	15
Common tern	-	-	5	-	-	1	-	-	-	-	-	-	6
Cormorant	-	-	-	4	-	1	-	-	-	-	-	-	5
Cormorant/shag	-	51	11	25	11	5	-	-	-	-	-	-	103
Eurasian curlew *Numenius phaeopus*	-	-	-	-	-	1	-	-	-	-	-	-	1
Diver species	1	-	-	-	-	-	-	-	-	-	-	-	1
Duck species	-	-	1	47	-	2	-	-	-	-	-	-	50
European herring gull	2	341	1,975	2,350	1,940	1,711	1	38	5	82	-	9	8,454
European storm petrel *Hydrobates pelagicus*	-	-	1	-	-	-	-	-	-	-	-	-	1
Feral pigeon *Columba livia*	-	-	2	-	-	-	-	-	-	-	-	-	2
European golden plover *Pluvialis apricaria*	-	2	-	-	-	-	-	-	-	-	-	-	2
Great black-backed gull	4	10	6	23	7	17	-	12	22	55	3	2	161
Great skua *Stercorarius skua*	-	-	1	-	2	1	1	1	-	-	-	-	6

Taxon	2022										2023		Total
	Mar	Apr*	May*	Jun*	Jul*	Aug*	Sep	Oct	Nov	Dec	Jan	Feb	
Grey heron *Ardea cinerea*	-	-	1	1	-	2	-	-	-	-	-	-	4
Gull species	1	9	14	12	16	94	-	-	-	-	-	2	148
Large gull species	1	5	4	12	9	50	1	1	-	1	-	-	84
Little auk *Alle alle*	-	-	-	-	-	-	-	-	-	-	-	1	1
Little gull	-	-	-	-	-	-	-	2	-	-	-	-	2
Leach's Storm Petrel *Hydrobates leucorhous*	-	-	-	-	-	-	-	1	-	-	-	-	1
Lesser black-backed gull	-	3	4	14	15	12	-	-	-	-	-	-	48
Manx shearwater	-	4	2	16	7	1	-	-	-	-	-	-	30
Northern fulmar	122	109	182	573	720	154	111	18	362	165	244	131	2,891
Northern fulmar/gull species	-	-	-	3	55	53	5	-	1	3	1	-	121
Northern gannet	127	473	1,075	1,435	369	211	425	127	16	50	4	17	4,329
Eurasian oystercatcher *Haematopus ostralegus*	-	-	-	-	-	9	-	-	-	-	-	-	9
Passerine species	-	-	-	-	-	-	-	67	-	-	-	-	67
Razorbill	326	2,924	2,196	1,444	1,627	9,118	320	189	110	262	31	410	18,957
Red-breasted merganser *Mergus serrator*	-	1	-	-	-	-	-	-	-	-	-	-	1

Taxon	2022										2023		Total
	Mar	Apr*	May*	Jun*	Jul*	Aug*	Sep	Oct	Nov	Dec	Jan	Feb	
Red-throated diver *Gavia stellata*	-	1	9	-	1	-	-	-	-	-	-	-	11
Sandwich tern	-	3	9	-	48	44	-	-	-	-	-	-	104
Shag	-	-	-	3	2	-	-	-	-	-	-	-	5
Shearwater species	-	-	-	-	-	1	-	-	-	-	-	-	1
Skua species	-	-	-	-	2	-	-	-	-	-	-	-	2
Small gull species	-	5	5	9	14	22	1	5	-	1	-	2	64
Small shearwater species	-	-	-	-	-	1	1	-	-	-	-	-	2
Sooty shearwater *Ardenna grisea*	-	-	-	-	-	-	-	1	-	-	-	-	1
Swan species	-	-	-	-	-	-	-	-	1	-	-	-	1
Tern species	-	-	6	-	1	-	-	-	-	-	-	-	7
Unidentified bird species	11	137	63	28	30	37	17	6	1	1	1	4	336
Wader species	-	-	-	-	-	12	-	-	-	-	-	-	12
Total	13,027	19,628	34,428	28,688	27,324	48,433	5,738	3,701	1,048	1,929	898	3,361	188,203

12.6 Embedded Mitigation

12.6.1 During the project design phase, several Embedded Mitigation measures are suggested to minimise potential impacts on offshore ornithology:

- Development of and adherence to an EMP, which will include an MPCP, and the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a VMP and NSP.
- Wind Turbine design to have a minimum lower blade tip height of 22 m above Mean High Water Springs (MHWS), accounting for pitch and roll as per Marine Guidance Note (MGN) 654.
- Drafting and implementation of a decommissioning programme.
- The development and adherence to an Entanglement Management Plan, or equivalent.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

12.6.2 These measures will adapt during the development process, through interface between the EIA process and the design and engineering activities and will require revision and feedback from consultees. The environmental measures outlined relate to ornithological features and their prey sources. This is supported by Appendix A: Draft Schedule of Mitigation and Commitments.

12.6.3 The significance of the effects on seabird receptors will determine the need to consider any Additional Mitigation measures. Identified Additional Mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

12.7 Potential Proposed Development Impacts

12.7.1 A range of potential impacts on seabirds have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development. These potential impacts have been identified and considered based on relevant guidance (NatureScot, 2023), third-party environmental reports (Section 12.3), professional experience and the understanding of the local offshore sensitivities.

12.7.2 There is an increasing amount of knowledge on the different responses birds have to activities in the marine environment, though it is understood that there are marked differences in the vulnerabilities of different species to potential impacts.

12.7.3 Based on the published literature and JNCC's ornithology renewables advice note (JNCC, 2020b) the following potential impacts on birds are identified:

- collision risk mortality due to collision with rotor blades;
- distributional responses, displacement and barrier effects from Offshore Infrastructure;
- disturbance to birds from vessel movements;
- disturbance to prey species and their habitats;
- temporary habitat loss and/or habitat disturbance;
- attraction to light;
- entanglement;
- collision risk mortality with substructure and underwater Offshore Infrastructure;
- accidental release of contaminants; and
- long term habitat loss.

12.7.4 The impacts scoped into the assessment are outlined in Table 12.4 together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

12.7.5 Potential impacts scoped out of the assessment are presented in Table 12.4, with justification.

Table 12.4: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Offshore Ornithology

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Collision risk mortality due to collision with rotor blades	×	✓	×	Some species are more at risk than others of colliding with the rotating Wind Turbine blades, depending on their: • Flight height; • Flight agility; and • Degree of Wind Turbines or OWF avoidance (micro/meso/macro avoidance)	Data collected from DAS and then modelled via Marine Renewables Strategic environmental assessment (MRSea) (where applicable) will predict the density of birds within the Array Area. Where species are recorded in low numbers (raw count <10 individuals) or in uniform density, design-based modelling will be used.	CRM will be performed on data acquired from the DAS of the Offshore Ornithology Study Area. The CRM will be run via the Stochastic Collision Risk Model (sCRM) Shiny application. Full methods of assessment presented within Section 12.8.
Distributional responses, displacement and barrier effects from Offshore Infrastructure	✓	✓	✓	Birds may be displaced from their preferred foraging areas (displacement) or be required to undertake more costly flights between the colony and their preferred foraging areas (barrier effects). Displacement and barrier effects have the potential to occur across all development phases with construction and decommissioning	Data collected from DAS and then modelled via MRSea (where applicable) will predict the density of birds within the Array Area and species-specific buffer. Displacement analysis will then be undertaken to predict the impact. Where	Displacement effects will be evaluated for seabirds from the data obtained from the DAS using displacement matrices. Full methods of assessment presented within Section 12.8.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				impacts lesser than during O&M when the number of Offshore Infrastructure is greatest.	species are recorded in low numbers (raw count <10 individuals) or in uniform density, design-based modelling will be used. Displacement analysis will then be undertaken to predict the impact.	
Disturbance to birds from vessel movements	✓	✓	✓	Birds may be disturbed from their preferred foraging areas by the transiting of vessels from between a port and the wind farm and along the Export Cable Corridor during construction and operation and maintenance activities. Disturbance from vessels occurs not just from the physical presence of the vessels but also the works the vessels is undertaken e.g. clearance of UXO (during construction).	Data collected from DAS and then modelled via MRSea (where applicable) will predict the density of birds within the Array Area and species-specific buffer. Where species are recorded in low numbers (raw count <10 individuals) or in uniform density, design-based modelling will be used. Displacement analysis will then be undertaken to predict the impact. Data will be obtained from Waggitt *et al.*	Disturbance effects of vessels will be evaluated for seabirds from the data obtained from the DAS, landfall surveys and Waggitt *et al.* (2019) using displacement matrices. Both quantitative and qualitative assessments may be undertaken for different areas and Proposed Development phases. Full methods of assessment presented within Section 12.8.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
					(2019) or the nearshore landfall surveys to predict the density of birds within the 10 km buffer from Export Cable Corridor to inform disturbance analysis within the Export Cable Corridor.	
Disturbance to prey species and their habitats	✓	✓	✓	The distribution of prey species could potentially be disturbed (increase or decrease) which may cause displacement effects up the food chain, or even attract certain species (who are then more at risk of collision). Changes in underwater noise (including during UXO clearance), hydrology, physical processes, sediment transport or wave exposure associated with all phases may also displace prey availability.	The assessment will be informed by Section 10: Fish and Shellfish Ecology, Section 9: Benthic Ecology and Section 7: Physical Processes.	The Offshore EIA Report will assess the impact on seabirds via the direct impact to other receptors. Full methods of assessment presented within Section 12.8.
Temporary habitat loss and/or disturbance	✓	×	✓	During construction and decommissioning the habitats are likely to be impacted by placement and/or removal of physical objects (e.g. cables, scour protection). Clearance of UXO during construction will also temporarily	The assessment will be informed by Section 10: Fish and Shellfish Ecology, Section 9: Benthic Ecology and Section 7: Physical Processes.	The Offshore EIA Report will assess the impact on seabirds via the direct impact to other receptors. Full methods of

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				impact the habitat. This direct impact to the habitats if likely to indirectly impact seabird species via increased suspended sediment or loss of foraging area. The indirect impact on seabirds will be assessed.		assessment presented within Section 12.8.
Attraction to light	✓	✓	✓	Permanent lit structures (e.g. navigational lights on Wind Turbines) may cause an impact to migrating birds. Attraction to light has the potential to increase the risk of the other impact pathways (e.g. distributional responses or collisions). This impact will specifically look at which species are thought vulnerable to light.	The vulnerability for migrant species to this impact will be informed by standard literature.	The Offshore EIA Report will assess disturbance to migrating species. Full methods of assessment presented within Section 12.8.
Entanglement	×	✓	×	If floating structures are taken forward for the Proposed Development there will be associated mooring lines (see Section 3: Project Description of this report for more details of the Proposed Development). There is potential that these mooring lines could lead to direct entanglement (primary entanglement) or secondary entanglement whereby	Data collected from DAS and then modelled via MRSea (where applicable) will predict the density of birds within the Array Area.	Species which are susceptible to entanglement (diving species) will be assessed against this impact pathway. Full methods of assessment presented within Section 12.8.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				debris gets entangled (e.g. discarded fishing gear) which birds subsequently get entangled in.		

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 12.5: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Offshore Ornithology

Impact	Justification
Collision risk with substructure and underwater Offshore Infrastructure	The risk of birds colliding with the stationary substructure or underwater infrastructure is markedly low (Furness *et al.*, 2012 and Isaksson *et al*, 2020). The substructures and underwater infrastructure are stationary and therefore do not present a risk of collision to seabirds. The risk of collision is primarily due to birds not being able to see the rotating blade due to its speed (Johnston *et al.*, 2014). Stationary structures present a vastly reduced impact and is therefore scoped out.
Accidental release of contaminants	The potential impacts caused by the accidental release of pollutants is covered by non-EIA legislation which mitigates against potential impacts to benthic, subtidal and intertidal receptors, thus significant impacts will not be generated for offshore or bird species. As part of the EMP an MPCP will be provided. The MPCP will contain measures to minimise impact to the environment.
Long term habitat loss	The impacts resulting from the footprint of the Offshore Infrastructure including Wind Turbine foundations or cable protection etc, are considered a permanent loss. However, this habitat loss would be highly localised and negligible for ornithological receptors due to the spatial scale over which these species occur. Scoping out of this impact was agreed at the Scoping Workshop in April 2024.

12.8 Proposed Assessment Methodology

12.8.1 Key seabird species will be assessed in relation to their seasonal use of the marine environment and their potential connectivity with the Offshore Ornithology Study Area. All assessed impacts will be specifically defined by breeding and non-breeding seasons, as set out in NatureScot (2020c).

12.8.2 The offshore ornithology section of the Offshore EIA Report will follow the methodology set out in Section 4: EIA Methodology. In addition to the overall EIA method, there are specific methods that will be used for the assessment of offshore ornithology as presented below for the following topics:

- baseline modelling;
- CRM;

- displacement assessment;
- apportioning; and
- Population Viability Analysis (PVA).

Baseline modelling

12.8.3 The assessment will be based on seabird abundance and density estimates within the Offshore Ornithology Study Areas. Seabird abundance and density calculations will differ between the Array Area Study Area and the Export Cable Corridor. This section is specific to the Array Area Study Area baseline modelling. Abundances and density estimates within the Export Cable Corridor will be taken from Waggit *et al.*, 2019 (as described in paragraph 12.3.7).

12.8.4 Consideration will be given to the appropriate reporting regions within the Array Area Study Area, with abundances and densities of birds produced using design-based methods, derived from raw DAS data. NatureScot and MD-SEDD have recently expressed a preference for deriving these estimates using model-based approaches, particularly the Marine Renewables Strategic environmental assessment (MRSea) package (NatureScot 2020b and 2023e).

12.8.5 For the Offshore EIA Report, the full 24 months of DAS will be analysed. It is intended that MRSea modelling will be undertaken for the density estimates and visual mapping within the Offshore EIA Report. MRSea modelling can only be used for species with a raw count >10 and with non-uniform distribution (NatureScot, 2023e). Where MRSea modelling cannot be used, design-based estimates of density and abundance will be used.

12.8.6 MRSea modelling incorporates environmental parameters within the density estimates and therefore is a slightly more sophisticated model. To provide information on the baseline environment from the first 12 months of data for this Offshore Scoping Report, the less sophisticated model (kernel density modelling) is considered appropriate as no species are proposed to be scoped out following review of the initial data.

12.8.7 The abundance estimates require correction to account for birds which were unidentified or submerged during the DAS. Unidentified birds are those which could not be identified to species level and were allocated to a relevant broad group, e.g. 'common guillemot/razorbill' or 'auk species'. Birds which were submerged during DAS are those which are estimated to have been foraging underwater during the snapshot of the DAS in an area of sea and were therefore not visible, known as availability bias.

12.8.8 To apportion unidentified birds, known species estimates for each survey month are increased proportionally. Each species will have a single proportional increase assigned to it for each survey month.

These ratios can simply be summed to get the total proportional increase. To exemplify this, consider a month with 1,200 'common guillemot/razorbills', 200 of which are unknown, 900 identified common guillemots, and 100 identified razorbills. Applying the formula leads to a ratio of:

200 (unknown 'common guillemot/razorbill') / (900 common guillemot + 100 razorbill) = 0.20.

12.8.9 Thus, both razorbill and common guillemot need to be increased by 0.20 (or multiplied by 1.20), which leads to an absolute estimate of 900*1.20 = 1,080 common guillemots and 100*1.2 = 120 razorbill. The 200 unknown birds have thus been proportionally attributed to razorbill and common guillemot (180 to common guillemot, and 20 to razorbill).

12.8.10 To correct for the availability bias of abundance estimates to account for submerged birds, correction factors are applied to estimates of sitting common guillemot, razorbill and Atlantic puffin, based on known times spent foraging underwater. JNCC (2013) advise that 23.75% of common guillemot, 17.4% of razorbill and 14.2% of Atlantic puffin are underwater when DAS is captured, therefore correction factors are assigned as 1.311, 1.211 and 1.165, respectively.

12.8.11 Availability bias is corrected for by applying the above correction factors to sitting auks (excluding other behaviours) using the following formula:

*(Absolute birds) = (Relative birds * proportion(sitting) / proportion(visible)) + (Relative birds * (1-proportion(sitting))).*

Collision risk modelling

12.8.12 The Stochastic Collision Risk Model (sCRM) tool (McGregor *et al.*, 2018) will be employed to assess the potential collision risk for key species resulting from the O&M phase of the Proposed Development. Options 1 and 2 of the basic Band (2012) model are likely to be used in the assessment of collision risk. Option 1 models collision risk by assuming a uniform distribution of birds at collision height across the rotor, giving a Proportion at Collision Height. Option 2 uses the flight height distribution of birds to calculate the proportion of birds flying at collision height.

12.8.13 Both generic and site-specific flight height data will be utilised within the CRM. As recommended by NatureScot (2023e), generic flight height will be taken from Johnston *et al.* (2014). Site-specific flight height will be obtained from LiDAR surveys of birds within the Array Area.

12.8.14 Morphological and behavioural parameters for the key species will be obtained from existing literature and are summarised in NatureScot

(2023e). Morphological parameters (body length, wingspan) are sourced from BTO BirdFacts (BTO, 2024). Nocturnal activity factors are derived from Garthe and Hüppop (2004) and Furness *et al*. (2018). Flight speed is derived from Pennycuick (1997) and Alerstam *et al*. (2007). The CRM also incorporates Wind Turbine parameters including rotor radius, Air Gap and maximum width of OWF, which will be provided as part of the PDE to inform the EIA. The maximum width of the Proposed Development is calculated by taking the two furthest apart points of the red-line boundary; this is indicative of the longest possible flight a bird could take through the wind farm if it was under continuous flight at a set speed.

12.8.15 Species differ in their susceptibility to collision risk depending on their avoidance response to moving Wind Turbine rotor blades. Avoidance rates (% avoidance) are applied to collision risk models to more realistically predict impacts, based on the best available literature and expert advice on seabird behaviour and flight response to Wind Turbines. Avoidance rates recommended by NatureScot (2023e) will be used in the CRM unless otherwise agreed.

12.8.16 A review of all the species recorded within the Array Area identified key species at risk of collisions from the first 12 month of data. The most abundant species, which are susceptible to collisions were black-legged kittiwake, northern fulmar and northern gannet. These species may change with the results from the second-year of DAS. Some species could be added if further assessment is needed, or species could be scoped out if only recorded sporadically or with very low numbers.

12.8.17 Migratory CRM will be used to predict the number of collisions of migratory birds based on the species and populations identified to be at risk of crossing the Bowdun Array on migration routes. The species at risk of migratory collision may include species not assessed for non-migratory collision risk and may include migratory waterbirds and migratory seabirds.

12.8.18 The stochastic migration CRM tool (mCRM) will be used as recommended by NatureScot (2023e). The mCRM tool uses the migration corridor of a target species and the footprint of the proposed OWF, along with Wind Turbines, morphological and behavioural parameters to model estimated collision mortalities in seasonal migration movements.

Displacement assessment

12.8.19 Following the SNCB interim displacement advice note (JNCC *et al*., 2022b) and NatureScot (2023e) guidance, displacement effects will be evaluated from the first 12 months of data and will be updated with the further 12 months for seabirds in flight and those sitting on the water, including both foraging and loafing activities, while addressing availability bias for seabirds potentially underwater during

the survey. Distributional responses, displacement and barrier effects from OWFs present a risk of increased energy expenditure or reduced energy intake as birds avoid or are completely displaced from foraging areas, resulting in reduced survival and/or productivity (NatureScot, 2023e).

12.8.20 Seabird species display varying magnitudes of displacement responses and subsequently mortality from displacement impacts of OWFs, therefore NatureScot (2023e) advise the use of species- or group-specific displacement and mortality rates (Table 12.6).

Table 12.6 Displacement and Mortality Rates to Be Used in Displacement Assessment, Obtained from NatureScot (2023e).

Species/species group	Displacement rate	Mortality rate (breeding season)	Mortality rate (non-breeding season)
Auks (guillemot, razorbill, puffin)	60%	3% and 5%	1% and 3%
Gannet	70%	1% and 3%	1% and 3%
Kittiwake	30%	1% and 3%	1% and 3%

12.8.21 SNCB guidance for assessing displacement impacts on seabirds from OWFs (JNCC *et al.*, 2022b; NatureScot, 2023e) advise the utilisation of the displacement matrix approach. The matrix approach applies displacement and mortality rates to peak seasonal abundances to estimate additional mortalities arising from displacement effects. The matrix-based approach will be employed for this assessment across all relevant species during specific seasonal periods.

12.8.22 A review of all the species recorded within the Array Area Study Area identified key species at risk of displacement from the first 12 months of data. The most abundant species, which are also susceptible to displacement were common guillemot, razorbill, and Atlantic puffin.

12.8.23 To assess displacement and barrier effects from Offshore Infrastructure, species densities will be determined using estimates derived from baseline DAS data from March 2022 to February 2024. Mean peak population abundances for each species within the site boundary plus an appropriate buffer during each seasonal period (breeding and non-breeding) will be derived from these estimated densities.

12.8.24 Disturbance associated with vessel movements and activities will use the baseline DAS data, nearshore landfall survey data and estimated densities from Waggitt *et al.* (2019). A radius around each

vessel will be assessed that covers the species-specific sensitivity of disturbance.

Apportioning

12.8.25 Apportioning is necessary to assess the impacts on different breeding colonies in different seasons. During the breeding and non-breeding season, age class apportioning will be based on stable age population models using proportions derived from site-specific survey data to assign impacts to between adults and immatures.

12.8.26 The predicted impacts on colonies from nearby SPAs is assessed by considering the size of a population at SPAs and non-SPAs, and the distance between the Proposed Development and those sites. It considers the presence of immature and non-breeding (sabbatical) birds, with a proportion of any impact from the Proposed Development also attributable to these populations following NatureScot (2023e) guidance.

Population Viability Analysis

12.8.27 PVA is an essential analysis to understand the population consequences of the predicted impacted. PVA will be undertaken when a decrease in survival of >0.02 percentage points is predicted (e.g. a survival rate decreases from 80% to 79.98%) in line with NatureScot guidance for a specific colony and species (NatureScot, 2023e). Within the Offshore EIA Report and when considering the regional population, the threshold when PVA will be undertaken will be >1% increase in baseline mortality (in line with Berwick Bank (SSE Renewables, 2022f) and West of Orkney (Offshore Wind Power Limited, 2023) applications). This serves as a valuable indication for further assessments to understand the long-term effects of additional mortalities.

12.8.28 PVA will be undertaken using the latest version of the Natural England PVA tool (Searle *et al.*, 2019), as recommended by NatureScot (2023e). This tool uses a Leslie Matrix model which is characterised by an age structured model and populated with life-history parameters, estimating population size over a defined period, often between 25 and 50 years.

Determination of Significant Effects

12.8.29 The assessment methodology outlined by CIEEM (2018) entails a structured approach. First, a baseline description of the current ornithological conditions in the study area is established, after which potential ornithological receptors are identified within this area.

12.8.30 Proposed Development activities are then assessed to determine their potential effects on these receptors throughout the Proposed Development lifecycle, including construction, O&M and

decommissioning phases. The effects of these activities are evaluated, considering factors such as magnitude, extent, duration, reversibility, timing, and frequency.

12.8.31 These effects are characterized for their likelihood of occurrence and assessed for their ecological significance and geographical scale, with consideration given to the certainty of predictions. Mitigation measures are proposed where applicable.

12.8.32 Residual effects are assessed for their ecological significance and geographical scale, with a focus on the certainty of predictions. Finally, cumulative effects are evaluated, taking into account any mitigation measures that have been implemented throughout the assessment process.

12.8.33 The assessment prioritizes significant effects on receptors, which are determined by first evaluating the importance (conservation value) and sensitivity of the receptor, as well as the magnitude of the impact. Sensitivity will be categorised between negligible and high, depending on vulnerability and/or recoverability of the receptor. The magnitude of impact will also be categorised between negligible and high, depending on the effect of the impact on the bird population.

12.8.34 Having established the importance, sensitivity, and vulnerability of an ornithological receptor, CIEEM guidelines (2018) will be followed to determine whether an effect is 'significant' or 'not significant', using an evidence-based approach. These guidelines actively discourage the use of a matrix approach due to the subjective nature of using value-based judgements to determine significance. Rather, determination of significance will be based on measurable species-specific impacts on population integrity using all data and evidence available, while refraining from using value-based judgements. Using this approach, if an effect is of a scale that does not affect population integrity, the effect is considered 'non-significant'.

12.9 Potential Inter-related Effects

12.9.1 Inter-related effects considered within the Offshore EIA Report will relate to several different effects and potential assessments.

12.9.2 Array lifetime effects, whereby an effect can occur across multiple phases of the development will be assessed. There is potential that if only one phase was considered in isolation, then the significance of the impact could be diluted.

12.9.3 Inter-related effects can also be receptor led, whereby a single receptor (e.g. black-legged kittiwake) can be impacted by multiple impacts. Each seabird species is likely to be impacted by each of the impacts (presented in Section 12.7) to varying degrees. The inter-relatedness of these impacts will be considered and assessed.

12.9.4 Finally the ecosystem based inter-related effects will also be considered. These ecosystem-based effects work by directly impacting one receptor which indirectly impacts another; for example the direct impact on fish (e.g. through increased noise) will indirectly impact seabirds. These indirect (and direct) inter-related effects at an ecosystem level will also be assessed within the Offshore EIA Report.

12.10 Potential Cumulative Effects

12.10.1 The predicted effects of the Proposed Development are anticipated to interact with other current or proposed projects thus creating cumulative effects on the offshore ornithology receptors.

12.10.2 The CEA will be undertaken in accordance with the methodology set out in Section 4: EIA Methodology, and will consider the same impacts as the assessment for the Proposed Development alone. The CEA will consider a range of projects dependent on their impact in addition to species' behaviour or distribution. The projects included within the CEA may include:

- any existing or in planning oil and gas installations;
- port developments; and
- other offshore renewable energy developments (including wind, wave and tidal).

12.10.3 Consideration of each other projects' spatial and temporal overlap will be provided to ascertain whether a cumulative effect could occur. Where no temporal or spatial overlap occurs for any of the phases of the Proposed Development, then no cumulative effect will be concluded.

12.10.4 The strategic level CEF, being developed by Centre for Ecology & Hydrology (CEH) on behalf of MD, is unlikely to be published in the timeframe for which the applicant can used within the EIA, therefore alternative approaches have been considered. As part of NEEOG, the Applicant has commissioned a report which will provide an agreed set of cumulative effects from constructed and submitted for examination projects which are likely to have a cumulative effect. All NEEOG projects will use these agreed CEA numbers, for comparable results. If the CEF, is available at time of submission then it may be used as an alternative or supplementary approach to the developer lead CEA.

12.11 Potential Transboundary Effects

12.11.1 There is the potential for different species or groups of seabirds to move across a variety of international and national boundaries depending on seasons, therefore transboundary impacts will be screened into the EIA. Published information on seabird foraging behaviour (i.e. Woodward *et al.*, 2019) will be used to determine transboundary connectivity during the breeding season.

12.11.2 As much of the work associated with the construction, O&M, and decommissioning of Proposed Development is localised and temporary, the associated impacts are in turn also expected to be localised and temporary. The impacts assessed are the same ones considered from the Proposed Development alone (Table 12.4).

12.12 Summary

12.12.1 In the context of Offshore Ornithology, a comprehensive assessment will be undertaken to assess the likely significant effects on bird species arising from various phases of the Proposed Development, including construction, O&M and decommissioning.

12.12.2 The Offshore Ornithology Study Areas consist of the Array Area Study Area (E3 POA plus a 12 km buffer around the perimeter, extending west to the coast during the breeding season - April to August inclusive) and the Export Cable Corridor Study Area (the Export Cable Corridor plus a 10 km buffer, up to MHWS). DAS were undertaken in the Offshore Ornithology Study Areas, following guidance by JNCC, covering the Array Area Study Area and part of the Export Cable Corridor Study Area. The site-specific surveys, primarily using DAS, will be integral to the Offshore EIA Report.

12.12.3 SPAs situated outside the Offshore Ornithology Study Areas are considered due to the extensive foraging ranges of certain seabird species. The baseline environment summary contains information gathered from the initial 12 months of DAS, highlighting key bird species and their seasonal presence. These include, but are not limited to Atlantic puffin, black-legged kittiwake, common guillemot, northern fulmar, razorbill, and northern gannet. Common guillemot and black-legged kittiwake were the most abundant species recorded during the first 12 months of DAS.

12.12.4 Potential Proposed Development impacts are identified, covering aspects such as habitat loss, collision risks, displacement, and contaminants. Embedded Mitigations are proposed during the project design phase to mitigate potential impacts, particularly focused on ornithological features and prey sources, subject to potential further revision based on stakeholder feedback.

12.12.5 The proposed assessment methodology outlines a systematic approach, including baseline modelling, CRM, displacement assessment, apportioning, and PVA for key seabird species.

12.12.6 Likely significant cumulative effects will be assessed, considering interactions with other projects like navigation, shipping, oil and gas installations, port developments, and other offshore renewable energy projects.

12.12.7 Likely significant inter-related effects will be assessed across the Proposed Development lifetime, considering effects on one receptor from multiple phases and/or multiple impacts (receptor-led impacts). Temporal and spatial considerations are integral to this evaluation.

12.12.8 Lastly, likely significant transboundary effects will be assessed, acknowledging the potential movement of seabirds across international and national boundaries. Localised and temporary impacts associated with the construction, O&M, and decommissioning phases are expected, encompassing factors like habitat loss, and disturbance to prey species.

13 Commercial Fisheries

13.1 Introduction

13.1.1 This section of the Offshore Scoping Report, prepared by NiMa Consultants Ltd., identifies the commercial fisheries receptors of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development on commercial fisheries.

13.1.2 In this section, 'commercial fishing' is defined as any form of fishing activity legally undertaken where the catch is sold for taxable profit.

13.2 Commercial Fisheries Study Area

13.2.1 The Proposed Development is located within the northern portion of ICES Division 4b (CNS) statistical area (NMPi, 2024); within UK Exclusive Economic Zone (EEZ) waters. For recording commercial fisheries landings, ICES Division 4b is divided into statistical rectangles, of which the Proposed Development overlaps with 42E7, 42E8 and 43E8.

13.2.2 For the purposes of the Offshore Scoping Report and for the subsequent Offshore EIA Report, two Commercial Fisheries Study Areas are proposed, as described below.

Local Commercial Fisheries Study Area

13.2.3 The Local Commercial Fisheries Study Area illustrated in Figure 13.1 comprises ICES rectangles 42E7, 42E8 and 43E8. This Local Commercial Fisheries Study Area focuses on the Proposed Development overlap with ICES rectangles.

Regional Commercial Fisheries Study Area

13.2.4 A wider regional study area will be considered to allow assessment of displacement impacts within the Offshore EIA Report. It is proposed that the Regional Commercial Fisheries Study Area will also include those ICES rectangles immediately adjacent to the Local Commercial Fisheries Study Area (rectangles 41E7, 41E8, 41E9, 42E9, 43E9, 44E9, 44E8, 43E7), as indicated in Figure 13.1.

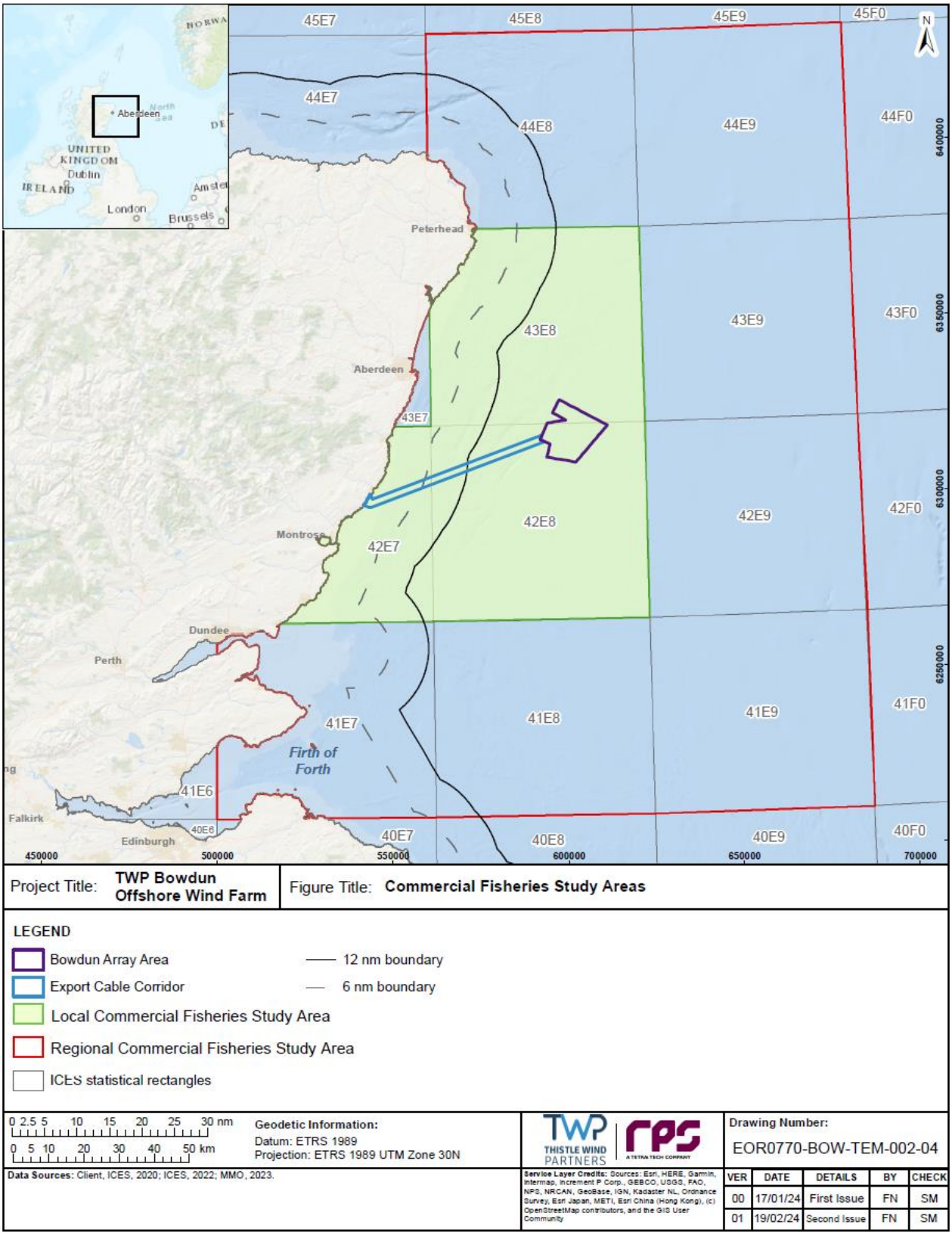


Figure 13.1: Commercial Fisheries Study Areas

13.3 Data Sources

13.3.1 The data sources that have been used to inform this section are presented within Table 13.1. These data sources will be taken forward and used to inform the subsequent EIA, alongside additional site-specific data that will be collected for the Proposed Development, such as Vessel Traffic Survey (VTS) data and any regionally specific data made available to the Proposed Development from commercial fisheries stakeholders. No site-specific commercial fisheries surveys will be undertaken. The data sources listed in Table 13.1 are all considered relevant and up to date; where new data becomes available, this will be used to inform Offshore EIA Report.

Table 13.1: Key Sources of Commercial Fisheries Data

Source	Summary	Coverage of Study Areas	Data Quality
MMO (2023b), UK annual fisheries landings statistics: MMO, 2018-2022	Annual fisheries landings data providing information on fishing activity for all UK commercial fishing vessel landings plus foreign vessel landings into UK ports. Note that the most recent data has been presented in the Offshore Scoping Report, but that longer term datasets will be analysed within the Offshore EIA Report.	UK national dataset providing full coverage of the Commercial Fisheries Study Areas.	The data are recorded from sales notes and landing declarations for all vessel lengths. Due to the UK legislation of Registration of Buyers and Sellers (The Registration of Fish Buyers and Sellers and Designation of Fish Auction Sites Regulations, 2005), data are considered accurate and verifiable. Data assessed with low uncertainty and high confidence.
MMO (2023b), UK Vessel Monitoring System (VMS) data: MMO, 2016-2020	VMS data for UK fishing vessels greater than 15 m in length, including vessels registered in Scotland, England, Northern Ireland, Wales and Isle of Man. 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. VMS data sourced from	UK national dataset providing full coverage of the Commercial Fisheries Study Areas.	The data are only available for 15 m and over vessels, so are not representative of <15 m vessels. Data assessed with medium uncertainty and medium confidence.

Source	Summary	Coverage of Study Areas	Data Quality
	MMO displays the first sales value (£) of catches.		
EU Data Collection Framework (DCF) (2020), EU annual fisheries landings statistics Scientific, technical and economic committee for fisheries, 2004-2016 EU DCF	Annual fisheries landings data for UK and EU registered fishing vessels landing to their home nation ports.	European-wide dataset providing full coverage of the Commercial Fisheries Study Areas.	The data are submitted by individual member states and therefore limitations vary per country. Vessels under 10 m may be omitted or mis-represented by the data. Accuracy is likely to be greater for landings from larger vessels. For UK vessels under 10 m length, data are assessed with: high uncertainty and low confidence. For all other EU vessels data are assessed with low uncertainty and high confidence.
ICES (2022b), EU VMS data: ICES, 2016-2020	VMS data for UK and EU fishing vessels greater than 12 m in length. VMS data sourced from ICES displays the surface Swept Area Ratio of catches by different gear types and	European-wide dataset providing full coverage of the Commercial Fisheries Study Areas.	The data are only available for 12 m and over vessels, so are not representative of <12 m vessels. Data assessed with medium uncertainty and medium confidence.

Source	Summary	Coverage of Study Areas	Data Quality
	covers EU (including UK) registered vessels 12 m and over in length. Surface Swept Area Ratio indicates the number of times in an annual period that a demersal fishing gear makes contact with (or sweeps) the seabed surface. Surface Swept Area Ratio provides a proxy for fishing intensity.		
Marine Scotland National Marine Plan Interactive (NMPi) (various publication dates) Marine Scotland MAPS NMPi (2024), Fisheries datasets	Fisheries datasets available from the Marine Scotland MAPS NMPi, including ScotMap data and heatmaps for activity by small fishing boats (<12 m in length).	Varying spatial coverage, in most cases providing full coverage of the Commercial Fisheries Study Areas.	Datasets involve use of/compilation of several of the other datasets listed in this table. Data assessed precautionarily with medium uncertainty and medium confidence.
European Maritime Safety Agency (EMSA) (2023), Fishing vessel route density data	Fishing vessel route density, based on vessel Automatic Information System (AIS) positional data. AIS is required to be fitted on fishing vessels ≥15 m length. Note that the most recent data has been presented in the Offshore Scoping Report,	European-wide dataset providing full coverage of the Commercial Fisheries Study Areas.	The data are only available for 15 m and over vessels, so are not representative of <15 m vessels. Data assessed with medium uncertainty and medium confidence.

Source	Summary	Coverage of Study Areas	Data Quality
	but that longer term datasets will be analysed within the Offshore EIA Report.		
ICES and MD (various publication dates), Key species stock assessments	Assessments of the status of commercially targeted fish and shellfish stocks.	Varying spatial coverage, in most cases providing full coverage of the Commercial Fisheries Study Areas.	Data assessed with low uncertainty and high confidence.
Scottish Government (2020a), SMP	Description of regional commercial fisheries activity.	Covering POA E3 and therefore providing full coverage of the Array Area.	Description relies on use of/compilation of several of the other datasets listed in this table. Data is no longer the most recently available in some cases. Data assessed precautionarily with medium uncertainty and medium confidence.
North Atlantic Fisheries College Marine Centre University of Highlands and Islands (UHI) (2021), Fisheries activity mapping in the North and East Coast Regional Inshore Fisheries Group (NERIFG) area	Mapping of fishing activity and critical habitats of key species within 12 nm of the coast in the NERIFG area.	Covers the NERIFG area, inclusive of the nearshore part of the Local Commercial Fisheries Study Area.	Datasets involve use of/compilation of several of the other datasets listed in this table. Data is no longer the most recently available in some cases. Data assessed precautionarily with medium uncertainty and medium confidence.

13.3.2 It should be noted that the quantitative datasets identified in Table 13.1 may not capture all commercial fisheries activity in the Commercial Fisheries Study Areas. For instance, the Vessel Monitoring System (VMS) datasets only include vessels ≥12 m (ICES data) or ≥15 m (MMO data) in length. Furthermore, VMS datasets are made publicly available following initial processing of data that may introduce some degree of uncertainty; it is understood that as a result of processing, data may lack spatial resolution due to removal of sensitive info, and that processors need to make informed judgements about inferring when a fishing vessel is transiting versus actively fishing.

13.3.3 However, in addition to VMS data, other published data does provide a useful insight into commercial fisheries activity undertaken in inshore areas (i.e. ScotMap inshore fisheries mapping accessed via Marine Scotland Maps National Marine Plan interactive (NMPi)).

13.3.4 Consultation with representatives of fishermen's associations and organisations has been and will continue to 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 Commercial Fisheries Study Areas. Consultation will also be important to inform gear specifications for vessels active in the Commercial Fisheries Study Areas, which will allow a full understanding of how different vessels and different gear configurations may be affected.

13.3.5 Variations and trends in commercial fisheries activity are an important aspect of the baseline assessment and is the principal reason for considering five to ten years of baseline data. Given the time periods considered in the Offshore Scoping Report (2018 to 2022), existing baseline data may capture changes in commercial fisheries activity resulting from the COVID-19 pandemic, which may have temporarily affected market demand and supply chains. Additionally, 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 a five-year time series but may benefit from longer term analysis dependant on the target species.

13.4 Baseline Environment

Commercial Fisheries in the Local and Regional Commercial Fisheries Study Areas

13.4.1 An understanding of the commercial fisheries baseline environment within the Commercial Fisheries Study Areas has been developed from the available literature and data sources presented in Table 13.1.

Local Commercial Fisheries Study Area

13.4.2 Landings by UK registered vessels from the Local Commercial Fisheries Study Area had an annual average landings value of approximately £6 million across the years 2018 to 2022 (MMO, 2023b), with landings values peaking in 2018 at £7.3 million and being at their lowest in 2020 at £4.5 million, likely a reflection of the effects of the COVID-19 pandemic.

13.4.3 Over the same time period, the annual average weight of landings from the study area was 1,900 tonnes, peaking at approximately 2,300 tonnes in 2018.

13.4.4 Landings of shellfish dominated, accounting for 94% of the total landings value (based on data from MMO, 2023b). Landings of demersal fish species accounted for 5% of the total landings value, and pelagic fish species around 1%. Scottish vessels were responsible for the majority (94%) of landings, with landings also being made by vessels registered in England. The main landing ports local to the Proposed Development include (but are not limited to) Arbroath, Peterhead and Montrose.

13.4.5 Figure 13.2 and Figure 13.3 show the top 12 species landed in the Local Commercial Fisheries Study Area by value and weight respectively, from 2018 to 2022 (MMO, 2023b). Figure 13.4 shows the landed value over the same period from the Local Commercial Fisheries Study Area by ICES rectangle and gear type. The key species landed are lobster *Homarus gammarus*, king scallop *Pecten maximus* (also referred to as scallop) and brown crabs *Cancer pagarus*.

13.4.6 MMO landings data (MMO, 2023b) confirms that the first sales value and weight of lobster fluctuated over the 2018 to 2022 period, showing a general pattern of decline and peaking at an annual landed value of £3.5 million in 2018 and dropping to £1.7 million in 2022. Landed values and weights of brown crabs and scallops have also been variable across the time period, with five-year averages of £1.1 million for brown crab and £1.3 million for scallop landed annually from the Local Commercial Fisheries Study Area. Landings of Nephrops *Nephrops norvegicus* are also taken from the Local Commercial Fisheries Study Area with an annual average value of £340,000.

13.4.7 Landing statistics (MMO, 2023b) indicate that landings by under 10 m length vessels (57%) and over 10 m vessels (43%) are made across the Local Commercial Fisheries Study Area. Key gear types deployed in the Local Commercial Fisheries Study Area include pots and traps, scallop dredges and demersal trawls. The majority of the landings by potting vessels are made by vessels ≤12 m in length, indicating the importance of the inshore fleet across the inshore portion of the Local Commercial Fisheries Study Area. Almost all of the landings by demersal trawl and dredge are by vessels >10 m in length.

13.4.8 Landings of the species detailed above vary seasonally. Landings of lobster show a late summer peak. Landings of brown crab are relatively more consistent year round with a slight peak across later autumn and winter. Landings of scallops by dredgers peak in spring and early summer. Inshore vessels are often equipped to move from species to species throughout the seasons. Landing trends per month will be analysed within the Offshore EIA Report 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.

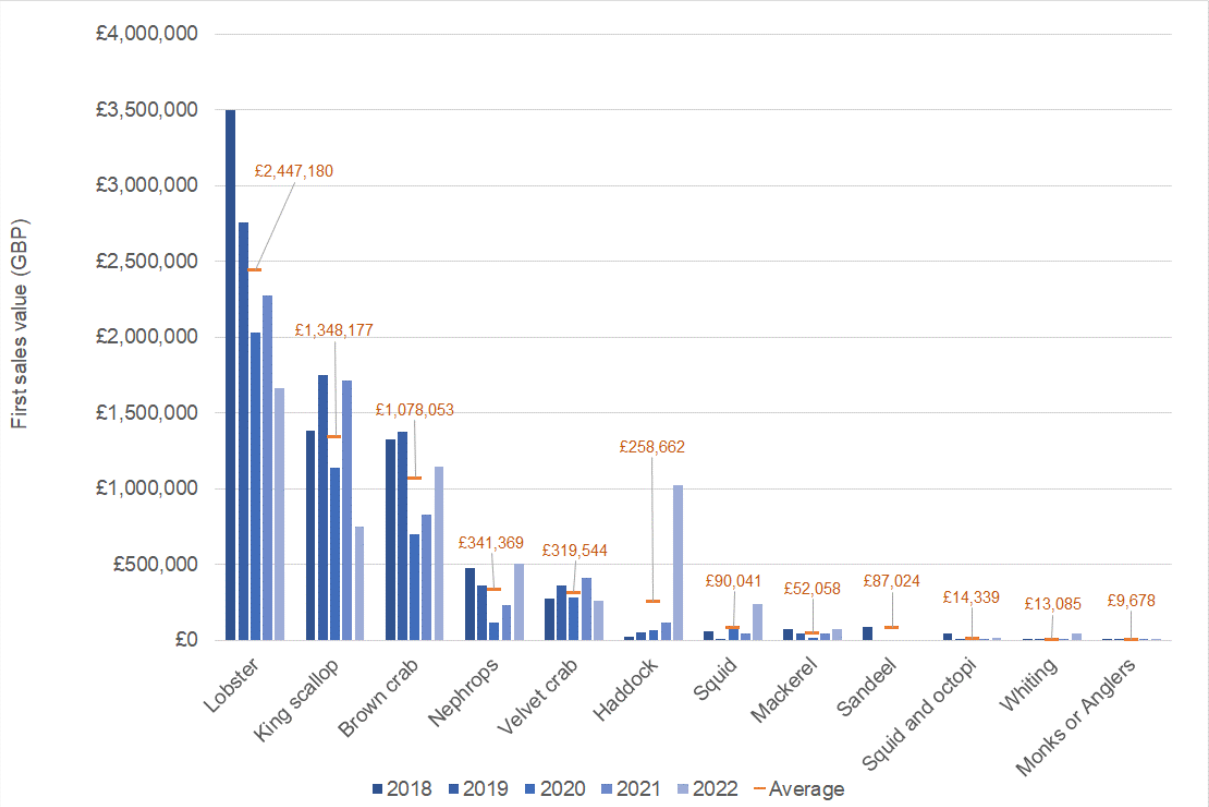


Figure 13.2: Top 12 Species by Value from 2018 to 2022 Landed from the Local Commercial Fisheries Study Area (MMO, 2023b)

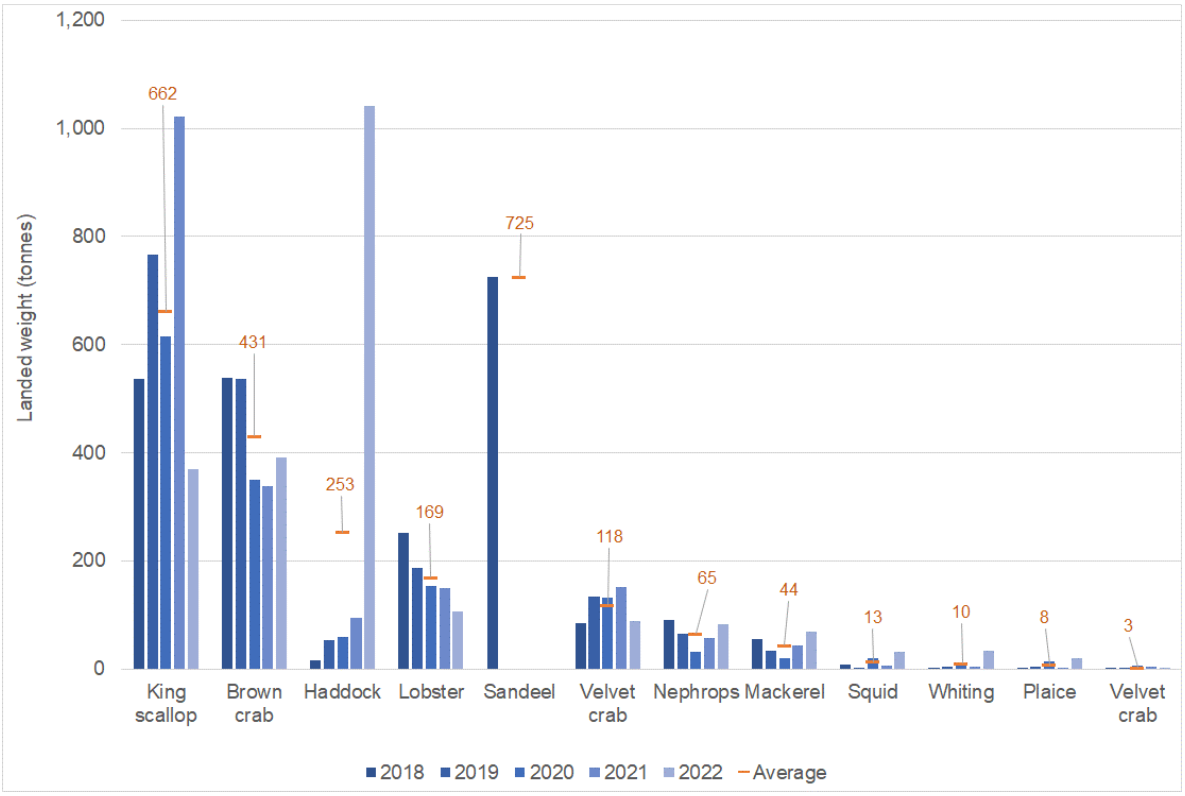


Figure 13.3: Top 12 Species by Weight from 2018 to 2022 Landed from the Local Commercial Fisheries Study Area (MMO, 2023b)

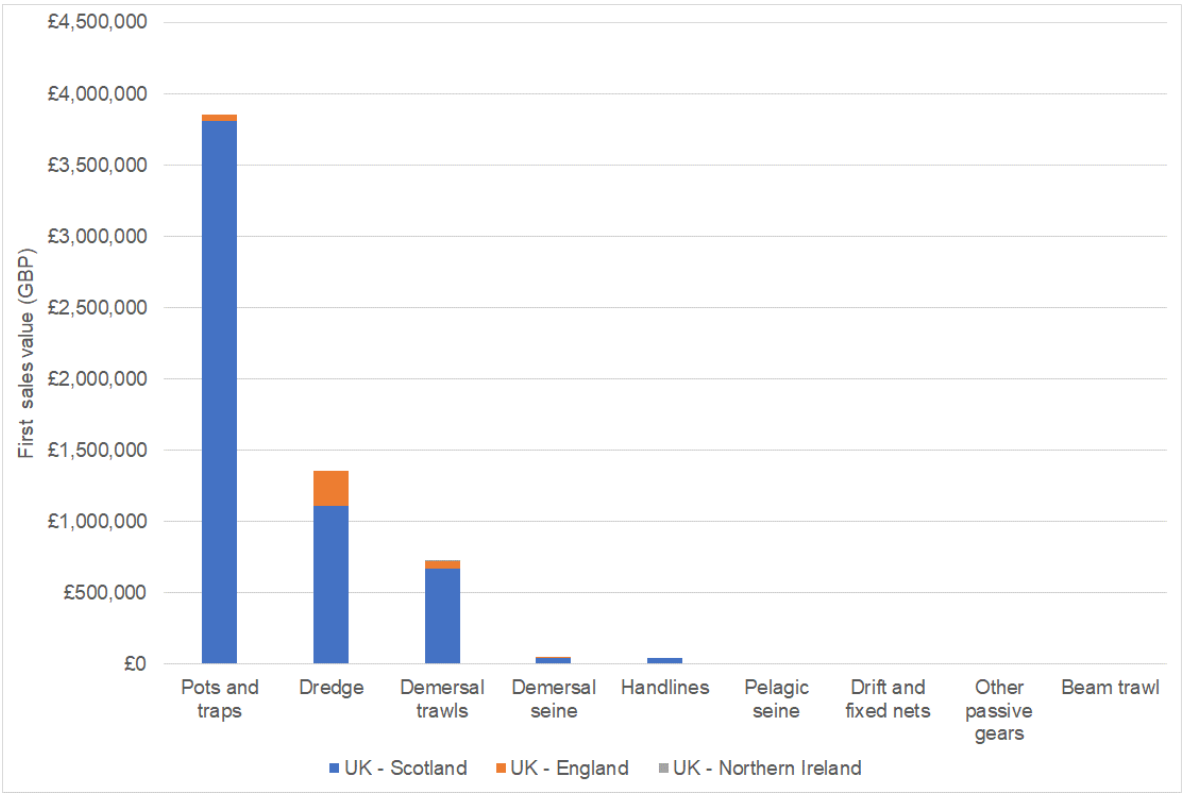


Figure 13.4: Average Landed Value from 2018 to 2022 from the Local Commercial Fisheries Study Area by Nation and Gear Type (MMO, 2023b)

Regional Commercial Fisheries Study Area

13.4.9 Figure 13.5 and Figure 13.6 show the top 12 species landed from the Regional Commercial Fisheries Study Area by value and weight respectively, from 2018 to 2022 (MMO, 2023b). Figure 13.7 shows the landed value over the same period from the Regional Commercial Fisheries Study Area by ICES rectangle and gear type. Key target species and active gear types are broadly aligned with those in the Local Commercial Fisheries Study Area, with pots and traps used to target shellfish including brown crab and lobster, and dredgers used to target scallop. Within the Regional Commercial Fisheries Study Area, landings data indicates the presence of demersal trawlers targeting Nephrops more intensively and targeting haddock and mixed demersal fish species. Data also indicates activity by pelagic trawlers targeting herring *Clupea harengus*.

Non-UK Landings

13.4.10 EU landings data indicates the potential for some fishing activity by EU vessels in the Commercial Fisheries Study Areas, including Danish and Dutch trawlers.

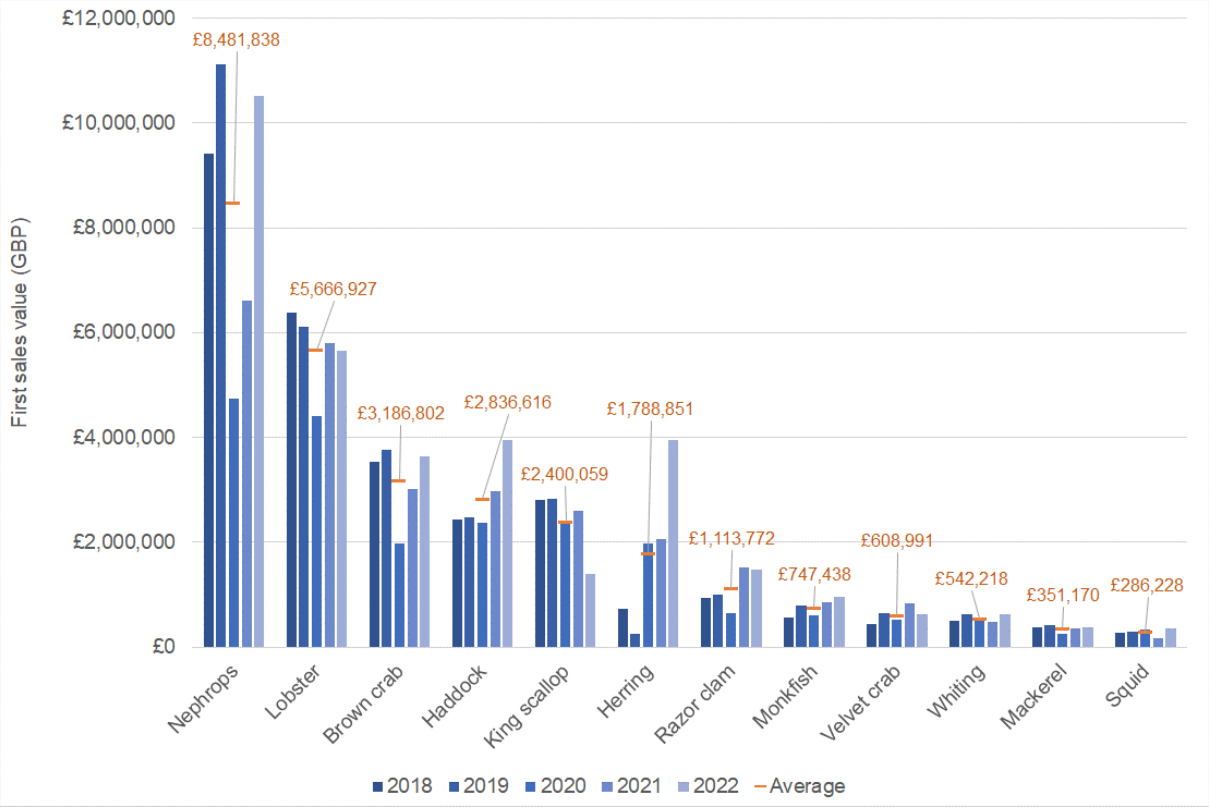


Figure 13.5: Top 12 Species by Value from 2018 to 2022 Landed from the Regional Commercial Fisheries Study Area (MMO, 2023b)

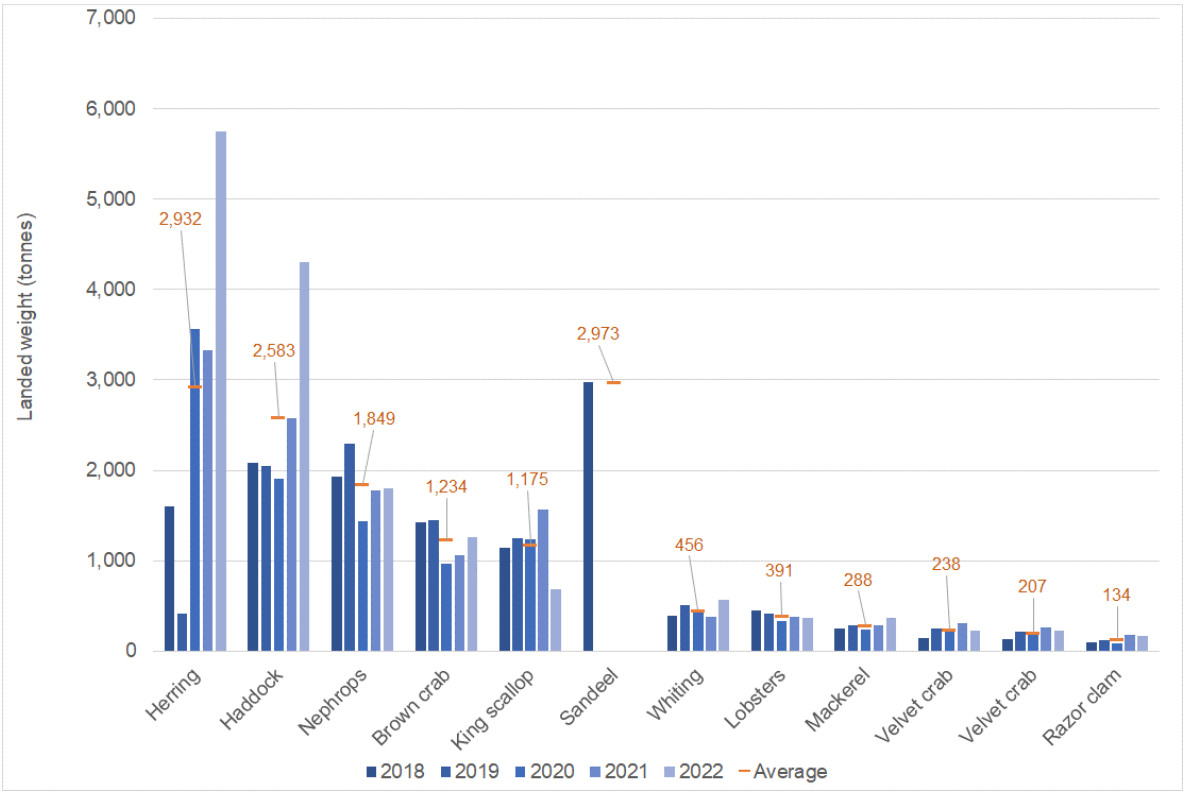


Figure 13.6: Top 12 Species by Weight (tonnes) from 2018 to 2022 Landed from the Regional Commercial Fisheries Study Area (MMO, 2023b)

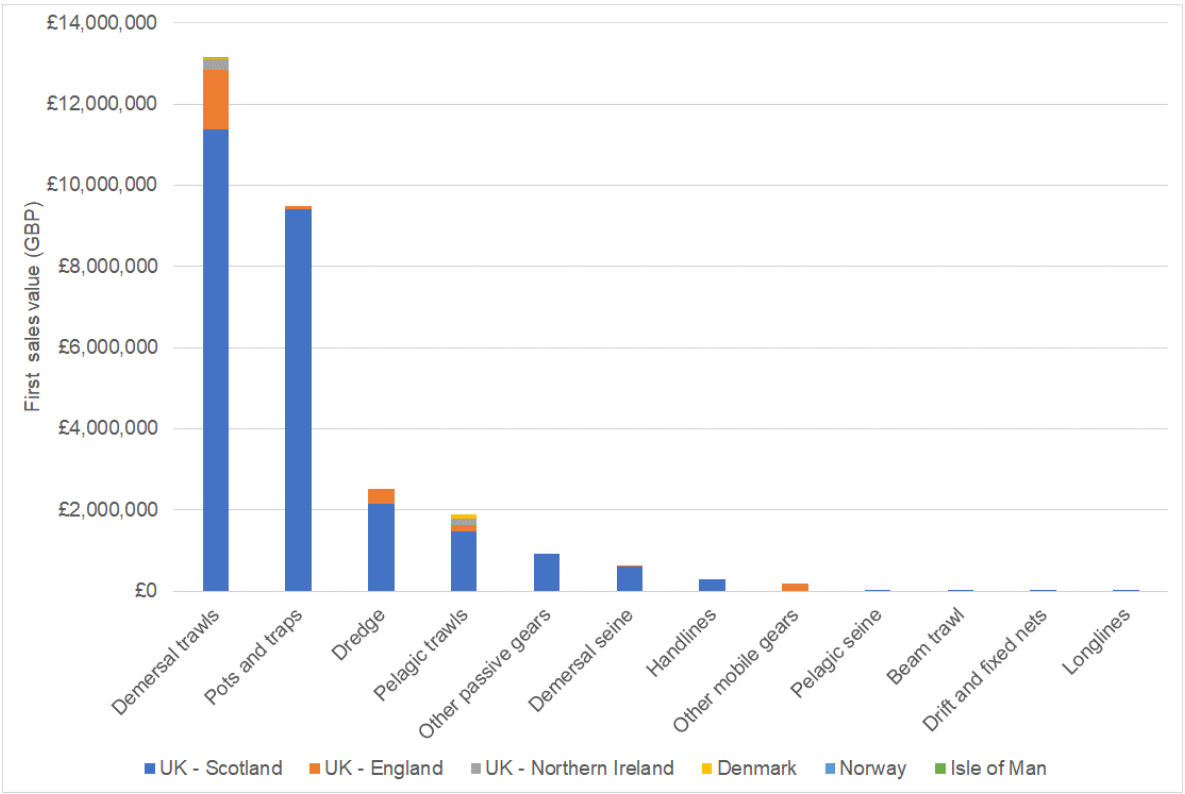


Figure 13.7: Average Landed Value from 2018 to 2022 (First Sales in £) from the Regional Commercial Fisheries Study Area by Nation and Gear Type (MMO, 2023b)

13.4.11 In addition to landings data, spatial data describing fishing activity is available, including AIS fishing vessel route density data. AIS is required to be fitted on fishing vessels ≥15 m length. The data (EMSA, 2023) presented in Figure 13.8 is specific to fishing vessels and indicates the route density per km^2 per year. This data does not distinguish between transiting vessels and active fishing but does provide a useful source to corroborate fishing grounds. Data indicates fishing vessel presence within the Proposed Development, with sustained fishing vessel presence across sections of the Export Cable Corridor, but with significant fishing grounds present throughout the wider region.

13.4.12 VMS and spatial data to map fishing activity is available for UK and EU fleets. VMS data sourced from ICES (2022b) displays the surface Swept Area Ratio of catches by different gear types and covers EU (including UK) registered vessels 12 m and over in length. Surface Swept Area Ratio indicates the number of times in an annual period that a demersal fishing gear makes contact with (or sweeps) the surface of the seabed. Surface Swept Area Ratio provides a proxy for fishing intensity and has been analysed to determine an average annual Swept Area Ratio based on data from 2016 to 2020. VMS data sourced from MMO displays the first sales value (£) of catches and covers UK registered vessels 15 m and over in length from 2016 to 2020. Inshore fisheries mapping data relating to the period 2017 to 2020 are also available for Scottish vessels under 12 m length and have been mapped.

13.4.13 Mapped data is provided for the following gear types:

- Figure 13.9: Demersal otter trawl, indicating some activity within the Local Commercial Fisheries Study Area including within the Array Area and Export Cable Corridor and greater levels of activity in the Regional Commercial Fisheries Study Area to the north and east of the Array Area;
- Figure 13.10: Demersal seine, indicating very limited activity within the Local Commercial Fisheries Study Area, including within the Array Area and greater levels of activity in the Regional Commercial Fisheries Study Area to the north and east of the Array Area;
- Figure 13.11: Dredge, indicating areas of activity within the Local and Regional Commercial Fisheries Study Area, across the Export Cable Corridor in particular but also within the Array Area;
- Figure 13.12: Pelagic trawl, indicating limited scope for activity in the Array Area and Export Cable Corridor, but with activity across the wider Regional Commercial Fisheries Study Area, offshore from the Array Area; and
- Figure 13.13: Scottish vessels under 12 m length, indicating high levels of activity in the nearshore section of the Export Cable Corridor and along the wider Aberdeenshire coastline.

13.4.14 The mapped spatial data presented below is aligned with that presented in the UHI study, which mapped fisheries and habitats in the NERIFG area, inshore of the Array Area (Shelmerdine and Mouat, 2021).

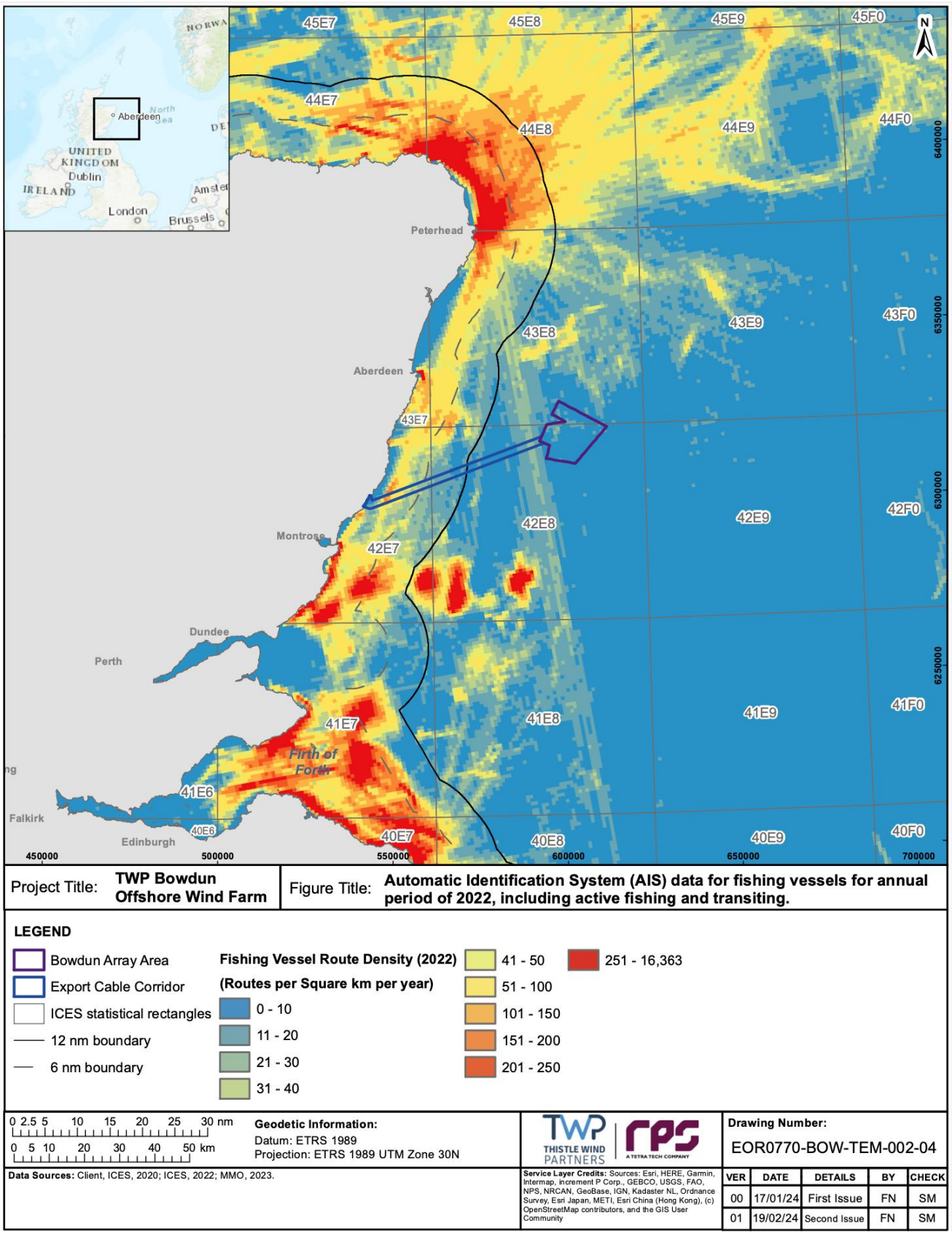


Figure 13.8: AIS Data for Fishing Vessels for Annual Period of 2022, Including Active Fishing and Transiting (EMSA, 2023)

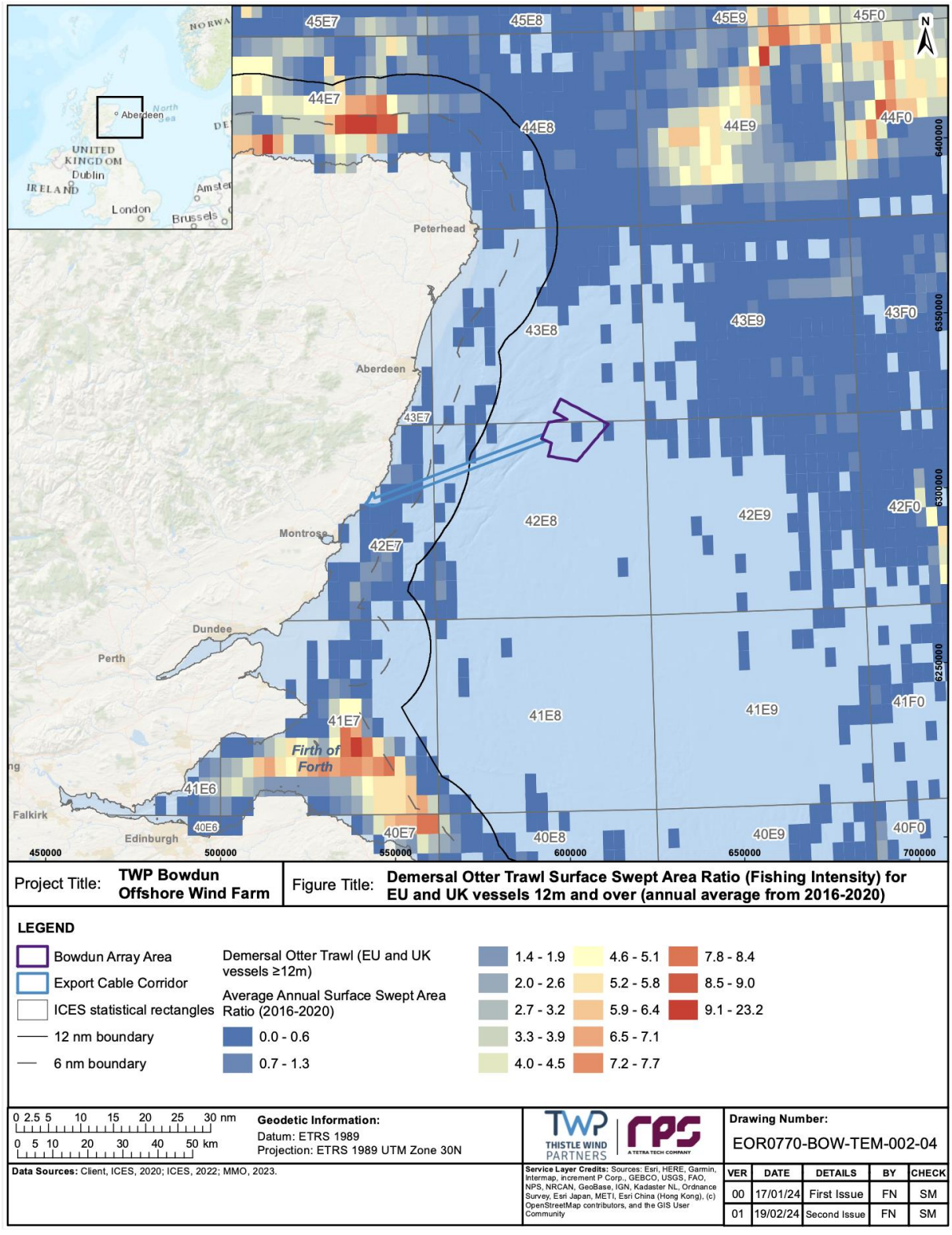


Figure 13.9: Demersal Otter Trawl Surface Swept Area Ratio (Fishing Intensity) for EU and UK Vessels 12 m and over (Annual Average 2016-2020) (ICES, 2022b)

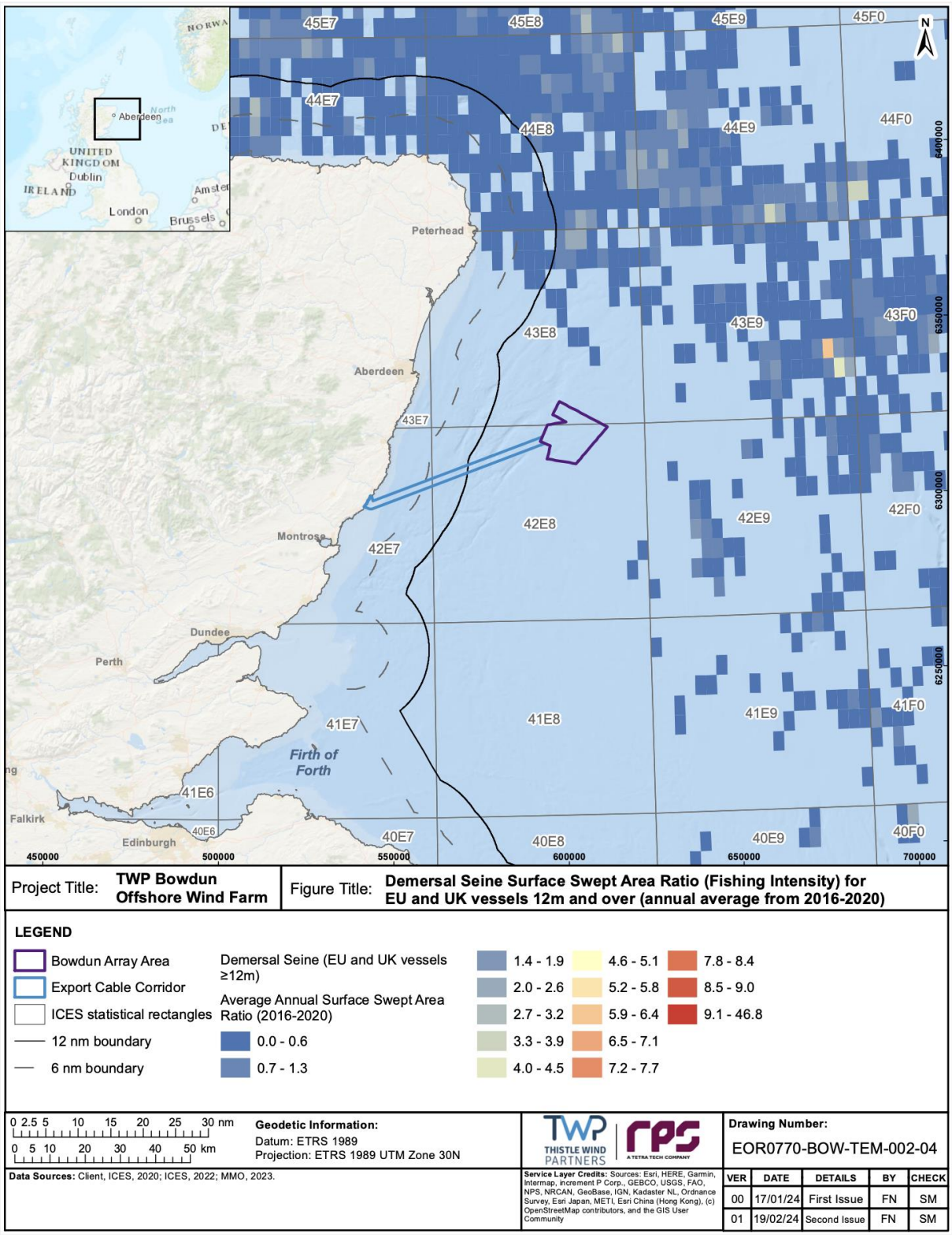


Figure 13.10: Demersal Seine Surface Swept Area Ratio (Fishing Intensity) for EU and UK Vessels 12 m and over (Annual Average 2016-2020) (ICES, 2022b)

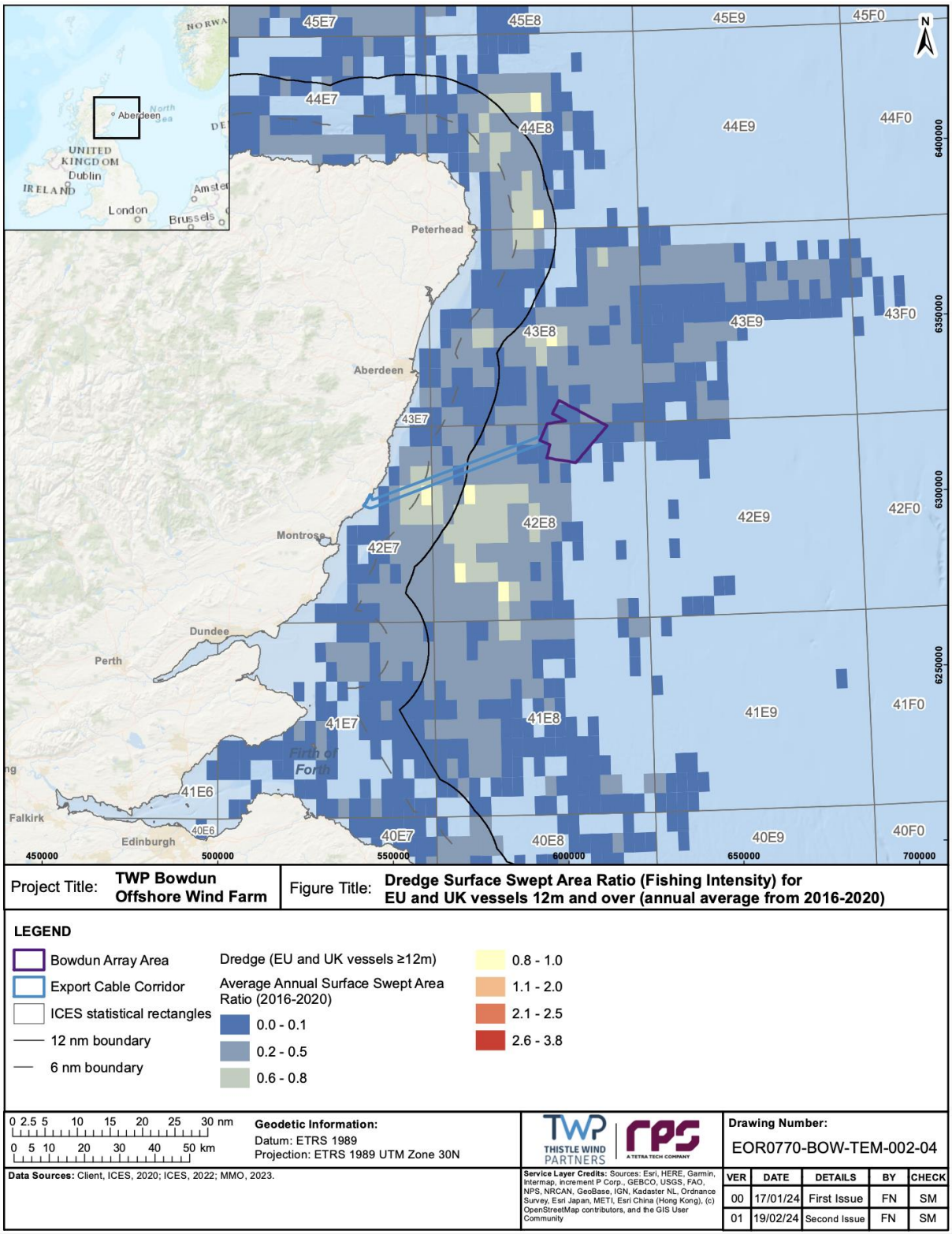


Figure 13.11: Dredge Surface Swept Area Ratio (Fishing Intensity) for EU and UK Vessels 12 m and over (Annual Average 2016-2020) (ICES, 2022b)

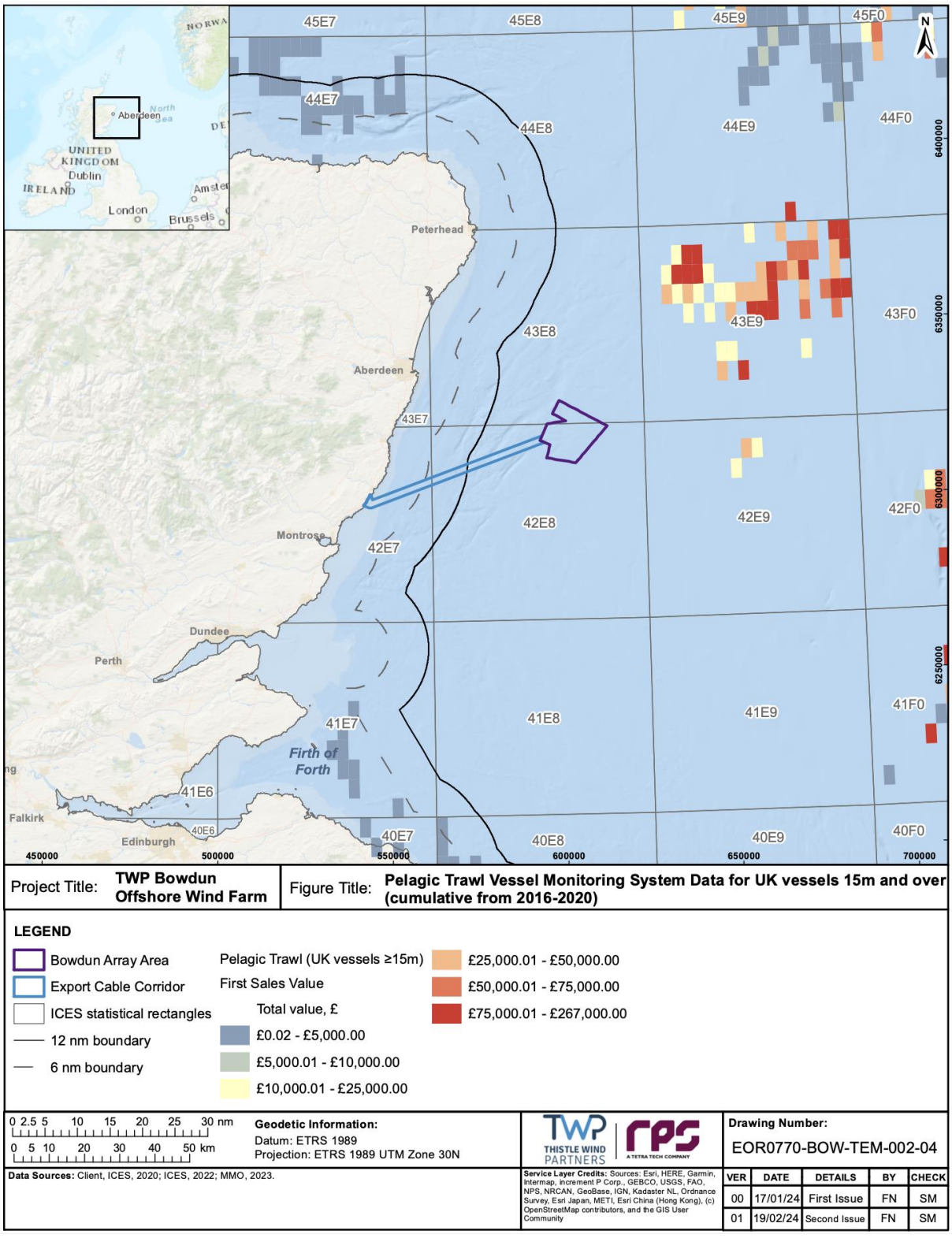


Figure 13.12: Pelagic Trawl Vessel Monitoring System Data for UK Vessels 15 m and over (Cumulative from 2016-2020 (MMO, 2023c))

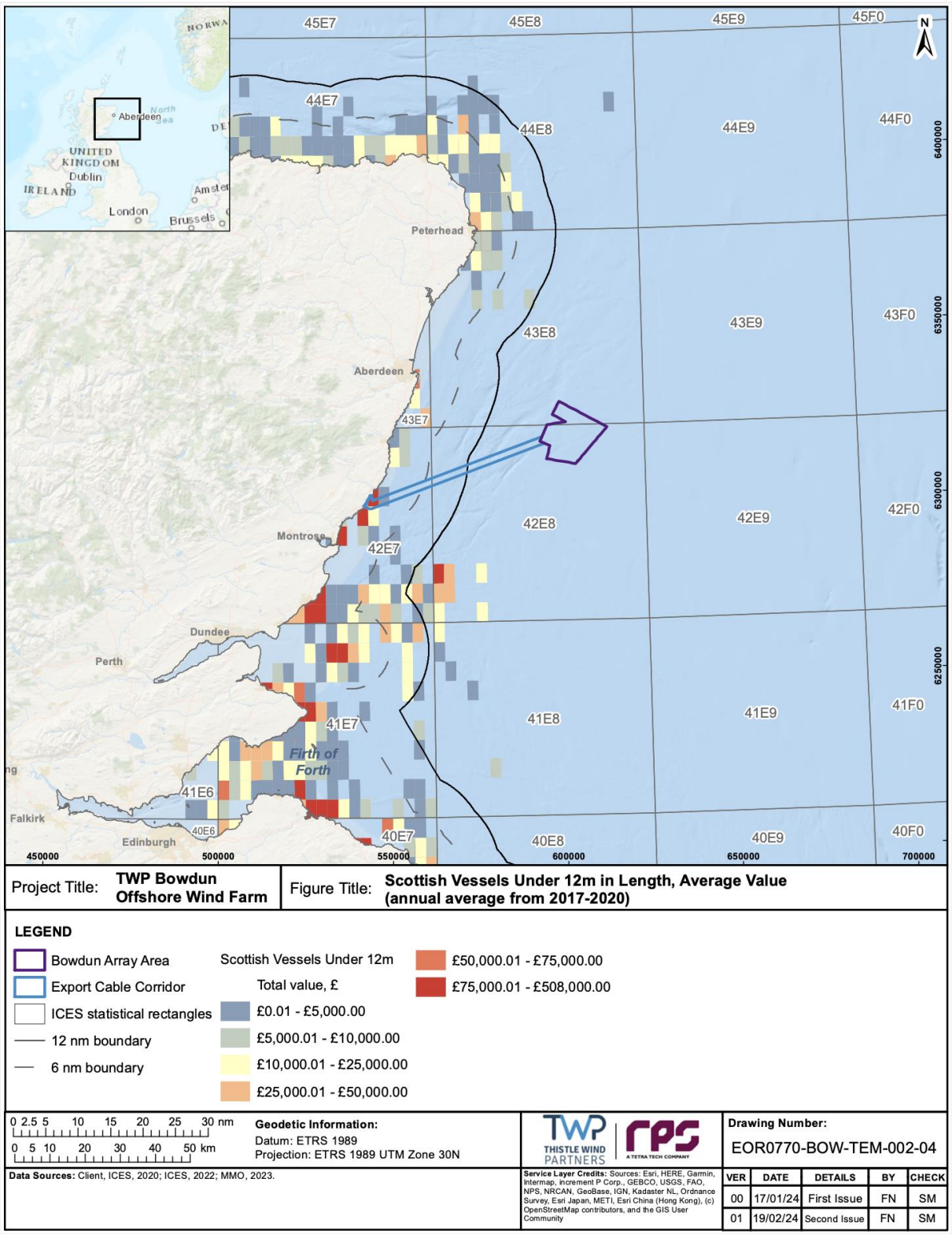


Figure 13.13: Scottish Vessels under 12 m in Length, Average Value (Annual Average from 2017 to 2020) (Marine Scotland NMPi, 2024)

Commercial Fisheries Receptors

13.4.15 The key commercial fisheries receptors within the Commercial Fisheries Study Areas are identified as follows:

- UK potters targeting brown crab and lobster;
- UK dredgers targeting king scallop; and
- UK demersal otter trawlers targeting Nephrops and haddock.

13.4.16 Salmon fishing and sea trout fishing rights in Scotland have historically included coastal fixed engine and net and coble fisheries. It is understood that there were a number of fixed engine sites for wild salmon and sea trout around Peterhead (Scottish Government, 2020c), though coastal salmon netting has been prohibited since 2016. There are not understood to be any active sites in the vicinity of the Array Area and Export Cable Corridor.

13.4.17 There are no active aquaculture facilities within the Local Commercial Fisheries Study Area, it is considered unlikely that there would be any aquaculture development offshore in the vicinity of the Array Area and Export Cable Corridor.

13.5 Embedded Mitigation

13.5.1 The following Embedded Mitigation is relevant to commercial fisheries. The Embedded Mitigation will evolve over the development process as the EIA progresses.

- Development and adherence to a CSIP post consent.
- Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.
- Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the CBRA and the CBA. Results of these assessments, and commitments to post construction monitoring, will be provided in the CaP.
- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a VMP and 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 project activity to other sea users (i.e. via Notice to Mariners (NtMs))).
- 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 operational phases of the Proposed Development and detail any mitigation measures to be put in place to limit effects on commercial fisheries activity.

- Appointment of a Fisheries Liaison Officer (FLO). The FLO will support ongoing liaison and ensure clear communication between the Applicant and commercial fishers.
- Advance warning and accurate location details of construction, maintenance and decommissioning operations, associated Safety Zones and advisory passing distances will be given via NtM and Kingfisher Bulletins.
- 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. Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015).
- Participation in any fisheries working group to assist with liaison between the Applicant and the fishing community.
- Application for and use of Safety Zones of up to 500 m during construction, major repairs 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, O&M and decommissioning phases. Such impacts may include partially installed structures or cables, extinguished navigation lights or other unmarked hazards. Safety Zones during the operational phase are also being considered. The Offshore EIA Report will include an assessment of the proposed approach to Safety Zones at the point of application).
- Any objects dropped on the seabed during works associated with the Proposed Development will be reported in line with MD-LOT procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- 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.

13.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

13.6 Potential Proposed Development Impacts

13.6.1 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

13.6.2 The impacts that have been scoped into the assessment are outlined in Table 13.2 together with a description of any additional data collection that will be required to enable a full assessment of the impacts.

13.6.3 No impacts are scoped out of the commercial fisheries assessment.

Table 13.2: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Commercial Fisheries

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Reduction in access to, or exclusion from established fishing grounds	✓	✓	✓	Construction, O&M and decommissioning activities have potential to create loss of fishing opportunities. During construction 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. Accessibility within the Array Area during the operational phase will be informed by Wind Turbine spacing, Wind Turbine layout and foundation type. In particular, mooring systems of floating foundations may affect the ability of commercial fishing fleets in deploying certain gears.	Data sources identified in Table 13.1 and information gathered via engagement with fisheries stakeholders will be used to characterise the baseline.	This impact will be subject to detailed assessment in the Offshore EIA Report. To confirm the likely significant environmental effect of the impact, further and more detailed analysis of baseline data sources will be undertaken alongside engagement with stakeholders to understand fishing activity within the Scoping Boundary.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Displacement leading to gear conflict and increased fishing pressure on adjacent grounds	✓	✓	✓	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.	As above.	As above.
Disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity	✓	✓	✓	Construction, O&M and decommissioning activities may lead to disturbance of commercially important fish and shellfish resources and therefore displace or disrupt a range of fishing activity.	As above.	To confirm the likely significant environmental effect of the impact, further assessment is required; assessment will be informed by the outcomes of the impact assessment in Section 10: Fish and Shellfish Ecology and it will be assumed that commercial fisheries will be affected as a result of any loss of resources.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Increased vessel traffic associated with the Proposed Development within fishing grounds leading to interference with fishing activity	✓	✓	✓	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.	As above.	To confirm the likely significant environmental effect of the impact, further assessment is required. Assessment will be informed by the outcomes of the impact assessment in Section 14: Shipping and Navigation and Navigational Risk Assessment (NRA).

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Proposed Development	✓	✓	✓	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, maintenance and decommissioning areas around Offshore Infrastructure with no or minimal impact on their steaming times. With Embedded Mitigation measures in place (Section 13.5), no likely significant environmental effect is expected but it remains likely to be an area of industry concern.	As above.	To confirm the likely significant environmental effect of the impact, further assessment is required. Assessment will be informed by the outcomes of the impact assessment in Section 14: Shipping and Navigation and NRA.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Physical presence of Offshore Infrastructure and potential exposure of that Offshore Infrastructure leading to gear snagging	✓	✓	✓	Standard industry practice and protocol (i.e. 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.	As above.	To confirm the likely significant environmental effect of this impact, further assessment is required, which will be informed by engagement with stakeholders. Safety aspects associated with this impact, including damage to property and vessel stability, will be considered within the impact assessment in Section 14: Shipping and Navigation, and NRA.

*Proposed Development phase refers to construction, O&M (O) and decommissioning (D).

13.7 Proposed Assessment Methodology

Additional Data Sources

13.7.1 Detailed analysis of baseline datasets will be undertaken within the EIA process to characterise long term patterns in commercial fisheries activity across the Commercial Fisheries Study Areas and predict potential impacts upon future commercial fishing activities. Data sources include those set out within Table 13.1 and will additionally be expected to include site-specific marine traffic (AIS and radar) data gathered for the Proposed Development, the results of any fisheries scouting surveys (fishing gear and vessel observations), and data gathered by the Applicant-appointed FLO.

13.7.2 Consultation with the commercial fishing industry has commenced and will continue to be undertaken to ground-truth available baseline data and gain further understanding of commercial fisheries activity by smaller vessels across the inshore portion of the Local Commercial Fisheries Study Area. Consultation will be undertaken with a number of relevant stakeholders, including the following:

- Scottish Fishermen's Federation (SFF);
- Scottish White Fish Producers Association (SWFPA);
- Scottish Pelagic Fisherman's Association (SPFA);
- NERIFG;
- other local fishermen's associations and existing commercial fisheries working groups;
- individual fishermen as identified by the Applicant-appointed FLO/other means; and
- any Norwegian and EU Member State representative organisations as identified during baseline data analysis.

13.7.3 Analysis of data and the results of consultation will provide an extended baseline characterisation of the Commercial Fisheries Study Areas, which will underpin and inform the impact assessment.

Guidance

13.7.4 In addition to the approach and guidance (of general relevance) outlined in Section 4: EIA Methodology, the assessment of potential impacts on commercial fisheries receptors will also comply with the following guidance documents where they are specific to this topic, which are recognised as being current and accepted:

- 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 (UK Fisheries Economic Network and Seafish, 2012);

- FLOWW Recommendations for Fisheries Liaison: best practice guidance for offshore renewable developers (FLOWW, 2014);
- 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, 2010a);
- Developing guidance on fisheries CEA for wind farm developers (Blyth-Skyrme, 2010b);
- CEA guidelines, guiding principles for cumulative impacts assessments in OWFs (RenewableUK, 2013);
- Guidelines for data acquisition to support marine environmental assessments of offshore renewable energy projects. Contract report: ME5403 (Cefas, 2012);
- Guidelines for liaison with the fishing industry on the UCKS – Issue 8 (Offshore Energies UK, 2023);
- Fishing and Submarine Cables - Working Together (International Cable Protection Committee, 2009);
- European Subsea Cables Association (ESCA) Guideline 01 and Appendices (ESCA, 2018); and
- OWFs - Guidance note for EIA in respect of Food and Environment Protection Act and Coast Protection Act 1949 requirements (Cefas, Marine Consents and Environment Unit, DEFRA and DTI (Cefas, 2004).

Assessment Methodology

13.7.5 The EIA will follow the general proportionate EIA approach outlined in Section 4: EIA Methodology. Definitions specific to commercial fisheries in relation to assessing the sensitivity of the receptor and magnitude of an impact will be provided to frame the assessment.

13.7.6 To explore trends in fishing patterns, the Offshore EIA Report will typically analyse five years of baseline data based on the most up to date data available for each particular data source at the time of analysis. Where appropriate, a longer timeline of data will be assessed; specifically, it is proposed to assess ten years of data for the king scallop fishery to take account of the cyclical nature of scallop grounds that typically produce higher yields every five to seven years. Longer term analysis may also be considered where historical fisheries (e.g. for smaller sized fish including haddock) have been present in the study area, and whilst not currently active have potential to return.

13.7.7 Where relevant, impact assessment will be informed by the outcomes of the fish and shellfish ecology (Section 10) and shipping and navigation (Section 14) assessments.

13.7.8 Impacts will be assessed for each relevant fleet/fishery scoped into Offshore EIA Report, and where relevant, impacts associated with

the Array Area and the Export Cable Corridor will be separately assessed.

13.8 Potential Inter-Related Effects

13.8.1 The assessment of potential inter-related effects on commercial fisheries will be considered within the Offshore EIA Report. It will include consideration of Proposed Development lifetime effects and receptor-led effects in line with the approach outlined in Section 4: EIA Methodology.

13.8.2 Assessment of inter-related effects on commercial fisheries will draw on the outcomes of other topic assessments; see:

- Section 10: Fish and Shellfish Ecology, which includes consideration of potential impacts on fish species of commercial importance; and
- Section 14: Shipping and Navigation, which includes consideration of potential impacts on vessel routing and navigational safety.

13.8.3 Effects on commercial fisheries are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual Proposed Development phase.

13.9 Potential Cumulative Effects

13.9.1 Section 4: EIA Methodology, details how potential cumulative effects will be assessed through a CEA and gives examples of the projects which are likely to be included in that assessment.

13.9.2 OWF projects and other activities, such as subsea cables and pipelines, relevant to the assessment of cumulative effects on commercial fisheries will be identified through a screening exercise. The potential effects considered in the cumulative assessment as part of the Offshore EIA Report will be in line with those described for the project-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 Scoping Boundary) or where management measures in place for the Proposed Development and other projects will reduce the risk of impacts occurring. Key potential cumulative effects are expected to result from a loss or restricted access to established fishing grounds and displacement of fishing activity.

13.9.3 It is recognised that a relatively large number of ScotWind sites have been identified in the east region, coupled with existing OWFs in the Forth and Tay area that continue to pose ongoing impact to the commercial fisheries sector; notably for the scallop sector. The

commercial fisheries CEA will scope in the following impacts which are considered to have regional significance:

- reduction in access to, or exclusion from established fishing grounds;
- displacement leading to gear conflict and increased fishing pressure on adjacent grounds; and
- disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity.

13.9.4 The CEA for commercial fisheries will consider the MDS for each of the projects and activities in line with the methodology outlined in Section 4: EIA Methodology. A CEA study area incorporating sections of the NNS (ICES division 4a) and CNS (division 4b) is proposed for the commercial fisheries.

13.10 Potential Transboundary Impacts

13.10.1 Transboundary impacts will be considered based on any potential displacement of fishing activity into the nearest EEA which is considered unlikely based on data presented in the Offshore Scoping Report. A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is limited potential for transboundary impacts upon commercial fisheries, though this will be confirmed in the Offshore EIA Report following further baseline data analysis and stakeholder engagement. Therefore, transboundary impacts for commercial fisheries have been screened in for further assessment.

13.11 Summary

13.11.1 Through initial analysis of baseline datasets relevant to defined local and regional study areas, this section of the Offshore Scoping Report has identified the following commercial fisheries receptors of relevance to the Proposed Development:

- UK potters targeting brown crab and lobster;
- UK dredgers targeting king scallop; and
- UK demersal otter trawlers targeting Nephrops and haddock.

13.11.2 A range of potential impacts on commercial fisheries have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development. The following potential impacts are proposed to be scoped into EIA:

- reduction in access to, or exclusion from established fishing grounds;
- displacement leading to gear conflict and increased fishing pressure on adjacent grounds;

- disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity;
- increased vessel traffic associated with the Proposed Development within fishing grounds leading to interference with fishing activity;
- additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Proposed Development; and
- physical presence of Offshore Infrastructure and potential exposure of that Offshore Infrastructure leading to gear snagging.

13.11.3 In the EIA, the commercial fisheries baseline will be characterised further, which will involve collation and analysis of a wider range of data sources covering a longer time series.

13.11.4 Engagement with stakeholders is ongoing and will continue throughout the EIA process to validate the commercial fisheries baseline and discuss the outcomes of impact assessment and approaches to mitigation where relevant.

14 Shipping and Navigation

14.1 Introduction

14.1.1 This section of the Offshore Scoping Report, prepared by NASH Maritime Ltd, identifies the current known baseline environment for shipping and navigation of relevance to Proposed Development and considers the potential impacts arising from the construction, O&M, and decommissioning of the Proposed Development. This section also provides the approach that will be used to undertake the Offshore EIA and the associated Navigational Risk Assessment (NRA).

14.2 Shipping and Navigation Study Area

14.2.1 The Shipping and Navigation Study Area (Figure 14.1) comprises an area of 10 nm buffer surrounding the Array Area and a 3 nm buffer for the Export Cable Corridor. The 3 nm buffer is considered an adequate study area when assessing the risks associated with subsea cables; whilst a 10 nm buffer has been selected for the Array Area, to reflect that the Array Area poses a greater hazard to navigation, in order to better assess the vessel routes in proximity to the surface-piercing structures. The Shipping and Navigation Study Area is consistent with industry best practice (MCA, 2021a) as applied to previous offshore renewable shipping and navigation studies (Buchan OWL, 2023; Mona Offshore Wind Limited, 2023; Morgan Offshore Wind Limited, 2023; Morecambe Offshore Wind Ltd, 2023). This study area provides further context to vessel traffic activity and routeing in proximity to the Proposed Development and allows for identification of key navigational features affecting vessel traffic.

14.2.2 It is recognised that the vessel traffic routeing through the Shipping and Navigation Study Area will also be affected by key navigational features located outside of the Shipping and Navigation Study Area. For example, the Proposed Development is 21.7 nm from the Port of Aberdeen, the largest berthage port in Scotland. Where appropriate features outside of the Shipping and Navigation Study Area will be identified and described if they are contextually relevant or affect routeing through the Shipping and Navigation Study Area.

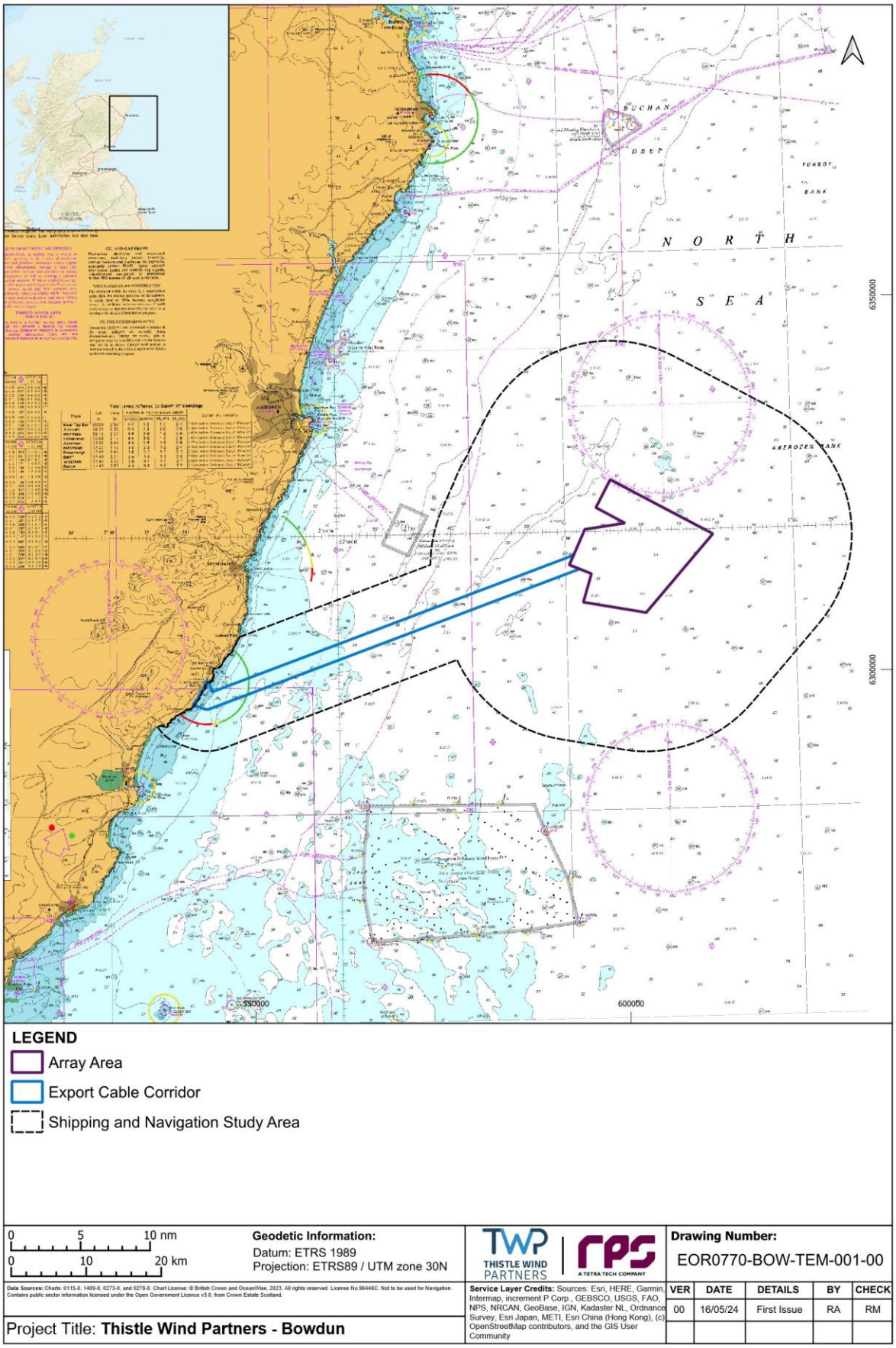


Figure 14.1: Shipping and Navigation Study Area

14.3 Data Sources

14.3.1 An initial desktop review of key literature and data sources has been undertaken to inform the shipping and navigation baseline (Table 14.1).

Table 14.1: Summary of Key Desktop Datasets and Materials

Title/Description	Source	Year	Author
Vessel route density by vessel category	EMODNet (EMODNet, 2022a)	2022	EMODNet
Vessel density of recreational boating activity	Royal Yachting Association (RYA) Coastal Atas 2019 (RYA, 2019)	2019	RYA
Admiralty Charts (0115-0, 1942-0, 0291-0) and Sailing Directions (NP52)	United Kingdom Hydrographic Office (UKHO) (Admiralty, 2023a and 2023b)	2023	UKHO
Locations and details of maritime accidents reported to the Marine Accident Investigation Branch (MAIB).	MAIB (Obtained through freedom of information request) (MAIB, 2024)	2008 - 2022	MAIB
OWF sites and Offshore Transmission Owners (OFTO) in planning, construction and operational phases	CES (CES, 2024a)	2024	CES
Tidal agreements in planning, construction and operational phases	CESEMO (CES, 2024b)	2024	CES
Oil and Gas fields, wells, pipeline infrastructure and surface infrastructure	North Sea Transition Authority (NSTA) (NTSA, 2024)	2023	NSTA
UK Disposal Sites	Cefas (Cefas, 2024c)	2023	Cefas
UK harbour areas and military and exercises areas	Digitised from Admiralty Charts (Admiralty, 2023a)	2023	UKHO

Legislation, Policy and Guidance

14.3.2 The following guidance documents will also be considered:

- The United Nations Convention on the Law of the Sea (UNCLOS) (1982);
- The International Convention for the Safety of Life at Sea (SOLAS) (1974);
- The International Convention on Prevention of Pollution from Ships (MARPOL) (1973);
- The International Convention on Standards of Training, Certification, and Watchkeeping (STCW) for Seafarers (1995) (as amended);
- The Convention on the International Regulations for Preventing Collisions at Sea (1972) (as amended);
- Maritime & Coastguard Agency (MCA) Marine Guidance Note (MGN) 654 Safety of Navigation: OREIs - Guidance on UK Navigational Practice, Safety and Emergency Response (MCA, 2021a);
- The International Maritime Organisation's (IMO) Formal Safety Assessment (FSA) (IMO, 2018);
- MGN 372 OREIs Guidance to Mariners operating in the vicinity of UK OREIs (MCA, 2022);
- Methodology for Assessing the Marine Navigational Safety Risks & Emergency Response of OREIs (MCA, 2021b);
- International Association of Lighthouse Authorities (IALA) Guideline G1162, Ed1.0 - The marking of offshore man-made structures (IALA, 2021);
- PIANC WG161-2018: Interaction between Offshore Windfarms and Maritime Navigation (PIANC, 2018); and
- HSE and MCA; Regulatory expectations on moorings for floating wind and marine devices (HSE/MCA, 2017).

14.4 Baseline Environment

14.4.1 This section provides a description of the shipping and navigation baseline environment, following a desk-based review, including key navigational features, marine traffic analysis and presentation of the maritime accidents that have occurred.

14.4.2 The key navigational features identified in the vicinity of the Shipping and Navigation Study Area are presented in Figure 14.1. These features are currently in place and may affect vessel routeing and operations in the future.

Local Ports and Harbours

14.4.3 The closest ports are Aberdeen, Montrose and Peterhead located 21.1 nm, 34.4 nm and 28.7 nm from the Array Area, respectively. These are all located on the East coast of Scotland, in Aberdeenshire to the north and Angus to the south. One dredging disposal site is located outside of Peterhead port. The busiest of these ports is Aberdeen which is the largest oil and gas support port in the UK.

Anchorages

14.4.4 There are no anchorages in the Shipping and Navigation Study Area, the closest is the Drilling Rig Anchorage, 3 nm outside of Aberdeen to the west.

Other Offshore Renewable Projects

14.4.5 The closest operational offshore renewable project is the Kincardine Floating OWF located 0.9 nm west of the Shipping and Navigation Study Area. This site has a capacity of 50 MW. Other nearby projects include: Seagreen OWF (Partial Generation/Under Construction), and Aberdeen (European Offshore Wind Deployment Centre (EOWDC)) (Fully Commissioned).

Oil and Gas Infrastructure

14.4.6 There are no oil and gas fields within the Shipping and Navigation Study Area. The closest oil field is Buzzard, 35 nm to the north of the Shipping and Navigation Study Area.

Other navigational features

14.4.7 Natural features of the local area, such as land mass and metocean characteristics of tidal currents, do not have a noted contribution to the navigational environment in proximity to the Proposed Development. Admiralty charts do not note any natural features that mariners should be aware of.

14.4.8 In the north-western extent of the Export Cable Corridor there is a Sector Light at Gourdon aiding vessels navigating to Gourdon Pier.

14.4.9 There are no cables, pipelines, aggregate extraction license areas, dredge disposal sites or Practice and Exercise Areas (PEXA) within the Shipping and Navigation Study Area. It is noted that the Eastern Green Link 2 subsea electrical cable has been granted consent (not started construction) and will be included as part of the future scenario assessments.

14.4.10 Where locations are known to the United Kingdom Hydrographic Office (UKHO), wrecks both those that are described as live and dead are presented on Admiralty charts (as listed in Table 14.1) along with

the recorded shallowest depth of the wreckage. There no shipwrecks in the Array Area. There are nine shipwrecks noted in the admiralty charts in the Export Cable Corridor, five of which have a known depth. Of the nine, UKHO considers two as dangerous wrecks, this categorisation is likely due to the sunken vessels causing a potential grounding hazard given the depth of water. These vessels are the TAURUS, a 124 m steam ship (foundered 06-06-1941) is located 3.6 nm from shore, and the BAKU STANDARD, a 101 m oil tanker (foundered 11-02-2018) is located 2.5 nm from shore. No wreck in the Shipping and Navigation Study Area is considered by UKHO to have an impact on shipping and navigation; however, wrecks in general will be considered within the NRA in relation to the Proposed Development.

Vessel Traffic

14.4.11 EMODNet vessel traffic activity data for 2022 (Figure 14.2) indicates there are no routes operating through the Array Area with more than 100 vessel transits per km^2 per year. Summer (30/06/2023 – 14/07/2023) and winter (05/01/2024 – 19/01/2024) seasonal VTSs have been undertaken; however, data was unavailable at time of submission of this Offshore Scoping Report. VTS data and findings will support the NRA and form part of the NRA report.

14.4.12 There are two frequented (>3 per day) routes that cross the Shipping and Navigation Study Area. Both of these routes operate to and from Aberdeen and transit east-west passing to the north of the Scoping Boundary. The vessels that operate on these routes are primarily transporting cargo.

14.4.13 The majority of vessel activity near to the Scoping Boundary is cargo or other vessels. Given the routes that are being used, these vessels are likely to be associated with the oil and gas industry comprising platform supply vessels and emergency response and rescue vessels. There is also activity for other vessels shown crossing the Export Cable Corridor to the Seagreen OWF.

14.4.14 There is limited tanker, passenger and fishing activity in the Shipping and Navigation Study Area. Tankers are generally shown navigating closer to shore, passenger vessels mainly operating ferry services from Aberdeen and fishing activity predominantly further North close to Peterhead and Fraserburgh. There are also low levels of recorded recreational activity with most activity occurring closer to shore where there is shelter from the prevailing conditions.

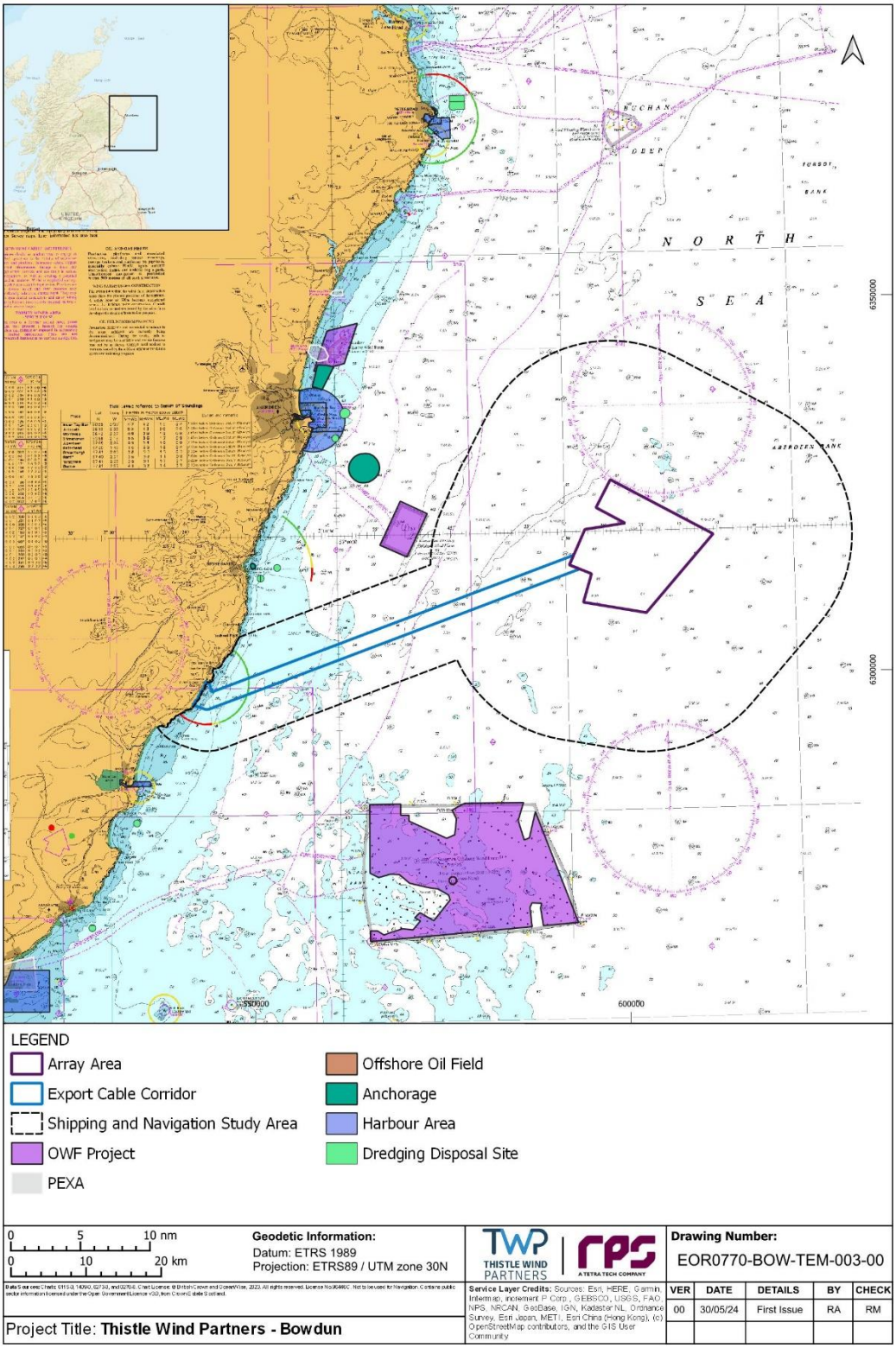


Figure 14.2: Key Navigational Features[6]

[6] Data up to 2022 used from EMODNet to form baseline maps. All fields both planned and constructed will be covered in NRA.

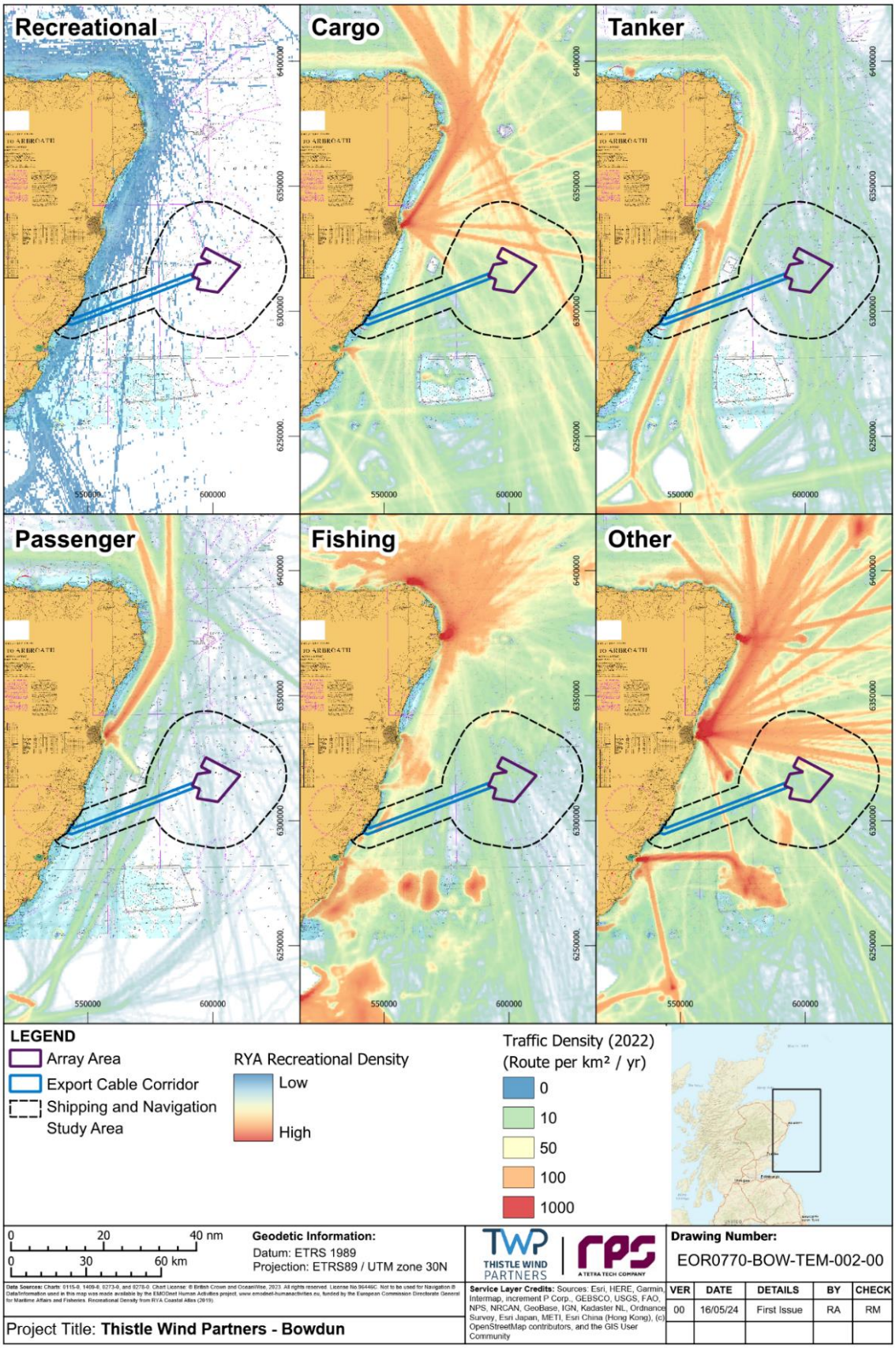


Figure 14.3: Vessel Traffic Density

Search and Rescue

14.4.15 Search and Rescue (SAR) near to the Proposed Development is co-ordinated from Aberdeen Coastguard Operations Centre. Royal National Lifeboat Institution (RNLI) all-weather lifeboats are located in Aberdeen and Stonehaven.

Maritime Incidents

14.4.16 Maritime incidents recorded in Marine Accident Investigation Branch (MAIB) (2008 to 2022) and RNLI (2024) databases have been collated and presented spatially in Figure 14.4. The majority of incidents are recorded close to shore and around ports. There have been two incidents recorded within the Scoping Boundary between 2008 and 2022 which involved a fishing vessel flooding due to bilge pumps being blocked and a fishing vessel engine failure. A mechanical/damage incident also took place on the periphery of the Scoping Boundary. There were 70 incidents recorded inside the Shipping and Navigation Study Area which included one collision between two fishing vessels which occurred in 1997.

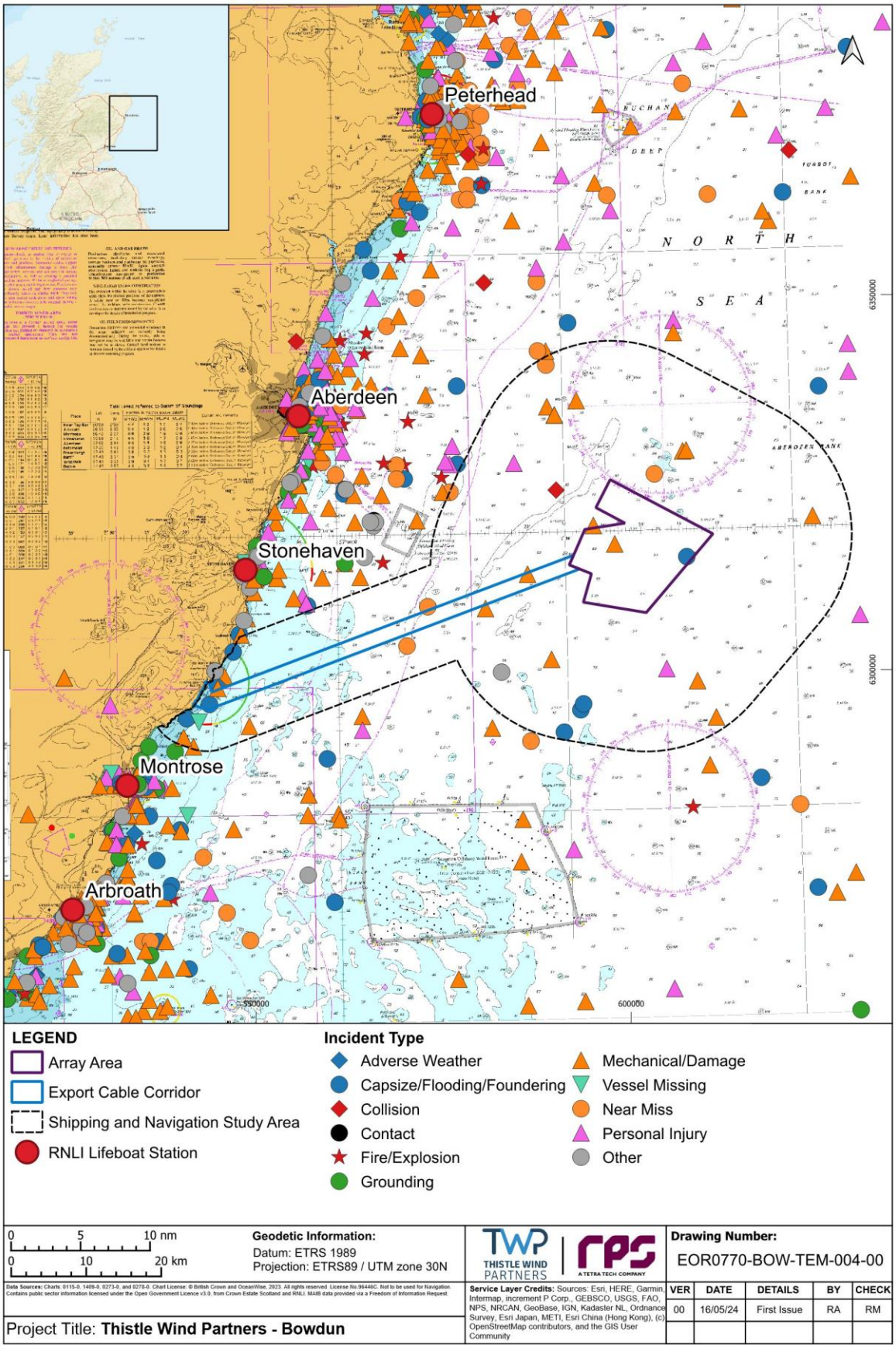


Figure 14.4: Historical Incidents (2008 to 2022)

14.5 Embedded Mitigation

14.5.1 The following Embedded Mitigation is relevant to shipping and navigation. Embedded Mitigation will evolve over the development process as the Offshore EIA Report progresses.

14.5.2 The requirement for and feasibility of any mitigation will be consulted upon with statutory consultees throughout the EIA process.

14.5.3 The following list of mitigation represents a mix of national requirements and industry best practice (see Section 14.3) to reduce the potential impact on shipping and navigation. These measures will be reviewed throughout the assessment and development process.

- Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.
- Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the CBRA and the CBA. Results of these assessments, and commitments to post construction monitoring, will be provided in the CaP.
- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a VMP and NSP.
- Advance warning and accurate location details of operations, associated Safety Zones and advisory passing distances will be given via NtMs and Kingfisher Bulletins.
- 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.
- Application for and use of Safety Zones of up to 500 m during construction, major repairs, and decommissioning phases.
- All vessels working on the Proposed Development to meet the required certification standards and carriage requirements. This also includes requiring that all crew operating the vessels have the required training and qualifications under national and international regulations.
- The Offshore Infrastructure with heights greater than 91.4 m will be marked on nautical charts including an appropriate chart note and will be alerted to aircrews through the Notice to Aviation (NOTAM) system.
- Suitable Aids to Navigation (AtoN) lighting and marking the Proposed Development will be implemented.

- Wind Turbine design to have a minimum lower blade tip height of 22 m above MHWS, accounting for pitch and roll as per MGN 654.
- Hydrographic surveys will fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard.
- Development of, and adherence to, an Emergency Response Cooperation Plan (ERCoP), developed in consultation with MCA.
- Development and adherence to an Operation and Maintenance Programme (OMP).
- Wind Turbine layout plan to be consulted on with MCA and Northern Lighthouse Board (NLB) prior to construction and either maintain regularity in lines of orientation or propose a suitable alternative layout.
- Development of, and adherence to, a Development Specification and Layout Plan (DSLP).
- Drafting and implementation of a decommissioning programme.
- Adherence with HSE/MCA guidance 'Regulatory expectations on moorings for floating wind and marine devices' as appropriate (HSE/MCA, 2017).
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- The Proposed Development will be marked on Admiralty charts including an appropriate chart note.
- Regular maintenance regime to check the Proposed Development Offshore Infrastructure.
- Compliance of project vessels with international marine regulations as adopted by the Flag State, including The Convention on the International Regulations for Preventing Collisions at Sea COLREGS (IMO, 1972a) and SOLAS (IMO, 1974).

14.6 Potential Proposed Development Impacts

14.6.1 A range of potential impacts on shipping and navigation have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

14.6.2 The impacts that have been scoped into the assessment are outlined in Table 14.2 together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (e.g. modelling) that will be required to enable a full assessment of the impacts.

14.6.3 There are no currently identified potential impacts scoped out of assessment in the NRA and Offshore EIA Report.

Table 14.2: Impacts Proposed to be Scoped into the Proposed Development Assessment for Shipping and Navigation

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Impact of cable systems and interactions with vessels at risk of snagging	✓	✓	✓	Once construction begins, there will be underwater obstructions in the form of cables and/or cable protection. Depending on sequencing of construction, these may be *in situ* for a period ahead of Wind Turbines being installed. Vessels can potentially snag fishing gear or anchors on this Offshore Infrastructure.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Review of nautical publications will complement baseline characterisation.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Deviation of commercial vessels	✓	✓	✓	Commercial vessels and ferries could potentially be displaced from existing routes due to the presence of the Array Area.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment. Modelling of deviations in terms of distance, time and vessel safety for the adverse weather routes will be undertaken in the NRA.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Increased collision risk	✓	✓	✓	Marine craft will be transiting to/from the area in all phases. There will be potential interaction with other vessels transiting in the area which leads to an increased risk of collision. In addition, displacement of vessels from the Array Area may increase the density of other routes affecting the risk of collision.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. AIS data will also be used to assess comparative baseline and future collision and contact/allision risk through the IALA Waterway Risk Assessment Program (IWRAP) modelling. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This includes vessel collision modelling to determine the change in risk in the area.
Increased contact/allision risk	✓	✓	✓	Surface piercing Offshore Infrastructure in the area will create a risk of contact for either powered or drifting vessels transiting the area.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. AIS data will also be used to assess comparative baseline and future collision and contact/allision risk through IWRAP modelling. Consultation	This impact will be assessed through the NRA following the guidance provided in MGN 654. This includes vessel allision modelling to determine the change in risk in the area.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
					with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	
Increased grounding risk	✓	✓	✓	Changes to vessel routeing as a result of the cable or project vessels may lead to a potential increase in the risk of grounding. In addition, project vessels could run aground whilst installing the Offshore Export Cable.	Data analysis will be undertaken on 12-months of vessel AIS data. AIS data will also be used to assess comparative baseline and future collision and contact/allision risk through IWRAP modelling. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Impact to SAR capability	✓	✓	✓	The increase in vessel activity may result in an increase in incidents. This along with the potential for reduced access for SAR responders due to Offshore Infrastructure may affect SAR capability.	Data analysis will be undertaken on 12-months of vessel AIS data. Review of nautical publications will complement baseline characterisation.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Interference with Radar, communications and	✓	✓	✓	Communication and positioning systems may be affected by the presence of Offshore Infrastructure.	Data analysis will be undertaken on 12-months of vessel AIS data. Review of nautical publications will	This impact will be assessed through the NRA following the guidance provided in MGN 654. This

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
positioning systems					complement baseline characterisation.	will include consultation with local and industry stakeholders to inform a formal risk assessment.
Reduction in Under Keel Clearance due to subsurface Offshore Infrastructure	✓	✓	✓	Use of cable protection associated with the Proposed Development has the potential to reduce the available depth of water along the cable route. This would reduce the available under keel clearance for vessels transiting the area.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Towage operations	✓	✓	✓	Towage will be required to take assembled floating Offshore Infrastructure to the Proposed Development during construction and decommissioning stages. Towage may also be required to take floating Offshore Infrastructure to and from the Proposed Development for maintenance purposes. There is potential for	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				impacts to occur during these operations including breakout and interaction with other vessels.		
Impact on port/harbours and nearshore operations	✓	✓	✓	Access to local ports may be affected by the presence of the Proposed Development and operations associated with it.	Data analysis will be undertaken on 12-months of vessel AIS data. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Impact on small vessel activity (fishing/recreational)	✓	✓	✓	Fishing or recreational vessels may be displaced from their current routes due to the presence of infrastructure and activities associated with the Proposed Development.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Breakout or loss of station of a floating Wind Turbine	✓	✓	✓	Any potential breakout of a Wind Turbine would result in an obstruction which would present a risk of allision for vessels navigating in the area.	Data analysis will be undertaken on 12-months of vessel AIS data. Review of nautical publications will complement baseline characterisation. Consultation with key stakeholders will be undertaken in relation to existing operations and the Proposed Development.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.
Impact of floating Wind Turbine mooring systems and interactions with vessels at risk of snagging	✓	✓	✓	Once construction begins, there will be underwater obstructions in the form of floating Wind Turbine mooring systems, such as mooring chains. Depending on sequencing of construction, these may be in situ for a period ahead of Wind Turbines being installed. Vessels can potentially snag fishing gear or anchors on this Offshore Infrastructure.	Two dedicated VTSs have been undertaken to characterise vessel movements in the area during the summer and winter months. This data collection will be supported by a 12-month analysis of AIS data. Review of nautical publications will complement baseline characterisation.	This impact will be assessed through the NRA following the guidance provided in MGN 654. This will include consultation with local and industry stakeholders to inform a formal risk assessment.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

14.7 Proposed Assessment Methodology

14.7.1 The principal guidance for assessing impacts to shipping and navigation is described in MGN 654 (MCA, 2021a). Annex 1 of MGN 654 describes the methodology by which an NRA should be undertaken, including data collection and consultation requirements.

14.7.2 To provide the data required to inform the NRA and Offshore EIA Report, VTSs have been undertaken to the standard of MGN 654. These consisted of two 14-day seasonally representative surveys covering a 10 nm buffer of the Array Area. The vessel-based surveys collect AIS, radar and visual observation data on all vessel movements. The summer survey was completed during June/July (30/06/2023 – 14/07/2023). The winter survey was completed during January 2024 (05/01/2024 – 19/01/2024). A recent 12-month AIS dataset covering the Shipping and Navigation Study Area will also be acquired from third-party AIS data providers and considered with other datasets where appropriate.

14.7.3 Collision and Allision Risk Modelling will be undertaken using the IALA Waterway Risk Assessment Program (IWRAP) Mk II software to analyse the proportion of the vessel traffic which may interact with the Array Area based on the disposition of the baseline (and future baseline) traffic. The model allows for quantitative vessel collision and contact likelihood modelling which will be undertaken on the baseline and Wind Turbine layouts. IWRAP Mk II is a quantitative tool for calculating the frequency of collisions, groundings and allisions for navigating vessels in a given waterway. The tool was developed by IALA to support coastal states in conducting risk assessments to address obligations under SOLAS Chapter V.

14.7.4 Consultation with key shipping and navigation stakeholders will be undertaken during and post scoping and used to inform the NRA and Offshore EIA Report ensuring a representative cross section of maritime users are considered. The list of consultees is anticipated to include:

- MCA;
- NLB;
- Chamber of Shipping;
- Ministry of Defence (MoD);
- Ports and harbours (including Aberdeen, Peterhead and Montrose);
- ferry operators (including NorthLink);
- cruise operators;
- oil and gas operators;
- East Region Developers;
- commercial regular runners/operators (e.g. oil and gas vessels and asset owners);

- RNLI;
- Royal Yachting Association (RYA) Scotland;
- Cruising Association;
- local yacht clubs;
- local fishing organisations including:
  - SWFPA;
  - SFF;
  - SPFA;
  - Inshore Fisheries Groups and individual smaller vessel operators or collectives where appropriate.

14.7.5 As per MGN 654, the NRA will follow the IMO's FSA methodology, an internationally recognised approach for conducting maritime risk assessments. The FSA is a structured and systematic methodology, aimed at enhancing maritime safety, including protection of life, health, the marine environment and property, by using risk analysis and, if appropriate, cost-benefit assessment. There are five steps within the FSA process:

1. identification of hazards;
2. risk analysis;
3. risk control options; and
4. cost-benefit assessment (if applicable); and
5. recommendations for decision making.

14.7.6 Hazards will be identified, and their likelihood and consequence scored to produce a risk score. This assessment will bring together the quantitative risk modelling, consultation feedback, analysis results, lessons learnt from previous developments and expert judgement. Where necessary, risk controls will be identified to mitigate any unacceptable risks and reduce the risks to As Low as Reasonably Practicable (ALARP). This will be presented in the form of a hazard log and used to inform the Offshore EIA Report. The hazard log will also be used to identify standard and Additional Mitigation measures required to demonstrate that the hazards are broadly acceptable or tolerable on the basis of ALARP declarations, in line with regulatory requirements. This will be presented in the form of a hazard log and used to inform the Offshore EIA Report.

14.7.7 Magnitude and sensitivity are required to be considered together to determine the significance of an effect. The definitions for magnitude and sensitivity will be dependent on the findings of the NRA and will be developed to be consistent with the methodology used for other topics.

Future Consultation

14.7.8 It is anticipated that further consultation will be required with a range of stakeholders detailed in Section 14.6 including as part of a Hazard Identification (HAZID) workshop.

14.7.9 The key topic areas to be discussed during pre-application are subject to the final details but are anticipated to include:

- finalisation of baseline and analysis of site-specific data collection;
- outputs of NRA and Offshore EIA Report;
- approach to the CEA and agreement of other projects to be considered; and
- Additional Mitigation and monitoring measures.

14.8 Potential Inter-Related Effects

14.8.1 The Offshore EIA Report will consider inter-related effects on shipping and navigation which may arise from the construction, O&M, and decommissioning of the Proposed Development. Inter-related effects refers to the effects arising from the Proposed Development across the development phases (Proposed Development lifetime) or different effects on one receptor in one phase (receptor led). The Offshore EIA Report will consider inter-related effects of impacts from all three phases of the Proposed Development. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) with the Proposed Development. This will ensure that the Proposed Development is appropriately considered, as a whole, within the inter-related effects assessment. Other topics considered for potential inter-related effects include:

- Section 13: Commercial Fisheries;
- Section 15: Aviation and Radar;
- Section 16: Infrastructure and Other Users; and
- Section 18: Socio-Economics, Tourism and Recreation.

14.9 Potential Cumulative Effects

14.9.1 There are likely potential cumulative effects on shipping and navigation receptors as a result of the Proposed Development when considered collectively with other projects and activities in the vicinity of other projects. This will be assessed in the Offshore EIA Report as part of the CEA for the Proposed Development lifetime in line with the process described in Section 4: EIA Methodology. The CEA process will have a screening stage and an assessment stage. The screening stage for Shipping and Navigation will consider other projects and activities within a range of up to 50 nm from the Scoping Boundary to be screened in depending on conceptual, physical or temporal overlap with the Proposed Development. Broader consideration will also be given beyond this range to the wider North Sea and also in relation to potential transboundary impacts where these are considered to have a potential contribution to the cumulative effects. By following MGN 654 guidance, impacts

assessed within the NRA will therefore be considered both in isolation and in combination with other projects and activities.

14.9.2 In 2023 the establishment of an Eastern Region Developers Group was proposed to collaboratively prepare an 'Eastern Region Shipping & Navigation Cumulative Baseline' study and thereby ensure an agreed and consistent approach to navigational issues. The group member projects for the Eastern Region are the following six Scotwind projects: Bellrock, Bowdun, Campion, Morven, Muir Mhor and Ossian.

14.9.3 The Eastern Region Developers Group is intended to review and agree a present-day regional baseline for the Eastern Region and then then to review and agree the principles of future vessel traffic with the Eastern Region projects in place. Projects outside of this region will also be considered in terms of their cumulative interface with the region. Therefore, the basis of the cumulative assessment described above may evolve as the Eastern Region Developers Group work progresses.

14.10 Potential Transboundary Impacts

14.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. There is potential for transboundary impacts upon shipping and navigation due to construction, O&M, and decommissioning impacts of the Proposed Development.

14.10.2 Given the nature of shipping and navigation, all activities and operations can have a transboundary element. These can range from the transshipment of goods internationally between ports, fishing by vessels from other countries, and recreational yachting between countries. Therefore, all potential impacts identified in Table 14.2 have also been considered here as potential transboundary impacts and will be classified as such in the Offshore EIA Report.

14.11 Summary

14.11.1 Shipping and Navigation risk and impacts will be assessed following relevant legislation, policy and guidance and in line with industry best practice – principally as defined in MGN 654. The consultation and baseline environment assessment undertaken to date has identified key potential impacts to be further considered and investigated within the NRA and Offshore EIA Report through historical AIS and incident data analysis, and qualitative and quantitative assessment methods. These identified impacts, together with further detailed shipping and navigation stakeholder consultation, will inform the formal risk assessment within the NRA to identify potential Additional Mitigation to the already defined Embedded Mitigation measures. The Offshore EIA Report will also take into consideration

the potential cumulative effects of other projects and activities, transboundary impacts and potential inter-related effects arising from the Proposed Development.

15 Aviation and Radar

15.1 Introduction

15.1.1 This section of the Offshore Scoping Report identifies the aviation and radar receptors of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M, and decommissioning of the Proposed Development on aviation and radar receptors.

15.1.2 This section has been prepared by Wing Commander Mike Coleman Royal Air Force (RAF) (Retd) of Coleman Aviation Limited.

15.1.3 The potential effects of Wind Turbines on aviation and radar are widely publicised, but the primary concern is one of safety. There are three primary scenarios that may lead to potential impacts:

- Physical obstruction: Wind Turbines and other Offshore Infrastructure can present a physical obstruction to an aircraft.
- Impacts on aviation radar systems and the provision of radar-based Air Traffic Services (ATS): Wind Turbines can create unwanted radar clutter which appears on radar displays and can affect the provision of ATS to pilots. Radar clutter (or false radar returns) can make it difficult for air traffic controllers to differentiate between aircraft and those radar returns resulting from the detection of Wind Turbines. Furthermore, the appearance of multiple false targets in close proximity can generate false aircraft tracks and reduce those returns from 'real' aircraft away from their true positions. It should be noted that impacts on radar systems are only possible if the Wind Turbine blades are moving, therefore this impact is generally applicable to the O&M phase, or at the time of blade tip installation depending at which location that takes place (i.e. within the Array Area or elsewhere).
- Communication, navigation and surveillance equipment: A wide range of systems, together with air-ground communications facilities, can be adversely affected by development of infrastructure projects; specifically, when located within the physical safeguarding zones of communication, navigation and surveillance equipment.

15.2 Aviation and Radar Study Area

15.2.1 A Primary Aviation and Radar Study Area is defined by a 9 nm (17 km) buffer around the Array Area in accordance with recommended consultation distances contained in Civil Aviation Publication (CAP) 764 (Civil Aviation Authority (CAA), 2016a). This enables identification of impacts on aviation receptors in the immediate vicinity of the Array Area including low-visibility helicopter operations to offshore

installations (e.g. oil and gas platforms). The Primary Aviation and Radar Study Area is illustrated in Figure 15.1.

15.2.2 A Secondary Aviation and Radar Study Area is defined by the range of the aviation receptors, in particular, Air Traffic Control (ATC) and air defence Primary Surveillance Radars (PSRs) which have the potential to be impacted by the Proposed Development. The Secondary Aviation and Radar Study Area is depicted in Figure 15.1 and covers potential receptors in the north of Scotland that could potentially be affected by Wind Turbines located within the Array Area. Although the operating range of aviation radars can be up to 200 nm (370 km), it is only the radar coverage over the Array Area that needs to be considered, as the question of whether the Wind Turbines themselves are visible to radar is the determining factor relating to aircraft safety.

15.2.3 This Secondary Aviation and Radar Study Area also encompasses the Export Cable Corridor which will enable any potential impacts on aviation receptors during installation of the Offshore Export Cables to be determined; in particular, at the Landfall location in respect of physical safeguarding zones associated with aviation communication, navigation and surveillance equipment such as navigation beacons.

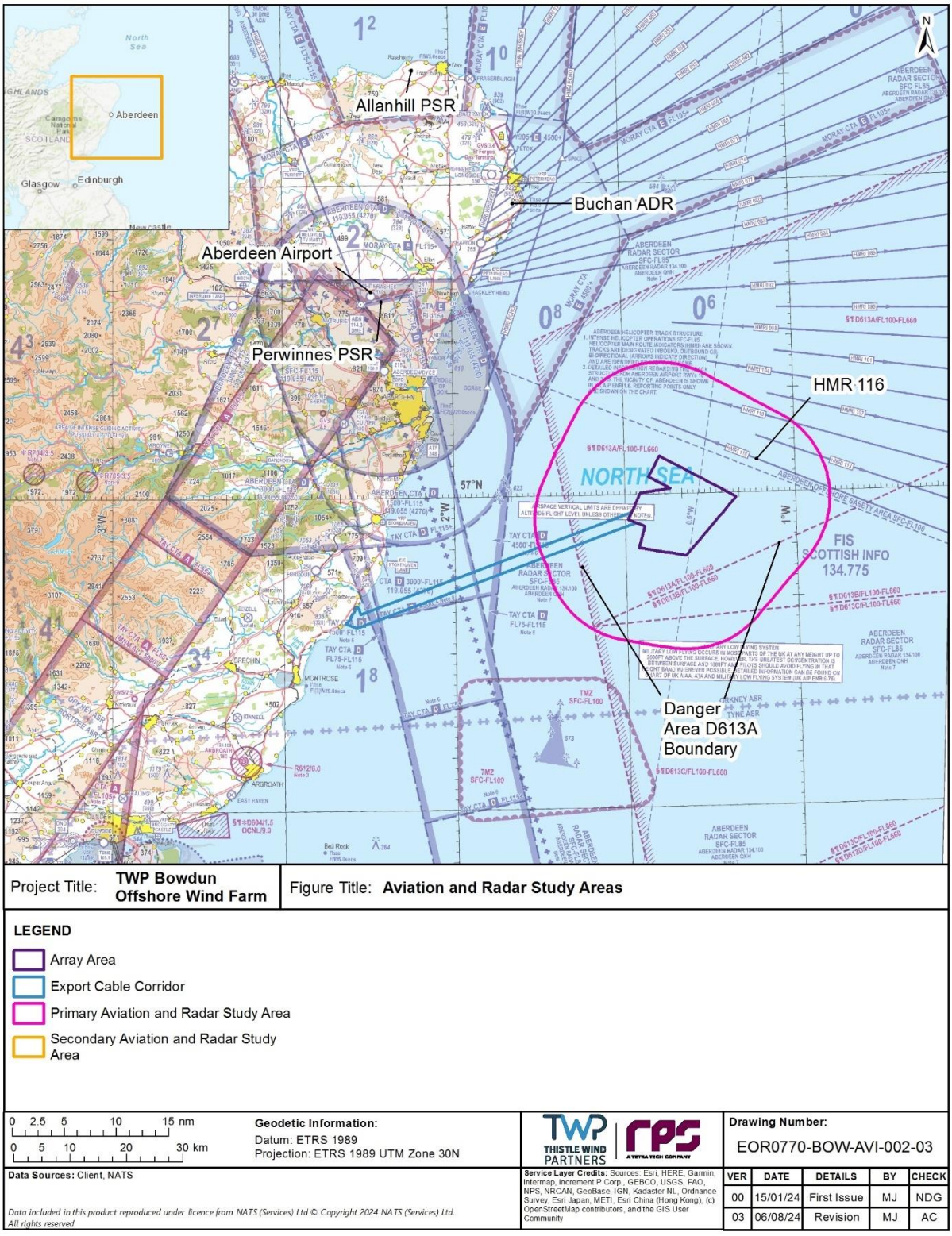


Figure 15.1: Aviation and Radar Study Areas

15.3 Data Sources

15.3.1 An initial desktop review of key literature and data sources, in particular the United Kingdom Integrated Aeronautical Information Publication (UK IAIP), was undertaken to inform the aviation and radar baseline (Table 15.1).

Table 15.1: Summary of Key Datasets and Reports for Aviation and Radar

Title	Source	Reference
UK Integrated Aeronautical Information Package	CAA	CAA (2024a)
Visual Flight Rules (VFR) Aviation Chart	CAA	CAA (2024b)
UK Military Aeronautical Information Publication (Mil AIP)	MoD	MoD (2024)
Self-Assessment Maps	National Air Traffic Services (NATS)	NATS (2024)
Scottish NPF4	Scottish Government	Scottish Government (2023)
Beatrice OWF Environmental Statement (ES)	Beatrice Offshore Wind Farm Limited (BOWL)	BOWL (2012)
Moray East OWF ES	Moray Offshore Renewables Limited (MORL)	MORL (2012)
Moray West Offshore Windfarm Offshore EIA Report	Moray Offshore Windfarm (West) Limited	Moray Offshore Windfarm (West) Limited (2018)
Neart na Gaoithe OWF ES	Neart na Gaoithe Wind Farm Limited	Neart na Gaoithe Wind Farm Limited (2019)
Seagreen Alpha and Bravo Wind Farms EIA Report	Seagreen Offshore Wind Farm Limited	SSE Renewables (2018)
West of Orkney OWF Offshore EIA Report	Offshore Wind Power Limited	Offshore Wind Power Limited (2023)

Title	Source	Reference
Dounreay Trì ES	Dounreay Trì Limited	Dounreay Trì Limited (2016)
Berwick Bank Wind Farm EIA Report	Berwick Bank Wind Farm Limited	SSE Renewables (2022f)

15.4 Baseline Environment

15.4.1 This section provides a description of the aviation and radar baseline environment, following a desk-based review, including civil airports and military aerodromes, radar systems and helicopter operations. There are no anticipated future changes to the airspace and aviation environment in the vicinity of the Proposed Development that are expected to impact the assessment of the effects on aviation receptors.

Civil Airports and Military Aerodromes

15.4.2 The nearest major civil airport to the Array Area is Aberdeen Airport located 27 nm (50 km) to the north-west. The published obstacle safeguarding area for airports of this nature is 30 nm (56 km), therefore the Proposed Development is inside the safeguarding area for Aberdeen Airport's Instrument Flight Procedures (IFPs).

15.4.3 The Export Cable Corridor and Landfall location are also outside the physical safeguarding areas of any aviation communication, navigation and surveillance infrastructure.

15.4.4 The nearest military aerodrome to the Array Area is Leuchars Station located 56 nm (104 km) to the south-west. The published obstacle safeguarding area for aerodromes of this nature is 30 nm (56 km), therefore the Proposed Development is outside the safeguarding area of any military aerodrome IFPs.

Civil Air Traffic Control Radars

15.4.5 The nearest civil ATC radars to the Array Area are the National Air Traffic Services (NATS) Perwinnes PSR located 26 nm (48 km) to the north-west and the Allanshill PSR located 43 nm (80 km) to the north-west. The proposed Wind Turbines are highly likely to be in Radar Line of Sight (RLOS) of both PSRs.

Military Air Traffic Control Radars

15.4.6 The nearest military ATC radar to the Array Area is the Leuchars Station PSR located 56 nm (104 km) to the south-west. The operating

range of the Leuchars PSR is 60 nm (111 km) and it is highly unlikely that the proposed Wind Turbines will be in RLOS of the radar.

Military Air Defence Radars

15.4.7 The nearest military air defence radar to the Array Area is located at Buchan 28 nm (52 km) to the north-west. The proposed Wind Turbines are highly likely to be in RLOS of the Buchan Air Defence PSR.

Low Flying (Including UK Search and Rescue)

15.4.8 The Array Area is located more than 12 nm (22 km) from the UK coastline and, therefore, is technically outside the UK Military Low Flying System; however, it is recognised that military aircraft may still be required to operate at low-level in the vicinity of the Proposed Development. Installation and presence of Wind Turbines can pose a physical obstruction to aviation operations and can be difficult to see from the air, particularly in poor meteorological conditions, leading to a potential increase in obstacle collision risk. Furthermore, during the construction phase, the presence and movement of installation vessels (with onboard cranes) may also present a potential obstacle collision risk to aircraft operations. Military aircraft can operate down to 100 ft above surface level over the sea.

15.4.9 UK SAR helicopters conducting operational missions are not constrained by the normal rules of the air and operate in accordance with their Aircraft Operator Certificate, which allows them flexibility to manoeuvre, as required, for the particular mission being carried out. Assessment of potential impacts on SAR operations will be included within the Offshore EIA Report. An ERCoP will be compiled in conjunction with MCA if required.

Helicopter Main Routes

15.4.10 Helicopter Main Routes (HMRs) are established to support the transport of personnel and logistics to offshore oil and gas installations. HMRs provide a network of offshore routes used by civilian helicopters to facilitate an obstacle free zone for safe flight when in-flight Visual Meteorological Conditions cannot be met. The HMR structure therefore provides both an identification of common flight paths and a safe means of traffic flow. HMR 116 is the nearest HMR to the Array Area and is located approximately 3 nm (5.55 km) to the north; it is primarily used for helicopter flights from Aberdeen Airport to the offshore oil and gas installations in the North Sea.

Offshore Helicopter Installations (Oil and Gas Platforms)

15.4.11 CAP 764 (CAA, 2016a) recommends that windfarm developers consult with the owners/operators of offshore helicopter installations when

a development is within 9 nm (17 km) of any helicopter installation. The nearest offshore helicopter installation to the Array Area is the Buzzard platform which is located approximately 45 nm (84 km) to the north-north-east.

Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military Practice and Exercise Areas)

15.4.12 The Array Area lies within the lateral boundaries of Danger Area D613A which is activated periodically by MoD by means of the NOTAM system. It is activated from Flight Level 100 (10,000 ft) up to Flight Level 550 (55,000 ft) and is used for military air combat training and supersonic flight. Although the Array Area is located within the lateral boundaries of D613A, military operations only commence from 10,000 ft above the Proposed Development.

Meteorological Office Radar

15.4.13 The closest Meteorological Office radar system is located at Hill of Dudwick near Ellon, Aberdeenshire. It is located 30 nm (56 km) to the north-west of the Array Area which is outside the 11 nm (20 km) safeguarding area for radars of this nature.

15.5 Embedded Mitigation

15.5.1 The following Embedded Mitigation has been proposed as part of the Proposed Development in order to reduce the potential for impacts to aviation and radar.

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Advance warning and accurate location details of operations, associated Safety Zones and advisory passing distances will be given via NtMs and Kingfisher Bulletins.
- Development of, and adherence to, a LMP. The LMP will detail how the final design complies with legal requirements with regards to shipping, navigation and aviation marking and lighting.
- The Offshore Infrastructure with heights greater than 91.4 m will be marked on nautical charts including an appropriate chart note and will be alerted to aircrews through the NOTAM system.
- Development of, and adherence to, an ERCoP in consultation with MCA.
- Development and adherence to an Operation and Maintenance Programme (OMP).
- CAA will be informed of the locations, heights and lighting status of the Wind Turbines, including estimated and actual dates of construction and the maximum heights of any

construction equipment to be used, prior to the start of construction.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

15.5.2 There is a commitment to implement these measures and they have been considered within this section of the Offshore Scoping Report. The nature and implementation of these measures is a standard approach in the development and assessment of offshore wind developments in Scotland and relate to regulation and guidance contained in the UK IAIP and MGN 654. The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

15.6 Potential Proposed Development Impacts

15.6.1 A range of potential impacts on aviation and radar have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development.

15.6.2 The impacts scoped into the assessment are outlined in Table 15.2together with a description of any additional data collection (e.g. IFP assessment) and supporting analyses (e.g. radar modelling) that will be required to enable a full assessment of the impacts.

15.6.3 Potential impacts scoped out of the assessment are presented in Table 15.3, with justification.

Table 15.2: Impacts Proposed to Be Scoped Into the Proposed Development Assessment for Aviation and Radar

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Potential impact on Aberdeen Airport IFPs	✓	×	×	The Array Area is within the safeguarding area of Aberdeen Airport. The Proposed Development could therefore create physical obstacles within the airport's safeguarded area which, in turn, could adversely impact the airport's IFPs. This impact will be scoped into the construction phase but scoped out of O&M and decommissioning phases as mitigation will have to be implemented prior to construction phase.	NATS, the provider of ATC services at Aberdeen Airport, are expected to request that an IFP assessment is commissioned from a CAA Approved Procedure Design Organisation. This will ascertain whether the Proposed Development's Wind Turbines will adversely impact Aberdeen Airport's IFPs and, if so, what amendments to the airport's IFPs will be required to mitigate any adverse impact.	Engagement has commenced with NATS regarding commissioning an IFP assessment in order to inform Aberdeen Airport's response to this Offshore Scoping Report.
Potential impact on NATS Perwinnes and Allanshill ATC PSRs	×	✓	×	The Proposed Development's Wind Turbines will potentially be within radar coverage of the NATS Perwinnes and Allanshill PSR systems. This impact will be scoped into the O&M phase but scoped out of the construction and decommissioning phases as	NATS will be requested to carry out a Technical and Operational Assessment (TOPA) to confirm any adverse impact and, if needed, investigate the mitigation options available.	Engagement has commenced with NATS regarding commissioning a TOPA in order to inform NATS' response to this Offshore Scoping Report.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				impact on PSR systems is only applicable when Wind Turbine blades are moving.		
Potential impact on MoD Buchan air defence PSR	×	✓	×	The Proposed Development's Wind Turbines will potentially be within radar coverage of MoD's Buchan Air Defence PSR. This impact will be scoped into the O&M phase but scoped out of the construction and decommissioning phases as impact on PSR systems is only applicable when Wind Turbine blades are moving.	MoD will be requested to carry out a Pre-Planning Assessment to confirm any adverse impact and, if needed, investigate the mitigation options available.	The Applicant intends to engage with MoD regarding a Pre-Planning assessment in order to inform MoD's response to this Offshore Scoping Report.
Potential obstacle collision risk to Low Flying aircraft (including SAR)	✓	×	×	Installation, and presence of, Wind Turbines can pose a physical obstruction to aircraft. Furthermore, during construction, the presence and movement of installation vessels (with onboard cranes) may also present a potential obstacle collision risk. Consequently, this impact remains scoped into the Offshore EIA Report	A LMP will be developed with all relevant aviation stakeholders and details of the Proposed Development's Wind Turbines will be included in aviation documentation and displayed on aviation charts.	A LMP will be developed which will detail how the final Wind Turbine layout design complies with legal requirements with regards to shipping, navigation and aviation marking and lighting.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				but for the construction phase only. Mitigation will have to be implemented prior to construction and will already be in place for O&M and decommissioning phases.		

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 15.3: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Aviation and Radar

Impact	Proposed Development Phase			Justification
	C	O	D	
Creation of an obstruction: Offshore Export Cable Route on Civil and Military communication, navigation and surveillance equipment	✓	✓	✓	The Export Cable Corridor and Landfall location are outside the physical safeguarding areas of any aviation communication, navigation and surveillance infrastructure and, therefore, will not adversely impact aviation operations. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Creation of obstruction: Military Aerodrome IFPs (including communication, navigation and surveillance equipment)	✓	✓	✓	The Proposed Development's Wind Turbines are not within the safeguarding area of any military aerodromes. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Impact on aviation radar systems: Military ATC PSR	✓	✓	✓	The Proposed Development's Wind Turbines are not within radar coverage of any military ATC PSR systems. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Creation of an obstruction: HMRs	✓	✓	✓	Construction of Wind Turbines within 2 nm (3.70 km) either side of an HMR would have the potential to restrict operations below the routine operational altitudes when icing conditions exist. The ability of a helicopter to operate at the expected altitudes would be dependent upon the Icing Level (the 0° isotherm). In this situation, helicopters operating on HMRs need an 'escape-route' if icing conditions are encountered unexpectedly; this would inevitably involve a descent. However, as outlined in CAP 764 (CAA, 2016a), CAA guidance is that, provided there are no Wind Turbines within 2 nm (3.70 km) either side, then helicopter operations on HMRs should not be affected. Consequently, helicopters operations on HMRs will not be affected by the Proposed

Impact	Proposed Development Phase			Justification
	C	O	D	
				Development. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Creation of an obstruction: Offshore Helicopter Installations	✓	✓	✓	In line with CAA guidance (CAA, 2016a), the Proposed Development's Wind Turbines are more than 9 nm (17 km) from any offshore helicopter installation. Consequently, helicopter operations into offshore installations are not expected to be affected by the Proposed Development. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Creation of an obstruction: Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military PEXAs)	✓	✓	✓	Although the Array Area is located within the lateral boundaries of Danger Area D613A, the presence of Wind Turbines within the boundaries of the Danger Area should not create any adverse impact as military operations do not commence until above Flight Level 100 (10,000 ft). It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.
Impact to Meteorological Office Radar	✓	✓	✓	The Proposed Development's Wind Turbines are not within radar coverage of any Met Office radar systems. It is proposed that this impact will be scoped out of further consideration within the Offshore EIA Report.

15.7 Proposed Assessment Methodology

15.7.1 The aviation EIA will be undertaken in line with the methodology set out in Section 4: EIA Methodology. The following specific legislation and guidance documents will also be considered:

- CAP 393 – Air Navigation: The Order and the Regulations (CAA, 2016b);
- CAP 670 – Air Traffic Services Safety Requirements (CAA, 2019);
- CAP 764 – CAA Policy and Guidelines on Wind Turbines (CAA, 2016a);
- CAP 774 – The UK Flight Information Services (CAA, 2021);
- Military Aviation Authority Regulatory Publication 3000 Series: Air Traffic Management Regulations (MAA, 2024);

- Manual of Military Air Traffic Management (MAA, 2019);
- UK IAIP (CAA, 2024a);
- UK Military Aeronautical Information Publication (Mil AIP) (MOD, 2024); and
- MGN 654: Safety of Navigation - OREIs - Guidance on UK Navigational Practice, Safety and Emergency Response (UK Government, 2021).

15.7.2 The methodology used for the aviation assessment is a desk-based review using the data sources as described in Table 15.1. However, defining categories of receptor sensitivity and magnitude of impact is not appropriate for aviation as baseline aviation activities and equipment are highly sensitive to impacts and any magnitude of restriction on, or compromise to, activities or equipment (without Embedded Mitigation) is considered to be high. Therefore, the sensitivity of receptor and magnitude of impact will be explained via professional reasoning and judgement rather than via definitions of different categories. These judgements will feed into the determination of significance.

15.7.3 The Applicant intends to engage with relevant aviation stakeholders in order to confirm any potential impacts and identify potential mitigation solutions. In particular, the Applicant expects to consult with the following aviation stakeholders:

- Aberdeen Airport – potential effect on Aberdeen Airport's IFPs;
- MCA – potential impact on SAR helicopter operations within the Array Area;
- MoD - potential impact on low flying operations and Buchan air defence PSR; and
- NATS - potential impact on the Allanshill and Perwinnes ATC PSRs.

15.7.4 The intention will be to confirm impacts and identify suitable mitigation solutions prior to formal submission of the application. Full details will be provided in the Offshore EIA Report.

Significance Criteria

15.7.5 An impact assessment matrix will be used to determine the significance of an effect. The potential significance of an effect is a function of the sensitivity of the receptor and the magnitude of the impact, as shown in Table 15.4. The signficiance levels are defined in Table 15.5.

Table 15.4: Matrix for Determination of Significance for Aviation and Radar

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

Table 15.5: Definition of Significance Levels for Aviation and Radar

Impact	Justification
Negligible	Normally no measurable change from baseline conditions which therefore do not require any alteration of existing operational and technical practice.
Minor	Occasional effects experienced which do not require any alteration of existing operational and technical practice.
Moderate	Periodic effects experienced which may require alterations to existing operational practice.
Major	Regular, frequent, or permanent effects which require changes to existing operational and/or technical practice in order to mitigate adequately, or which are not capable of being mitigated adequately.

15.7.6 For the purposes of this assessment:

- a level of effect of moderate or more will be considered a 'significant' effect; and
- a level of effect of minor or less will be considered 'not significant'.

15.7.7 Effects of moderate significance or above are therefore considered important in the decision-making process, whilst effects of minor significance or less warrant little, if any, weight in the decision-making process.

15.8 Potential Inter-Related Effects

15.8.1 The aviation and radar assessment will be linked to Section 14: Shipping and Navigation due to the need to ensure that SAR helicopter lighting and marking requirements are considered jointly with SAR surface vessel lighting and marking requirements. Where design commitments are made to avoid, limit or mitigate impacts on receptors considered within this assessment, these will also be considered with those made in Section 14: Shipping and Navigation to avoid conflicting mitigation commitments between the two assessments.

15.9 Potential Cumulative Effects

15.9.1 In terms of cumulative effect, any potential impact on an aviation receptor is generally treated as a standalone effect. Whilst other windfarm developments may be located in close proximity, the effect on each receptor is considered on a case-by-case basis. Although mitigation may have been agreed for other developments, discussion and agreement with aviation stakeholders will be carried out under separate arrangement, specific to the Applicant and the Proposed Development. It is considered that mitigation will be agreed and implemented following engagement with key stakeholders which will mitigate possible effects resulting from the Proposed Development, and as such no specific cumulative effects on aviation and radar receptors are expected.

15.10 Potential Transboundary Impacts

15.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon aviation and radar as a result of construction, O&M, and decommissioning impacts of the Proposed Development.

15.11 Summary

15.11.1 The aviation and radar scoping section of this Offshore Scoping Report considers the potential impacts from the Proposed Development.

15.11.2 Information on aviation was collected through a detailed desktop review of existing studies and datasets. The desktop review was conducted using comprehensive aviation documentation and charts to identify potential aviation receptors during the construction, O&M and decommissioning phases of the Proposed Development. The Applicant intends to engage with Aberdeen Airport, MoD and NATS.

15.11.4 Two Aviation and Radar Study Areas: a Primary Aviation Study Area around the Array Area, and a Secondary Aviation Study Area, were defined to ensure that all relevant aviation receptors were assessed. The aviation receptors considered were as follows:

- civil airport IFPs;
- military aerodrome IFPs;
- civil ATC PSR;
- military ATC PSR;
- military Air Defence PSR;
- military low flying and SAR helicopter operations;
- HMRs;
- offshore helicopter installations (oil and gas platforms);
- Local Airspace Restrictions (Prohibited/Restricted/Danger Areas and Military PEXAs; and
- Meteorological Office radar.

15.11.5 The desktop review determined that the following aviation receptors would potentially be affected by the Proposed Development:

- Aberdeen Airport's IFPs;
- MoD Buchan Air Defence PSR;
- Military low flying and SAR helicopter operations; and
- NATS Allanshill and Perwinnes ATC radars.

15.11.6 Consultation has commenced with Aberdeen Airport, MoD and NATS in order to identify how adverse impact on Aberdeen Airport's IFPs, the Buchan Air Defence radar and the NATS Allanshill and Perwinnes radars can be alleviated. It is anticipated that mitigation agreements will be in place prior to submission of Offshore EIA Report and that suitable suspensive conditions can be agreed with both parties prior to any consent decision.

15.11.7 In terms of military low flying and SAR helicopter operations, pilots are ultimately responsible for seeing and avoiding obstructions. Wind Turbines can be difficult to see from the air, particularly in poor meteorological conditions, leading to a potential increase in obstacle collision risk. In order to alleviate this risk, CAA and MoD will request that, in the interests of air safety, the turbines are fitted with MoD accredited aviation safety lighting and in accordance with the Air Navigation Order (ANO) (CAA, 2016a) and that details of the Proposed Development are included on aviation charts. These arrangements form part of the Embedded Mitigation measures identified in the scoping section.

15.11.8 In terms of cumulative effects, the impact on any aviation receptor is generally treated as a standalone impact. The predicted effects from the Proposed Development on aviation receptors are considered to be localised to within the footprint of the development site. Consequently, the Proposed Development is not considered to present any cumulative effect on aviation receptors in the region.

15.11.9 No potential exists for transboundary impacts upon aviation receptors due to construction, O&M and decommissioning of the Proposed Development.

16 Infrastructure and Other Users

16.1 Introduction

16.1.1 This section of the Offshore Scoping Report identifies the infrastructure and other users receptors of relevance to the Proposed Development which are not addressed in other sections of the Offshore Scoping Report. It considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development on existing infrastructure and other users.

16.1.2 Potential impacts to commercial fishing receptors are addressed in Section 13: Commercial Fisheries. Potential impacts upon infrastructure and other users related to navigational safety are addressed in Section 14: Shipping and Navigation. Potential impacts on helicopter access to oil and gas platforms are addressed in Section 15: Aviation and Radar.

16.2 Infrastructure and Other Users Study Areas

16.2.0 In order to assess impacts on different groups of infrastructure and other users receptors, two study areas have been defined and are shown in Figure 16.1. These are the Local Infrastructure and Other Users Study Area and the Regional Infrastructure and Other Users Study Area.

16.2.1 The Local Infrastructure and Other Users Study Area comprises the Scoping Boundary with an additional a 1 km buffer. Oil and gas infrastructure, cables and pipelines and offshore renewables projects undergoing maintenance require 500 m Safety Zones. The Local Infrastructure and Other Users Study Area exceeds the extent of direct physical overlap, and any Safety Zones, between the Proposed Development and the following receptors:

- recreational activities;
- offshore energy projects, including:
  - OWFs;
  - oil and gas activities;
  - CCS.
- cable and pipelines;
- offshore microwave fixed communication links; and
- Radar Early Warning Systems (REWS).

16.2.2 The Regional Infrastructure and Other Users Study Area is based on one Spring Tidal Excursion from the Scoping Boundary. One Spring Tidal Excursion is considered to be the maximum area within which increases in SSCs could arise from activities associated with the Proposed Development. The Spring Tidal Excursion varies, ranging from 663 m from the east boundary of the Array Area to 10.3 km from the north boundary of the Array Area. The buffer from the Spring Tidal

Excursion at the mid-Export Cable Corridor is 6.2 km before expanding to its greatest extent of 10.6 km parallel to its landfall location on the east Aberdeenshire coast.

16.2.3 The only infrastructure and other users (i.e. human environment) receptors particularly susceptible to increases in SSCs are:

- marine aggregate extraction and disposal sites; and
- scuba divers.

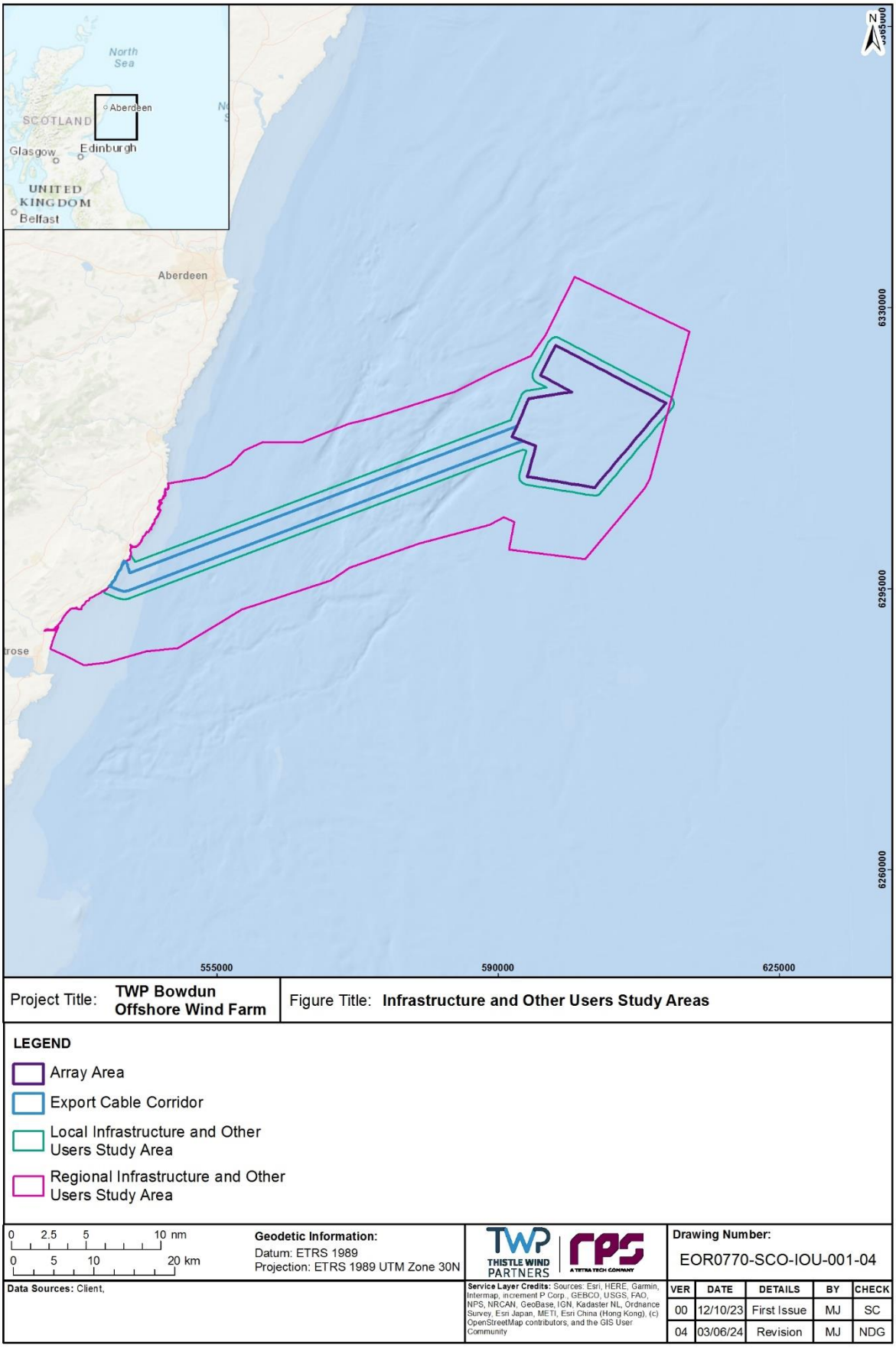


Figure 16.1: Infrastructure and Other Users Study Areas

16.3 Data Sources

16.3.0 An initial desktop review of literature and data sources has been undertaken to inform the infrastructure and other users baseline (Table 16.1).

Table 16.1: Summary of Key Desktop Datasets and Materials

Title	Source	Year	Author
Aggregate extraction	EMODNet Web Map Viewer - Human Activities	2024	EMODNet
Awarded Marine Licences	MD Portal	2024	MD
Cables (Power and Telecoms)	Kingfisher Information Service – Offshore Renewable and Cable Awareness (KIS-ORCA) Map	2024	KIS-ORCA
Disposal sites	EMODNet	2024	EMODNet
Energy and Infrastructure Projects	CES Spatial Hub	2024	CES
Hydrocarbon Fields	North Sea Transition Authority (NSTA) United Kingdom Continental Shelf (UKCS) Lease Agreements Interactive Web Map	2024	NSTA
OWFs	4-C Global Offshore Renewable Map	2024	4C Offshore
Oil and Gas licences	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA
Oil and Gas Platforms	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA
Pipelines	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA
Recreational Activities	UK Coastal Atlas of Recreational Boating	2018	RYA

Title	Source	Year	Author
Recreational Diving Sites	Professional Association of Diving Instructors (PADI) Guide to UK Dive Sites	2024	PADI
Recreational Fishing	NMPi Web Map Services - Marine Recreation and Tourism Survey 2015 - Sea angling	2024	Scottish Government
Recreational Traffic	NMPi Web Map Services - AIS - Shipping Traffic - Average weekly density of vessel types	2019	Scottish Government
Subsurface Structures	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA
Summer and Winter VTSs	Two site-specific 14-day VTSs have been undertaken (30 June to 14 July 2023 and 05 to 19 January 2024); however, data was unavailable at time of submission of this Offshore Scoping Report, see Section 14: Shipping and Navigation. NASH (commissioned by TWP)	2023, 2024	NASH
UKCS Blocks	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA
Wells	NSTA UKCS Lease Agreements Interactive Web Map	2024	NSTA

16.4 Baseline Environment

16.4.1 This section provides a summary of the baseline environment of infrastructure and other users.

16.4.2 With the exception of marine VTSs, no site-specific surveys have been undertaken to inform this Infrastructure and Other Users section. Due to availability of suitable data throughout the east of

Scotland's coastal area, new data or modelling studies will not be required to characterise the infrastructure and other users baseline for the Offshore EIA Report.

Local Infrastructure and Other Users Study Area

Recreational Activities

16.4.3 There are two general categories of recreational sailing: offshore and inshore. Forms of offshore sailing include cruising or organised offshore racing of yachts, though powerboats can also be included in offshore racing. Smaller vessels such as dinghies and other recreational craft are those typically used for inshore activities. This can be either nearshore racing, predominantly within sight of a club facility, or leisure cruising. Inshore racing courses are established by navigational buoyage and bespoke racing marks. Leisure cruising may involve multi-day voyages, including transit across the North Sea between Scotland elsewhere in Northern Europe, or single-day journeys between local ports, harbours and/or marinas. The Array Area portion of the Local Infrastructure and Other Users Study Area is not located within sufficient proximity to land to impact activities that are generally associated with inshore recreational sailing. The landfall approach of the Export Cable Corridor, however, does encompass inshore areas which have increased recreational sailing and motor cruising activity.

16.4.4 Navigation safety and risk to recreational vessels is considered in Section 14: Shipping and Navigation. This section of the Offshore Scoping Report which considers infrastructure and other users will only discuss recreational sailing and motor cruising activity receptors.

16.4.5 Figure 16.2 shows the recreational sailing and motor cruising activity within the Local Infrastructure and Other Users Study Area. The activity is of low to medium intensity. While the RYA data is limited to inshore waters, AIS data tracks show that recreational vessels also transit through the Local Infrastructure and Other Users Study Area.

16.4.6 Data from the marine VTSs and consultation activities carried out to inform the NRA (Section 14: Shipping and Navigation), will be used as an additional data source to inform the assessment on recreational sailing and cruising receptors.

16.4.7 Levels of other recreational activities within the Local Infrastructure and Other Users Study Area are given in Table 16.2. Recreational activity data is based on 2016 survey data. Survey data such as this may mask very low levels of activity as no intensity, or activities may occur which are not captured by the data, resulting in no activity being recorded.

Table 16.2: Selected Recreational Activities and Their Levels within the Local Infrastructure and Other Users Study Area (Scottish Government, 2024)

Activity	Level
Coastal climbing, bouldering and coasteering	N/A
General marine and coastal recreation	High
Long-distance swimming in the sea	N/A
Sea canoeing/kayaking	Medium
Surfing, surf kayaking, or paddleboarding	Medium
Water-skiing and wakeboarding	N/A
Windsurfing and kite surfing	N/A

Recreational Fishing

16.4.8 The level of recreational sea angling from shore and aboard private vessels within the Local Infrastructure and Other Users Study Area is high (NMPi, 2024). As part of the scoping process consultation with local operators will take place to understand operational range and activities.

16.4.9 The Infrastructure and Other Users section of the Offshore EIA Report will only consider recreational fishing receptors. The commercial fisheries section of the Offshore EIA Report will consider impacts on commercial fishing receptors.

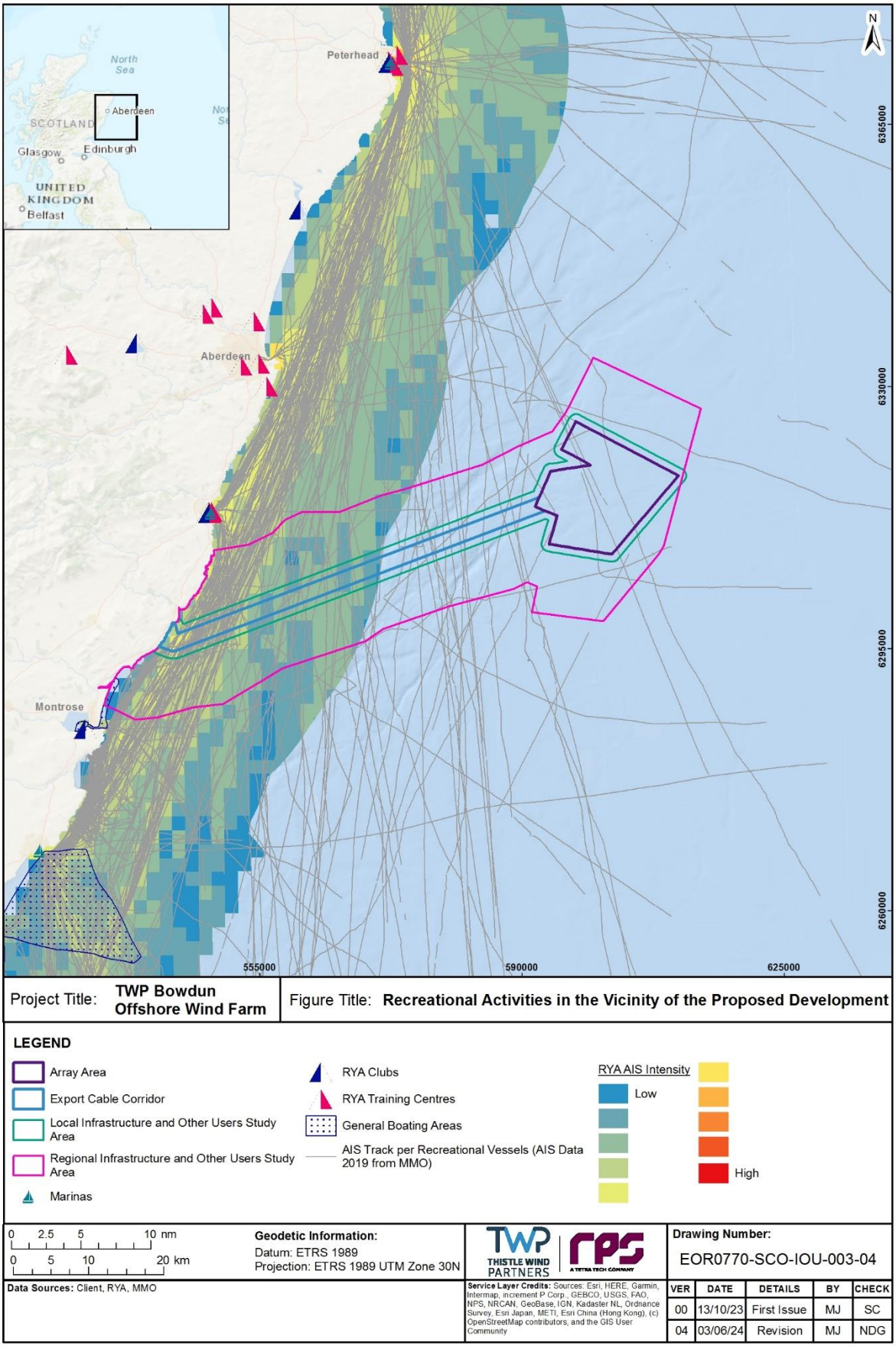


Figure 16.2: Recreational Activities in the Vicinity of the Proposed Development

Offshore Renewables Projects

16.4.10 OWFs in proximity to the Local Infrastructure and Other Users Study Area are shown in Figure 16.3. There are no OWFs within the Local Infrastructure and Other Users Study Area; the nearest operational OWF is Kincardine OWF, located approximately 20.1 km to the west of the Scoping Boundary (4C Offshore, 2024). The nearest OWF under construction is Seagreen, 27.9 km to the south-west of the Scoping Boundary.

16.4.11 The nearest OWFs at the planning application stage are the Morven OWF and Ossian OWF, approximately 10 km and 25.4 km to the south-east of the Scoping Boundary, respectively (4C Offshore, 2024).

16.4.12 There are no consented OWFs or other offshore renewables projects (e.g. wave and tidal) within the Local Infrastructure and Other Users Study Area.

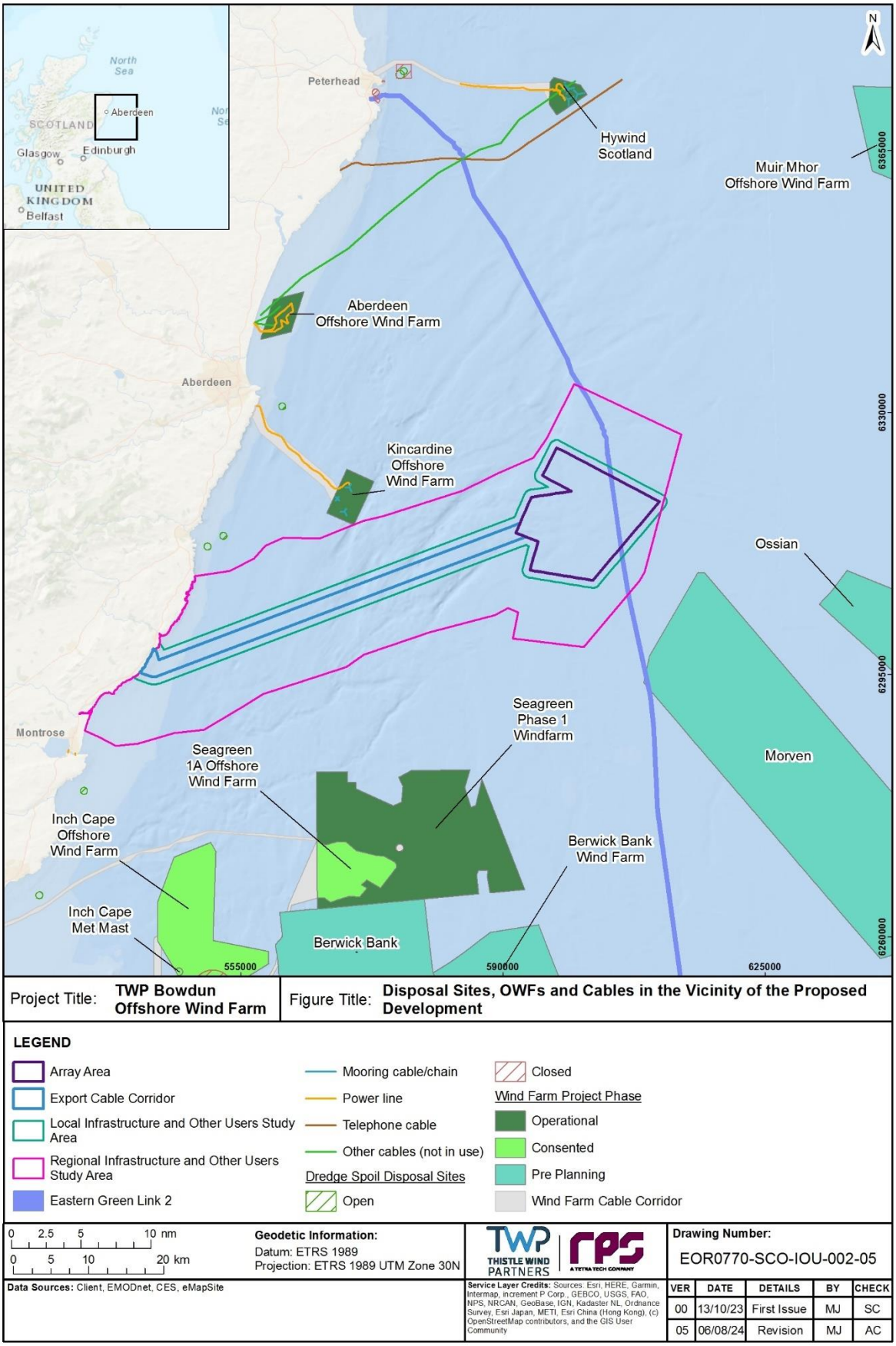


Figure 16.3: Disposal Sites, OWFs and Cables in the Vicinity of the Proposed Development

Oil and Gas Operations

16.4.13 Oil and gas activities are supported by installations on Scotland's east coast, such as Port of Aberdeen, Montrose Port, St Fergus Gas Terminal, Cruden Bay Oil Terminal and Grangemouth refinery.

16.4.14 There are no oil and gas platforms, known hydrocarbon fields or currently active hydrocarbon licence blocks located within or near the Local Infrastructure and Other Users Study Area. The closest active licence block, block 27/3, currently licenced by North Sea Natural Resources Ltd, is located 34.9 km east of the Scoping Boundary.

16.4.15 There is one plugged and abandoned exploration well within the Scoping Boundary, ID 167199 Reg. 26/04-1 (Shell U.K. Limited). There are no other subsea structures located within the Local Infrastructure and Other Users Study Area.

16.4.16 The 33rd Oil and Gas Licensing Round was launched by the North Sea Transition Authority (NSTA) in October 2022. There were 27 licences offered and six blocks merged into five existing licences in the first batch of the Licencing Round (NSTA, 2023). While there has historically been oil and gas activity in the vicinity of the Infrastructure and Other Users Study Areas there is, however, a lack of existing activity in the vicinity of the Local Infrastructure and Other Users Study Area. Therefore, the potential for oil and gas exploration in this region of the North Sea is low.

16.4.17 In addition to the necessary infrastructure, the oil and gas industry relies on associated services. These include:

- Vessels for supply or support during operations. Vessels and associated navigational considerations are addressed separately in Section 14: Shipping and Navigation.
- Helicopters for personnel transfer and evacuation during emergencies. Helicopter and other aviation considerations are addressed separately in Section 15: Aviation and Radar.

Carbon Capture and Storage

16.4.18 There are no CCS projects located within the Local Infrastructure and Other Users Study Area. The nearest CCS licences (CS003, CS011, and CS012) are over 100 km to the north of the Scoping Boundary. Therefore, CCS has not been considered further within the Offshore Scoping Report and is scoped out of the EIA.

Pipelines

16.4.19 There are no oil and gas pipelines located within the Local Infrastructure and Other Users Study Area. The nearest gas pipelines are the Fulmar Gas Pipeline to St Fergus, (approximately 57 km to the north of the Scoping Boundary) and the Forties to Cruden Bay

Pipeline (approximately 41 km to the north of the Scoping Boundary). Therefore, pipelines have not been considered further within the Offshore Scoping Report and are scoped out of the EIA.

Cables

16.4.20 There are no operational cables within the Local Infrastructure and Other Users Study Area (KIS-ORCA, 2024). The Eastern Green Link 2 (EGL 2) HVDC cable has been granted consent (not started construction) and intersects the Scoping Boundary north to south in the eastern quarter of the Array Area.

16.4.21 Where Inter-Array, Interconnector, or Offshore Export Cables associated with the Proposed Development will be required to cross an active cable, it is intended that a commercial 'crossing agreement' on standard industry terms will be entered, in due course. This is a formal arrangement that establishes the responsibilities and obligations of both parties and allows operations to be managed safely.

Offshore Microwave Fixed Communication Links

16.4.22 Offshore microwave fixed links, which are used to facilitate communications between offshore oil and gas platforms, are considered within this section. Marine navigation, communications, and position-fixing equipment is addressed in Section 14: Shipping and Navigation.

16.4.23 Due to the location of offshore assets presented in Figure 16.4, it is unlikely that microwave fixed telecommunications links cross the Local Infrastructure and Other Users Study Area. This will be further explored through a desk study and consultation for the EIA.

Radar Early Warning Systems

16.4.24 The physical presence of Wind Turbines has the potential to impact the performance of REWS through interference by creating high radar returns, shadowing (producing an area behind a wind turbine which the radar beam is unable to fully illuminate), increased number of detections and false alarm/track generation. Oil and gas operators sometimes use REWS as part of offshore platform anti-collision safety systems.

16.4.25 The nearest manned offshore platform is Kittiwake located 114.7 km north-east from the Scoping Boundary. At this distance, the potential that REWS could be impacted by the Proposed Development is extremely low. REWS have, therefore, not been considered further within the Offshore Scoping Report and are scoped out of the EIA.

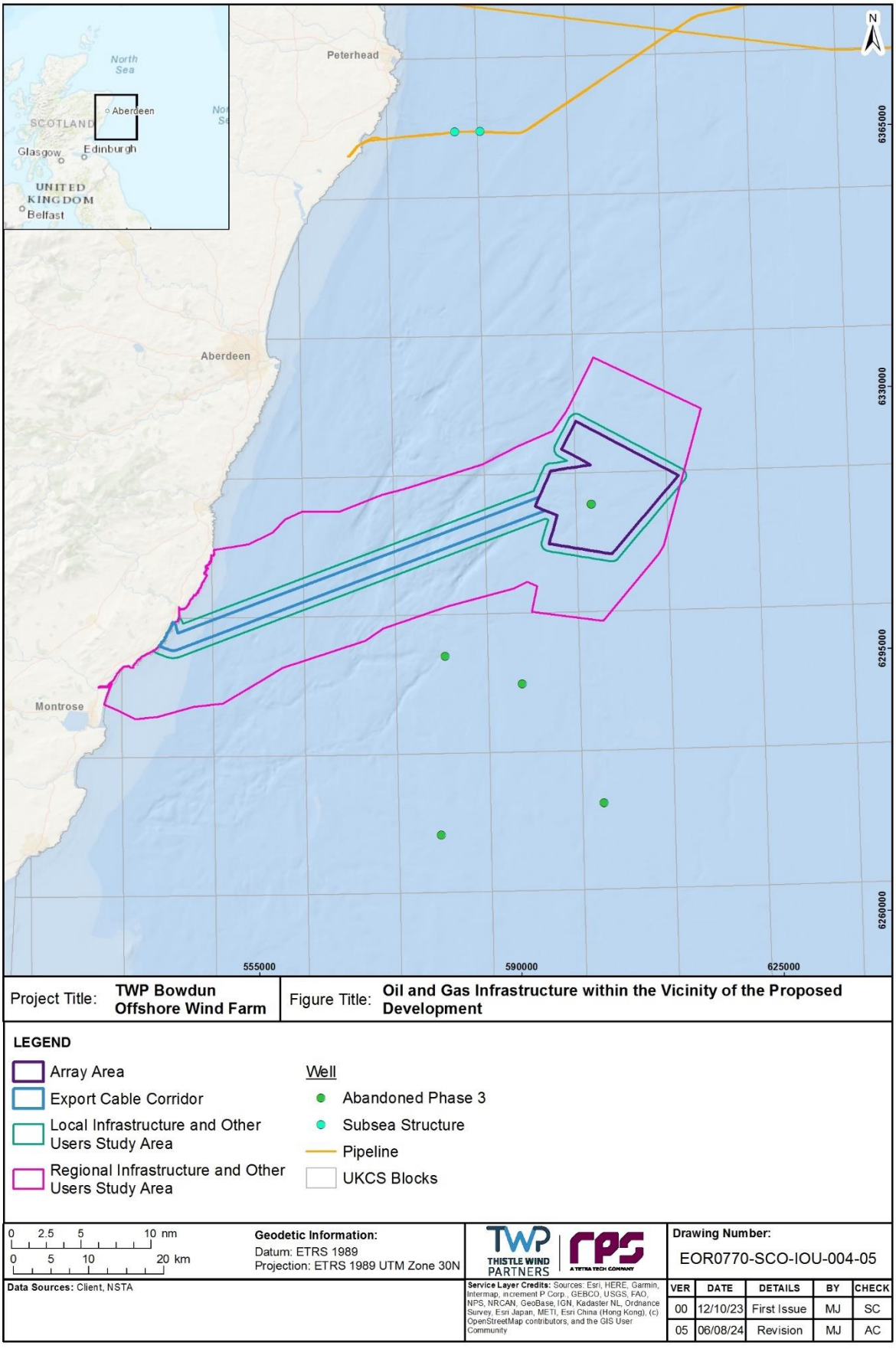


Figure 16.4: Oil and Gas Infrastructure Within the Vicinity of the Proposed Development

Regional Infrastructure and Other Users Study Area

Marine Aggregate Extraction

16.4.26 There is a substantial marine sand and gravel resource in Scotland, but historically the marine aggregate industry has been underdeveloped due to extensive land supplies and more readily accessible marine resources elsewhere in UK waters. Marine aggregate licences in Scotland have been issued to two sites: one in the Firth of Forth and the second in the Firth of Tay (EMODNet, 2024). These sites do not overlap with the Regional Infrastructure and Other Users Study Area. Therefore, Marine Aggregate Extraction sites have not been considered further within the Offshore Scoping Report and are scoped out of the EIA.

Disposal Sites

16.4.27 A review of potential active or closed marine disposal sites identified no active or closed disposal sites within the Regional Infrastructure and Other Users Study Area (EMODnet, 2024). Marine disposal sites have, therefore, not been considered further within the Offshore Scoping Report and are scoped out of the EIA.

Scuba Diving

16.4.28 There are no recreational dive sites within the Regional Infrastructure and Other Users Study Area (PADI, 2024). Therefore, scuba diving has not been considered further within the Offshore Scoping Report and is scoped out of the EIA.

16.5 Embedded Mitigation

16.5.1 The following Embedded Mitigation measures are relevant to infrastructure and other users and will evolve for the Proposed Development as the EIA progresses.

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a VMP and NSP.
- Advance warning and accurate location details of operations, associated Safety Zones and advisory passing distances will be given via NtMs and Kingfisher Bulletins.
- 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.
- Application for and use of Safety Zones of up to 500 m during construction, major repairs, and decommissioning phases.
- Any objects dropped on the seabed during works associated with the Proposed Development will be reported in line with

MD-LOT procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.

- The Offshore Infrastructure with heights greater than 91.4 m will be marked on nautical charts including an appropriate chart note and will be alerted to aircrews through the NOTAM system.
- Development and adherence to an Operation and Maintenance Programme (OMP).
- Wind turbine layout plan to be consulted on with MCA and NLB prior to construction.
- Consultation with infrastructure and other users stakeholders, as required.
- Drafting and implementation of a decommissioning programme.
- Entrance into cable crossing agreements, as required.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- The Proposed Development will be marked on Admiralty charts including an appropriate chart note.

16.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

16.6 Potential Proposed Development Impacts

16.6.1 A range of potential impacts on Offshore Infrastructure and other users have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development.

16.6.2 The impacts that have been scoped into the assessment are outlined in Table 16.3 together with a description of any additional data collection (i.e. marine VTSs) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

16.6.3 Potential impacts scoped out of the assessment are presented in Table 16.4, with justification.

Table 16.3: Impacts Proposed to Be Scoped Into the Proposed Development Assessment for Infrastructure and Other Users

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Displacement of recreational activities (including recreational sailing, cruising and recreational fishing).	✓	✓	✓	Safety zones and advisory clearance distances established during construction, O&M and decommissioning activities may displace recreational activities.	Review of desktop data, including results of the marine VTSs, supported by the outcome of consultation.	Qualitative assessment informed from the results of baseline data review and consultation.
Impacts to early development cables or pipelines or restrictions on access to cables or pipelines.	✓	✓	✓	There is one consented cable (EGL 2 HVDC) within the Scoping Boundary and, therefore, there is potential for impacts to existing cables or restrictions on access to cables from installation, O&M and decommissioning activities. Crossing and proximity agreements will be established where required with known existing cables operators.	Review of desktop data supported by the outcome of consultation.	Qualitative assessment informed from the results of baseline data review and consultation.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Interference with offshore microwave fixed communication links.	×	✓	×	The presence of Wind Turbines within the Scoping Boundary may affect offshore microwave fixed links between offshore oil and gas platforms.	Review of desktop data. Consultation with oil and gas operators to inform the assessment.	Qualitative assessment informed from the results of baseline data review and consultation.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 16.4: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Infrastructure and Other Users

Impact	Justification
Increased SSC and associated deposition affecting recreational diving sites.	There are no recreational diving sites within the Regional Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.
Increased SSC and associated deposition affecting aggregate extraction areas.	There are no aggregate extraction areas within the Regional Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.
Alterations to sediment transport pathways affecting aggregate extraction areas.	There are no aggregate extraction areas within the Regional Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.
Impact on marine disposal sites.	There are no marine disposal sites within the Regional Infrastructure and Other Users Study Area, as described in Section 16.4. As such, impacts on marine disposal sites have been scoped out of the EIA.
Reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure).	There are no active oil and gas exploration blocks within the Local Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.
Impacts on CCS	There are no CCS projects within the Local Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.
Interference with the performance of REWS located on oil and gas platforms.	There are no REWS within the Regional Infrastructure and Other Users Study Area, as described in Section 16.4. As such, there is no potential impact pathway, and, therefore, it is proposed that this impact is scoped out of the EIA.

16.7 Proposed Assessment Methodology

16.7.0 The Infrastructure and Other Users Offshore EIA Report section will follow the methodology set out in Section 4: EIA Methodology. The following guidance documents will be considered, which are specific to infrastructure and other users:

- The RYA's Position on Offshore Renewable Energy Developments: Paper 1 (of 4) – Wind Energy, June 2019 (RYA, 2019b).
- International Cable Protection Committee (ICPC) Recommendations:
  - Recommendation No.2-11B: Cable Routing and Reporting Criteria (ICPC, 2015);
  - Recommendation NO.3-10C: Telecommunications Cable and Oil Pipeline/Power Cables Crossing Criteria (ICPC, 2014); and
  - Recommendation No.13-2C: The Proximity of Offshore Renewable Wind Energy Installations and Submarine Cable Infrastructure in National Waters (ICPC, 2013).
- ESCA Guideline No. 6, The Proximity of OREIs and Submarine Cable Infrastructure in UK Waters (ESCA, 2023).
- Pipeline Crossing Agreement and Proximity Agreement Pack (Oil and Gas UK, 2021).

16.8 Potential Inter-Related Effects

16.8.0 The assessment of potential inter-related effects will be considered within the Infrastructure and Other Users section of the Offshore EIA Report. It will include consideration of the lifetime effects and receptor-led effects of the Proposed Development in line with the approach outlined in Section 4: EIA Methodology.

16.9 Potential Cumulative Effects

16.9.0 There is potential for cumulative effects to arise from other projects or activities in the vicinity of the Regional Infrastructure and Other Users Study Area in the North Sea where these could act collectively with the Proposed Development to affect infrastructure and other users receptors. The CEA will consider the MDS for each of the projects or activities. The CEA will follow the approach outlined in Section 4: EIA Methodology.

16.10 Potential Transboundary Impacts

16.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening Report. This screening exercise identified that there is no potential for transboundary impacts upon Infrastructure and Other Users

receptors due to construction, O&M and decommissioning impacts of the Proposed Development.

16.11 Summary

16.11.1 The scoping exercise has identified the following activities within the Local Infrastructure and Other Users Study Area with varying intensities, concentrated along the coast and near shore areas:

- low to medium intensity of recreational sailing and motor cruising;
- medium intensity of sea canoeing/kayaking;
- medium intensity of surfing/surf kayaking/paddleboarding;
- high levels of general marine and coastal recreation; and
- high levels of sea angling from shore and from vessels.

16.11.2 The scoping exercise has also identified that the EGL 2 HVDC cable, which is currently in planning stage, crosses the Array Area in its Eastern quarter.

16.11.3 Within the Regional Infrastructure and Other Users Study Area The scoping exercise has identified that there are no active marine aggregate licences, active or closed disposal sites, or recreational scuba diving sites.

16.11.4 Potential impacts that may arise from the Proposed Development include:

- displacement of recreational activities (including recreational sailing, cruising and recreational fishing);
- impacts to early development cables or pipelines or restrictions on access to cables or pipelines; and
- interference with offshore microwave fixed communication links.

16.11.5 It is recommended that designed-in mitigation to avoid or mitigate impacts on these activities are developed in consultation with participants as the EIA process progresses.

17 Major Accidents and Disasters

17.1 Introduction

17.1.1 This section of the Offshore Scoping Report identifies the potential vulnerability of the Proposed Development to major accidents and disasters and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development. A standalone major accidents and disasters assessment is proposed to be scoped out, as all identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, Risk Assessment Method Statements (RAMS), and/or management plans.

17.2 Major Accidents and Disasters Study Area

17.2.1 The considered risks of major accidents and disasters relevant to offshore energy projects include existing and possible future infrastructure and activities such as offshore cables, CCS, natural gas storage and underground gasification, oil and gas infrastructure, commercial fisheries, civil and military aviation and shipping and navigation. The consideration of major accidents and disasters utilises baseline information drawn from specific technical topics included within the wider Offshore Scoping Report:

- Section 7: Physical Processes;
- Section 13: Commercial Fisheries;
- Section 14: Shipping and Navigation;
- Section 15: Aviation and Radar; and
- Section 16: Infrastructure and Other Users.

17.2.2 The study areas for these baseline topics differ from each other due to the varying ranges of different receptors for which impacts must be considered. However, despite these differences, all relevant study areas are appropriate for the consideration of major accidents and disasters.

17.3 Baseline Environment

17.3.1 Guidance defines a major accident as an event that threatens immediate or delayed serious environmental effects on human health, welfare and/or the environment (IEMA, 2020b). Additionally, major accidents can be caused by disasters which are anthropogenic or environmental. Disasters can, therefore, be external (i.e. an act of terrorism) or a natural phenomenon (i.e. extreme weather) both with the potential to create a scenario that meets the definition of a major accident.

17.3.2 The main risks presented by OWFs are related to the safety of personnel (with fire accidents a particular of focus), failure of infrastructure (such as corrosion or blade failure) and equipment and obstructions to navigation. Other key risks to OWFs are related to the weather (such as gale-force winds and lightning strikes), shipping disruption and interactions with subsea cables (Mou *et al.*, 2021). The risk of sabotage, although remote, has also been considered in this section.

17.3.3 The consideration of the major accidents and disasters baseline within this Offshore Scoping Report section comprises a summary of the information from the topics discussed in Section 17.2 above. Each summary is presented in Sections 17.3.4 to 17.3.30 below.

Physical Processes

17.3.4 This section provides an overview of the physical processes baseline, as described in detail in Section 7: Physical Processes.

17.3.5 The Physical Processes Study Area (Figure 7.1, Section 7: Physical Processes) has been defined by expert judgement based on (amongst other things) an understanding of regional scale processes including analysis of prevailing wave direction and the tidal excursion distance from the Array Area and the Export Cable Corridor.

17.3.6 The baseline environment for physical processes includes a varied number of components, namely: bathymetry, water levels, currents, waves, stratification, seabed sediments, and geomorphology.

17.3.7 Tidal currents are relatively weak across the Physical Processes Study Area, with mean spring peak current speeds of less than 1 m/s in most areas.

17.3.8 Winds in the region are most frequent from the north-west and north-north-west (approximately 17% of the time), with the stronger winds tending to come from the north-westerly quadrant.

17.3.9 Seabed sediments across the Physical Processes Study Area are dominated by sand, with varying contributions of gravel.

17.3.10 The coastline within the Physical Processes Study Area consists of large stretches of erosion resistant rock, although beaches with dune systems are also present (Figure 7.3, Section 7: Physical Processes).

Commercial Fisheries

17.3.11 This section provides an overview of the commercial fisheries baseline, as described in detail in Section 13: Commercial Fisheries.

17.3.12 The Local Commercial Fisheries Study Area is defined by the ICES rectangles within which the Scoping Boundary is situated (Figure 13.1, Section 13: Commercial Fisheries), which is as follows:

- ICES rectangle 42E7: within which the western half of the Export Cable Corridor Scoping Boundary is located;
- ICES rectangle 42E8: within which the majority of the southern portion of the Array Area and eastern half of the Export Cable Corridor Scoping Boundaries are located; and
- ICES rectangle 43E8: within which the northern portion of the Array Area Scoping Boundary is located.

17.3.13 The Regional Commercial Fisheries Study Area includes those ICES rectangles immediately adjacent to the Local Commercial Fisheries Study Area (rectangles 41E7, 41E8, 41E9, 42E9, 43E9, 44E9, 44E8, 43E7), as indicated in Figure 13.1, Section 13: Commercial Fisheries.

17.3.14 The Local Commercial Fisheries Study Area supports various commercial fishing activities, namely potting, scallop dredging and demersal trawling. Most (94%) of the activity within the area is undertaken by Scottish vessels, with minimal activity from English-registered vessels; EU landings data indicates the potential for some fishing activity by EU vessels, including Danish and Dutch trawlers. Route density data shows that there is sustained fishing vessel presence parallel to the coast within the Export Cable Corridor and a fishing vessel transit route near where the Export Cable Corridor joins the Array Area (Figure 13.8, Section 13: Commercial Fisheries)

17.3.15 MMO data indicate that landings by vessels under 10 m in length account for 57% of the total, while vessels over 10 m in length account for 43% of the total (MMO, 2023a). Key gear types deployed include pots and traps, scallop dredges and demersal trawls. Spatial data indicates that dredging activity (as a function of surface swept area ratio) is present within the Local and Regional Commercial Fisheries Study Area, across the Export Cable Corridor in particular but also within the Array Area (Figure 13.11, Section 13: Commercial Fisheries). Data indicates some demersal otter trawl activity within the Local Commercial Fisheries Study Area including within Array Area and Export Cable Corridor and greater levels of activity in the Regional Commercial Fisheries Study Area to the north and east of the Array Area (Figure 13.9, Section 13: Commercial Fisheries). Data also indicates high levels of potting activity in the nearshore section of the Export Cable Corridor and along the wider Aberdeenshire coastline (Figure 13.13, Section 13: Commercial Fisheries).

Shipping and Navigation

17.3.16 This section provides an overview of the shipping and navigation baseline, as described in detail in Section 14: Shipping and Navigation.

17.3.17 The Shipping and Navigation Study Area is defined as an area of 10 nm (18.52 km) surrounding the Array Area and 3 nm (5.6 km) buffer around the Export Cable Corridor (Figure 14.1, Section 14: Shipping and Navigation).

17.3.18 Figure 14.3, Section 14: Shipping and Navigation demonstrates that there are no routes operating through the Array Area with more than 100 vessel transits per km^2 per year. There are two frequented (>3 per day) routes that operate to and from Aberdeen, transiting east-west through the Shipping and Navigation Study Area to the north of the Scoping Boundary. Of the vessels transiting the area, the majority are cargo or other vessels, likely associated with the oil and gas industry, comprising platform supply vessels and emergency response/rescue vessels. There is also activity associated with the Seagreen OWF. Recreational and passenger navigation as well as tanker traffic intensity is increased towards the coast, across the Shipping and Navigation Study Area and Export Cable Corridor near Landfall.

17.3.19 Maritime incidents recorded in Marine Accident Investigation Branch (MAIB) (2008 to 2021) and RNLI (2024) databases show that the majority of incidents are recorded close to shore and around ports. There have been two incidents recorded within the Scoping Boundary between 2008 and 2022 which involved a fishing vessel flooding due to bilge pumps being blocked and a fishing vessel engine failure. A mechanical/damage incident also took place on the periphery of the Scoping Boundary. There were 70 incidents recorded inside the Shipping and Navigation Study Area which included one collision between two fishing vessels which occurred in 1997.

Aviation and Radar

17.3.20 This section provides an overview of the aviation and radar baseline, as described in detail in Section 15: Aviation and Radar.

17.3.21 The Proposed Development is located within the Scottish Flight Information Region (NATS, 2024a). The nearest UK civil airport to the Proposed Development is Aberdeen airport, located 27 nm (50 km) to the north-west of the Scoping Boundary (Figure 15.1, Section 15: Aviation and Radar).

17.3.22 A preliminary RLoS analysis indicates that the Proposed Development sits within the RLoS of several Civil ATC, Military ATC, and Military air defence PSR stations. These are presented in Table 17.1 below.

Table 17.1: Civil and Military PSRs and Their Distances and Direction from the Proposed Development

PSR	Distance and Direction from Proposed Development	Within RLoS Likelihood
Civil ATC PSRs		
Perwinnes	26 nm (48 km) north-west	Highly likely
Allanshill	43 nm (80 km) north-west	Highly likely
Military ATC PSRs		
Leuchars	56 nm (104 km) south-west	Highly unlikely
Military Air Defence PSRs		
Buchan	28 nm (52 km) north-west	Highly likely

17.3.23 The Array Area lies within the lateral boundaries of UK Military PEXA: Danger Area D613A, which is activated periodically by MoD by means of the NOTAM system. It is activated from Flight Level 100 (10,000 ft) up to Flight Level 550 (55,000 ft) and is used for military air combat training and supersonic flight. Although the Scoping Boundary is located within the lateral boundaries of D613A, the presence of the Offshore Infrastructure will not create any adverse impact, or vice-versa, as military operations do not commence until about Flight Level 100 (10,000 ft).

Infrastructure and Other Users

17.3.24 This section provides an overview of the infrastructure and other users baseline, as described in detail in Section 16: Infrastructure and Other Users.

17.3.25 The closest operational OWF is Kincardine, located approximately 20.1 km to the west of the Scoping Boundary. Morven and Ossian OWFs are in the planning stage and are approximately 10 km and 25.4 km to the south-east of the Scoping Boundary, respectively (4C Offshore, 2024). There are no other offshore renewables projects (e.g. wave and tidal) within the Local Regional Infrastructure and Other Users Study Area.

17.3.26 No operational cables overlap with the Scoping Boundary (Kingfisher Information Service – Offshore Renewable & Cable Awareness (KIS-Orca), 2024). Eastern Green Link 2 HVDC cable and associated cable protection has been granted consent (not started construction), with plans intersecting the Scoping Boundary in its eastern quarter.

17.3.27 There are no oil and gas pipelines within the Scoping Boundary.

17.3.28 Oil and gas operations are represented by one plugged and abandoned well within the Scoping Boundary (ID 167199 Reg. 26/04-1 (Shell U.K. Limited)). The closest active licence block, block 27/3, currently licenced by North Sea Natural Resources Ltd, is located 34.9 km east of the Scoping Boundary.

17.3.29 There are currently no active licences for marine aggregate extraction, active or closed disposal sites, CCS areas, hydrocarbon fields, oil and gas platforms, subsurface structures (protective structures, pipeline junctions, manifolds, wellheads, trees and valves) or recreational dive sites within the Scoping Boundary.

17.3.30 Recreational boating intensity is greater in the nearshore area of the Scoping Boundary near Landfall, but still of low to medium intensity. AIS data (current to 2019) provides a minimum picture of vessel activity, as the data only represents those vessels that carry AIS transponders, which may exclude a large proportion of small recreational craft that use the areas close inshore (RYA, 2024). In addition to recreational boating, other recreational activities of relevance to the Proposed Development include:

- general marine and coastal recreation;
- sea canoeing/kayaking; and
- surfing, surf kayaking, or paddleboarding.

17.4 Embedded Mitigation

17.4.0 The following Embedded Mitigation measures, presented in Table 17.2 are relevant to the technical topics which inform this Major Accidents and Disasters section of the Offshore Scoping Report. A complete list of Embedded Mitigation is shown in Appendix A: Draft Schedule of Mitigation and Commitments. Embedded Mitigation will evolve over the development process as the EIA progresses.

Table 17.2: Proposed Embedded Mitigation for the Topics that Inform Major Accidents Disasters

Reference	Mitigation Commitment	Relevant Topics in the Offshore Scoping report					
		Section 7: Physical Processes	Section 13: Commercial Fisheries	Section 14: Shipping and Navigation	Section 15: Aviation and Radar	Section 16: Infrastructure and Other Users	Section 17: Major Accidents and Disasters
1	Development and adherence to a CSIP post consent.	✓	✓				✓
2	Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.	✓	✓	✓			✓
4	Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the CBRA and the CBA. Results of these assessments, and commitments to post construction monitoring, will be provided in the CaP.		✓	✓			✓
5	Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.		✓	✓			✓
6	Development of, and adherence to a CMS along with a CoCP.	✓	✓	✓	✓	✓	✓
7	All relevant HSE procedures will be followed.	✓	✓	✓	✓	✓	✓
8	Development of and adherence to a VMP and NSP.		✓	✓		✓	✓
9	Development of and adherence to a FMMS. The FMMS will set out the means of ongoing fisheries liaison and detail any mitigation to be put in place to limit effects on commercial fisheries activity.		✓				✓
10	Appointment of a FLO. The FLO will support ongoing liaison and ensure clear communication between the Applicant and commercial fishers.		✓				✓
11	Advance warning and accurate location details of operations, associated Safety Zones and advisory passing distances will be given via NtMs and Kingfisher Bulletins.		✓	✓	✓	✓	✓
12	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.		✓	✓	✓	✓	✓
13	Adherence to good practice guidance with regards to fisheries liaison and procedures in the event of interactions between the Proposed Development and fishing activities (e.g. Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015).		✓				✓
14	Participation in any fisheries working group to assist with liaison between the Applicant and the fishing community.		✓				✓
15	Application for and use of Safety Zones of up to 500 m during construction, major repairs, and decommissioning phases.		✓	✓		✓	✓
16	Any objects dropped on the seabed during works associated with the Proposed Development will be reported in line with MD-LOT procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.		✓			✓	✓
17	All vessels working on the Proposed Development will meet the required certification standards and carriage requirements along with following international marine regulations.			✓			✓
18	The Offshore Infrastructure with heights greater than 91.4 m will be marked on nautical charts including an appropriate chart note and will be alerted to aircrews through the NOTAM system.			✓	✓	✓	✓
19	Suitable Aids to Navigation (AtoN) lighting and marking the Proposed Development will be implemented.			✓			✓

Reference	Mitigation Commitment	Relevant Topics in the Offshore Scoping report					
		Section 7: Physical Processes	Section 13: Commercial Fisheries	Section 14: Shipping and Navigation	Section 15: Aviation and Radar	Section 16: Infrastructure and Other Users	Section 17: Major Accidents and Disasters
20	Wind Turbine design to have a minimum lower blade tip height of 22 m above MHWS, accounting for pitch and roll as per MGN 654.			✓			✓
21	Hydrographic surveys will fulfil the requirements of the IHO Order 1a standard.			✓			✓
22	Development of, and adherence to, an ERCoP in consultation with MCA.			✓	✓		✓
23	Development and adherence to an Operation and Maintenance Programme (OMP).			✓	✓	✓	✓
24	Wind Turbine layout plan to be consulted on with MCA and NLB prior to construction.			✓		✓	✓
25	Development of, and adherence to, a DSLP.			✓			✓
26	CAA will be informed of the locations, heights and lighting status of the Wind Turbines, including estimated and actual dates of construction and the maximum heights of any construction equipment to be used, prior to the start of construction.				✓		✓
27	Consultation with infrastructure and other users stakeholders, as required					✓	✓
37	Drafting and implementation of a decommissioning programme.	✓	✓	✓	✓	✓	✓
39	Adherence with HSE/MCA guidance ‘Regulatory expectations on moorings for floating wind and marine devices’ as appropriate (HSE/MCA, 2017).			✓			✓
40	Entrance into cable crossing agreements, as required.					✓	✓
42	Achieve appropriate design and layout of Wind Turbines within the Array Area.	✓	✓	✓	✓	✓	✓
48	The Proposed Development will be marked on Admiralty charts including an appropriate chart note.			✓		✓	✓
49	Regular maintenance regime to check the Proposed Development Offshore Infrastructure.			✓			✓
50	Compliance of project vessels with international marine regulations as adopted by the Flag State, including COLREGS (IMO, 1972) and SOLAS (IMO, 1974).			✓			✓

17.5 Potential Proposed Development Impacts

17.5.0 A range of potential hazards have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. All identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, RAMS, and/or management plans set out in Section 17.4. Therefore, it is proposed to scope out all potential hazards resulting from the Proposed Development as having the potential to result in major accidents and disasters.

17.5.1 Potential impacts scoped out of the assessment, with respect to the Proposed Development's vulnerability to existing hazards are presented in Table 17.3. Potential impacts scoped out of the assessment, with respect to the Proposed Development's potential to cause major accidents and disasters are presented in Table 17.4. Both tables are presented with justification.

Table 17.3: Hazards Proposed to Be Scoped out of the Assessment Regarding the Proposed Development's Vulnerability to Existing Hazards

Impact	Justification
Collision risk: shipping and navigation	The collision risk potential from existing shipping and navigation could be increased by the Proposed Development. This risk would impact all three phases of the Proposed Development. Section 14: Shipping and Navigation, sets out how this impact will be addressed and therefore it is proposed to not consider this impact in a major accidents and disasters assessment.
Collision risk: aviation (military and civil)	The measures outlined in Section 17.4 relevant to aviation and radar reduce the potential for collision events to extremely low. These measures include but are not limited to the use of appropriate lighting and marking of OSPs and Wind Turbines, communication with UKHO, and adherence to ERCoP. It is therefore proposed to not consider this impact as part of a major accidents and disasters assessment.
Snagging risk: commercial fisheries	Snagging of equipment could occur with respect to commercial fishery activity within the Local and Regional Commercial Fisheries Study Areas. The approach to the assessment of this impact is set out in Section 13: Commercial Fisheries. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.

Impact	Justification
Risk of accident: cables and pipelines	Section 16: Infrastructure and Other Users, sets out the approach to early development cables or pipelines or restrictions on access to cables or pipelines will impact the Proposed Development. Due to the Embedded Mitigation set out in Section 16: Infrastructure and Other Users, the potential risk of accidents occurring as a result of the presence of cables and pipelines will be very low. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
Risk of accidents: extreme weather (and storm surge)	With consideration of the Proposed Development's location, potential climate risks may include sea level rise, waves and storms. Although Offshore Infrastructure are designed to be resilient to storm events with factors of safety incorporated into the design, the effects of climate change are projected to increase over time and so the risks posed by climate change to the Proposed Development will be assessed for the O&M and Decommissioning Phases as per Section 22: Climate Change. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
Risk of accident: oil and gas infrastructure	Section 16.4: Infrastructure and Other Users shows that there are no active oil and gas exploration blocks within the Infrastructure and Other Users Study Area. As such, there is no impact receptor pathway.
Pollution of the marine environment (structures)	Where there is potential of pollution of the marine environment, the risk is mitigated by the implementation of measures set out in standard post-consent plans (i.e. EMPs (including MPCPs)). These plans include key emergency contact details, planning for accidental spills and the addressing of all potential contaminant releases. These plans also set out industry good practice and OSPAR (Oslo-Paris), IMO and MARPOL guidelines for preventing pollution at sea. In addition to these measures, the quantity of chemicals in any OWF project structure is too low to result in any event which may be considered a major accident or disaster pollution event. This impact has been proposed to be scoped out of assessment for benthic ecology, marine mammals, fish and shellfish ecology, and ornithology. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.

Impact	Justification
Sabotage/Terrorism events	The potential for a sabotage event is extremely low. If a sabotage event were to occur, any effects on water and air quality would dissipate quickly and be isolated to a remote, offshore location. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.

Table 17.4: Hazards Proposed to Be Scoped out of the Assessment Regarding the Proposed Development's Potential to Cause Major Accidents and Disasters

Impact	Justification
Physical impacts (collision, allision)	There is the potential for major accidents and/or disasters due to collision/allision incidents involving the vessels associated with the Proposed Development, during all phases. The approach to how this impact will be addressed is set out in Section 14: Shipping and Navigation. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
UXOs	Should UXOs require clearance, this will be identified by the Applicant and specific procedures and risk assessments will be undertaken to mitigate risk to personnel and infrastructure. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
Pollution of the marine environment (vessels)	While there is a risk of accidental pollution from vessels, the risk is mitigated by the measures which are set out in standard post consent plans (i.e. an EMP including an MPCP which will be implemented as part of the Proposed Development (Section 17.4). This impact has been proposed to be scoped out of assessment for benthic ecology, marine mammals, fish and shellfish ecology, and ornithology therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
Fire at Wind Turbine/OSPs (including from third-party interference)	Standard health and safety plans and protocols implemented by the Applicant mean that the potential for fire events is low. If a fire event does occur, any effects on water and air quality would be quickly dissipated and the remote offshore location means the event would be isolated. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.

Impact	Justification
Snagging risk – commercial fisheries	Snagging of equipment could occur with respect to commercial fishery activity in the Scoping Boundary. The approach to the assessment of this impact is set out in Section 13: Commercial Fisheries. It is therefore proposed not to consider this impact as part of a major accidents and disasters assessment.
Collision risk – aviation (military and civil)	The measures outlined in Section 17.4 relevant to aviation (military and civil) reduce the potential for collision events to extremely low. These measures include but are not limited to the use of appropriate lighting and marking of OSPs, communication with UKHO, and adherence to ERCoP. It is therefore proposed to not consider this impact as part of a major accidents and disasters assessment.

17.6 Potential Inter-Related Effects

17.6.1 No inter-related effects on major accidents and disasters have been identified. Identification and assessment of inter-related effects will be considered within the individual chapters of the Offshore EIA Report. Therefore, the assessment of potential inter-related effects will not be considered further in relation to major accidents and disasters.

17.7 Potential Cumulative Effects

17.7.1 Due to the location and nature of the Proposed Development as well as existing design measures or legal requirements, codes and standards that adequately control the potential for major accidents and disasters (IEMA, 2020b), a specific major accidents and disasters assessment is proposed to be scoped out. Cumulative Effect Assessments will be carried out within the individual chapters of the Offshore EIA Report for the impacts identified above. Therefore, it is proposed that the potential for cumulative effects to arise from other projects or activities in the vicinity of the Proposed Development will not be considered further, as a standalone assessment, in the EIA process.

17.8 Potential Transboundary Impacts

17.8.0 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon major accidents and disasters due to construction, O&M and decommissioning impacts of the Proposed Development.

17.9 Summary

17.9.1 This section of the Offshore Scoping Report identified the potential vulnerability of the Proposed Development to major accidents and disasters and considered the potential impacts arising from the construction, O&M and decommissioning phases of the OWF for the following topics:

- Section 7: Physical Processes;
- Section 13: Commercial Fisheries;
- Section 14: Shipping and Navigation;
- Section 15: Aviation and Radar; and
- Section 16: Infrastructure and Other Users.

17.9.2 While a range of potential hazards have been identified which may occur during each phase of the Proposed Development, all identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, RAMS, and/or management plans. Therefore, a specific major accidents and disasters assessment is proposed to be scoped out.

18 Socio-Economics, Tourism and Recreation

18.1 Introduction

18.1.1 This section of the Offshore Scoping Report, prepared by BiGGAR Economics Ltd., identifies the socio-economic, tourism and recreation receptors of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development. The analysis of these impacts will build on the current version publicly available of the Supply Chain Development Statement (SCDS) Outlook (TWP, 2023), which sets out the supply chain commitments and ambitions of the Proposed Development.

18.1.2 The key impacts proposed to be addressed include:

- foreseen potential Scottish and the wider UK supply chain expenditure;
- increase in employment and Gross Value Added (GVA);
- demographic changes;
- changes to housing demand;
- changes to other local public and private services;
- socio-cultural impacts;
- changes to tourism receptors; and
- changes to recreation receptors (including marine recreation).

18.2 Socio-Economic Study Area

18.2.1 Whilst the Proposed Development is located offshore, for most of the socio-economic effects, the relevant study areas are onshore, since the organisations, individuals and communities that might be affected by the Proposed Development are based in onshore communities, including coastal communities. The study areas for the Proposed Development are defined independently of the definition of study areas for the Onshore Scoping Report, however the methodology used to define these study areas is the same.

18.2.2 The socio-economic effects will be assessed at the level of Scottish and UK economies. Where geographic concentrations of impact are identified, including in and around construction and O&M ports, socio-economic effects will also be considered for local areas in line with the Scottish Government's MD guidance on local areas.

18.2.3 The Socio-Economic Study Areas have been defined in line with the guidance on identification of 'local areas' for offshore developments published by MD (Marine Scotland, 2022). This guidance identified six principles for identifying local study areas for offshore development:

- 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.

18.2.4 The socio-economic impacts will be assessed for Scotland and the UK. At the time of completing the EIA, it is unlikely that key epicentres, such as construction and O&M ports will have been selected. If port locations, for either the construction or O&M phases, have been determined prior to the assessment, a more Local Socio-Economic Study Area will be defined in line with the principles above and included as a Socio-Economic Study Area.

18.2.5 For tourism and recreation, the focus of the assessment will be onshore. Given the distance from the coast of Aberdeen City and Aberdeenshire to the Array Area (38 km at closest point), it is anticipated there will be limited effects associated with visibility. The tourism and recreation assessment however will consider any findings from Section 20: Seascape and Visual Impact. Onshore environmental effects are likely to occur at receptors in Aberdeen City and Aberdeenshire, and therefore the potential impact on the tourism economy in Aberdeen City and Aberdeenshire will be considered as part of the assessment.

18.2.6 The main potential changes to visitor behaviour would be expected to arise due to increased activity at ports and harbours. Therefore, in addition to the Local Tourism and Recreation Study Area, more local study areas, which are expected to include the electoral wards around the chosen port(s), may be defined if these locations are identified prior to the preparation of the Offshore EIA Report.

18.2.7 The tourism and recreation impacts, including impacts on the tourism sector in general will be assessed for the Local Tourism and Recreation Study Area (Figure 18.1). The demographic, housing and other service provision impacts will be assessed for a defined study area if port locations have been determined prior to the assessment.

If no ports have been defined, these impacts will be discussed based on a range of port location scenarios, such as those in a rural or urban location.

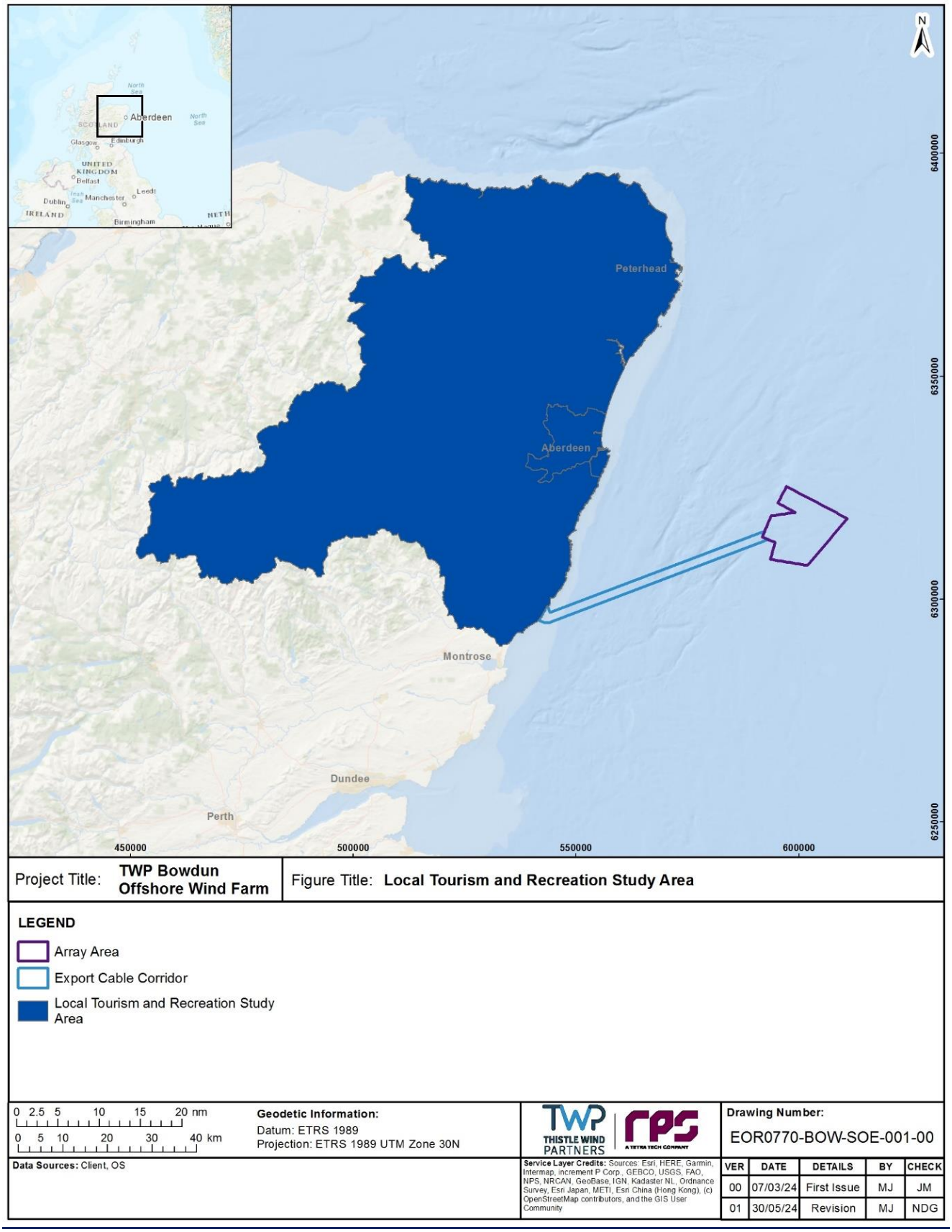


Figure 18.1: Local Tourism and Recreation Study Area

18.3 Data Sources

18.3.1 Table 18.1 provides a summary of the data sources considered to determine the socio-economics, tourism and recreation baseline. These data sources will be taken forward and used to inform the Offshore EIA Report. The sources listed are the latest available data at the time of preparing the Offshore Scoping Report. The latest data available at the time of writing the socio-economics, tourism and recreation section of the Offshore EIA Report will be consulted.

Table 18.1: Summary of Key Desktop Datasets and Materials

Title	Source	Reference
Mid-2021 Population Estimates Scotland	National Records of Scotland	National Records of Scotland (2022)
2020-based interim national population projections: year ending June 2022 estimated international migration variant	Office for National Statistics (ONS)	ONS (2023a)
Population estimates – local authority based by five year age band.	ONS	ONS (2022c)
Business Register and Employment Survey 2021	ONS	ONS (2022b)
Annual Population Survey 2022	National Records of Scotland	National Records of Scotland (2023b)
Annual Survey of Hours and Earnings 2022	ONS	ONS (2022a)
Industrial Strategy - Offshore Wind Sector Deal	UK Government	UK Government (2019)
General Advice for SEIA	Scottish Government	Scottish Government (2022d)
Defining 'Local Area' for Assessing the Impact of Offshore Renewable and Other Marine Developments: Guidance Principles	Marine Scotland	Marine Scotland (2022)
Supply Chain Development Statement Outlook Update	TWP	TWP (2023)

Title	Source	Reference
Grampian Factsheet - 2019	VisitScotland	VisitScotland (2020)

18.4 Baseline Environment

Socio-Economic Baseline

18.4.1 This section presents baseline socio-economic statistics for each of the Socio-Economic Study Areas.

Population Baseline

18.4.2 In 2021, the Local Tourism and Recreation Study Area had a population of 490,100 which is equivalent to 9% of the population of Scotland as a whole (National Records of Scotland, 2022). The age profile of the area is similar to that of Scotland, with 64% of the population aged 16 to 64 and 19% of the population aged 65 and over.

18.4.3 The population of the area has increased by 3% since 2011, the same as the change in population across Scotland during this time. However, it is projected that while the Scottish population will increase slightly over the period to 2043, the population of the Local Tourism and Recreation Study Area will decrease by 2% in this period (ONS, 2023a). The working age population across both Scotland and the Local Tourism and Recreation Study Area is projected to decrease in this period.

Table 18.2: Population Baseline

	Local Tourism and Recreation Study Area	Scotland	UK
Total Population (2021)	490,100	5,479,900	67,026,300
Population % under 16	17%	17%	18%
Population % aged 16 – 64	64%	64%	63%
Population % aged 65 and over	19%	20%	19%
Population (2011)	476,200	5,299,900	63,285,100
Population Projection (2043)	500,700	5,503,019	72,121,453

Labour Market Baseline

18.4.4 The economic activity rate, which is the share of the population aged between 16 and 64 that is either employed or actively looking for

work, is 79% in the Local Tourism and Recreation Study Area (ONS, 2023b). This is higher than the average for Scotland. The median annual gross income is slightly lower (ONS, 2022a) and the level of unemployment is slightly higher in the Local Tourism and Recreation Study Area, compared to the rest of Scotland.

Table 18.3: Labour Market Baseline

	Aberdeen City and Shire	Scotland	UK
Economic Activity Rate	79%	77%	78%
Unemployment Rate	5%	3%	4%
Median Annual Gross Income	£27,381	£27,698	£27,756

Industrial Structure Baseline

18.4.5 The three top sectors of employment (ONS, 2022b) in the Local Tourism and Recreation Study Area are:

- human health and social work activities, which employs 14% of the workforce;
- wholesale and retail trade, 13%; and
- professional, scientific and technical activities, 11%.

18.4.6 Tourism related employment (covering accommodation and food service activities and the arts, entertainment and recreation) in the Local Tourism and Recreation Study Area accounts for 9% of all jobs, compared to 10% across Scotland as a whole.

18.4.7 The socio-economic baseline will be expanded in the Offshore EIA Report to add more detail on the indicators of sensitivity of each of the economic receptors and enable the relative magnitude of each impact to be quantified for each Socio-Economic Study Area.

Tourism Baseline

18.4.8 As highlighted in the above section, the tourism economy in the Local Tourism and Recreation Study Area is slightly less concentrated than in other areas of Scotland and the sector directly employs around 18,000 people in the area. In 2019, it was estimated that there were 1.3 million overnight visits to the area, with a total spend of £317 million (Visit Scotland, 2020).

18.4.9 The tourism and recreation baseline in the Offshore EIA Report will identify the tourism and recreation receptors, such as visitor attractions, tourist routes or accommodation providers, in the Local Tourism and Recreation Study Area that will be potentially affected by direct environmental effects of the Proposed Development. It will

also identify the key drivers of the tourism economy and assess how these could be affected by the Proposed Development.

18.5 Embedded Mitigation

18.5.1 The following Embedded Mitigation measures are relevant to socio-economics, tourism and recreation. The Embedded Mitigation measures will evolve over the development process as the EIA progresses.

18.5.2 As per conditions of the Applicant's Option to Lease Agreement with CES, a SCDS Outlook update was submitted, and made public, in April 2023. This update outlines commitment and ambition scenarios for the foreseen geographical supply chain expenditure in Scotland and the rest of the UK in the development and construction phases, and the first six years of O&M. As part of this Offshore Scoping Report, the following Embedded Mitigation measures have been committed to that will enhance the level of economic benefit realised through the supply chain;

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- The Applicant will work with other developers, Government and key stakeholders to assist in the addressing barriers to local supply chain participation.
- The Applicant will engage with local supply chain as part of a developing strategy to lever oil and gas competencies and maximise local content as much as practicable for the Proposed Development.
- The Strategic Investment Model (SIM) will be followed as a mechanism set up to support investment in major manufacturing and recycling/repurposing facilities and to enable infrastructure projects in Scotland.
- The Energy Pathfinder will be followed to ensure complete visibility of the work programme and an opportunity for Scottish and UK suppliers to bid for work.
- Drafting and implementation of a decommissioning programme.

18.5.3 The Applicant is actively engaging with local supply chain as part of a developing strategy to lever oil and gas competencies and maximise local content options for the Proposed Development. The technology agnostic approach to project design and procurement taken by TWP aims to maximise the use of local businesses and market entrants, as well as established UK businesses. Furthermore, the Applicant has become an early adopter of Energy Pathfinder, which is run by NSTA. This is a contract advertising platform that will ensure there is complete visibility of the work programme and an opportunity for Scottish and UK suppliers to bid for work.

18.5.4 The Applicant, through its strong engagement in the Collaborative Framework Working Group (CFWG), has supported the development of the Strategic Investment Model (SIM), a mechanism set up by the industry to support investment in major manufacturing facilities and to enable infrastructure projects in Scotland.

18.6 Potential Proposed Development Impacts

18.6.1 A range of 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. The construction phase will include:

- development;
- manufacturing and fabrication; and
- installation.

18.6.2 The impacts that have been scoped into the assessment are outlined in Table 18.4 together with a description of any additional data collection and supporting analyses that will be required to enable a full assessment of the impacts.

18.6.3 Potential impacts scoped out of the assessment are presented in Table 18.5 with justification.

Table 18.4: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Socio-Economics, Tourism and Recreation

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Increase in employment and GVA	✓	✓	✓	The construction, operation and decommissioning of the Proposed Development will require expenditure with companies in each of the Study Areas. This will support employment and generate GVA, including impacts associated with spending in the wider supply chain (indirect effects) and spending by staff (induced effects).	Desk-based review to develop a detailed baseline assessment of relevant socio-economic conditions, including an assessment of employment and the businesses by sector.	An economic impact model will be developed to estimate direct, indirect, and induced employment impacts of the Proposed Development for the Economic Study Areas. This will include impacts on sectors directly related to development, construction, operation, and decommissioning of the Proposed Development (consultancies, manufacturing/fabrication, ports, services, etc.) and broader indirect sectors such as commercial fishing. Impacts will be assessed relative to the relative socio-economic profile of each Study Area.
Demographic changes	✓	✓	✓	The employment supported during the construction and decommissioning of the Proposed Development may attract permanent or transient workers to each Study Area.	Desk-based review to develop a detailed baseline assessment of demographic trends and issues in each Study Area. Data on demographic changes will come from labour demand analysis in the	An assessment of likely changes due to temporary or permanent workforce will put any demographic change in the context of each Study Area. The impacts of demographic changes will be assessed as far as practicable, including the scale of any impact and its potential to be

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
					economic impact model. Demographic split of workforce will draw from sector wide studies on workforce demographics.	significant. If ports have been determined by the time of the assessment, it will be possible to be more definitive on the likely significance of these impacts.
Changes to housing demand	✓	✓	✓	Any demographic changes during the construction, operation and decommissioning of the Proposed Development may cause changes to demand in the housing market of each Study Area.	Desk-based review to develop a detailed baseline assessment of housing market trends and issues in each Study Area. Data on demographic changes will come from labour demand analysis in the economic impact model.	An assessment of likely changes due to temporary or permanent workforce will put any housing market impacts in the context of each Study Area. The impacts of demographic changes and the implications for housing demand will be assessed as far practicable, including the scale of any impact and its potential to be significant. If ports have been determined by the time of the assessment, it will be possible to be more definitive on the likely significance of these impacts.
Changes to other local public and private services	✓	✓	✓	Any demographic changes during the construction, O&M and decommissioning of the Proposed Development may cause changes to	Desk-based review to develop a detailed baseline assessment of public and private service provision in each Study Area. Data	An assessment of likely changes due to temporary or permanent workforce will put any public and private service provision impacts in the context of each Study Area.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				demand for local public and private services of each Study Area.	on demographic changes will come from labour demand analysis in the economic impact model.	The impacts of demographic changes and the implications for demand on local public and private services will be assessed as far as practicable, including the scale of any impact and its potential to be significant. If ports have been determined by the time of the assessment, it will be possible to be more definitive on the likely significance of these impacts.
Changes to tourism receptors	✓	✓	✓	The construction, O&M and decommissioning of the Proposed Development has the potential to influence visitor behaviour, depending on the other environmental impacts that are generated.	Data on drivers of the tourism economy and the identification of receptors in each of the Study Areas will be taken from VisitScotland and local tourism organisations.	The assessment will consider whether the drivers of the tourism economy, or individual receptors, are significantly affected by the Proposed Development by considering relevant sections of the Offshore EIA Report. If significant effects are identified on any of these receptors, an assessment will be made regarding how these effects will influence visitor behaviour.
Changes to recreation receptors	✓	✓	✓	The construction, O&M and decommissioning of the Proposed Development has the potential to influence	Recreational assets in each of the Study Areas will be taken from Google searches, consultations,	The assessment will consider whether recreational assets, are significantly affected by the Proposed Development by considering the shipping and

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				recreational assets, including marine recreation, depending on the other environmental impacts that are generated.	VisitScotland and local tourism organisations.	navigation section of the Offshore EIA Report. If significant effects are identified on any of these receptors, an assessment will be made regarding how these effects will influence recreational amenity in line with NatureScot guidance.
Socio-cultural Impacts	✓	✓	×	Changes in demographics may led to changes in community character, quality of life and community stress.	Baseline information on socio-cultural impacts will build on evidence from communities with a similar previous experience of offshore wind and the socio-economic baseline of the area. It will also be informed by the wider stakeholder engagement exercise.	The Applicant is supporting a collaborative approach to primary social research through the Scottish Offshore Wind Energy Council (SOWEC) and CES. The potential impacts will be considered based on baseline data, and the project description and shall be discussed qualitatively. If the port location(s) have yet to be selected, the assessment will develop logic chains of social impacts and potential effects on communities for a range of potential epicentre scenarios.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 18.5: Impacts Proposed to Be Scoped out of the Proposed Development Assessment for Socio-Economics, Tourism and Recreation

Impact	Justification
Socio-cultural Impacts during the Decommissioning Phase	Socio-cultural effects are highly dependent on social baseline information and perceptions. Due to a likely lack of clarity on decommissioning activities and because the social perceptions baseline is unlikely to still be applicable at the decommissioning phase it will not be possible to complete a meaningful assessment.
Transboundary effects	The transboundary socio-economic effects will be located in countries out with the UK that are involved in the supply chain. At the time of the Offshore EIA Report submission, these countries are unknown and therefore it will not be possible to reliably model these impacts.

18.7 Proposed Assessment Methodology

Guidance

18.7.1 The socio-economics assessment will follow the assessment methodology set out in Section 4: EIA Methodology. Specific to the socio-economic effects related to the offshore elements, the following guidance documents will also be considered:

- Guidance on assessing the socio-economic impacts of OWFs (Glasson *et al.*, 2018);
- General Advice for Socio-Economic Impact Assessment (Scottish Government, 2022d);
- Defining 'Local Area' for Assessing Impact of Offshore Renewables and Other Marine Developments: Guidance Principles (Scottish Government, 2022c);
- A Two Way Conversation with the People of Scotland on the Social Impact of Offshore Renewables (Scottish Government, 2022e);
- Public perceptions of OWF Developments in Scotland (Scottish Government, 2022f);
- UK Offshore Wind Sector Deal (UK Government, 2020); and
- The Green Book: Appraisal and Evaluation in Central Government (UK Government, 2022).

18.7.2 The Scottish Government is in the process of developing guidance on the assessment of the socio-economic impacts of OWF projects. It is expected that this shall be published prior to the submission of the Offshore EIA Report. If available, this will be considered within the Offshore EIA Report. The Applicant will engage with MD's Marine

Analytical Unit (MAU) throughout the pre-application phase to ensure that any methodologies applied are in line with developing guidance.

18.7.3 In December 2022, MAU published 'General Advice for Socio-Economic Impact Assessment'. This document summarised the draft guidance being prepared by MAU. One of the key recommendations is that the onshore and offshore elements of an offshore wind project are considered in the same assessment. The consenting strategy for the Project is to have separate applications for both the onshore and offshore elements and therefore a separate standalone assessment of both elements of the Project will be prepared. To support this, the methodology and impacts considered for both the onshore and offshore assessments will be consistent and the approach outlined in this section will be consistent to the approach described in equivalent section of the Onshore Scoping Report. In addition, the combined impacts of all elements of the Project will be considered in a stand-alone SEIA study.

18.7.4 The 'General Advice for Socio-Economic Impact Assessment' also outlines the socio-economic, tourism and recreation impacts that should be considered in an assessment. These are listed in paragraph 18.2.3.

Socio-economic Impacts

18.7.5 Socio-economic impacts will be assessed for each of the Socio-Economic Study Areas, as described in Section 18.2, and the sensitivity will be considered based on the relative size of the economy, with smaller study areas considered more sensitive to change than larger study areas.

18.7.6 The impacts 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 construction phase of the Proposed Development.
- Jobs: this is a measure of long term employment (greater than 10 years) 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 O&M phase of the Proposed Development.

18.7.7 The economic impacts associated with the supply chain shall 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) impacts. In addition to this, the Proposed Development shall also consider the impacts of staff spending and the economic impact that this subsequent increase in demand stimulates (the induced impact).

18.7.8 It is acknowledged that at the time of writing, the exact levels of expenditure are unknown. This expenditure will increase the amount of beneficial economic impacts. The socio-economic assessment shall therefore consider the reasonable MDS of the lowest, realistic levels of expenditure associated with the Proposed Development, in line with the Applicant's commitment in the SCDS: Outlook (TWP, 2023). However, these may be subject to change as the Proposed Development is refined. This will also affect the assumptions for the reasonable MDS for the Proposed Development.

18.7.9 The socio-economic assessment will cover all three phases of the Proposed Development.

18.7.10 The impacts during the construction phase will be based on the actual expenditure that has occurred to date as well as the planned expenditure associated with this phase. In addition to the total impact over the period, the assessment will also consider the timings of impacts during this phase to understand the peaks and troughs of this activity.

18.7.11 The economic impacts will also consider any reduction in activity in other sectors that are identified in other chapters of the Offshore EIA Report. As described in paragraph 18.8.1, this will include commercial fisheries and shipping and navigation.

18.7.12 The impacts during O&M of the Proposed Development will be based on projected operational expenditure.

18.7.13 Where impacts are expected to occur over several years, a discount rate will be applied. This allows impacts that occur sooner to be valued more highly than impacts that occur in the future, also known as time preference. In this instance a discount rate of 3.5% will be used, which is in line with the UK Government's Green Book (UK Government, 2022).

18.7.14 Once the economic impact of the Proposed Development has been assessed in terms of GVA and employment, an assessment will be made about the relative magnitude of the impact. Using the methodology outlined in Section 4: EIA Methodology, the significance of the effect will then be assessed.

Demographic Impacts

18.7.15 The employment that would be created as a result of the Proposed Development would have demographic impacts if this employment helps to retain or attract people to the communities where this activity occurs. The potential impacts of demographic change will be

assessed as far as possible, including the scale of any impact and its potential to be significant.

18.7.16 The sensitivity of each of the demographic receptors will be determined by the trends in demographics in the potential host communities and then projections estimated for how these demographics will change over time, and how the demographics of the workforce would relate to different communities. The magnitude of any demographic change will be determined by the change relative to the current population.

Housing

18.7.17 The potential impacts on housing is one of the key issues that is a priority for coastal communities (Scottish Government, 2022e). The demographic changes that result from the employment opportunities have the potential to change the level of demand for housing.

18.7.18 As with the demographic impacts, potential effects on housing will vary considerably between communities. The sensitivity of any housing market to changes in demand as a result of the Proposed Development will be determined by factors including:

- the population of the community, including the wider travel to work area;
- the availability of housing or other accommodation within the community;
- the scale of the overnight tourism sector in the community;
- the ability of the housing market to adjust supply to respond to changes in demand; and
- the relative level of housing affordability in the area.

18.7.19 Similarly, the magnitude of any change will be determined by the peak level of additional accommodation demand in each area, relative to the baseline accommodation provision. The magnitude of any change in housing demand would also be determined by the demographic changes as a result of the Proposed Development. This would be determined by the baseline labour supply in each of the potential areas and the relative size of any transient labour population.

Local Public and Private Services

18.7.20 As with the housing market, the demographic changes that could result from the employment opportunities, could result in changes to the level of demand for other services. This will include:

- public and private sector services;
- educational services;
- health services and social support;

- police, fire, recreation, transport; and
- local authority finances.

18.7.21 The assessment of the effect on these services will also be determined by factors of sensitivity that will be specific to the potentially impacted communities. This will include the capacity of each service in each of the potential areas and the ability of the service to adapt to changes in demand.

18.7.22 The magnitude will also be determined by the relative demographic change in each potential area, which will vary based on the size of the population and the availability of labour in each of the Socio-Economic Study Areas.

18.7.23 As the location of the construction base and O&M base is unlikely be determined by the time of submission of the Offshore EIA Report, the assessment will consider the potential scale of additional demand on other services that would occur during the peak periods of employment based on the potential demographic effects in each potential host area and the propensity of each demographic group to use each of the services listed.

Tourism and Recreation Impacts

18.7.24 The assessment will also consider the potential for tourism and recreation impacts. Studies (Oxford Brookes University, 2021) have found that the presence of energy infrastructure itself does not have an effect on tourism and recreation assets, rather how visitors react to the other environmental effects that are caused by this infrastructure. For example, if the construction results in marine vessel restrictions that deter marine recreation visitors from coming to the area. The tourism and recreation assessments will be based on the sensitivity of the tourism economy, or assets in each area and the magnitude of any potential change in behaviour.

18.7.25 The tourism and recreational baseline will identify receptors in the Tourism and Recreation Study Area and map these against any significant effects identified for other relevant topics of the Offshore EIA Report. If significant effects are identified on these receptors, the tourism assessment will consider if the receptors are sensitive to the particular environmental effect identified.

18.7.26 The assessment of recreational effects will be similar and will apply the ‘Environmental Impact Assessment Handbook’ guidance (NatureScot, 2018) on sensitivity and magnitude of recreational assets to those receptors that will experience significant environmental effects.

18.8 Potential Inter-Related Effects

18.8.1 This assessment will be informed by relevant conclusions of other technical topics within the Offshore EIA Report including (but not limited to) commercial fisheries, shipping and navigation and seascape and visual impact. The conclusions of these sections will be reviewed and assessed in relation to the socio-economic impacts. The following potential inter-related effects have been identified:

- There may be an effect on the commercial fisheries sector (Section 13: Commercial Fisheries), which could have an impact on the net jobs and GVA impacts.
- Additional vessels movements and any restriction on access predicted as part of the shipping and navigation (Section 14: Shipping and Navigation) will be used to identify potential effects on marine recreation users, such as yachting.
- There may be a reduction in the appeal, enjoyment and accessing of recreational areas or tourism assets as a result of the Proposed Development which relates to seascape and visual impact (Section 20: Seascape and Visual Impact) and any disruption or deviation of such.

18.9 Potential Cumulative Effects

18.9.1 There is the potential for cumulative effects on the socio-economic, tourism and recreational receptors which may arise from the construction, O&M and decommissioning of the Proposed Development when they occur alongside the activities of other projects. The CEA will follow the approach outlined in Section 4: EIA Methodology, and will be included in the socio-economics section of the Offshore EIA Report.

18.9.2 Known projects and activities located within Scotland which will be considered in terms of potential cumulative effects will include but not necessarily be limited to:

- other offshore renewable energy projects and associated infrastructure, such as other ScotWind and INTOG projects in the North Sea;
- onshore energy generation projects
- energy transmission projects;
- energy infrastructure developments in the hydrogen, oil and gas sectors;
- onshore transportation infrastructure projects; and
- major onshore commercial development projects.

18.10 Potential Transboundary Impacts

18.10.1 The largest Socio-Economic Study Area used in this assessment is the UK. However, the Proposed Development will result in supply chain expenditure other countries beyond the UK, in addition to demand for specialist skills which are not available locally. This will, in turn led to socio-economic impacts to areas outside of the UK in the form of job creation and contribution to GVA. These will not be considered as part of the economic impact assessment because the economic impacts will be dependent on the properties of the national economies where this activity occurs. At the time of the Offshore EIA Report submission, these countries are unknown and therefore it will not be possible to reliably model these impacts. It is therefore proposed to scope out socio-economic, tourism and recreation transboundary effects of the EIA.

18.11 Summary

18.11.1 The socio-economic, tourism and recreation assessment will consider the potential effects on economic, tourism and recreation receptors of the Proposed Development, in line with the relevant guidance. The methodology applied will ensure that all effects are assessed against the baseline conditions of each receptor and will draw on effects identified elsewhere in the Offshore EIA Report.

18.11.2 The key impacts proposed to be scoped into the assessment include:

- increase in employment and GVA;
- demographic changes;
- changes to housing demand;
- changes to other local public and private services;
- socio-cultural impacts;
- changes to tourism receptors; and
- changes to recreation receptors (including marine recreation).

19 Marine Archaeology

19.1 Introduction

19.1.1 This section of the Offshore Scoping Report identifies the marine archaeology receptors of relevance to the Proposed Development that can be identified from desktop data sources and considers the potential effects arising from the construction, O&M and decommissioning of the Proposed Development that may impact them.

19.2 Marine Archaeology Study Area

19.2.1 The Marine Archaeology Study Area is shown in Figure 19.1 and is defined as the Scoping Boundary plus a 2 km buffer. This encompasses all elements of the Array Area and Export Cable Corridor and was used as the search area for obtaining records from relevant archive databases. This Marine Archaeology Study Area allows for a greater understanding of the wider archaeological baseline environment and archaeological trends within the region to be recognised and to allow any archaeological sites identified to be represented in a broader archaeological context.

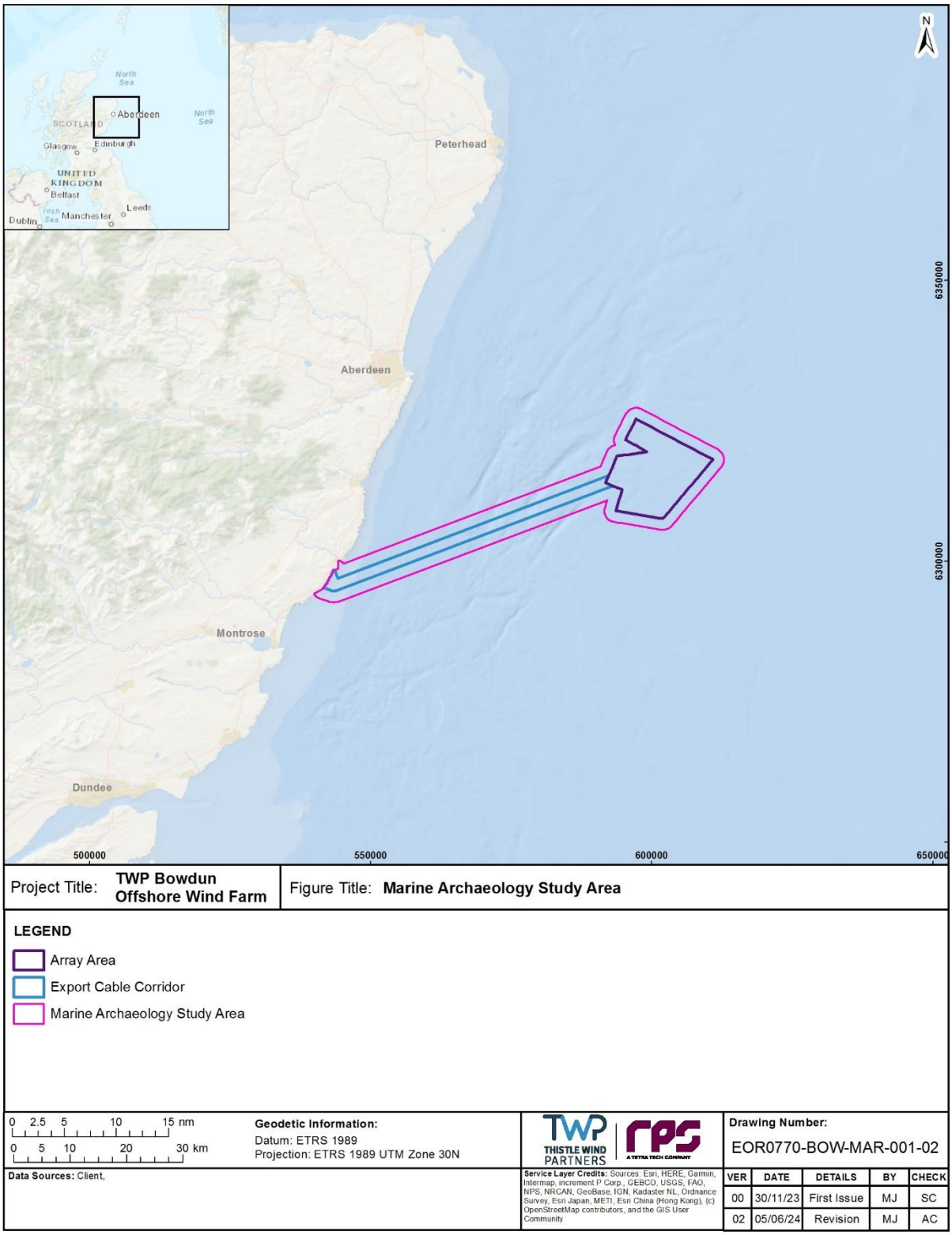


Figure 19.1: Marine Archaeology Study Area

19.3 Data Sources

19.3.1 A number of data sources were consulted to inform the marine archaeology section of the Offshore Scoping Report and will be used to inform the Marine Archaeology Technical Report to be submitted with the Offshore EIA Report. Data sources of relevance to the Proposed Development are given in Table 19.1. Additional sources consulted include historic Ordnance Survey maps and Admiralty Charts. Aberdeenshire Council was contacted but do not hold any records for the Marine Archaeology Study Area.

Table 19.1: Data Sources of Relevance to Marine Archaeology

Dataset	Source	Year	Author
UKHO Wreck and Obstructions Data	UKHO	2023	UKHO
National Record of the Historic Environment (NRHE) records (Canmore – including shipping and aviation wrecks, protected wrecks, and Historic Marine Protected Areas (HMPAs)	Historic Environment Scotland (HES)	2023	HES
Protected Wrecks Map	MD	2023	MD
GeoIndex (Offshore)	British Geological Survey (BGS)	2023	BGS
Submerged Landscapes	EMODNet Geology	2023	BGS

19.4 Consultation

19.4.1 The approach to consultation for the Proposed Development is set out in Section 5: Consultation and Engagement. No pre-application pre-scoping consultation has been undertaken to date for marine archaeology.

19.5 Baseline Environment

19.5.1 Marine archaeology is considered within the following categories:

- submerged prehistoric archaeology: This includes palaeochannels and other inundated terrestrial landforms that may preserve sequences of sediment of palaeoenvironmental interest as well as Palaeolithic and Mesolithic sites and artefacts;

- maritime archaeology: This relates generally to craft or vessels and any of their associated structures and/or cargo; and
- aviation archaeology: This comprises all military and civilian aircraft crash sites and related wreckage.

19.5.2 Archaeology is considered in terms of periods that represent timeframes which are defined and categorised by the culture of the people of the time. Notable changes in culture and activities are indicated by changes in chronological periods. Conventionally, early prehistoric dates are given in terms of years Before Present (BP); later prehistory and historic periods are referred to as Before Christ (BC) or *Anno Domini* (AD). The chronological periods and their corresponding date ranges that are considered in this report are provided in Table 19.2 (ScARF, 2012a).

Table 19.2: Archaeological Periods and Associated Date Ranges (ScARF, 2012a)

Period	Date Range
Palaeolithic	Circa 14,700 BP to 13,000 BP
Mesolithic	14,000 BP to 6,100 BP
Neolithic	6,100 BP to 4,500 BP
Chalcolithic and Bronze Age	4,500 BP to 2,800 BP/800 BC
Iron Age	800 BC to AD 400
Roman presence	AD 77 to 211
Medieval	AD 400 to 1500
Modern	AD 1500 to Present Day

Submerged Prehistoric Archaeology

19.5.3 The earliest evidence of human occupation in Scotland is sparse but exists in the form of lithic tool assemblages such as at Howburn Farm, South Lanarkshire (Ballin *et al.*, 2010) and Nethermills Farm, Aberdeenshire (Ballin and Wickham-Jones, 2017). Occupation of Scotland at this time is likely to have been in the context of communities gradually expanding northward following the retreat of the ice sheets at the end of the LGM. The LGM peaked at around 18,000 BP and the ice sheets began to retreat around 13,000 BP. Reoccupation of previously glaciated areas may have been rapid, and movement of people and animals moving north and westward from mainland Europe across southern Britain and across the now submerged Doggerland palaeolandscape (Fitch, *et al.*, 2011).

19.5.4 The net result of physical effects during the last Ice Age means that relative sea level was up to 45 m lower along much of the coast of Scotland, suggesting that there is potential for surviving palaeoenvironmental and possibly prehistoric archaeological evidence close to shore within the Marine Archaeology Study Area (ScARF, 2012a).

19.5.5 Raised marine deposits have been found within the inner estuaries of Scottish rivers, suggesting that even nearshore areas were submerged by the Windermere Interstadial (circa 15,000 to 13,000 BP). This in turn suggests that offshore areas were submerged by this period at least, or perhaps even earlier. (Peacock, 1999; Holloway *et al*., 2002; Stoker *et al*., 2008; Brooks *et al.* 2011). Thus, it can be inferred that most of the Marine Archaeology Study Area may have been submerged relatively quickly following the LGM.

19.5.6 The areas of seabed in the vicinity of the landfall location of the Offshore Export Cable on the east-central Aberdeenshire coast has been modelled to be subaerial as late as 6,000 BP, only reaching the current sea level by 4,000 BP (Brooks, *et al.*, 2011; Figure 19.2). However, modelling of the stages of marine transgression following the LGM indicates that the Marine Archaeology Study Area may have remained submerged from shortly after the LGM to the Present Day. This suggests that the greatest potential for submerged prehistoric archaeology will be found in the Westernmost 1.6 km of the Marine Archaeology Study Area.

19.5.7 The above evidence and modelling for submerged palaeocoastlines and associated landscapes suggests that the potential for submerged prehistoric archaeology within the Scoping Boundary is low. The greatest potential is likely to be localised and found closer to shore and in association with palaeolandscape features. The highest potential for palaeolandscapes and submerged prehistoric archaeology on the seabed are limited to the shallower parts of the Scottish Shelf and around the Northern Isles, such as the submerged forest at Sanday, Orkney (ScARF, 2012b). Archaeological assessment of the site-specific geophysical survey data will provide further information on the potential for submerged prehistoric archaeology within the Marine Archaeology Study Area.

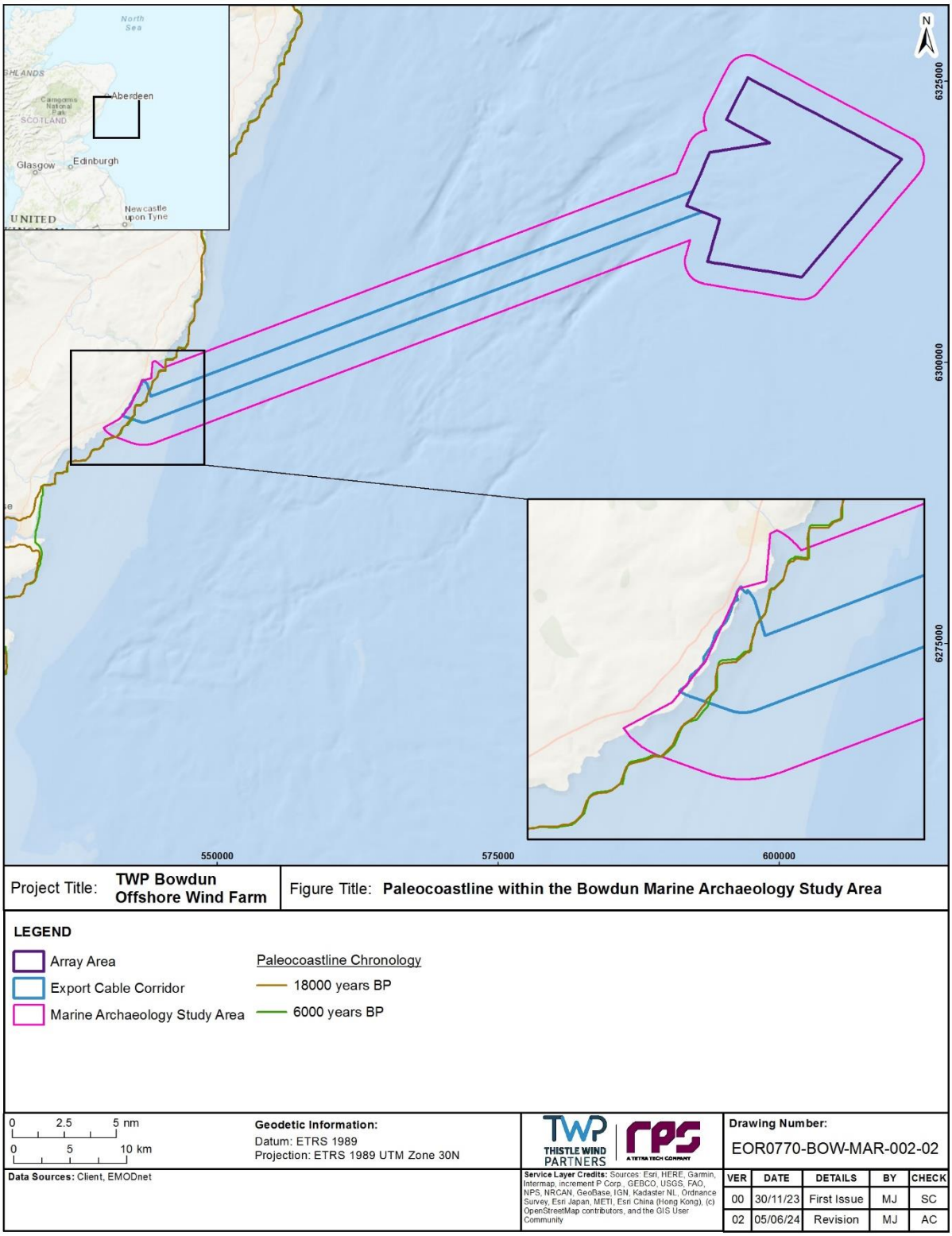


Figure 19.2: Palaeocoastlines Within the Marine Archaeology Study Area (Brooks *et al.*, 2011)

Maritime and Aviation Archaeology

19.5.8 The desktop study has identified 13 wrecks or possible wreck sites that UKHO records as 'live' within the Marine Archaeology Study Area. These are presented in Table 19.3 and their distribution is shown in Figure 19.3.

19.5.9 One of the 13 wrecks, HMS *Repro* (UKHO 70430), was sunk while in active service with the Royal Navy. It was mined off Todhead Point on 26 April 1917 by the German submarine UC-41 and 13 lives were lost. While maritime military vessels are not automatically protected by the Protection of Military Remains Act 1986 (as amended), MoD holds the power to protect, through this Act, any vessel that was lost during active service. Of the remaining 12 live wrecks, five can be positively identified, no further information is known about the other seven, but the geophysical survey data may help to provide further evidence for the origin of these wrecks. These wrecks are summarised in Table 19.3 and their locations shown in Figure 19.3 and the details are presented within Appendix F: Gazetteers of Marine Archaeology.

Table 19.3: Maritime Archaeology Identified Within the Marine Archaeology Study Area

ID	Name	Description
UKHO 70430	HMS *Repro*	Mined off Todhead Point on 26 April 1917 by the German submarine UC-41 and 13 lives were lost.
UKHO 3059	*Baku standard*	Torpedoed by UC 58 on 11 February 1918 during passage from Clyde to the Firth of Forth with a cargo of crude oil. The wreck appears broken and degraded, with surrounding scour.
UKHO 3057	*Hornby*	Recorded in Canmore and Aberdeenshire HER as Hawnby, a steel steamship stranded near the entrance to Johnshaven harbour in 1914.
UKHO 58703	*Karianda*	Took on water after developing an electrical fault. The crew of two were rescued from dingy after the vessel had sunk. The wreck appears intact, with the bow to the south-east.
UKHO 3176	*Sandvik* (possibly)	Sunk by a torpedo from UC-77 during passage from London for Christiana with a cargo of coke.
UKHO 3171	*Tanevik*	Foundered under tow while on passage from Methil for Buckie. The wreck appears intact with the bow possibly to the west.
UKHO 3174	Unknown	The upright and intact remains of an unknown wreck. Bow to the north-east.

ID	Name	Description
UKHO 3175	Unknown	The intact remains of an unknown wreck with the bow to the north-west. The remains appear to be collapsing.
UKHO 3180	Unknown	Sank while under tow of Icelandic trawler *Solpakur* together with three other fishing vessels while on passage for Grimsby for scrapping. The wreck is with mast removed but otherwise upright and intact, with the bow to the south.
UKHO 73769	Unknown	The highly degraded remains of an unknown wreck.
UKHO 71167	Unknown	The intact remains of an unknown wreck atop a rocky seabed. The bow is to the east.
UKHO 3056	Unknown	The intact remains of an unknown wreck. The bow is to the east-north-east.
UKHO 73761	Unknown	The upright and intact remains of an unknown wreck. Bow to the south-east.

19.5.10 Historic Marine Protected Areas (HMPAs) are designated under Section 67 of the Marine Scotland Act 2010 in order to protect marine historic assets (e.g. historic shipwrecks) of national importance within Scottish Territorial Waters. There are no HMPAs within the Marine Archaeology Study Area.

19.5.11 Within UKHO data for the Marine Archaeology Study Area there are six 'Dead' records; indicating that material which was once observable on the seabed has since not been detected by repeated surveys, therefore considered to no longer exist at the given location. It may be that the material has become buried, dispersed or has disintegrated over time. These records include a duplicate record for HMS *Repro*, records for the wrecks of the *Reindeer, Taurus*, one record of an obstruction, one record of foul ground, and two records labelled 'Unknown' though one of these relates to a relict flare stack frame. While 'Dead' records represent an observed lack of material on the seabed, it is worth noting that 'Dead' wrecks may be buried or flattened at those locations and whilst they no longer represent a navigational hazard archaeological material may still be present at these locations.

19.5.12 There are no records of live aviation remains within the desktop data for the Marine Archaeology Study Area.

19.5.13 Archaeological assessment of the site-specific geophysical survey data will inform the further characterisation of maritime archaeology of the Marine Archaeology Study Area.

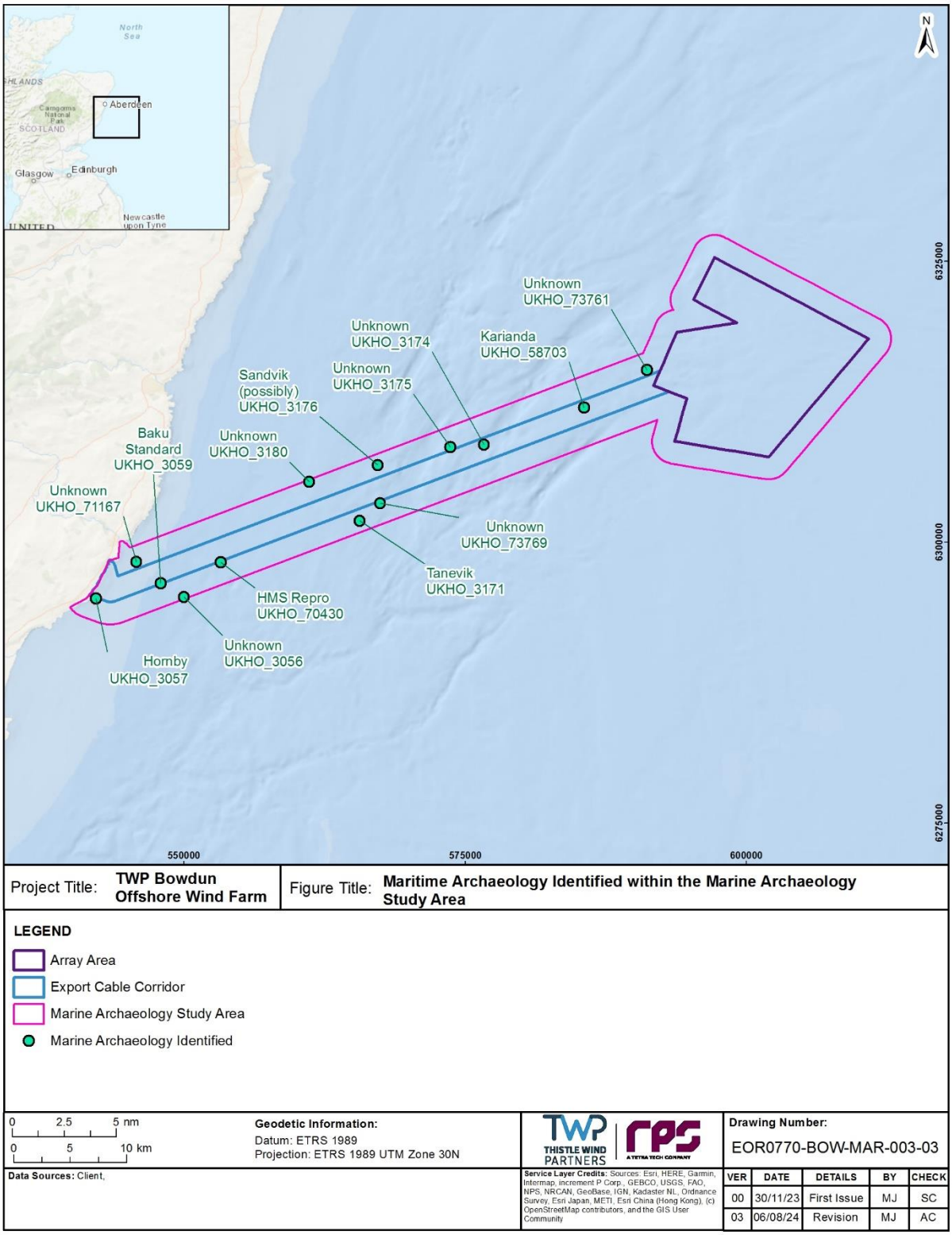


Figure 19.3: Maritime Archaeology Identified Within the Marine Archaeology Study Area

Maritime Archaeology Potential

19.5.14 Maritime archaeological sites and materials are defined as the physical remains of boats and ships that have been wrecked, sunk, or have foundered, as well as artefacts which rest upon the seabed as the result of being jettisoned or lost overboard (e.g. anchors, cannon or fishing gear). The maritime archaeological record for the Marine Archaeology Study Area has been considered chronologically for the following broad temporal phases as described in Table 19.2.

19.5.15 The existence and survival of Palaeolithic and Mesolithic watercraft are highly speculative in the UK, economic strategies such as seal-hunting, particularly around the Pleistocene-Holocene Transition (circa 12,000 to 8,000 BP) may have led to the need for watercraft (Ballin and Bjerck, 2016). Mesolithic material at sites on the Northern Isles such as Stronsay, Orkney suggest potential travel by watercraft (Lee and Woodward, 2009). Neolithic evidence (circa 5,800 to 4,500 BP) in eastern Scotland and the Northern Isles is particularly strong. Maritime contact with communities around the North Sea littoral during the Scottish Neolithic is inferred by the similarity of contemporaneous domestic architecture in Aberdeenshire (e.g. Crathes and Balbride) with contemporaneous examples in Northern France (ScARF, 2012b).

19.5.16 Maritime activity in the Bronze Age (circa 4,500 to 2,800 BP) is evidenced by vessel examples and equipment, such as the Carpow logboat from the Tay Estuary, an inshore example of a probably common type of vessel used across historical periods (Strachan, 2010). A fragment of an earlier logboat, dating to circa 4,000 BP was found at Catherinefield, Dumfries and Galloway (Mowat, 1996).

19.5.17 Iron Age (800 BC to AD 400) maritime activity is evidenced by sites such as Dumbuck crannog which lies on the intertidal foreshore of the Firth of Clyde (Sands and Hale, 2001). Structural timbers have been dated to this period, and at least 30 logboats have been found on, or close to, the shores of the inner Firth of Clyde. This suggests that the firths of the eastern coast of Scotland may hold similar evidence, including watercraft capable of coastal journeys. A number of whale bone artefacts have been recovered from Iron Age sites in Scotland (such as Foshigarry, North Uist (Finlay, 1991)), Orkney (Nicholson and Davis, 2007) and Shetland (Cussans and Bond, 2015). It is, however, unclear whether these were derived from primary whale hunting from ocean-faring vessels, shore drives, or opportunistic recovery from beached animals (MacGregor, 1974; Baldwin, 2008).

19.5.18 The potential for the survival of maritime archaeology from the Medieval period (AD 1500 to Present) is higher than from prehistoric periods but still rare, as ship construction at the time relied heavily on organic building materials that are less likely to survive atop and within the seabed. Early medieval boats are known from the inland

waterways of Perth and Kinross, such as the Errol 2 logboat (radiocarbon dated to between AD 548-AD 599) (Strachan, 2010).

19.5.19 Due to the advent of shipping records and the increasing use of metal structural elements into vessel designs throughout the Modern Period (AD 1500 to Present), losses from this time represent the greatest potential for unrecorded archaeology to be discovered. Wrecks from the 19th and early 20th centuries are often more visible to geophysical survey on the seabed than remains of wooden vessels. Metal construction materials reflect sonar signals better than wood, producing more recognisable anomalies in bathymetric data, and generate strong magnetic anomalies. This greater visibility is reflected in the generally higher number of known wrecks (i.e. those that have been located and accurately charted on the seabed) in contrast to earlier periods.

19.5.20 In addition to the live records discussed above, there are 144 entries for Recorded Losses from the Canmore and HER datasets within the Marine Archaeology Study Area. Recorded losses represent maritime and aviation records that have no specific location attached to them but are given often arbitrary spatial attribution. Recorded losses are often grouped with reference to a geographic, hydrographic, or other point of reference, making the positional data of these records unreliable. However, they do provide information on the historical marine traffic of the general region. The majority of the Recorded Losses for within the Marine Archaeology Study Area are commercial shipping losses, predominantly dating to the 19th and 20th century of the Modern period. Some of these vessels were sunk as the result of enemy action during both World Wars. Notable among these is the record for a possible submarine (National Record of the Historic Environment (NRHE) ID: 200111). As with HMS *Repro*, any remains of an active-duty military vessel may result in designation for the purposes of the Protection of Military Remains Act 1986 (as amended). So, while there is no evidence for the vessels themselves to be present at the location identified in the Recorded Losses dataset, debris observed on the seabed identified in site-specific geophysical survey data may have arisen from wartime activity.

Aviation Archaeology Potential

19.5.21 Thousands of military and civilian aircraft casualties have occurred in UK waters since the advent of powered flight in the early 20th century. The bulk of these casualties date to losses during World War II. Most of these losses, in turn, are concentrated off the southern and eastern coasts of England. However, there is the potential for aviation casualties in North-eastern Scotland. Aviation training and mission flights were conducted from eastern Scotland such as RAF Edzell, RAF Montrose, Arbroath (HMS Condor) RAF Dalcross, RAF Kinloss, RAF Lossiemouth, Crimond (HMS Merganser), and RAF Dyce during World War II, all of which may contribute as yet

unlocated aviation losses within the Marine Archaeology Study Area (Scottish Aviation Trail, 2024).

19.5.22 While the aviation archaeology record is potentially large, the ephemeral nature of aircraft remains on the seabed means that a great many sites remain unknown and unrecorded. Additionally, although aircraft loss records are abundant, they seldom carry accurate spatial data, which further complicates any assessment of the likely presence of aircraft wreckage in any area of seabed.

19.5.23 Since the conclusion of World War II, despite the volume of both military and civilian air traffic, there have been few civilian aviation losses off the east coast of Scotland in the vicinity of the Proposed Development. The potential for post-World War II aircraft remains unclear for the Scoping Boundary, but the potential is considered to be low. Additionally, wrecks of civilian aircraft are not subject to designation under the terms of the Protection of Military Remains Act 1986 (as amended).

19.5.24 Despite the number of military aviation installations in Eastern and Northern Scotland, only two of the 144 Recorded Losses from within the Marine Archaeology Study Area relate to aviation wreckage. The record (NRHE ID 328314) describes aviation material trawled up in 1936, 19.3 km off of Stonehaven, after a long time in the sea. This may not represent a wartime loss, but aviation wreck material of such an early date, should any more survive, would be significant. Another unknown aircraft (NRHE: 313229) crashed on 27 February 1942. Similarly, it is unknown if this is a wartime loss but if so, then it is automatically designated for the purposes of the Protection of Military Remains Act 1986.

19.6 Embedded Mitigation

19.6.1 The following Embedded Mitigation is relevant to marine archaeology. The Embedded Mitigation will evolve over the development process as the Offshore EIA Report progresses.

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- The identification and implementation of Archaeological Exclusion Zones (AEZs) around receptors identified as having a known archaeological potential (the size of the AEZ will be evidence based and established as a precautionary approach to ensure that it is of sufficient size to protect the site from the nature of the impact (The Crown Estate (TCE), 2021; Wessex Archaeology, 2007).
- The development of and adherence to, an Outline Written Schemes of Investigation (WSI).
- Provision of a Protocol for Archaeological Discoveries (PAD similar to that set out by TCE (TCE, 2014) for unexpected

archaeological discoveries made during the course of the development.
- Archaeological input into relevant site pre-construction geophysical and Remotely Operated Vehicle (ROV)/diver surveys with appropriate monitoring, if necessary.
- Drafting and implementation of a decommissioning programme.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.
- Identification and implementation of Temporary Archaeological Exclusion Zones (TAEZs) around encounters of previously unknown archaeological sites.
- Micrositing of Offshore Infrastructure to avoid any known archaeological receptors identified in pre-construction surveys.
- Archaeological input into specifications for and analysis of pre-construction geotechnical surveys. This might include the presence of a geoarchaeologist on board the survey vessel and provision for sampling, analysis and reporting of recovered cores. The results of all geoarchaeological investigations to be complied in a final report which includes a sediment deposit model.

19.6.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

19.7 Potential Proposed Development Impacts

19.7.1 A range of potential impacts on marine archaeology have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development.

19.7.2 The impacts that have been scoped into the assessment are outlined in Table 19.4 below together with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. physical processes modelling) that will be required to enable a full assessment of the impacts. No potential impacts are proposed to be scoped out of the assessment.

Table 19.4: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Marine Archaeology

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors	✓	✓	✓	Seabed disturbance and associated deposition could arise during the construction phase from seabed preparation, foundation and cable installation activities. This could lead to effects on known archaeological receptors. Effects from decommissioning are expected to be similar to, or less than, effects from construction. Seabed disturbance and associated deposition could arise during the maintenance phase from cable repair activities which could lead to effects on known archaeological receptors.	A desktop data review will identify known archaeological receptors within the Marine Archaeology Study Area. A geophysical survey is being completed to establish seabed conditions on and below the sea floor within the Array Area and a 1 km corridor of the Offshore Export Cable Scoping Boundary. The current geophysical data does not currently include the entire seabed within the Scoping Boundary. Geophysical survey data will also be interpreted for any objects of possible anthropogenic origin and will provide an	The marine archaeology baseline developed from the review of desktop data and archaeological assessment of geophysical survey data, with reference to the physical processes modelling, will consider the extent of sediment disturbance and associated deposition. The sensitivity of receptors will be assessed against the magnitude of each impact as defined through the MDS to determine the significance of effect.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
					evidential basis to inform the Ground Model. The PAD document is the statement of procedure for the discovery of any previously unknown marine archaeology receptors. Qualitative assessment informed by review of desktop data and archaeological assessment of geophysical survey data and, preparation of a technical report and draft WSI.	
Direct damage to maritime archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaolandscapes and associated	✓	✓	✓	Activities during the construction phase could directly affect any archaeological receptors present within the Scoping Boundary. These effects will likely be localised but would lead to adverse and irreversible damage to	As above; site-specific geophysical data will inform the detailed archaeological baseline environment. A database of anomalies will be created by recording the positions and dimensions of anomalies with	As above for sediment disturbance, without reference to physical processes modelling.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
archaeological receptors)).				archaeological receptors, should they occur. Effects from decommissioning are likely to be similar or less than effects from construction.	archaeological potential and acquiring an image of each anomaly for future reference. Anomalies of medium and high potential will be established with AEZs and their locations recorded in the Outline WSI and PAD.	
Direct damage to deeply buried marine archaeology receptors (e.g. palaeolandscapes and associated archaeological receptors).	✓	✓	✓	As above for direct damage to buried marine archaeology receptors.	As above for direct damage, with reference to the preliminary ground model which presents the Quaternary stratigraphy of the Marine Archaeology Study Area.	As above for direct damage to marine archaeology receptors.
Alteration of sediment transport regimes	×	✓	×	The physical presence of Offshore Infrastructure foundations associated with the Proposed Development and any scour/cable protection may lead to localised changes in tide and wave	As above, with reference to Section 7: Physical Processes which will consider the extent of potential changes in the wave and tidal regime.	As above for sediment disturbance, with reference Physical processes modelling.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				climate. These changes could affect the distribution of sediment, which could then be directed towards or away from known archaeological receptors causing damage. The extent of these effects will be considered in Section 7: Physical Processes, subsequently informing any potential effects on archaeological receptors.		

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

19.8 Proposed Assessment Methodology

19.8.1 A Marine Archaeology Technical Report will be prepared to characterise the baseline conditions for the Proposed Development, which will inform the Marine Archaeology Chapter of the Offshore EIA Report. These documents will be prepared and submitted as part of the Offshore EIA Report, along with an Outline WSI and PAD to support the Offshore Application, this will be updated post-consent.

19.8.2 A geophysical survey has been undertaken to establish seabed conditions on and below the sea floor within a 1 km corridor of the Export Cable Corridor section of the Scoping Boundary, and therefore the data does not currently cover the entire area within the Scoping Boundary. Archaeological assessment of the site-specific geophysical data, combined with the desktop data from the entire Marine Archaeology Study Area will inform a detailed marine archaeology baseline and be presented in the Marine Archaeology Technical Report.

19.8.3 Specific to the marine archaeology, the following legislation and guidance documents will also be considered:

- Protection of Wrecks Act 1973 (UK Government, 1973);
- Ancient Monuments and Archaeological Areas Act 1979 (as amended) (UK Government, 1979);
- Protection of Military Remains Act 1986 (as amended) (UK Government, 1986);
- Merchant Shipping Act 1995 (UK Government, 1995);
- Marine (Scotland) Act 2010 (UK Government, 2010);
- MPS 2011 (UK Government, 2011);
- Scotland's National Marine Plan 2015 (Scottish Government, 2015a);
- Scottish Marine Regions Order 2015 (Scottish Government, 2015b);
- Designation Policy and Selection Guidance (HES, 2020a)
- Standard and guidance for historic environment desk-based assessment (Chartered Institute for Archaeologists, 2014a);
- Code of Conduct (Chartered Institute for Archaeologists, 2014b);
- COWRIE Historic Environment Guidance for the Offshore Renewable Energy Sector (Wessex Archaeology, 2007);
- Offshore Renewables PAD (TCE, 2014);
- Offshore Geotechnical Investigations and Historic Environment Analysis: Guidance for the Renewable Energy Sector (Gribble and Leather, 2011);
- Principles of Cultural Heritage Impact Assessment in the UK (IEMA, IHBC and CIfA, 2021);

- Environmental Archaeology, A Guide to the Theory and Practice of Methods, from Sampling and Recovery to Post-excavation (second edition) (Campbell, *et al*., 2011);
- Marine Geophysical Data Acquisition, Processing and Interpretation – guidance notes (English Heritage, now Historic England, 2013);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (Oxford Archaeology, 2008);
- Deposit Modelling and Archaeology – Guidance for Mapping Buried Deposits (Historic England, 2020);
- Archaeological Written Schemes of Investigation for OWF Projects (TCE, 2021); and
- Code of Practice for Seabed Development (The Joint Nautical Archaeology Policy Committee, 2006).

19.8.4 A Marine Archaeology Technical Report will be produced alongside the Offshore EIA Report. This will build upon the marine archaeology baseline summarised in Section 19.5 and include the results of the archaeological assessment of the site-specific geophysical survey data, which is not available prior to the submission of the Offshore Scoping Report. The Marine Archaeology Technical Report will also present a more comprehensive overview of relevant desktop data (including those outlined in Table 19.1). Marine archaeology receptors will be identified using the baseline presented within the Marine Archaeology Technical Report, which will be carried forward to the marine archaeology assessment in the Offshore EIA Report. The receptors identified will be assessed against the impacts presented in Table 19.4 for all stages of development (construction, O&M, and decommissioning phases). The impacts presented in Table 19.4 will be described in terms of magnitude of impact and correlated against the sensitivity of the marine archaeology receptors to produce an assessment of significance of effect for each receptor.

19.9 Potential Inter-Related Effects

19.9.1 The Offshore EIA Report will consider inter-related effects on Marine Archaeology which may arise from the construction, O&M and decommissioning phases of the Proposed Development in line with the approach outlined in Section 4: EIA Methodology, of this Offshore Scoping Report. It will include consideration of Proposed Developments lifetime effects and receptor-led effects. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) from the Proposed Development. This will ensure that the Proposed Development is appropriately considered as a whole within the inter-related effects assessment.

19.10 Potential Cumulative Effects

19.10.1 There is potential for cumulative effects to occur from other projects within the Marine Archaeology Study Area. The CEA will follow the approach outlined in Section 4: EIA Methodology and will be included in the marine archaeology section of the Offshore EIA Report.

19.10.2 Potential impacts to be assessed in the CEA will be as defined for the Proposed Development alone, as set out in Table 19.4. For the CEA, the Marine Archaeology Study Area will be used as a screening distance to identify relevant projects and activities.

19.11 Potential Transboundary Impacts

19.11.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon marine archaeology due to construction, O&M and decommissioning impacts of the Proposed Development.

19.12 Summary

19.12.1 The scoping exercise has identified some potential for submerged prehistoric archaeology within the Marine Archaeology Study Area, close to shore and in association with palaeolandscape features.

19.12.2 The scoping exercise has identified 13 live records of wrecks or possible wreck sites within the Marine Archaeology Study Area. One of these 13 sites, HMS *Repro* (UKHO 70430), was sunk while in active service with the Royal Navy. It is important to note that HMS *Repro* is within the Scoping Boundary rather than the wider Marine Archaeology Study Area. Although not automatically protected under the auspices of the Protection of Military Remains Act 1986 (as amended), an active duty loss, HMS *Repro* may qualify for designation under this legislation. The other 12 records represent wreck material on the seabed. Archaeological assessment of the site-specific survey data will provide further information on these and assess the archaeological potential of all identified anomalies.

19.12.3 Potential impacts that may arise from the Proposed Development include:

- sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors;
- direct damage to maritime archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaeolandscapes and associated archaeological receptors);
- direct damage to deeply buried marine archaeology receptors (e.g. palaeolandscapes and associated archaeological receptors); and

- alteration of sediment transport regimes.

19.12.4 A Marine Archaeology Technical Report will include a detailed desktop review of marine archaeology within the Marine Archaeology Study Area, as well as an archaeological assessment of site-specific geophysical data. This Technical Report will establish the archaeological baseline for the Proposed Development and will inform the assessment of significant effects that will be presented in the Marine Archaeology section of the Offshore EIA Report and will include a robust mitigation strategy, including the development and implementation of AEZs and an Outline WSI and PAD, to ensure the protection of the marine archaeology resource within the Marine Archaeology Study Area.

20 Seascape, Landscape and Visual Impact

20.1 Introduction

20.1.1 This section of the Offshore Scoping Report identifies the seascape, landscape and visual resources of relevance to the Proposed Development and considered the potential impacts which may arise from the construction, O&M and decommissioning of the Proposed Development up to MHWS. It also sets out the proposed methodology for the assessment.

20.1.2 The purpose of the Seascape, Landscape and Visual Impact Assessment (SLVIA) is to identify and determine, in a transparent way, the likely significant environmental effects that the Proposed Development may have on the Seascape Character, Landscape Character or Visual receptors within an identified study area.

20.2 Seascape, Landscape and Visual Impact Assessment Study Area

20.2.1 The SLVIA Study Area (Figure 20.1) comprises of a 60 km buffer surrounding the Array Area. The 60 km study area has been selected in accordance with NatureScot guidance (2017).

20.2.2 A Preliminary Zone of Theoretical Visibility (ZTV) has been prepared (Figure 20.2) to a 60 km radius from the boundary of the Array Area to ensure that all seascape, coastal landscapes and visual receptors that may experience significant effects are identified. Further detail in relation to the theoretical visibility of turbines is provided on Figure 20.3 to Figure 20.5 inclusive.

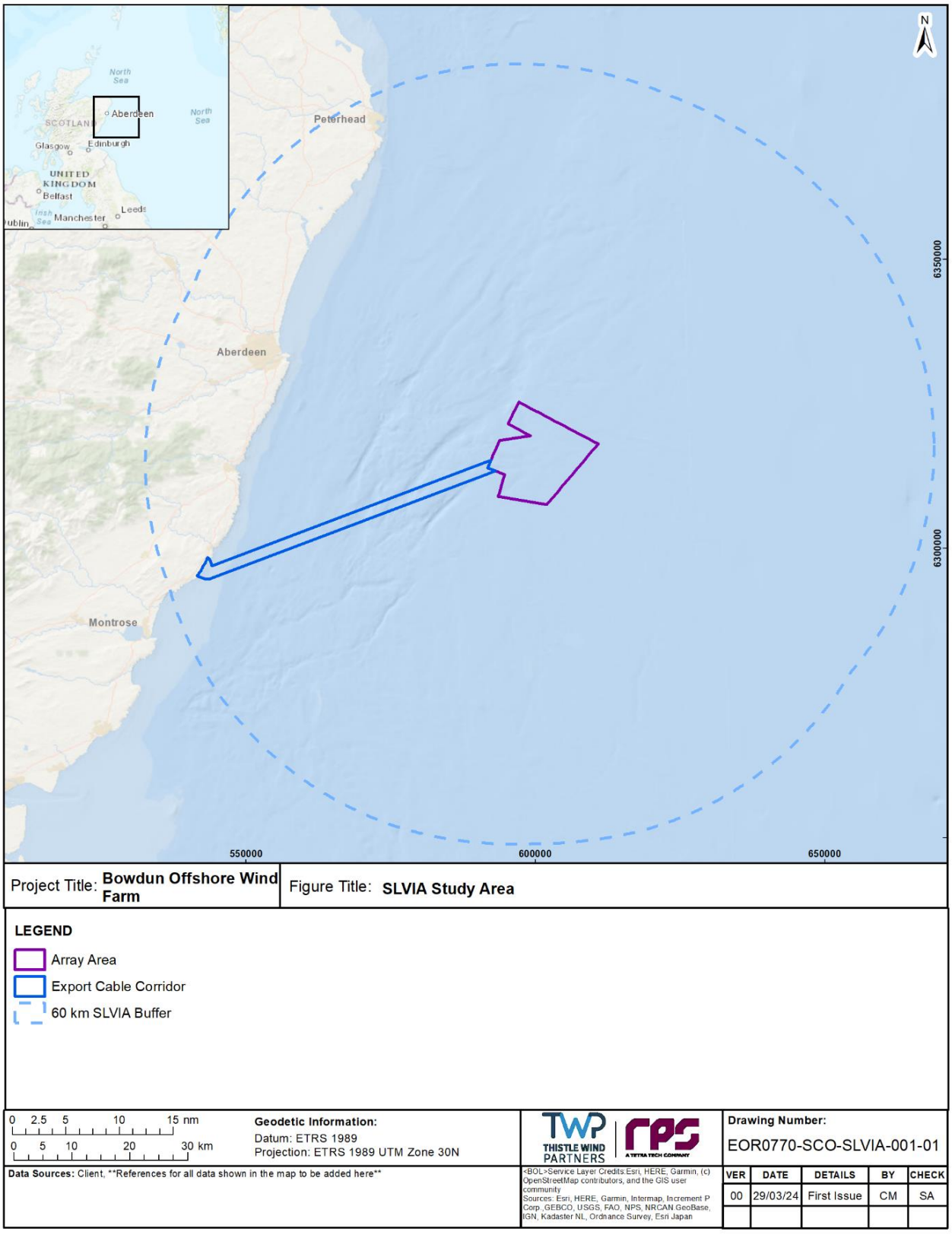


Figure 20.1: SLVIA Study Area

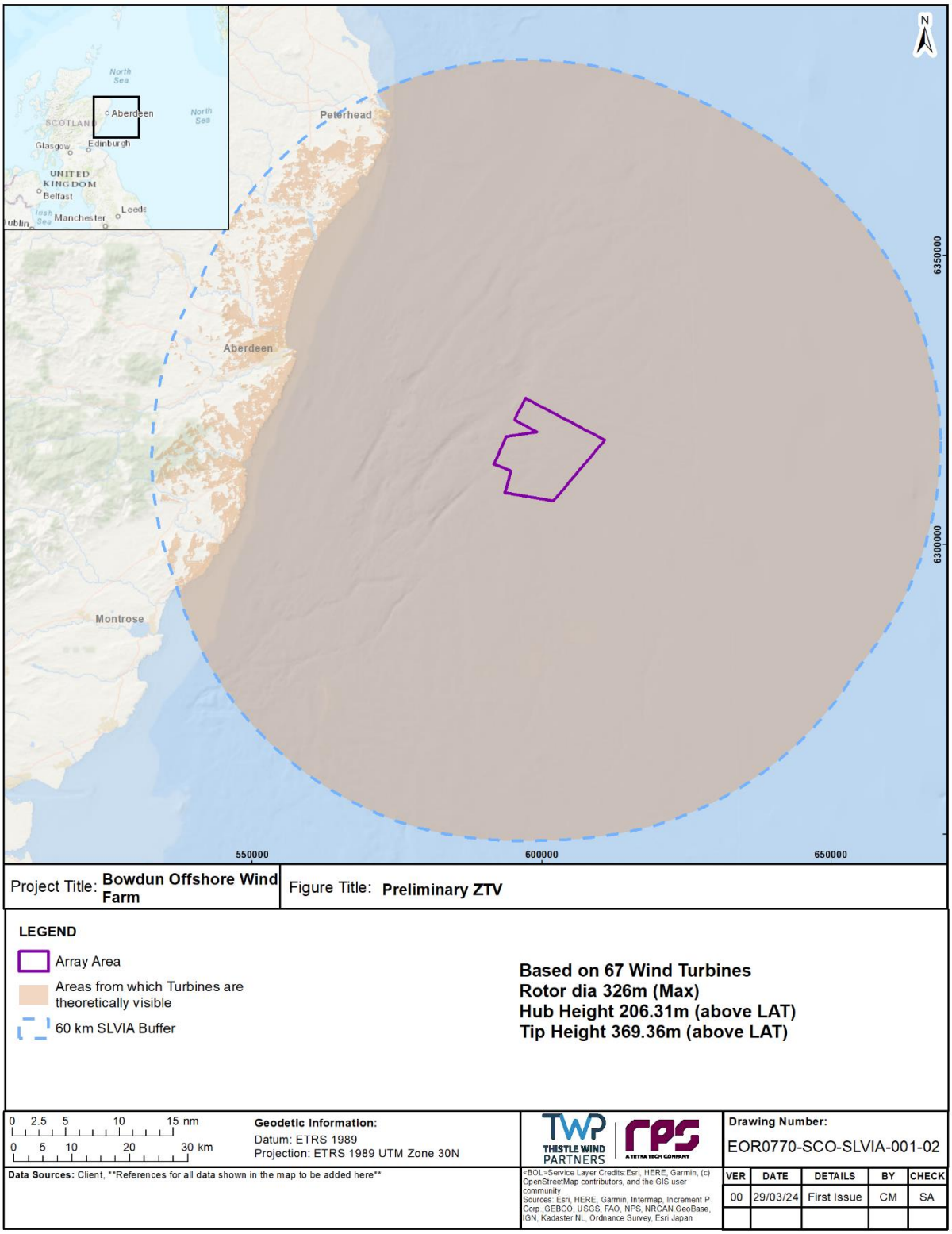


Figure 20.2: Preliminary ZTV

20.3 Data Sources

20.3.1 A detailed SLVIA desktop study will be completed to identify sites of seascape, landscape and visual importance within the SLVIA Study Area identified in Section 20.2.

20.3.2 Potential sources of desktop study data are listed in Table 20.1.

Table 20.1: Summary of Key Desktop Datasets and Materials

Title	Source	Year	Author
National Coastal Character Map	NatureScot	2018	NatureScot (formerly Scottish Natural Heritage (SNH))
Coastal Character Assessment	NatureScot	2023	NatureScot (formerly SNH)
ALDP 2023	Aberdeenshire Council	2023	Aberdeenshire Council
Aberdeen Local Development Plan 2023	Aberdeen City Council	2023	Aberdeen City Council
Number 80 Aberdeen Landscape Character Assessment	SNH	1996	Aberdeen City Council and NatureScot (formerly SNH)
Ferry Routes – Orkney and Shetland	Northlink Ferries	2024	Northlink Ferries

Planning Policy and Legislation

20.3.3 Relevant policy and legislation will be taken into account for the SLVIA including:

- The European Landscape Convention (Natural England, 2006);
- The Environment Strategy for Scotland (Scottish Government, 2020d);
- NPF4 (Scottish Government, 2023);
- Scottish Government, Guidance for applicants on using the design envelope for applications under Section 36 of the Electricity Act 1989 (Scottish Government, 2022d); and
- ALDP 2023 (Aberdeenshire Council, 2023).

20.4 Baseline Environment

20.4.1 A preliminary appraisal of the existing baseline seascape, landscape and visual conditions associated with the Proposed Development has been undertaken and will be progressed further as the design process associated with the Proposed Development continues. This has been done by providing an overview of the seascape character, landscape character and visual context within which the Proposed Development sits, or which lies immediately adjacent to the Proposed Development.

20.4.2 At this stage, the Project Description is indicative, and a PDE approach is outlined in Section 3: Project Description, to allow sufficient flexibility to accommodate future project refinement.

20.4.3 The following forms a summary of the data collated, and work undertaken to date.

- review of National Coastal Character;
- review of National Landscape Character Types (LCTs);
- review of Local LCTs;
- review of Designated Areas; and
- preparation of preliminary ZTV.

20.4.4 A preliminary appraisal of the existing baseline within the SLVIA Study Area has been undertaken and is presented below.

Landscape and Coastal Character

20.4.5 Seascape and landscape resources within the SLVIA Study Area may be affected by either construction, O&M or decommissioning activities.

National Coastal Character

20.4.6 At a national scale, the SLVIA Study Area coincides with two of the 13 Scottish coastal character types that occur in 33 indicative National Seascape Character Areas. Type 2: Rocky Coastline/Open Sea Views and Type 3: Deposition Coastline, Open Views, are relevant to the seascape, landscape and visual resources impact assessment.

National Landscape Character

20.4.7 LCTs are areas of consistent and recognisable landscape character. NatureScot's landscape character map (NatureScot, 2019) and associated LCT descriptions indicate that the SLVIA Study Area coincides with the following LCT's (Figure 20.3 and Figure 20.4):

- LCT 0: Urban;
- LCT 2: Cliffs and Rocky Coast – Aberdeen;
- LCT 4: River Valley – Aberdeen;

- LCT 5: Low Hills – Aberdeen;
- LCT 6: Undulating Open Farmland;
- LCT 7: Undulating Wooden Farmland – Aberdeen;
- LCT 8: Urban and Farmland;
- LCT 9: Wooded Estates – Aberdeen;
- LCT 11: Fragmented Rocky Coast;
- LCT 12: Beaches, Dunes, and Links – Aberdeenshire;
- LCT 17: Coastal Agriculture Plain – Aberdeenshire;
- LCT 24: Coastal Farmed Ridges and Hills – Aberdeenshire;
- LCT 26: Wooded Estates – Aberdeenshire;
- LCT 27: Farmed Moorland Edge – Aberdeenshire;
- LCT 29: Summits and Plateaux – Aberdeenshire; and
- LCT 31: Broad Wooded and Farmed Valley.

Local Landscape Character

20.4.8 The Aberdeen Local Development Plan (2023) contains, as supplementary guidance, a Landscape Character Assessment.

20.4.9 The Landscape Character Assessment that accompanied the Aberdeen Local Development Plan identifies nine LCTs and 28 Landscape Character Areas (LCAs) in Aberdeen and review of the preliminary ZTV indicates that all LCT's and LCA's defined in the supplementary guidance are located within the SLVIA Study Area.

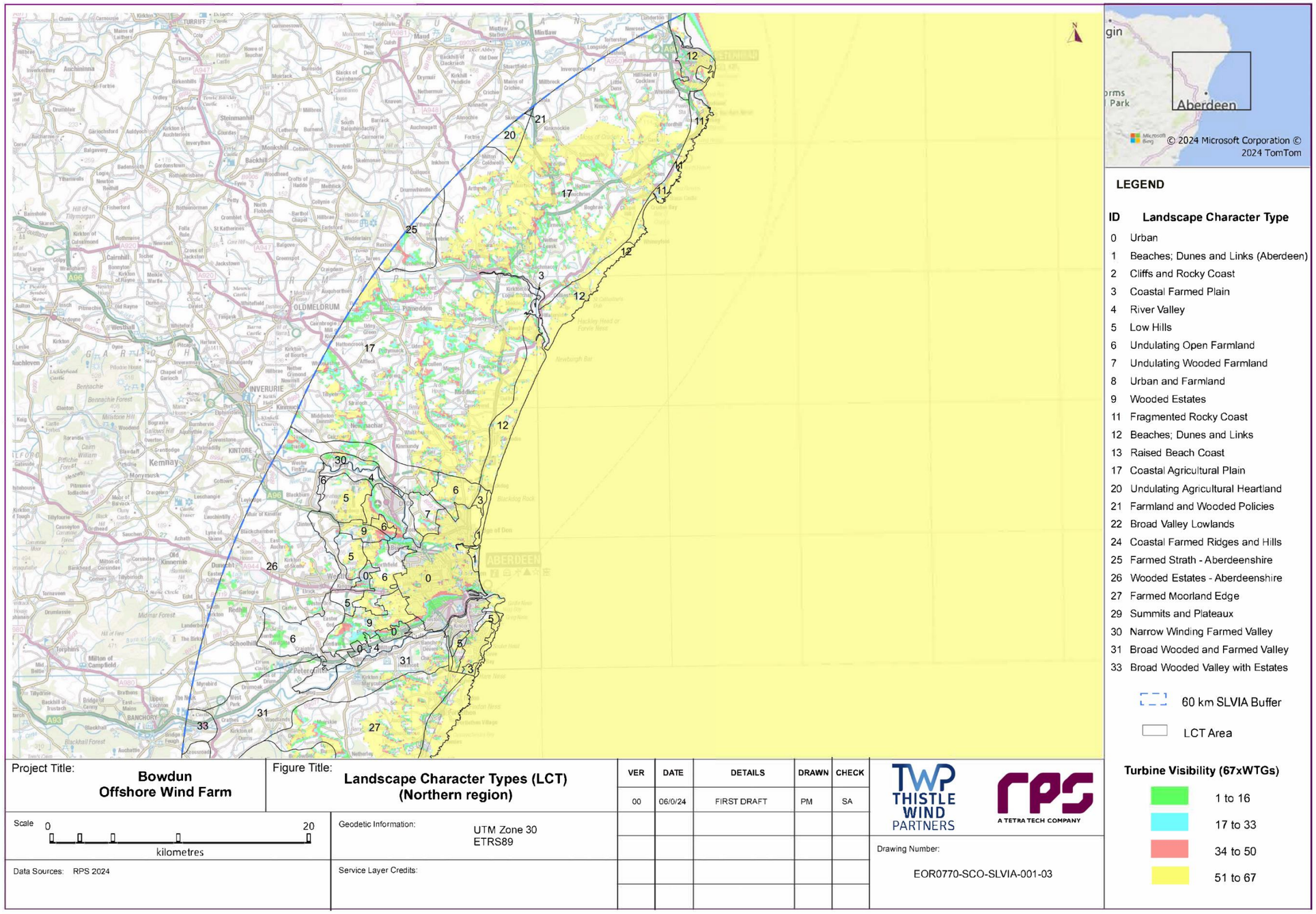


Figure 20.3: Landscape Character Types (Northern Region)

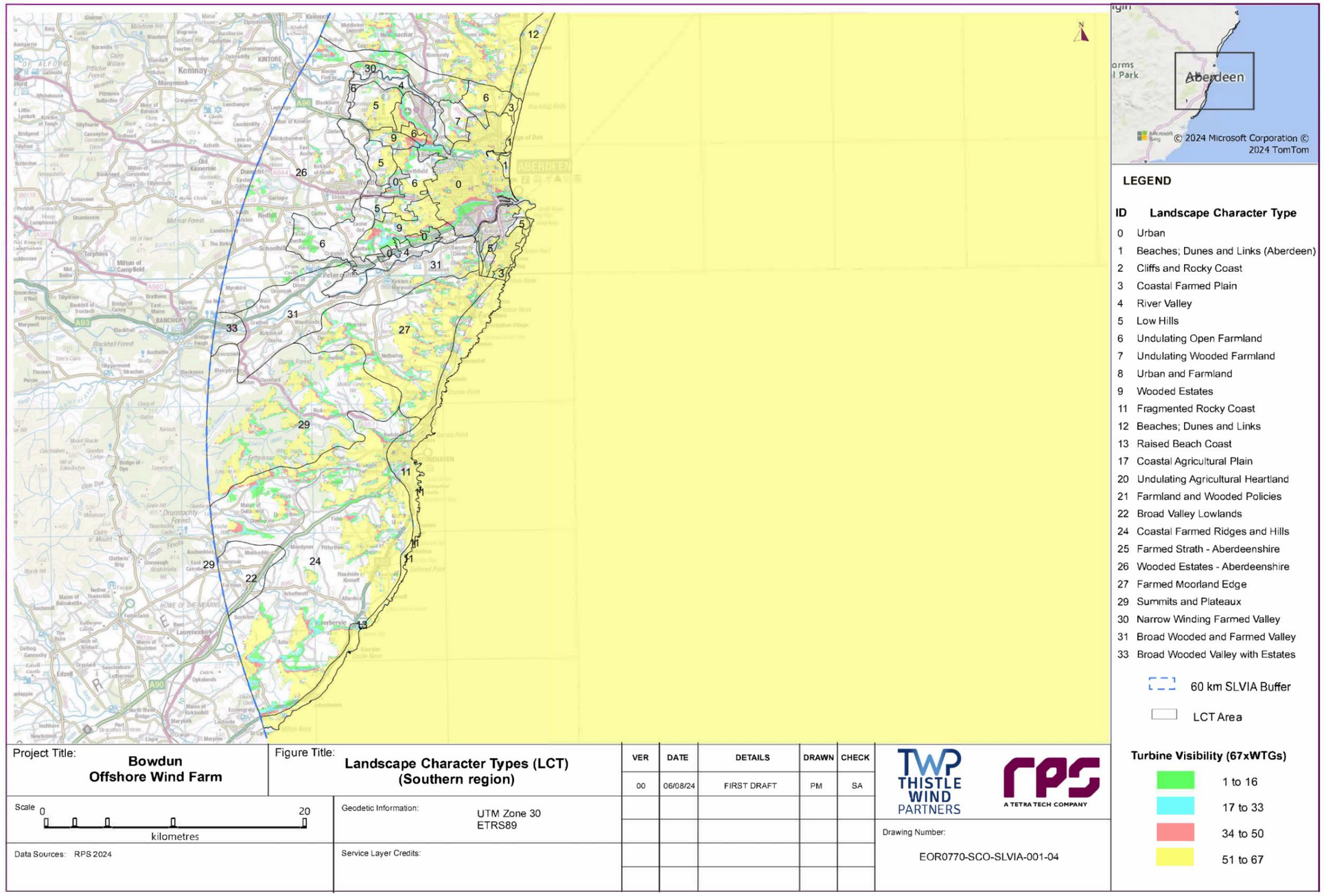


Figure 20.4: Landscape Character Types (Southern Region)

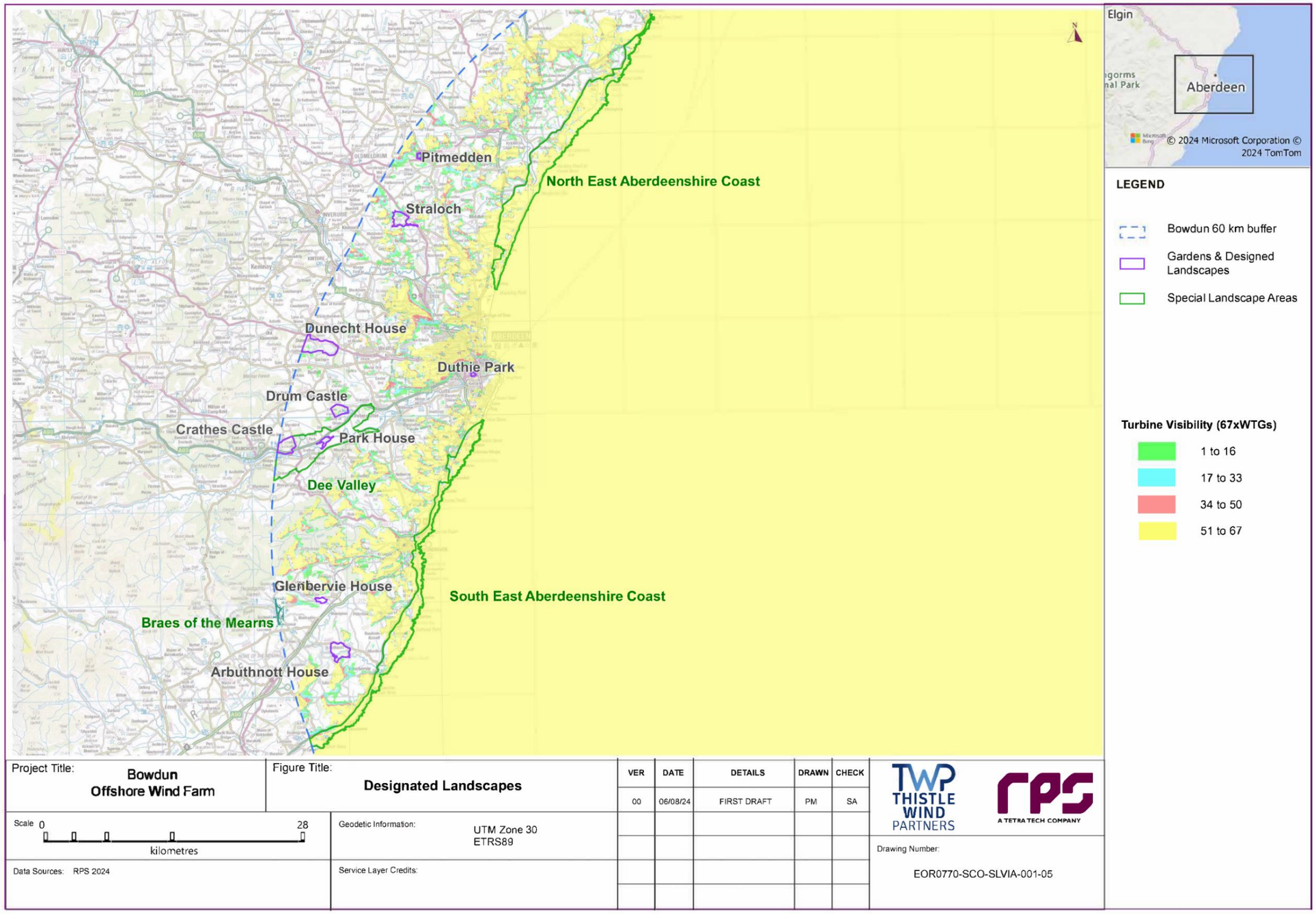


Figure 20.5: Landscape Designations

Designated Areas

20.4.10 There are designated areas within Aberdeenshire, including Gardens and Designed Landscapes and Special Landscape Areas.

Special Landscape Areas

20.4.11 Special Landscape Areas (SLAs) are a local landscape designation placed on an area that exhibits particular qualities and characteristics within them that are valued locally. SLAs complement the National Scenic Area designation, which identifies those landscapes that are seen as nationally important owing to their unsurpassed scenery.

20.4.12 Aberdeenshire's landscape is characterised by a unique mix of coast, farmland, moorland, forest, woodlands and river valleys. Within this broad pattern of landscape character, there are very important variations in local landscape character and quality. Individual glens, rivers, hills, lowland valleys, lochs and settlements have strong, distinctive, and important relationships with neighbouring landscapes and areas.

20.4.13 A review of the preliminary ZTV has indicated that the following Special Landscape Areas are located within the SLVIA Study Area (Figure 20.5):

- North Aberdeenshire Coast; and
- South-East Aberdeenshire Coast.

Gardens and Designed Landscapes

20.4.14 A review of the preliminary ZTV has indicated that due to the fragmented and variable nature of the theoretical visibility the following identified Gardens and Designed Landscapes are predicted to experience no visibility of the Proposed Development (Figure 20.5);

- Drum Castle;
- Park House;
- Crathes Castle;
- Glenbervie House;
- Duthie Park; and
- Arbuthnott House.

20.4.15 The Gardens and Designed Landscapes that are predicted to experience visibility of the Proposed Development include;

- Pitmedden;
- Stralochl; and
- Dunecht House.

20.4.16 However, a review of the preliminary ZTV against the boundary of these Gardens and Designed Landscapes (Figure 20.6) indicates that

very minor portions of the identified sites are predicted to experience theoretical visibility of the Proposed Development. However, this is considered not to be significant in the context of these sites and as such impacts on Gardens and Designed Landscapes are not considered further.

20.5 Embedded Mitigation

20.5.1 The following embedded, standard mitigation is relevant to seascape, landscape, and visual impact. The embedded, standard mitigation will evolve over the development process as the Proposed Development progresses:

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of, and adherence to, a DSLP.
- Colouration of the Wind Turbines and blades will be to industry standard which reduces visibility of the Wind Turbines.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

20.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

20.6 Potential Proposed Development Impacts

20.6.1 A range of potential impacts on seascape, landscape and visual resources have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development. For the purposes of the Offshore Scoping Report, those arising as a result of the decommissioning phases of the Proposed Development have been considered to be equivalent to or of a lesser impact than the construction phase.

20.6.2 For potential visual impacts arising as a consequence of the Proposed Development on land-based receptors, a range of publicly accessible viewpoints will be utilised to illustrate the existing (baseline) and proposed views of the Proposed Development. Land-based receptors within the coastal landscape with potential to have views of the Proposed Development are considered to include:

- Recreational receptors:
  - walkers, equestrians and cyclists using the public rights of way networks;
  - users of beaches, public open space and common land;
  - tourists and visitors using facilities such as hotels and cafes within settlements;
  - tourists and visitors at coastal caravan and camping sites; and

    - tourists and visitors at attractions and points of interest.
- Residential receptors:
    - people at their places of work.
- Transient receptors:
    - occupiers of vehicles travelling on local and national road networks.

20.6.3 For potential visual impacts arising as a consequence of the Proposed Development on water-based receptors, wireline imagery of the Proposed Development will be utilised to illustrate proposed views from;

- passengers and workers on board commercial ferries or cruise liners;
- people at their place of work on passing cargo, tanker or other commercial vessels;
- people at their place of work on manned static oil and gas platforms or travelling to the platforms; and
- people at their place of work on commercial fishing vessels.

20.6.4 As the layout of the Proposed Development has not been finalised, the following suggested viewpoints, identified in Table 20.2, are provided for discussion purposes and will be refined following production of the Proposed Development ZTV mapping. Viewpoint locations illustrated on Figure 20.6 have been selected to illustrate potential views from both land-based and water-based receptors and final locations to be used within the SLVIA are to be agreed as part of the EIA consultation.

Table 20.2: Preliminary Viewpoint Locations

Viewpoint Nr.	Location	Receptors
01	Buchan Ness	Recreational, Tourist, Residential
02	Slains Castle	Recreational, Tourist
03	Cruden Bay	Residential, Recreational
04	Whinnyfold	Residential, Outdoor workers, Recreational
05	Collieston	Recreational, Tourist, Residential
06	Newburgh (Car Park)	Recreational, Tourist, Outdoor workers,
07	Balmedie (Beach Access)	Recreational, Tourist
08	Aberdeen – Orkney Ferry Link	Recreational, Tourist, Passengers/Workers on Ferry
09	Royal Aberdeen Golf Course (GC)	Outdoor workers, Recreational, Tourist
09a	Royal Aberdeen GC (Car Park)	Outdoor workers, Recreational, Tourist
10	Broad Hill, Aberdeen	Recreational, Tourist, Outdoor workers
11	Torry Battery	Recreational, Tourist, Outdoor workers
12	Girdle Ness Lighthouse	Recreational, Tourist
13	Baron's Cairn	Recreational, Tourist, Workers at their place of work
14	Portlethen	Recreational, Tourist, Residential
15	Muchalls	Residential
16	A92 Parking Bay	Transient receptors on A92
17	Stonehaven Pier	Recreational, Tourist, Residential
18	Stonehaven Memorial	Recreational, Tourist
19	Bervie Bay	Outdoor workers, Recreational
20	Ellon/A90	Transient receptors on A90

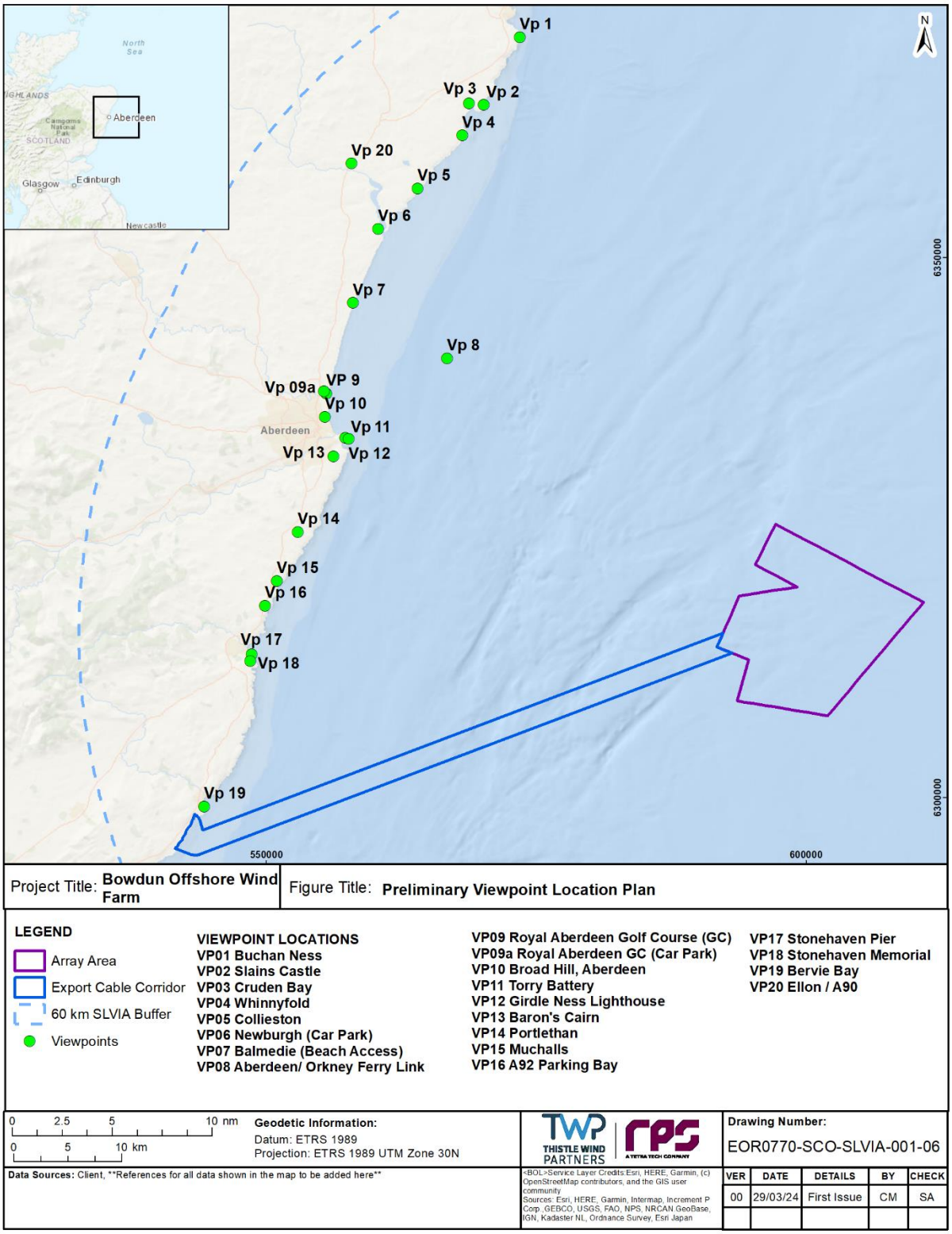


Figure 20.6: Preliminary Viewpoint Location Plan

20.6.5 The impacts that have been scoped into the assessment are outlined in Table 20.3 with a description of any additional data collection (i.e. site-specific surveys) and supporting analyses (i.e. modelling) that will be required to enable a full assessment of the impacts.

20.6.6 Based on the currently available baseline seascape, landscape and visual resource information and the Project Description (Section 3: Project Description), a number of impacts are proposed to be scoped out of the assessment. These scoped-out impacts are outlined with a justification in Table 20.4.

Table 20.3: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Seascape, Landscape and Visual Resources

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Export Cable Corridor and Landfall Area– impacts on Seascape, Landscape and Visual resources	✓	×	✓	Visual impacts arising as a consequence of specialised vessels being present in views during construction activities associated with the Export Cable Corridor. Landscape and Seascape impacts associated with works associated with the connection of the Offshore Export Cable to the Onshore Export Cable at the Landfall Area. Landscape, Seascape and visual impacts arising as a consequence of the presence of the Landfall Area construction compound and Landfall Area construction machinery and related activities.	Aberdeenshire Council, Aberdeen City Council, NatureScot and National Coasteering Charter Seascape and Landscape Character Assessments. Project specific site-based landscape analysis. Site based visual analysis.	SLVIA to be undertaken in accordance with current guidance (Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3). Assessments to be based on MDS layout.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Offshore Wind Turbines and OSP – impacts on Seascape, Landscape and Visual resources	✓	✓	✓	Seascape, Landscape and Visual impacts arising due to the presence of specialised vessels for construction activities associated with the construction of Wind Turbines. Seascape, Landscape and Visual impacts arising as a consequence of the presence of specialised vessels for construction activities associated with the OSPs. Visual impacts arising as a consequence of Wind Turbines and other structures under partial and full construction during construction and decommissioning phases. Seascape, Landscape and visual impacts of Wind Turbines and OSPs within open sea views. Visual impacts arsing as a consequence of introduction of new structures into views. Seascape and Visual impacts arising as a consequence of	Aberdeenshire Council, Aberdeen City Council, NatureScot and National Coasteering Charter Seascape and Landscape Character Assessments. Project specific site-based landscape analysis. Site based visual analysis.	SLVIA to be undertaken in accordance with current guidance (GLVIA 3). Seascape and Landscape impact assessments to be based on MDS layout. Visual Impact assessment to include baseline imagery from land-based receptor locations with montages produced for the operational phase. Visual Impact assessment to include baseline wirelines and proposed wirelines from water-based receptors.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				movements to and from the Offshore Infrastructure during the O&M phase.		

*Proposed Development Phase refers to construction (C), O&M (O) and decommissioning (D)

Table 20.4: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Seascape, Landscape and Visual Resources

Impact	Justification
Construction	
Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the Array Area.	Lighting associated with the Array Area construction activities are highly unlikely to be visible/perceptible due to distance. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
O&M	
Long-term night-time impacts on coastal landscape character and visual amenity.	Aviation warning lights and navigation lights mounted on Wind Turbines are highly unlikely to be visible/perceptible due to distance. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
Decommissioning	
Temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the Array Area.	Lighting associated with the Array Area decommissioning activities is highly unlikely to be visible/perceptible due to distance. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.

20.7 Proposed Assessment Methodology

Approach to Assessment

20.7.1 The methodology and approach to the SLVIA assessment will be carried out in accordance with best practise guidance described in the following documents:

- GLVIA 3, published by the Landscape Institute and IEMA (2013);
- Landscape Institute Technical Guidance Note 06/19: Visual Representation of Development Proposals (Landscape Institute, 2019);
- Guidance: Assessing the Cumulative Effects of Wind Farms (SNH, 2012a);
- Natural England and DEFRA Guidance Landscape and Seascape Character Assessments (DEFRA, 2014);
- Offshore Renewables – Guidance on Assessing the Impact on Coastal Landscape and Seascape (SNH, 2012b);
- Scottish Seascape in relation to Wind farms (SNH, 2005); and
- Visual Representation of Wind Farms: Guidance, Version 2.2, published (NatureScot, 2017).

20.7.2 Specific to the SLVIA assessment the following will be considered:

- the baseline stage will evaluate the sensitivity or nature of receptors through the analysis of their susceptibility to change as a result of the Proposed Development;
- the nature or magnitude of impact on receptors will be evaluated using current best practice guidance; and
- significance of effect will be assessed through a combination of sensitivity/susceptibility and magnitude to establish which are significant. Professional judgement informed by best practice guidance and consultation will be used to determine significance.

20.7.3 GLVIA 3 recommends that an SLVIA '*concentrates on principles and process*' and *'does not provide a detailed or formulaic 'recipe'' to assess effects, it being the 'responsibility of the professional to ensure that the approach and methodology adopted are appropriate to the task in hand*' (The Landscape Institute and IEMA, 2013).

20.7.4 The effects on the seascape and landscape resources and visual receptors will be assessed by considering the proposed changes in baseline conditions (the impact of the Proposed Development) against the type of seascape resource, landscape resource of visual receptor (including the importance and sensitivity of that resource or receptor). These factors are determined through a combination of quantitative (objective) and qualitative (subjective) assessment using professional judgement. The assessment methodology is summarised in Figure 20.7.

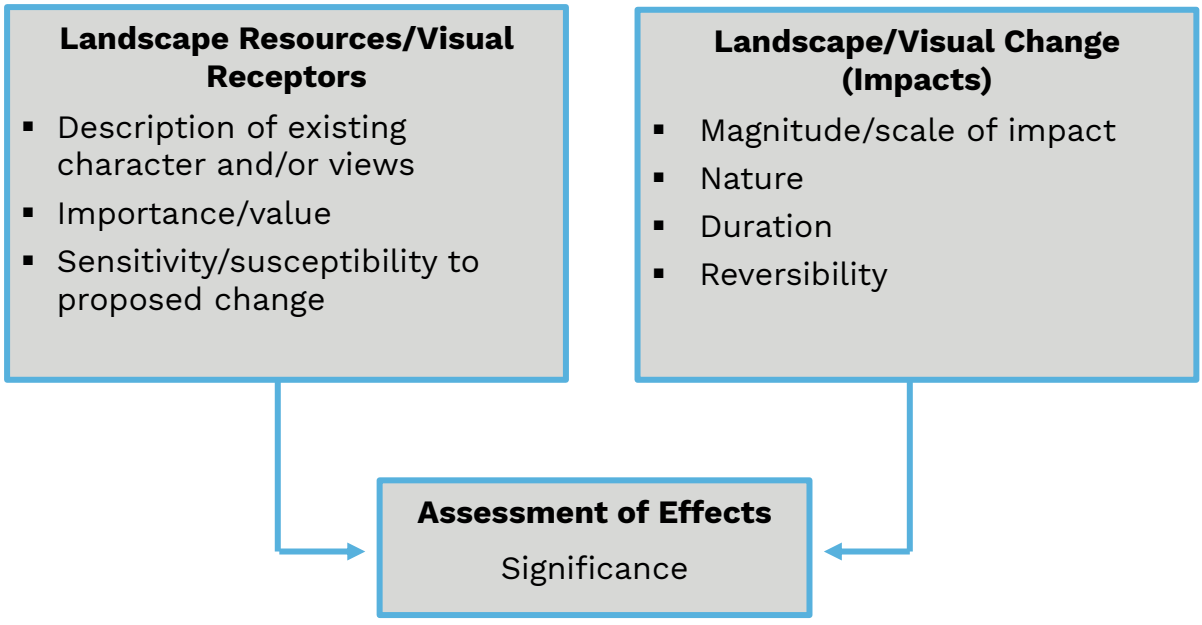


Figure 20.7: Assessment Methodology Summary

20.7.5 The likely significant seascape, landscape and visual effects will be described covering type (e.g. direct, indirect or cumulative), temporal nature (short, medium and long term, permanent or temporary), and valency (beneficial and adverse). For the purposes of this assessment, effects will be defined based on the scenario of an individual who may perceive the Proposed Development as an adverse addition to the seascape or view. Effects will therefore be defined as adverse within the Offshore EIA Report; but may in fact be seen as beneficial by large numbers of viewers. An individual who perceives OWFs as a beneficial addition to the seascape or view may consider the same effects to be beneficial or neutral in nature.

20.7.6 The capacity of the seascape and or landscape to accept change of the type proposed by the Proposed Development will be assessed by reviewing the sensitivity of each seascape and landscape character area identified from the Scottish LCTs Map and accompanying information, produced by NatureScot. Overall key landscape components are normally landform, vegetation, historical and built form components. Landform relates to topography, drainage characteristics and geology. Historical and cultural components include historic landscapes, listed buildings, conservation areas and historic designed landscapes. Vegetation plays an important role in how the landscape and visual resources of an area are viewed and is an integral component of landscape character.

20.8 Potential Inter-Related Effects

20.8.1 The Offshore EIA Report will consider inter-related effects on seascape, landscape, and visual resources which may arise from the construction, O&M, and decommissioning of the Proposed Development. Inter-related effects refer to the effects arising from the Proposed Development either across the development phases (Proposed Development lifetime) or different effects on one receptor in one phase (receptor led). The Offshore EIA Report will consider inter-related effects of impacts from all three phases of the Proposed Development. Inter-related effects will be assessed through consideration of all effects upon a receptor (including both spatial and temporal overlap) with the Proposed Development. This will ensure that the Proposed Development is appropriately considered, as a whole, within the inter-related effects assessment. There are potential inter-relationships with other topics, for example:

- Section 14: Shipping and Navigation; and
- Section 15: Aviation and Radar.

20.9 Potential Cumulative Effects

20.9.1 There is potential for cumulative effects to occur with other operational, consented or planned, projects and activities within the SLVIA Study Area.

20.9.2 The assessment of cumulative effects on seascape, landscape and visual resources will be undertaken in accordance with guidance within the SNH (2012) document: Assessing the Cumulative Effects of Wind Farms. Cumulative effects occur when a combination of two or more developments influence the perception of seascape/landscape character. Cumulative visual effects occur in several ways, either arising when developments are visible in combination or succession from a particular viewpoint or appearing sequentially as multiple developments when moving through the landscape. Cumulative effects can also develop through a gradual change in perception over time. In establishing the baseline conditions, the seascape, landscape, visual resources, and cultural heritage setting impact assessment would take account of the presence of other operational or consented coastal and offshore developments.

20.10 Potential Transboundary Impacts

20.10.1 A screening of transboundary impacts associated with the Proposed Development has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon seascape, landscape, and visual resources due to construction, O&M, and decommissioning impacts of the Proposed Development.

20.11 Summary

20.11.1 The scoping exercise has determined the potential for Seascape, Landscape and Visual effects arising from the Proposed Development during the construction, O&M, and decommissioning phases. As such, a SLVIA Chapter will be presented in the Offshore EIA Report.

20.11.2 The SLVIA will follow industry-standard guidelines with accompanying graphics being produced from selected locations as an aid to the visual assessment and to accurately represent the Proposed Development at various stages. As an aid to the assessment, wirelines will be provided for identified ferry links to Orkney and Shetland.

20.11.3 Following a preliminary review of the SLVIA Study Area against the preliminary ZTV, it is considered that there is the potential for impacts to occur on two National Coastal Character areas, 16 LCTs and 2 Special Landscape Areas. A review of the ZTV against identified

Gardens and Designed Landscapes within the SLVIA Study Area has concluded that there are no significant impacts predicted to occur to any of the Gardens and Designed Landscapes.

20.11.4 In relation to visual impacts a range of potential receptors within the SLVIA Study Area have been identified, with 20 viewpoint locations suggested for consideration and agreement.

20.11.5 In relation to inter-related effects, it is concluded that there is the potential inter-relationship with Shipping and Navigation and Aviation and Radar.

20.11.6 The assessment of cumulative effects arising because of the Proposed Development in combination with other operational, consented or planned projects of a similar nature and scale will be undertaken in accordance with guidance produced by NatureScot.

20.11.7 In relation to transboundary impacts, it is concluded that there is no potential for transboundary impacts upon seascape, landscape and visual resources.

21 Cultural Heritage

21.1 Introduction

21.1.1 This section of the Offshore Scoping Report identifies the onshore cultural heritage assets potentially of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development. Such impacts may occur as a result of visual change in the setting of heritage assets that in turn affects their cultural significance. As discussed in Table 21.5 below, there is no potential for significant effects to arise in relation to the Offshore Export Cables and this section therefore focuses on the Offshore Generation Assets, which will be located within the Array Area.

21.2 Cultural Heritage Study Area

21.2.1 The Array Area is located approximately 38 km to the east of the Aberdeenshire coast (Figure 21.1), at the closest point of the Scoping Boundary.

21.2.2 There is no specific guidance on appropriate study areas for Cultural Heritage Impact Assessment (CHIA). As the potential impacts of the Proposed Development upon onshore heritage assets stem from visual change in their setting, the Cultural Heritage Study Area is based on that developed for the Section 20: Seascape and Visual Impact Assessment. The SLVIA Study Area extends 60 km from the Array Area and it is considered that seascape, landscape and visual receptors beyond this distance are unlikely to experience significant effects.

21.2.3 Similarly, cultural heritage receptors at distances greater than 60 km from the Array Area are unlikely to experience significant effects. The Wind Turbines and OSPs will appear very small and recessive in the wider seascape and will often be obscured from view by atmospheric conditions resulting in negligible potential for visual change in their setting to adversely affect their cultural significance. As such, there is negligible potential for significant effects to occur outside the Cultural Heritage Study Area. Planning Advice Note 1/2013: Environmental Impact Assessment (Scottish Government, 2013) directs that the EIA process should focus on significant environmental effects and consequently, 60 km represents an appropriate outer limit to the Cultural Heritage Study Area.

21.2.4 Appendix 1 of the EIA Handbook (HES and NatureScot, 2018) stresses that study areas should be applied with discretion, as their rigid application may lead to an unwieldy assessment that does not focus on the significant effects. Consequently, it is proposed that the CHIA should cover only those assets where it is considered there is

potential for a significant effect rather than undertaking a disproportionate, all-encompassing assessment.

21.3 Data Sources

21.3.1 The cultural heritage baseline study will draw upon the data sources listed in Table 21.1.

Table 21.1: Summary of Key Desktop Datasets and Materials

Source	Type of Data
HES data portal	Spatial data for designated heritage assets.
HES designated heritage asset descriptions	Physical descriptions and Statement of Cultural Significance.
Readily available published sources	Peer-reviewed and similar publications providing background information.

21.3.2 As far as reasonably practicable, desk-based research will be augmented and verified through visits to receptors and the surrounding area to gather baseline setting data.

21.4 Baseline Environment

21.4.1 This section provides a brief summary of the baseline environment as relevant to the current CHIA. In keeping with the weight given to the preservation of designated heritage assets' setting by NPF4 (Scottish Government, 2023) and industry standard practice, it considers only designated heritage assets in particular those that are of international and national importance:

- World Heritage Sites (WHS);
- Scheduled Monuments;
- Category A Listed Buildings;
- Inventory Gardens and Designed Landscapes; and
- Inventory Battlefields.

21.4.2 The Cultural Heritage Study Area takes in the coast and hinterland of Aberdeenshire. There is plentiful evidence of human activity of all periods in this area. However, relatively intensive agricultural use has resulted in visible evidence of prehistoric activity being restricted to substantial ritual sites such as stone circles and burial cairns, with prehistoric settlement largely only surviving as buried archaeology. Scattered along the coastline are a series of Medieval castles occupying naturally defensible promontories and Post-Medieval settlements that largely developed in response to the growth of the fishing industry in the 19th century, but which also include manufacturing elements such as flax mills. Also present along the

coast are remnants of the anti-invasion defences erected in the early part of World War 2. Away from the coast, the historic settlement pattern is more scattered and agricultural in character.

21.4.3 There is a large number of designated heritage assets in the Cultural Heritage Study Area. However, these are for the most part located in urban or built-up locations, in particular Aberdeen and Peterhead, or along the valleys that run inland and consequently have minimal visual relationships with the seascape. Designated heritage assets within the Cultural Heritage Study Area are enumerated in Table 21.2 and shown on Figure 21.1.

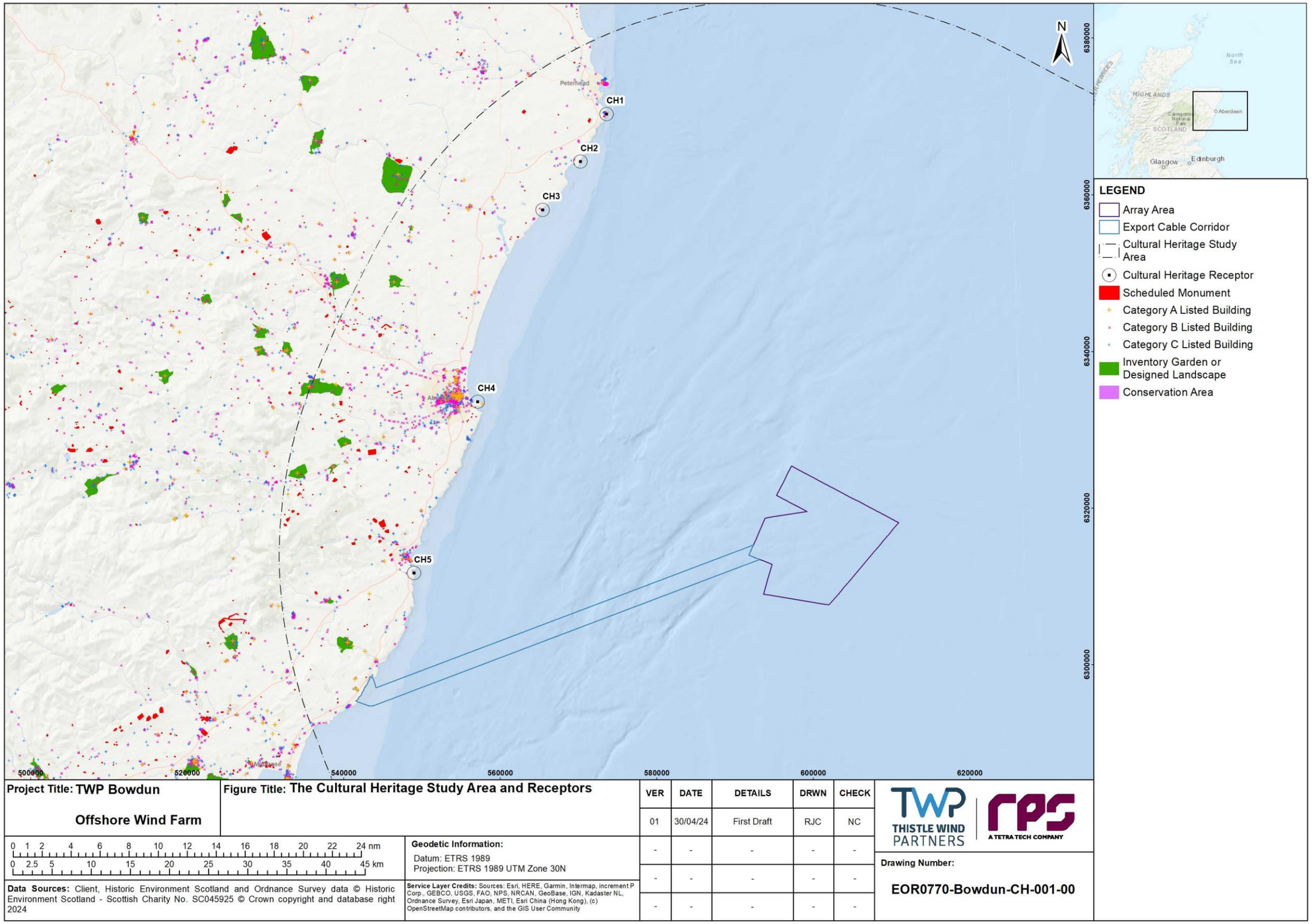


Figure 21.1: Cultural Heritage Study Area and Receptors

Table 21.2: Summary of Designated Heritage Assets by Distance within the Cultural Heritage Study Area

Distance from Array Area (km)	Designated Heritage Assets
0 to 10	None
10 to 20	None
20 to 30	None
30 to 40	Scheduled Monuments: 8 Category A Listed Buildings: 1 Category B Listed Buildings: 1 Category C Listed Buildings: 30 Conservation Areas: 1
40 to 50	Scheduled Monuments: 60 Category A Listed Buildings: 109 Category B Listed Buildings: 1318 Category C Listed Buildings: 918 Inventory Gardens and Designed Landscapes: 1 Conservation Areas: 15
50 to 60	Scheduled Monuments: 114 Category A Listed Buildings: 38 Category B Listed Buildings: 315 Category C Listed Buildings: 457 Inventory Gardens and Designed Landscapes: 8 Conservation Areas: 10

21.4.4 Given that impact is determined with reference to cultural significance, simple intervisibility and visual change in a heritage asset's setting cannot be equated directly with an adverse impact; in most instances where the Proposed Development will be visible from heritage assets or otherwise appear in their setting this will represent a neutral change, as the heritage asset's significance does not draw substantively upon a visual or historic relationship with the seascape. Given this and the very large number of designated heritage assets present within the Cultural Heritage Study Area, assessment of all assets where change in setting will occur, would be disproportionate.

21.4.5 Cultural heritage assets have therefore been identified as receptors where there is a known visual relationship with the sea that contributes substantively to their cultural significance and where change as a result of the Proposed Development might result in significant effects. The identified receptors span a range of periods and locations. All are classed as nationally important based on their designation, with the exception of New Slains Castle. This is a

Category B Listed Building and is consequently considered to be of regional importance but has associations of national importance. The identified receptors are summarised in Table 21.3.

Table 21.3: Nationally Important Designated Heritage Assets Considered as Potential Receptors

Reference	Asset and Status	Description and Relationship	Distance from Array Area (km)
CH1 (LB16367)	Buchan Ness Lighthouse Category A Listed Building	Lighthouse designed by Robert Stevenson and built 1824/7. Located on a promontory, the distinctive lighthouse is seen from the shore against the backdrop of the North Sea. These views contribute to its aesthetic appreciation and an understanding of its function.	50
CH2 (LB52471)	New Slains Castle Category B Listed Building	Castle/house, first built around 1597 with later additions and alterations, extensively remodelled in the 19th century. The building has strong associations with Bram Stoker, appearing in his novels and probably providing inspiration for elements of Dracula's castle. Sited on a promontory overlooking the sea. The dramatic ruins of the building are seen against the backdrop of the sea when approaching contributing to their aesthetic appreciation and the sense of place, which is closely tied to the building's associative characteristics.	45
CH3 (SM3250)	Slains Castle Scheduled Monument	Remains of a tower-house and associated earthworks, probably of later Medieval date. Sited on a promontory the remains are seen against the backdrop of the sea when approaching. These views contribute to the aesthetic appreciation of the monument and an understanding of its functional relationship with its surroundings	45

Reference	Asset and Status	Description and Relationship	Distance from Array Area (km)
CH4 (SM9215 & LB20078)	Torry Battery (Scheduled Monument) & Girdleness Lighthouse (Category A Listed Building)	Lighthouse designed by Robert Stevenson and built 1830. The nearby battery was built 1857/61 in response to fears of a French invasion. The visual relationship between the two assets, with the lighthouse being seen against the backdrop of the sea in views from the battery, contributes to an understanding of their function and their aesthetic appreciation.	40
CH5 (SM986)	Dunnottar Castle Scheduled Monument	Medieval castle spectacularly sited on a craggy promontory. Views out to sea from the castle and views of the castle against the backdrop of the sea contribute greatly to its aesthetic appreciation and an understanding of its function.	44

21.5 Embedded Mitigation

21.5.1 The Embedded Mitigation will evolve over the development process as the Proposed Development progresses. Embedded Mitigation in respect of Cultural Heritage may include:

- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- 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, whilst reducing visibility of lighting from cultural heritage receptors.
- Colouration of the Wind Turbines and blades will be to industry standard which reduces visibility of the Wind Turbines.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

21.5.2 The requirement for and feasibility of any mitigation will be consulted upon with statutory consultees throughout the EIA process.

21.6 Potential Proposed Development Impacts

21.6.1 A range of potential impacts on cultural heritage assets have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development.

21.6.2 Potential impacts scoped out of the assessment are presented in Table 21.5, with the rationale and justification explained.

Table 21.4: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Cultural Heritage

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Impacts (daytime) of the O&M of the offshore elements of the Proposed Development upon the identified cultural heritage receptors	×	✓	×	Limited potential for significant effects in respect of potential receptors resulting from disruption of visual relationships. Such impacts would be long term and reversible.	Analysis of the cultural significance and setting of the identified receptors drawing upon HES data, published sources and site surveys.	A detailed assessment of the potential effects will be undertaken for the identified receptors. This will be informed by the baseline study, ZTV analysis and wireframe/photomontage visualisations.

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 21.5: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Cultural Heritage

Impact	Justification
Construction phase impacts relating to setting.	Impacts relating specifically to the construction phase will be localised, transitory and temporary, ceasing at the end of the construction phase. There is therefore no potential for them to be significant.
O&M phase impacts relating to the setting of nationally important cultural heritage assets within the Cultural Heritage Study Area not identified as cultural heritage receptors	Whilst the Proposed Development will result in change in the setting of such assets, it is considered that this is not likely to result in significant effects owing to their characteristics and the contribution of setting to their cultural significance. In keeping with the approach espoused in the EIA Handbook (HES and NatureScot, 2018), it is proposed to scope these out, to allow the assessment to focus on likely significant effects.
O&M phase impacts relating to the setting of cultural heritage assets of less than national importance (Category B and C Listed Buildings and Conservation Areas) within the Cultural Heritage Study Area	Given the distance of the Array Area from such assets, significant effects are only likely to occur where the receptor is of the highest sensitivity (i.e. of national or international importance). There is therefore no potential for significant effects to occur in respect of assets of less than national importance.
O&M phase impacts relating to the setting of cultural heritage assets outside the Cultural Heritage Study Area	Potential visibility falls rapidly outside the Cultural Heritage Study Area and any visible change will be at a distance of over 60 km. Cultural heritage assets are very rarely sensitive such distant change, and any such change has no potential to result in a significant effect.
O&M phase impacts relating to the offshore export cables.	The Offshore Export Cables will be submerged and hence have no potential to affect the setting of cultural heritage assets. Maintenance of the Offshore Export Cables may entail occasional short-term change in the setting of heritage assets, primarily in the form of vessels being visible. It is not considered that this has the potential to affect the cultural significance of heritage assets.

Impact	Justification
O&M phase impacts (night-time) relating to the identified cultural heritage receptors.	Aviation warning lights and navigation lights mounted on Wind Turbines are highly unlikely to be visible/perceptible due to distance. Therefore, it is proposed that this impact is scoped out of further consideration within the Offshore EIA Report.
Decommissioning phase impacts relating to the setting of onshore cultural heritage assets	Impacts relating specifically to the decommissioning phase will be transitory and short-lived. There is therefore no potential for them to be significant.

21.7 Proposed Assessment Methodology

21.7.1 The CHIA will follow the methodology set out in Section 4: EIA Methodology. Specific to the CHIA, the following guidance documents will also be considered:

- Standard and Guidance for Historic Environment Desk-Based Assessment (Chartered Institute for Archaeologists, 2020);
- Historic Environment Guidance for the Offshore Renewable Energy Sector (COWRIE, 2007);
- Guidance for Assessment of Cumulative Impacts on the Historic Environment from Offshore Renewable Energy (COWRIE, 2008);
- EIA Handbook (HES and NatureScot, 2018);
- Historic Environment Circular 1 (HES, 2019a);
- Historic Environment Policy for Scotland (HES, 2019b); and
- Managing Change in the Historic Environment: Setting (HES, 2020b).

21.7.2 In accordance with the approach outlined in the EIA Handbook (HES and NatureScot, 2018) and Managing Change in the Historic Environment: Setting (HES, 2020b) the CHIA will consider magnitude in terms of change in the cultural significance of the affected heritage asset and sensitivity in terms of importance. It involves the following stages:

- Stage 1: identify the historic assets that might be affected by the Proposed Development;
- Stage 2: define and analyse the setting by establishing how the surroundings contribute to the ways in which the historic asset or place is understood, appreciated and experienced; and
- Stage 3: evaluate the potential impact of the proposed changes on the setting, and the extent to which any adverse impacts can be mitigated.

21.7.3 This scoping exercise, which is a qualitative assessment, represents Stage 1.

21.7.4 The assessment will be supported by appropriate visualisations. The locations of the viewpoints for these will be agreed with consultees. Key Consultees comprise HES and Aberdeen City Council and Aberdeenshire Council.

21.8 Potential Inter-Related Effects

21.8.1 Across the Proposed Development's lifetime, the effects on cultural heritage receptors are not anticipated to interact in such a way as to result in combined effects of greater significance than the assessments presented for each individual phase or when considered in conjunction with other topics addressed in the Offshore EIA Report.

21.9 Potential Cumulative Effects

21.9.1 Cumulative effects may arise as a result of the Proposed Development being seen in combination with other OWFs off the Aberdeenshire coast. Where the Proposed Development results in an adverse impact, this may result in greater impact magnitude and hence a greater cumulative effect. Cumulative effects will therefore be considered where adverse effects have been identified in respect of the Proposed Development alone.

21.10 Potential Transboundary Impacts

21.10.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts upon cultural heritage due to construction, O&M, and decommissioning impacts of the Proposed Development.

21.11 Summary

21.11.1 The cultural heritage section of the Offshore EIA Report will consider the likely significant environmental effects of the Proposed Development upon onshore cultural heritage assets within 60 km of the Array Area. It is considered that there is only potential for significant effects to occur during the O&M phase and that this potential relates only to the Offshore Generation Assets. These will be theoretically visible from a large number of heritage assets resulting in distant change in their setting. However, in most cases such change is likely to be neutral. A number of heritage assets have been identified as receptors where there is potential for the Proposed Development to affect their cultural significance and potentially result in a significant effect. The assessment will be undertaken in accordance with relevant guidance, informed by the results of site visits and supported by appropriate visualisations.

21.11.2 It is proposed that construction and decommissioning effects be scoped out of the assessment as such effects will be relatively localised, transitory and temporary.

22 Climate Change

22.1 Introduction

22.1.1 This section of the Offshore Scoping Report identifies the climate change receptors of relevance to the Proposed Development and considers the potential impacts arising from the construction, O&M and decommissioning of the Proposed Development.

22.1.2 With consideration of the EIA Guide to Assessing GHG Emissions and Evaluating their Significance (IEMA, 2022) and the EIA Guide to Climate Change Resilience & Adaptation (IEMA, 2020a), the following aspects of climate change are relevant to the assessment:

- GHG Emissions Assessment: The emission of GHGs contributing to climate change, including GHG emissions arising from the construction, O&M and decommissioning phases of the Proposed Development and potential subsequent disturbance of blue carbon systems; and
- Climate Change Resilience: The potential risks to the Proposed Development arising from a changing climate and its vulnerability to climate change.

22.2 Climate Change Study Area

22.2.1 GHG emissions have a global effect rather than directly affecting any specific local receptor. The assessment on climate change will therefore focus on the impact of GHG emissions on the global climate and be considered in the context of UK Government projections consistent with national carbon budget commitments. This will be expressed in the form of the atmospheric concentration of the relevant GHGs, expressed in Carbon Dioxide Equivalents (CO_2e). Relevant GHGs included in CO_2e typically consists of mostly carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O), as well as other GHGs.

22.2.2 GHG emissions will be assessed on a life-cycle basis for activities required for the construction, O&M and decommissioning phases of the Proposed Development. Pre-construction emissions, including emissions from pre-construction surveys, will also be considered in the assessment although these are expected to be negligible compared to emissions from other phases of the Proposed Development. This will consider GHG emissions caused directly and indirectly from sources at a variety of locations, including the onsite activities and the associated supply chain.

22.2.3 The cumulative effects of the Proposed Development will also be considered. As the Proposed Development is expected to generate renewable electricity with a connection to the National Grid, avoided or 'saved' baseline GHG emissions will be considered to account for

energy generated from the Proposed Development and its effects, in comparison to alternative grid-connected electricity generators.

22.2.4 The assessment of Climate Resilience will consider activities associated with O&M and decommissioning phases and not construction phase due to the short duration (indicative five years) (additional information can be found in Table 22.3). The Climate Change Resilience Study Area will use the Scoping Boundary (Figure 1.1, Section 1: Introduction). The assessment will consider potential climate change hazards which may impact on infrastructure and activities required for the delivery of the Proposed Development. There is overlap in the intertidal area between the Proposed Development and onshore elements of the Project, and where relevant, onshore studies may be utilised to inform the assessment.

22.2.5 The Climate Change Study Area therefore consists of two different boundaries: a boundary for the assessment of GHG emissions which is set out in Section 22.7 and a geographical boundary for the assessment of Climate Change Resilience using the Scoping Boundary (and is hereinafter referred to as the Climate Change Resilience Study Area).

22.3 Data Sources

22.3.1 The data sources used to inform the baseline assessment will primarily comprise of actual data (such as material quantities and fuel consumption) and published material that is publicly available online. No baseline surveys will be required to support the climate change assessment. Where a date or edition has been specified, this is the current edition but the latest version available at the time of assessment will be used. These data sources are summarised in Table 22.1.

Table 22.1: Climate Change Baseline Data Sources

Title	Source	Reference
Climate Change Committee (CCC) – Progress Report to Parliament (2023)	CCC	CCC (2023)
Digest of UK Energy Statistics (DUKES)	DESNZ and BEIS	DESNZ and BEIS (2023)
Published Environmental Product Declarations (the outputs of Lifecycle Analysis studies – Life Cycle Assessments)	Various (where available)	Various (where available)
Valuation of Energy Use and GHG: Supplementary guidance to the HM Treasury Green Book and supporting data tables	DESNZ	DESNZ (2023b)
UK GHG Conversion Factors (2023)	DESNZ	DESNZ (2023c)
National Grid Future Energy Scenarios (2023)	National Grid ESO	National Grid ESO (2023)
Met Office UKCP18 Marine Report	Palmer *et al.*	Palmer *et al.* (2018)
UK's third Climate Change Risk Assessment (CCRA3) (2021)	CCC	CCC (2021)
Offshore Energy SEA	DESNZ, BEIS and Offshore Petroleum Regulator for Environment and Decommissioning (OPRED)	DESNZ, BEIS and OPRED (2023)

22.4 Baseline Environment

22.4.1 The current baseline environment for the GHG assessment relates to the current location of the Proposed Developments and its contribution towards global atmospheric concentration of GHG emissions. When considering the direct emissions from the site, a review of existing blue carbon systems and seabed conditions affected by the Project will be undertaken. In addition, the purpose of the Project is to reduce the GHG intensity associated with the UK National Grid. As such, the current UK electricity grid baseline, which is the carbon intensity of the grid-average electricity generation without the Project, shall be considered.

22.4.2 The current baseline for climate resilience are the current climatic conditions informed by the Met Office metrological records for the Climate Change Resilience Study Area.

Future Baseline Conditions

22.4.3 The future baseline GHG emissions for blue carbon systems and the seabed, in the absence of the Proposed Development, would be expected to remain similar to the existing conditions.

22.4.4 The future UK electricity grid baseline will also be considered using projected future energy scenarios. However, there is much uncertainty around future UK electricity grid trajectories owing to shifting political drivers and the pace of technological innovations.

22.4.5 The future baseline for climate resilience will be informed by climate projections from Climate Change Risk Assessment (CCRA3) (CCC, 2022) and the Met Office UKCP18 (Palmer *et al.*, 2018) probabilistic projections covering the Scoping Boundary. It is expected that climate projections will follow a similar trend to that of the rest of Scotland and the UK which shows hotter and drier summers with wetter and warmer winters.

22.5 Embedded Mitigation

22.5.1 The following Embedded Mitigation is relevant to climate change. The Embedded Mitigation will evolve over the development process as the EIA progresses.

- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS.
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- All vessels working on the Proposed Development will meet the required certification standards and carriage requirements along with following international marine regulations.
- Some of the components required for construction are likely to be fabricated at UK manufacturing sites, reducing potential carbon emissions from the transportation of materials compared to if procured overseas.
- Additionally, Offshore Infrastructure is typically designed to be resilient to climate risks such as storms and waves with factors of safety incorporated into the design.
- Drafting and implementation of a decommissioning programme.

22.5.2 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees throughout the EIA process.

22.6 Potential Proposed Development Impacts

22.6.1 A range of potential impacts related to climate change have been identified which may occur during the construction, O&M and decommissioning phases of the Proposed Development.

22.6.2 The impacts that have been scoped into the assessment are outlined in Table 22.2 together with a description of any additional data collection (i.e. material quantities) and supporting analyses (i.e. assessment of climate risks and adaptation) that will be required to enable a full assessment of the impacts. Data collection and summary of approach applies to the construction, O&M and decommissioning phases for GHG emissions and the O&M and decommission phases for climate change resilience.

22.6.3 Potential impacts scoped out of the assessment are presented in Table 22.3 with justification.

Table 22.2: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Climate Change

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
The impact of GHG emissions arising from the construction and installation of the Proposed Development.	✓	×	×	GHG emissions arising from the construction and installation of the Proposed Development would contribute to the lifecycle total and net GHG balance of the Proposed Development.	The baseline for blue carbon systems will use publicly available data on organic and inorganic carbon stored within sediments located in the Scoping Boundary. While there are no other existing OWF developments within the Scoping Boundary, there are telecommunication cables and power cables within the Scoping Boundary, identified through publicly available information, which would characterise the current land use and be considered within the baseline environment as these may have disturbed carbon storage within	The assessment will take into account the IEMA EIA Guide to Assessing GHG Emissions and Evaluating Their Significance (IEMA, 2022) or any updates to this guidance. It will be undertaken on a lifecycle basis, calculating the GHG emissions associated with the construction, operation and decommissioning of the Proposed Development (where suitable information is available in relation to the decommissioning phase). The assessment will include an embodied carbon assessment of the Proposed Development.
The impact of GHG emissions arising from the consumption of materials and activities required to facilitate the O&M phase and the impact of avoided emissions associated with the estimated abatement of UK Grid emissions due to the Proposed Development.	×	✓	×	GHG emissions arising from the consumption of materials and activities required to facilitate the O&M phase would contribute to the lifecycle total and net GHG balance of the Proposed Development. Exporting renewable energy to the grid during the Proposed Development's operational phase is anticipated to have a net benefit compared to the future baseline for energy generation.		

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
The impact of GHG emissions arising from the disturbance of blue carbon systems and seabed change, including benthic and subtidal/intertidal ecology, during the construction, O&M and decommissioning phases.	✓	✓	✓	GHG emissions arising from the disturbance of blue carbon systems during the construction, O&M and decommissioning phases will be considered as part of the overall GHG impact of the Proposed Development. This includes the potential for installation activities to disrupt marine carbon store habitats and cause seabed change.	ocean sediments and vegetation, such as through clearance.	Calculations will be informed by actual data where available. If unavailable, published carbon intensity benchmarks will be used together with Environmental Product Declarations.
The impact of GHG emissions arising from decommissioning works (e.g. plant/equipment, fuel and vessel use) and the recovery (or disposal) of materials.	×	×	✓	GHG emissions arising from decommissioning works (e.g. plant/equipment, fuel and vessel use) and the recovery (or disposal) of materials would contribute to the lifecycle total and net GHG balance of the Proposed Development.		

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Climate resilience of the Proposed Development.	×	✓	✓	With consideration of the Proposed Development's location, potential climate risks may include sea level rise, waves and storms. Although offshore assets are designed to be resilient to storm events with factors of safety incorporated into the design, the effects of climate change are projected to increase over time and so the risks posed by climate change to the Proposed Development will be assessed. Other potential risks include increased cooling demand for equipment and machinery due to rising average global temperature. As the climate is projected to change significantly in the future by the decommissioning phase compared to the	The future baseline environment will consider the Scoping Boundary based on the Met Office UKCP18 marine report (Palmer *et al.*, 2018), which considers future trends in sea level rise, waves and storms.	The section will include the assessment of climate risks and adaptation. This will consider the potential climatic conditions for the operational life of the Proposed Development. A high-level assessment of potential risks will be presented, which will inform potential resilience measures to be considered in detailed design. The assessment will take into account the IEMA EIA Guide to Climate Change Resilience and Adaptation (IEMA, 2020a) or any updates to this guidance.

Impact	Proposed Development Phase*			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				baseline, there may be climate risks such as overheating of equipment and machinery and increased frequency of extreme weather events that may disrupt decommissioning activities.		

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

Table 22.3: Impacts Proposed to Be Scoped Out of the Proposed Development Assessment for Climate Change

Impact	Justification
Climate resilience of the Proposed Development - construction	The Proposed Development is unlikely to experience significant changes in climate during construction compared to the current baseline due to the short duration (indicative five years construction period). Additionally, as construction is anticipated to begin soon (within the next 5-10 years) for operation of the Proposed Development by the 2030s, climate conditions during construction will be similar to the current baseline. The Applicant's contractors will employ good construction and health and safety practices with respect to risks such as heatstroke or storm events offshore.
In-Combination Climate Impact (ICCI)	ICCI will be addressed individually within relevant topic Offshore EIA Report sections. This may include technical topics such as physical processes and benthic ecology, with other technical topics included where authors deem ICCI relevant to their respective topics. Each relevant topic section will consider how potential climatic changes may affect topic-specific future baselines, including the sensitivity or resilience of receptors.

22.7 Proposed Assessment Methodology

22.7.1 The climate change assessment will consider the following guidance documents:

- IEMA EIA Guide to Assessing GHG Emissions and Evaluating their Significance (IEMA, 2022); and
- EIA Guide to Climate Change Resilience & Adaptation (IEMA, 2020a).

GHG Emissions Assessment

22.7.2 The assessment on GHG emissions will be undertaken on a lifecycle basis, calculating the GHG emissions associated with the construction, O&M and decommissioning of the Proposed Development.

22.7.3 The sensitive receptor will be defined as the global atmospheric concentration of GHGs and it will be characterised as having a 'high' sensitivity, given the severe consequences of climate change and cumulative contributions of other sources. GHG emissions have a global effect rather than directly affecting specific local receptors to which levels of sensitivity can be assigned. The global atmospheric concentration of the relevant GHGs, expressed in CO_2e, will therefore be treated as a single receptor of high sensitivity, given the severe consequences of climate change.

22.7.4 GHG emissions contribute to the effect of climate change. Assessment guidance from IEMA (2022) describes five levels of significance for emissions resulting from a development, each based on how the Proposed Development contributes towards achieving net zero and 1.5°C-aligned reduction trajectory. To aid in considering whether effects are significant, the guidance recommends that GHG emissions should be contextualised against pre-determined carbon budgets, or policy and performance standards where a budget is not available. It is a matter of professional judgement to integrate these sources of evidence and evaluate them in the context of significance.

22.7.5 The main sources of GHG emissions arising from the construction, O&M and decommissioning phases of the Proposed Development would be:

- Embodied carbon associated with materials used for construction and maintenance of the Proposed Development. As such, a detailed embodied carbon assessment will be undertaken;
- Fuel/energy use in vessels and machinery for the construction, O&M and decommissioning of the Proposed Development; and
- GHG emissions arising from potential disturbance of blue carbon systems and seabed change including benthic and subtidal/intertidal ecology.

22.7.6 GHG emissions generated by the Proposed Development will be expressed as tonnes (t)CO_2e. The assessment will use the 100-year global warming potential values for non-CO_2 GHGs from the Intergovernmental Panels on Climate Change (IPCCs) Sixth Assessment Working Group 1 Report (IPCC, 2021) or as otherwise defined in literature sources.

22.7.7 For the construction and O&M phases, actual data will be used (e.g. material quantities, fuel consumption etc.) from detailed design information associated with the construction and installation of the Proposed Development.

22.7.8 Where actual data from detailed design information is unavailable, published carbon intensity benchmark values will be used for project-specific materials estimates, together with published Environmental Product Declarations concerning Life Cycle Assessment research into embodied carbon.

22.7.9 The assessment will consider avoided or 'saved' GHG emissions which reflects the reduction in GHG emissions as a result of the Proposed Development during the operational phase. This will be assessed based on the carbon intensity of the alternative grid average and marginal generation source that is displaced (i.e. the generator that would be supplying the grid in the absence of the Proposed Development).

22.7.10 For the decommissioning phase, actual data will be used (such as material quantities) from recycling and recovery activities. Where material quantities information is unavailable, published Environmental Product Declarations concerning Life Cycle Assessment research into embodied carbon associated with recycling and recovery will be used.

22.7.11 The IEMA (2022) guidance states that a development's GHG impacts should be contextualised, for example, on a sectoral basis, compared to the UK's national carbon budget or compared to policy requirements and performance standards, to determine whether a project's carbon footprint will support or undermine a 1.5°C compatible trajectory towards net zero.

22.7.12 It is considered that the significance of the Proposed Development's GHG emissions can be contextualised in the following ways:

- with reference to the absolute magnitude of net GHG emissions as a percentage of applicable carbon budgets at the UK and Scotland scale;
- through considering any increase/reduction in absolute GHG emissions and GHG intensity compared with baseline scenarios, including projections for future changes in those baselines; and
- with reference to whether the Proposed Development contributes to and is in line with the UK's national carbon budget goals, and existing or emerging policy that supports GHG emissions reduction consistent with science-based commitments to limit climate change to an internationally agreed level.

Climate Change Resilience

22.7.13 The section will include the assessment of climate risks and resilience with the methodology approach informed by the IEMA (2020a) guidance. This will consider potential future climatic conditions based on climate projections from the Met Office UKCP18 marine report (Palmer *et al.,* 2018), which describes possible future trends in waves and storms across the operational lifetime of the Proposed Development. A high-level assessment of the vulnerability of the Proposed Development from potential future climate risks will be presented and will inform potential resilience measures to be considered in detailed design.

22.7.14 To support the assessment of ICCI, as recommended in IEMA (2020a), the future climate trends will also be provided to relevant EIA topic authors to ensure that climatic changes can be considered, where relevant, for the topic-specific future baselines, including the sensitivity or resilience of identified receptors. The approach on the assessment of ICCI is described in Section 22.8.

22.8 Potential Inter-Related Effects

22.8.1 ICCI has been scoped out of the climate change section but will be considered individually within the relevant topic sections of the Offshore EIA Report, such as physical processes and benthic ecology, with other technical topics included where authors deem ICCI relevant to their respective topics. Climate projections data will be provided to relevant Offshore EIA Report topic authors to assess how climate change may affect the topic-specific future baselines, including the sensitivity or resilience of identified receptors.

22.9 Potential Cumulative Effects

22.9.1 In general, all developments which emit GHGs have the potential to affect the atmospheric mass of GHGs as a receptor, and so may have a cumulative effect on climate change. IEMA (2022) states that GHG emissions from specific cumulative projects should not be individually assessed but requires assessment of effect resulting from the whole Project. Therefore, accounting for the Proposed Development and the Onshore Transmission Assets would ensure a whole Life Cycle Assessment with regards to GHG emissions and subsequent effects. This will include consideration of:

- GHG emissions from the Proposed Development and Onshore Transmission Assets; and
- Overall net GHG emissions for the lifetime of the Proposed Development when considered together with the Onshore Transmission Assets.

22.9.2 Cumulative effects from Climate Change Resilience are not considered as this is specific to the Proposed Development and will not result in impacts to neighbouring developments.

22.10 Potential Transboundary Impacts

22.10.1 The Proposed Development is considered to have the potential to impact the atmospheric mass of GHGs, which is defined as a high sensitivity receptor, and so this may have a transboundary impact on climate change. Countries have their own defined carbon budgets and international commitments which inform their carbon and climate change policies and targets. These policies and targets are intended to limit GHG emissions to acceptable levels that fall within that country's carbon budget and international commitments. The assessment will not consider other country's carbon budgets and international commitments. Only the UK's Carbon Budget and related climate policies and objectives shall be considered in the assessment for the Proposed Development.

22.10.2 Transboundary impacts from Climate Change Resilience are not considered as this is specific to the Proposed Development and will not result in impacts to neighbouring developments.

22.11 Summary

22.11.1 The proposed scope of the climate change section of the Offshore EIA Report will consider:

- GHG Emissions Assessment: GHG emissions arising from and abated by the Proposed Development.
- Climate Change Resilience: Resilience of the Proposed Development resulting from a changing climate.

22.11.2 The main guidance used to inform the assessment of climate change are:

- IEMA EIA Guide to Assessing GHG Emissions and Evaluating their Significance (IEMA, 2022); and
- IEMA EIA Guide to Change Resilience & Adaptation (IEMA, 2020a).

GHG Emissions Assessment

22.11.3 The assessment of GHG emissions arising from the Proposed Development is scoped in for the construction, O&M and decommissioning phases. This includes an embodied carbon assessment and consideration for the abatement of GHG emissions as a result of the Proposed Development generating energy. GHG emissions arising from the disturbance of blue carbon systems and seabed change including benthic and subtidal/intertidal ecology will also be considered. The sensitive receptor will be defined as the global atmospheric concentration of GHGs, and it will be characterised as having a 'high' sensitivity.

22.11.4 Cumulative effects between the Proposed Development and the Onshore Transmission Assets will be assessed with consideration of overall net GHG emissions for the lifetime of these assets to ensure a whole Life Cycle Assessment with regards to GHG emissions of the Proposed Development.

Climate Change Resilience

22.11.5 The assessment of climate resilience of the Proposed Development is scoped in for the O&M and decommissioning phase. The construction phase will be scoped out as this phase is unlikely to experience significant changes in climate due to the short duration and any climate impacts would be addressed by construction and health and safety best practice. The sensitive receptors will be defined as the Proposed Development assets located within the Scoping Boundary.

22.11.6 ICCI will be considered individually within relevant topic sections of the Offshore EIA Report using climate projections data provided to Offshore EIA Report topic authors.

23 Offshore Water Quality and Water Framework Directive

23.1 Introduction

23.1.1 This section of the Offshore Scoping Report presents the scope for the assessment of the likely significant environmental effects (as per the EIA Regulations) of the Proposed Development on offshore water quality. Specifically, this section scopes the potential impacts of the Proposed Development during the construction, O&M and decommissioning phases and includes the potential for impacts on the Environmental Objectives of the coastal water bodies that could be affected in the context of the Water Framework Directive (WFD) (Council Directive 2000/60/EC establishing a framework for community action in the field of water policy) which was adopted by the EC in December 2000. The WFD was transposed into law in Scotland by the Water Environment and Water Services (Scotland) Act 2023 (hereafter referred to as 'the WEWs Act'). The WFD is retained EU legislation and is still applicable in Scotland as set out in the Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019.

23.2 Offshore Water Quality Study Area

23.2.1 The seabed and coastal areas that may be influenced by changes to physical processes due to the Proposed Development are identified within the Physical Processes Study Area (Section 7: Physical Processes). This will be defined as one spring Tidal Ellipse. A spring Tidal Excursion is the maximum distance (modelled as ranging from 3.36 nm (6.22 km) to 5.09 nm (9.43 km) around the Scoping Boundary) suspended sediment, and therefore potential bound contaminants, may be transported prior to being carried back on the returning tide. On this basis, the coastal water bodies and marine area that intersects the boundary of one Spring Tidal Excursion will be used to define the Offshore Water Quality Study Area (Figure 23.1) for the offshore water quality assessment and WFD Assessment.

23.2.2 The WEWs Act defines 'coastal water' as 'water (other than groundwater) within the area extending landward from the 3 nm limit up to the limit of the highest tide or, where appropriate, the seaward limits of any bodies of transitional water, but does not include any water beyond the seaward limits of territorial sea of the UK adjacent to Scotland' (Scottish Government 2023).

23.2.3 The coastal water bodies that occur within the Offshore Water Quality Study Area are illustrated in Figure 23.1. These water bodies fall within the ZoI of the Proposed Development as outlined in paragraph 23.2.1. The impact of the different components of the

Proposed Development on these coastal water bodies will be considered as part of the WFD compliance assessment.

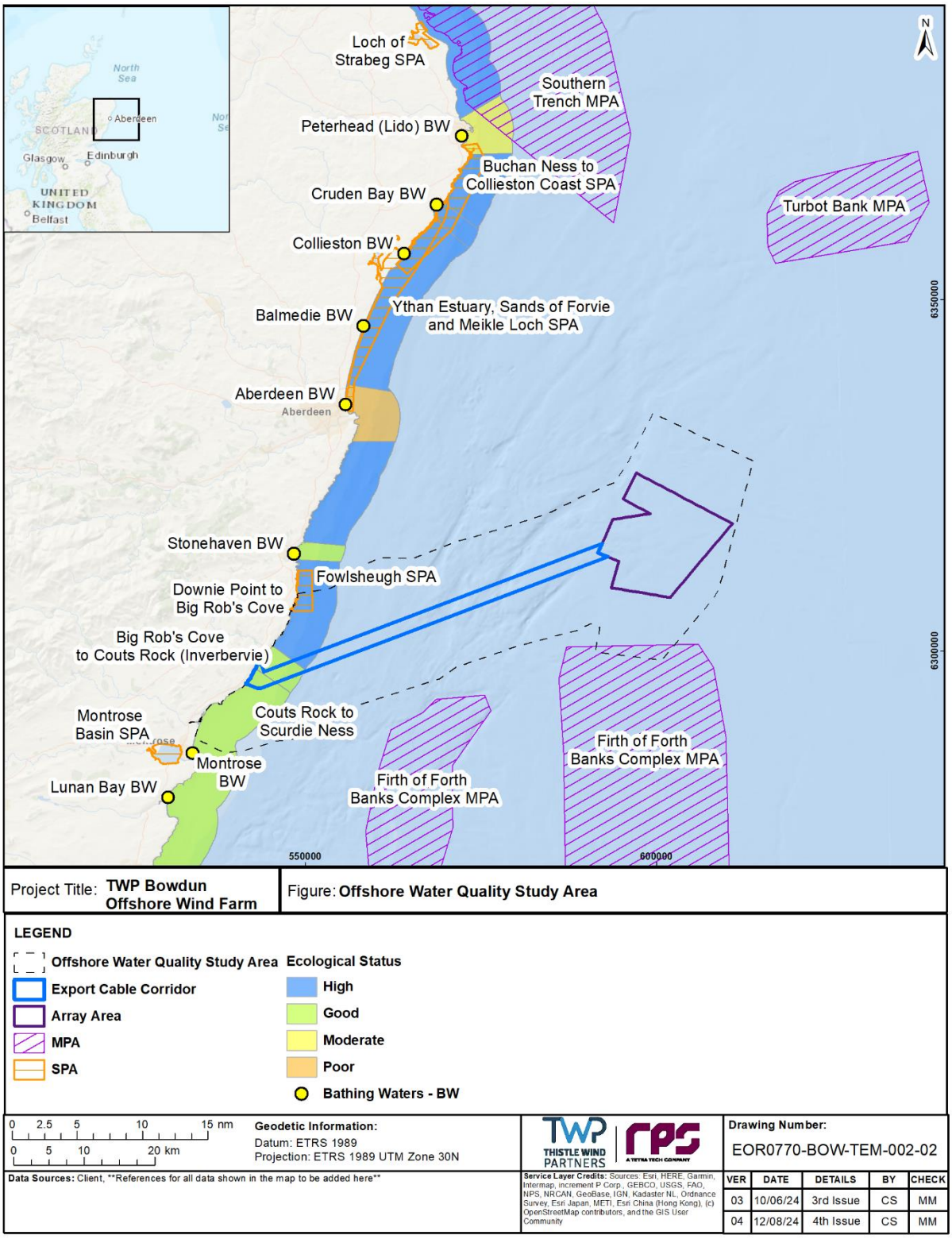


Figure 23.1: Offshore Water Quality Study Area

23.3 Data Sources

23.3.1 Table 23.1 provides a summary of the data sources used to assist in establishing the water quality baseline for the Offshore Scoping Report.

Table 23.1: Summary of Key Desktop Datasets and Materials

Title	Source	Year	Author
The Marine Scotland NMPi Maps	NMPi,	2023	NMPi
WFD Cycle 3 Coastal Waterbodies	Water Classification Hub	2023a	SEPA
River Basin Management Planning (RBMP) Measures and Objectives	Water Environment Hub	2023b	SEPA
RBMPs 2021-2027: Register of Protected Areas	RBMP	2023b	SEPA
Montrose Bathing Water Profile	SEPA	2023c	SEPA
Stonehaven Bathing Water Profile	SEPA	2023d	SEPA
NatureScot: Conservation Advice Package and Conservation Management Objectives	NatureScot	2009, 2018, and 2019	NatureScot

23.4 Policy and Legislative Context

23.4.1 Policy and legislation on renewable energy infrastructure is presented in Section 2: Policy and Legislation.

Legislative Context

23.4.2 The Proposed Development will be undertaken in line with the following key legislation which is relevant to the offshore water quality and WFD:

- WEWS Act; this Act transposes the requirement of the WFD into Scottish law.
- The WFD; this is the European legislation which was developed to establish systems to manage Europe's water environment; rivers, lakes, estuaries, coastal waters, and groundwater bodies. Article 6 of the WFD also requires the compilation of a register of water dependent protected areas which include, drinking waters, areas designated for economically significant aquatic species (Shellfish Waters), recreational waters (Bathing Waters),

nutrient sensitive waters, and areas designated for the protection of habitats or species (such as SPAs and SACs).

- The Water Environment (Controlled Activities) (Scotland) Regulations 2011 (as amended); these regulations were introduced under the 2003 Act to control engineering activities affecting the water environment, including coastal waters.
- Marine Strategy Regulations 2010 transpose the requirements of the EU's MSFD into domestic law requires the UK to put in place measures to achieve or maintain GES in the marine environment.
- The Environment (EU Exit) (Scotland) (Amendment etc.) Regulations 2019; Legislation implementing the requirements of the EU directives such as the WFD and MSFD, so that it continues to work in the same way after the withdrawal of the UK from the EU on 31 January 2020.
- The Bathing Water (Scotland) Regulations 2008 details quality standards for bathing water sites across Scotland. It is a requirement for each bathing location to develop and maintain a bathing water profile for each designated site to monitor water quality and to inform the public of water quality incidents that may arise at these locations.
- The Urban Waste Water Treatment Directive (UWWTD) (Council 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.
- The Water Environment (Shellfish Water Protected Areas: Designation) (Scotland) Order 2013 which repealed the Shellfish Waters Directive and came into force on 22 December 2013.
- The Habitats Directive and Birds Directive, see Section 2: Policy and Legislation.

WFD (Council Directive 2000/60/EC)

23.4.3 SEPA and MD are the relevant authorities tasked with implementation of the WFD in Scotland. A key requirement of the WFD is for surface water bodies to attain at least good surface water status, requiring both ecological status and chemical status to reach at least good status, and there should be no deterioration in existing status.

23.4.4 To facilitate implementation of the WFD, Scotland is divided into three River Basin Districts (RBDs); the Scotland RBD, the Solway Tweed RBD and a small area of the Northumbria RBD which is located in both Scotland and England. Each RBD contains several water bodies which must be assessed and managed to meet WFD objectives. The WFD requires the preparation of a Programme of Measures (PoMs) outlining the steps that will be taken to meet WFD

objectives as applicable to each water body. This PoM is contained within an overarching River Basin Management Plan (RBMP). In the case of International RBDs, a separate RBMP has been published with harmonised status, objectives and programmes of measures for cross border water bodies. SEPA published the third RBMP 2021-2027 in December 2021. The Proposed Development is located within the Scotland RBD.

23.4.5 It will be a requirement that the Proposed Development does not result in any deterioration of the current status of the relevant water bodies and does not prevent the improvement in status where it is required under the WEWS Act. It will also be necessary to demonstrate that the objectives of hydrologically linked water dependent protected areas, as listed in the Register of Protected Areas under the RBMP, will not be significantly affected. Any new development must ensure these fundamental objectives of the WFD are not compromised.

23.4.6 SEPA and MD consider that any impact from a development that compromises the achievement of WFD objectives or causes deterioration in the status of waters, to be a significant environmental effect.

MSFD (Council Directive 2008/56/EC)

23.4.7 The overarching aim of the Directive is to protect Europe's marine waters by applying an ecosystem-based approach to the management of human activities while enabling the sustainable use of the marine environment for present and future generations. The Directive establishes a legal framework for the development of marine strategies designed to achieve GES in the marine environment by the year 2020 (EU, 2008). The marine strategy involves defining GES, setting environmental targets and indicators, implementing monitoring programmes for ongoing assessment, and developing and implementing programmes of measures to achieve or maintain GES.

23.4.8 GES is defined as 'the environmental status of marine waters where these provide ecologically diverse and dynamic oceans and seas which are clean, healthy and productive within their intrinsic conditions, and the use of the marine environment is at a level that is sustainable, thus safeguarding the potential for uses and activities by current and future generations.'

23.4.9 The assessment of GES is undertaken by reference to qualitative descriptors which define overarching objectives in respect of key socio-economic or ecological aspects of the marine environment. Those relevant to offshore water quality include:

- eutrophication; and
- contaminants.

Policy Context

National Marine Plan 2015

23.4.10 As outlined in Section 2: Policy and Legislation, the Scottish NMP (Scottish Government, 2015a) sets out strategic policies for the sustainable development of Scotland's marine resources out to 200 nm. It is required to be compatible with the UK MPS and existing marine plans across the UK.

23.4.11 Policies of the NMP relevant to water quality include:

- By contributing to the management of human induced pressures on water quality, marine planning will provide one delivery mechanism for RBMPs (Marine planning and RBMPs).
- Developments and activities should not result in a deterioration of the quality of waters to which the WFD, MSFD or other related Directives apply and also take account of Shellfish Growing Waters and Bathing Water Directives. Decision makers should satisfy themselves where relevant that any development will not cause a deterioration in status of any water to which the WFD applies, subject to the provision of Article 4.7 of that Directive (Gen 12 Water Quality and Resource).
- Development and use of the marine environment must:
  - comply with legal requirements for protected areas and protected species;
  - not result in significant impact on the national status of
  - PMFs; and
  - protect and, where appropriate, enhance the health of the marine area (GEN 9 Natural heritage).

Sectoral Marine Plan for Offshore Wind Energy 2020

23.4.12 The SEA of the SMP identified that there is a potential effect on water quality during the construction, O&M and decommissioning processes, from all of the technologies, due to increased turbidity, seabed disturbance and contamination from construction, O&M, decommissioning equipment and vessels. It is likely the magnitude of the effects will differ between the technologies employed during the construction, O&M and decommissioning.

23.4.13 The SEA states that the associated effect on marine biodiversity, particularly those dependent on existing water conditions such as benthic species (i.e. filter feeders) is likely to be site specific.

The Aberdeenshire Local Development Plan

23.4.14 The ALDP includes a policy whereby 'new development.....must not prejudice water quality or flow rates, or their ability to achieve or maintain good ecological status ...Any such developments must

contribute to the objectives set against the relevant water bodies through the river basin management process...'.

23.5 Baseline Environment

23.5.1 This section provides a summary of the offshore water quality baseline environment, based on desktop data. This section also considers relevant designations such as the status/classification of WFD water bodies, Bathing Waters, Shellfish Water Protected Areas, and nutrient sensitive areas.

Water Framework Directive Status

23.5.2 The Offshore Water Quality Study Area crosses or is close to the boundary of the following water bodies; outlined in Table 23.2 and illustrated in Figure 23.1:

- Cout's Bay to Scurdie Ness;
- Big Rob's Cove to Cout's Rock; and
- Dony Point to Big Rob's Cove.

23.5.3 These waterbodies are within the Export Cable Corridor.

23.5.4 Baseline data has been collated from existing sources (Table 23.1) such as the Water Environment Hub, Water Classification Hub and water quality monitoring stations included in the SEPA WFD monitoring programme, as part of their RBMP reporting.

23.5.5 The current WFD Environmental Objectives for the water bodies that could potentially be impacted by the Proposed Development have also been collated from the SEPA's Water Classification Hub to ensure the potential impacts from the Proposed Development do not compromise the achievement of the WFD objectives.

23.5.6 The most recent available WFD monitoring data available sourced from the SEPA's Water Classification Hub is outlined in Table 23.2 (SEPA, 2022). Figure 23.1 illustrates the surface water status for the water bodies in the Offshore Water Quality Study Area.

Table 23.2: WFD Waterbodies

Waterbody Name	Waterbody Code	Waterbody Type	WFD Ecological Status 2021	WFD Chemical Status 2021	Heavily Modified Waterbody
Big Rob's Cove to Couts rock (Inverbervie)	200087	Coastal	Good	Pass	No
Couts Rock to Scurdie Ness	200084	Coastal	Good	Pass	No
Downie Point to Big Rob's Cove	200092	Coastal	Good	Pass	No

Protected Areas

23.5.7 One of the objectives of the water quality assessment will be to demonstrate that the Proposed Development will not prevent the achievement of the objectives of the water dependent protected areas associated with the water bodies affected, including bathing waters, nutrient sensitive waters, shellfish waters and the National Site Network.

23.5.8 Within the wider area there are several offshore protected areas as outlined in Table 23.3. These protected areas have their own monitoring and assessment requirements to determine their condition. They are often assessed for additional pollutants or requirements relevant to their designation.

Table 23.3: Designated Sites within the Offshore Water Quality Study Area

Designated Sites	Site
Designated Bathing Waters	None within the Offshore Water Quality Study Area
UWWTD Sensitive Areas – Lochs and Estuaries	None within the Offshore Water Quality Study Area
SACs	None within the Offshore Water Quality Study Area
SPAs	Fowlsheugh
MPAs	Firth of Forth Banks Complex,
Designated Shellfish Waters	None within the Offshore Water Quality Study Area

Bathing Waters

23.5.9 The following bathing water designations are closest to the Proposed Development:

- Stonehaven; and
- Montrose.

23.5.10 The latest bathing water quality results for these sites (from 2022/2023) were Good and Excellent status respectively. These locations are situated close to or within the Offshore Water Quality Study Area.

23.5.11 The main pressures affecting bathing waters are:

- sewage discharges;
- combined sewer overflows;
- agricultural runoff; and
- urban disuse runoff.

23.5.12 Stonehaven and Montrose bathing waters are both located outside of the Offshore Water Quality Study Area and therefore unlikely to be impacted by the Proposed Development. These are located 12.8 km and 14.4 km from the Offshore Water Quality Study Area.

Nutrient Sensitive Areas – Lochs and Estuaries

23.5.13 Lochs and estuaries are selected as nutrient sensitive areas under the UWWTD if these waterbodies are found to be eutrophic or have the potential to become eutrophic in the near future if appropriate protection is not taken to reduce increasing nutrient trends. Lochs and estuaries that have poor water exchange, and/or receive large quantities of nutrients are classified as nutrient sensitive.

23.5.14 There are no waters designated under the UWWTD within the Offshore Water Quality Study Area.

Special Areas of Conservation and Special Protection Areas

23.5.15 The National Site Network for SACs and SPAs are included in the Register of Protected Areas included within the RBMP which helps to ensure that water bodies within these areas are managed and that they achieve the objectives required by the WEWS Act and the Water Environment (Register of Protected Areas) (Scotland) Regulations 2004 to protect the Conservation Objectives of water dependent SACs and SPAs. SACs and SPAs of most relevance to the Proposed Development is Fowlsheugh SPA, situated approximately 7 km from the Offshore Water Quality Study Area.

Marine Protected Areas

23.5.16 MPAs are designated under the Marine (Scotland) Act 2010 and the MCAA 2009. The MPA network protects nationally and internationally important marine wildlife, habitats, geology, and underwater landforms. The MPA of most relevance to the Proposed Development is The Firth of Forth Banks Complex MPA which overlaps with the Offshore Water Quality Study Area (Figure 23.1).

Shellfish Water Protected Areas

23.5.17 Shellfish Waters Protected Areas are designated as a protected area under the WFD and all shellfish protected waters have an objective that 'good' water quality, as defined by Council Directive 2006/113/EC, is maintained within these areas to ensure the production of high-quality shellfish.

23.5.18 There are no designated Shellfish Water Protected Areas within the Offshore Water Quality Study Area. Therefore, Shellfish Water Protected Areas have not been considered further within the Offshore Scoping Report.

MSFD Status

23.5.19 The Proposed Development is located within the Greater North Sea MSFD sub region. A summary of the progress towards the achievement of GES under the MSFD is provided in Table 23.4.

Table 23.4: Summary of Progress towards GES

Qualitative Descriptor	GES Achieved	Trend since Period 1	Commentary
Biodiversity - Cetaceans	Partially achieved	Stable	The status of coastal bottlenose dolphin and minke whale are consistent with the achievement of GES in the Greater North Sea, but unknown/uncertain elsewhere.
Biodiversity – seals	Partially achieved	Improving	The UK has achieved its aim of GES for grey seals in the Greater North Sea. Harbour seals in the Greater North Sea have not yet achieved GES.
Biodiversity – birds	Not achieved	Declining	The UK has achieved its aim of GES for non-breeding waterbirds in the Greater North Sea. Breeding seabirds have not achieved GES.
Biodiversity - fish	Not achieved	Improving	Demersal fish communities are recovering from over-exploitation in the past, GES has not yet been achieved in the Greater North Sea.
Biodiversity – pelagic habitats	Partially achieved	Stable	Prevailing environmental conditions are likely to be driving the observed changes in plankton communities, but human activities cannot be ruled out and it is uncertain whether GES has been achieved.
Biodiversity – benthic habitats	Not achieved	Stable	The levels of physical damage to soft sediment habitats are not consistent with the achievement of GES in the Greater North Sea. Sublittoral rock and biogenic habitats have not yet achieved GES.
Non-Indigenous species (NIS)	Not achieved	Stable	The UK has not yet achieved its aim of GES for NIS. Our ability to detect new NIS has improved but there has been no significant change in the number of new records of NIS made between 2003 and 2014 suggesting the current PoMs is maintaining the current status.
Commercially exploited fish and shellfish	Not achieved	Improving	The percentage of quota stocks fished below Maximum Sustainable Yield (MSY) and the proportion of marine fish spawning stock biomasses capable of producing MSY have increased significantly since 1990
Food webs	Partially achieved	Improving	It is known that components of the marine food web are changing, but it is not clear how they are affecting each other.

Qualitative Descriptor	GES Achieved	Trend since Period 1	Commentary
Eutrophication	Achieved	Stable	The UK has largely achieved its aim of GES for eutrophication.
Sea-floor integrity	Achieved	Stable	The UK continues to achieve its aim of GES for hydrographical conditions.
Hydrographic conditions	Achieved	Stable	The UK continues to achieve its aim of GES for hydrographical conditions.
Contaminants	Achieved	Stable	Concentration of hazardous substances and their biological effects are generally meeting agreed target thresholds. Highly persistent legacy chemicals are the cause of the few failures, mainly in coastal waters close to polluted sources.
Contaminants in fish	Achieved	Stable	The UK has achieved its aim of GES for contaminants in seafood. There is a high level of compliance with agreed safety levels.
Litter	Not achieved	Stable	The UK has not yet achieved its aim of GES for litter. Beach litter levels in the Greater North Sea have increased.
Introduction of energy	Partially achieved	Stable	The achievement of GES for underwater noise in the UK is uncertain. Research and monitoring programs established since 2012 have provided an improved understanding of the impacts of sound on marine ecosystems.

23.6 Embedded Mitigation

23.6.1 As stated in Section 4: EIA Methodology, the primary and tertiary mitigation measures, which are defined below (adapted from IEMA, 2016) are Embedded Mitigation and have been considered in the scoping of offshore water quality impacts.

23.6.2 The following Embedded Mitigation measures are relevant to offshore water quality and WFD. The Embedded Mitigation measures will evolve over the development process as the EIA progresses.

- Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the CBRA and the CBA. Results of these assessments, and commitments to post construction monitoring, will be provided in the CaP.
- Development of and adherence to an EMP, which will include an MPCP, MMMP, the commitments to environmental monitoring and actions to minimise INNS the latter will outline measures to ensure vessels comply with (the IMO ballast water management guidelines (IMO, 2004), it will consider the origin of vessels and contain standard housekeeping measures for such vessels as well as measures to be adopted in the event that a high alert species is recorded).
- Development of, and adherence to a CMS along with a CoCP.
- All relevant HSE procedures will be followed.
- Development of and adherence to a VMP and NSP.
- Development of, and adherence to, an ERCoP in consultation with MCA.
- Development and adherence to an Operation and Maintenance Programme (OMP).
- Drafting and implementation of a decommissioning programme.
- Regular maintenance regime to check the Proposed Development Offshore Infrastructure.
- Achieve appropriate design and layout of Wind Turbines within the Array Area.

23.6.3 The requirement for and feasibility of any mitigation measures will be consulted upon with statutory consultees, including MD–LOT, SEPA and NatureScot, throughout the EIA process.

23.7 Potential Proposed Development Impacts

23.7.1 A range of potential impacts on the existing offshore water quality have been identified which may occur during the construction, O&M, and decommissioning phases of the Proposed Development. When the Embedded Mitigation measures outlined in paragraph 23.6.2 are

considered, the potential impact on water quality is not likely to be significant.

23.7.2 Furthermore, many of these potential impacts will be considered in other sections of the Offshore EIA Report (e.g. Physical Processes, Benthic Ecology and Fish and Shellfish Ecology), while the potential impacts on WFD waterbodies will be considered as part of the WFD compliance assessment which will be included as a technical annex to the Offshore EIA Report; a WFD Assessment is included at Appendix G: Water Framework Directive Assessment. Furthermore, the impacts on designated sites will be considered as part of the HRA and MPA assessments. Therefore, it is proposed to scope out the requirement for a dedicated water quality section in the Offshore EIA Report.

23.7.3 The potential impacts that have been considered in the scoping assessment for offshore water quality are outlined in Table 23.5 together with the rational for scoping these out for consideration as a standalone chapter in the EIA, noting that the majority of these assessments will be undertaken by receptor-specific sections of the Offshore EIA Report, or as part of the WFD assessment.

Table 23.5: Impacts Proposed to Be Scoped into the Proposed Development Assessment for Offshore Water Quality

Impact	Proposed Development Phase *			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
Increased suspended sediment concentrations and associated deposition and potential impact to physical features	×	×	×	Suspended sediment and deposition due to the construction, O&M and decommissioning of Proposed Development can have an adverse impact on the biological elements, supporting physico-chemical elements and water dependant habitats and aquatic ecology. However, these impacts will be assessed within the relevant receptor-specific sections of the EIA. These include: • Section 7: Physical Processes • Section 9: Benthic Ecology • Section 10: Fish and Shellfish Ecology • Section 11: Marine Mammals The impact of SSC on offshore water quality is therefore scoped out of	Data collected during the site-specific geophysical and geotechnical survey campaign will provide data to support the development of the physical processes' numerical modelling. Site-specific metocean data may also be utilised to validate desktop sources.	The potential impacts will be fully assessed as part of the WFD compliance assessment technical report, and through the receptor-specific sections of the Offshore EIA.

Impact	Proposed Development Phase *			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				further assessment within an offshore water quality EIA chapter as it will be fully assessed within other sections of the EIA, as well as within the WFD assessment.		
The impact of habitat disturbance and its impact on the supporting hydromorphological conditions of water bodies	×	×	×	Changes in physical processes including alterations to tidal/flow regime and impacts to shoreline associated with the construction, O&M and decommissioning phases of the Proposed Development could impact on the hydromorphological supporting conditions of the water bodies affected. However, such impacts will be considered as part of WFD assessment, and will also be considered within the relevant receptor-specific sections of the EIA. These include: • Section 7: Physical Processes • Section 9: Benthic Ecology	Data collected during the site-specific geophysical and geotechnical survey campaign will provide data to support the development of the physical processes' numerical modelling. Site-specific metocean data may also be utilised to validate desktop sources. Data collection and analysis requirements are detailed within the relevant receptor-specific sections of the Offshore Scoping Report.	The potential impacts will be fully assessed as part of the WFD compliance assessment technical report, and through the receptor-specific sections of the Offshore EIA.

Impact	Proposed Development Phase *			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				• Section 10: Fish and Shellfish Ecology The impact is therefore scoped out of further assessment within an offshore water quality EIA chapter as it will be fully assessed within other sections of the EIA, as well as within the WFD assessment.		
The impact of pollution caused by accidental spills/contaminant release	×	×	×	Activities required for the construction, O&M and decommissioning of the Proposed Development could result in accidental spills or contaminant release, including from drilling fluids, which could adversely affect supporting physico-chemical conditions. However, all works on the Proposed Development will be subject to strict environmental controls set out in the EMP and MPCP and Waste Management Plan (WMP) (see Appendix	Data collection and analysis from benthic survey campaign including PSA and contaminant analysis.	This will be addressed through the associated Major Accident and Disasters mitigation measures.

Impact	Proposed Development Phase *			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				A: Draft Schedule of Mitigation and Commitments). Through these control measures, pollution events will be reduced as far as is reasonably practicable. Therefore, no significant effects are anticipated from this impact and it is proposed to scope this impact out of further consideration within an offshore-water quality specific EIA section.		
The impact of spreading INNS	×	×	×	There is potential for the increased risk of introduction and spread of INNS during all phases of development. This is due to vessel movements into the Proposed Development area, which may act as vectors facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent	Data collection and analysis requirements are detailed within the relevant receptor-specific sections of the Offshore Scoping Report.	The potential impacts will be fully assessed as part of the WFD compliance assessment technical report, and through the receptor-specific sections of the Offshore EIA.

Impact	Proposed Development Phase *			Justification	Data collection and analysis required to characterise the baseline environment	Summary of the proposed approach to assessment
	C	O	D			
				increased available habitat for INNS to colonise in the O&M phase. However, such impacts of INNS will be assessed within the relevant receptor-specific sections of the EIA. These include: • Section 9: Benthic Ecology • Section 10: Fish and Shellfish Ecology The impact of INNS on offshore water quality is therefore scoped out of further assessment within an offshore water quality EIA chapter as it will be fully assessed within other sections of the EIA, as well as within the WFD assessment.		

*Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

23.8 Proposed Assessment Methodology

23.8.1 It is proposed to scope out the offshore water quality as a dedicated section of the Offshore EIA Report and to ensure the potential significant effects on water quality are addressed as part of the WFD compliance assessment (to be submitted as a separate technical annex) and also as part of the assessment of the key receptors that could be subject to potentially significant effects due to change in the water quality of the receiving environment in the relevant EIA topic chapters (e.g. benthic ecology, fish and shellfish ecology, marine mammals and commercial fisheries). The proposed methodology for the assessment of these effects is presented in each of the individual sections of this Offshore Scoping Report dealing with these receptors. The methodology for the WFD compliance assessment will be detailed in a Technical Annex to the Offshore EIA Report.

23.8.2 The WFD scoping exercise that is required under the WFD assessment on estuarine and coastal waters, based on the scoping template provided in the Environmental Agency guidance 'Clearing the Waters for All' (Environmental Agency, 2023), outlines the contributing elements to water body status that could be affected This guidance has been used in the absence of specific guidance from MD-LOT and is recognised as good practice. According to this guidance, and as informed by relevant industry guidance (IEMA, 2015b), impacts on fish and habitat biology, chemistry and hydromorphology need to be considered in relation to WFD water body status classes and reported under a specific WFD section in any EIA report or report produced or in a separate WFD compliance report. The scoping exercise for each water body that could potentially be affected is included in Appendix G: Water Framework Directive Assessment.

23.9 Potential Inter-Related Effects

23.9.1 A description of the likely inter-related effects due to offshore water quality impacts arising from the Proposed Development have been addressed in the relevant sections in the Offshore Scoping Report that consider its likely impact on sensitive receptors (e.g. Section 9: Benthic Ecology and Section 10: Fish and Shellfish Ecology).

23.9.2 An assessment of the inter-related effects (Proposed Development lifetime effects) that are predicted to arise during the construction, O&M phase, and decommissioning of the Proposed Development and also the inter-related effects (receptor-led effects) that are predicted to arise for sensitive receptors will be undertaken in the relevant topic chapters within the Offshore EIA Report.

23.10 Potential Cumulative Effects

23.10.1 It is proposed to scope out the potential effects on offshore water quality with the potential impacts on offshore water quality sensitive receptors considered in other sections of the Offshore EIA Report (e.g. Benthic Ecology and Fish and Shellfish Ecology). The CEA for these individual assessments will consider the water quality impact associated with the Proposed Development together with other relevant projects and activities. Cumulative effects are therefore the combined effect of the Proposed Development in combination with the effects from a number of different projects on the same receptor or resource (e.g. coastal water bodies and marine water quality). See Section 4: EIA Methodology for detail on CEA methodology.

23.11 Potential Transboundary Impacts

23.11.1 A screening of transboundary impacts has been carried out and is presented in Appendix B: Transboundary Screening. This screening exercise identified that there is no potential for transboundary impacts on water quality due to construction, O&M and decommissioning impacts of the Proposed Development. This assessment is made on the basis that the distance that suspended sediments and other potential bound contaminants may be transported prior to being carried back on the returning tide, will not impact on any territorial waters for other European countries.

23.12 Summary

23.12.1 The Offshore Scoping Report presents the scope for the assessment of the likely significant environmental effects from the Proposed Development on offshore water quality. The assessment is based on guidance developed by EIA Regulations and is undertaken in a staged approach to ensure that those components of the Proposed Development and the associated activities are assessed in the context of the quality elements that contribute to overall WFD and MSFD status.

23.12.2 The key focus of the assessment was to ensure that the Proposed Development does not result in a deterioration in water quality that could impact on the achievement of GES under the MSFD and the current WFD status based on the 2021 baseline as reported in the Scotland RBMP 2022-2027. It is proposed to scope out the offshore water quality as a dedicated section of the Offshore EIA Report and to ensure the potential significant effects on water quality are addressed as part of the WFD compliance assessment (to be submitted as a separate technical annex) and the sections considering the key receptors that could be subject to potentially significant effects due to change in the water quality of the receiving environment (e.g. water dependent protected areas, benthic, subtidal

and intertidal ecology, fish and shellfish ecology, marine mammals and commercial fisheries).

23.12.3 The preparation of a standalone WFD compliance assessment will demonstrate that the Proposed Development will not compromise the achievement of the MSFD and WFD objectives for the improvement in the overall status of the water bodies which could be affected.

23.12.4 The overall conclusion of the Offshore Scoping Report is that there is potential for impacts on offshore water quality, however the potential for significant effects on the receiving environment will be addressed in individual sections of the Offshore EIA Report that assess the impacts on sensitive receptors. The relevant elements contributing to the overall MSFD and WFD status will be scoped into a dedicated technical annex of the WFD assessment.

23.12.5 The Offshore Scoping Report has concluded that it will be unlikely for significant environmental effects to impact on offshore water quality, particularly when Embedded Mitigation is considered. However, relevant environmental receptors will consider the potential impact of changes in water quality in relevant topic sections and an assessment against the WFD objectives, from the construction, O&M and decommissioning activities associated with the Proposed Development will be considered in a technical annex based on the outcome of the WFD scoping exercise undertaken as part of this offshore water quality scoping.

24 Other Environmental Topics

24.1 Introduction

24.1.1 This section sets out the approach for the other environmental topics that are required to be considered within the EIA Regulations, but for which it is proposed to be scoped out of the EIA Offshore Report.

24.2 Topics With Supporting Information in the Offshore EIA Report

24.2.1 Topics that are proposed to be scoped out of further consideration in the Offshore EIA Report, as they are considered within relevant other topic sections, are detailed below.

Human Health

24.2.2 The potential impacts to environmental, social, behavioural, and economic determinants of human health arising from the Proposed Development are considered within the following topic-specific sections of this Offshore Scoping Report:

- Section 13: Commercial Fisheries, which assesses potential impacts such as disturbance to the commercial fishing industry, that could have economic implications (considered within Section 18: Socio-Economics, Tourism and Recreation);
- Section 14: Shipping and Navigation, which assesses potential impacts to shipping and navigation including safety of navigation, deviation of commercial vessels and displacement of small recreational vessels, that may result in economic and tourism impacts (also considered further within Section 18: Socio-Economics, Tourism and Recreation);
- Section 16: Infrastructure and Other Users, which considers any recreational access that may be impacted as a result of the Proposed Development;
- Section 17: Major Accidents and Disasters, which considers the potential vulnerability to major accidents and disasters proposes to scope out a standalone major accidents and disasters assessment, as all identified hazards will be assessed within respective technical topic chapters in the Offshore EIA Report or will be managed via adherence to industry requirements, RAMS, and/or management plans;
- Section 18: Socio-Economics, Tourism and Recreation, which assesses the overarching social and economic impacts of the Proposed Development;
- Section 20: Seascape and Visual Impact, which assesses the potential impacts to visual change in the seascape;

- Section 22: Climate Change, includes the assessment of GHG emissions and abatement as a result of the Proposed Development that may indirectly affect human health, along with the Proposed Development's resilience to climate change; and
- Section 23: Offshore Water Quality and Water Framework Directive, proposes to scope out possible impacts to water quality. However, potential impacts on WFD waterbodies will be considered as part of the WFD compliance assessment which will be included as a technical annex to the Offshore EIA Report.

Waste

24.2.3 It is anticipated that the majority of waste associated with the Proposed Development will be generated during the construction and decommissioning phases.

24.2.4 Whilst this topic will not have a specific section within the Offshore EIA Report, it will be considered within specific receptor sections where applicable. In addition, a Waste Management Plan (WMP) will be produced for the Proposed Development, which will describe the processes for handling and managing any waste materials. This WMP will form part of the Project's EMP.

24.2.5 The WMP will identify, describe, and quantify the types of waste arising from the Proposed Development, and outline how these will be managed within the waste hierarchy (e.g. re-used, recycled, recovered or disposed of). In outlining these management procedures, the WMP will have consideration of relevant legislation and international obligations, including the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (London Convention and London Protocol; IMO, 1996 and IMO, 1972) and MARPOL (MARPOL; IMO, 1973 and IMO, 1978).

24.2.6 In addition to outlining the management processes, the WMP will identify the roles and responsibilities of the person(s) that will be responsible for the implementation of such processes. This will include details of any relevant mandatory training requirements, such as method statements and toolbox talks, to ensure management processes are followed effectively.

24.2.7 The WMP will also define any ongoing monitoring requirements, such as regular inspections, to ensure that the waste management measures outlined in the WMP are followed appropriately and fit for purpose.

24.2.8 The WMP will be provided prior to the construction of the Proposed Development, when design details have been further refined.

Other Residues and Emissions

24.2.9 The potential impacts of residues and emissions (e.g. pollutants, light, airborne noise and vibration), excluding air quality impacts, arising from the construction, O&M, and decommissioning of the Proposed Development are covered within the relevant topic specific sections of this Offshore Scoping Report.

24.2.10 Potential light pollution impacts are addressed within Section 20: Seascape and Visual Impact. Any potential impacts from vibrations are assessed within Section 8: Subsea Noise. Similarly, airborne noise during construction and O&M will be considered within Section 12: Offshore Ornithology, as it relates to disturbance to seabirds.

24.3 Topics Proposed to be Scoped Out

24.3.1 The only topics proposed to be fully scoped out from the Offshore EIA Report are Offshore Airborne Noise and Vibration and Air Quality. A detailed justification is provided below.

Offshore Airborne Noise and Vibration

24.3.2 During the construction, O&M and decommissioning of the Proposed Development, there is the potential for airborne noise and vibration to arise. Piling, and auxiliary construction activities (vessels, use of other machinery and generators) may introduce noise and vibration which has the potential to impact marine users and onshore human receptors.

24.3.3 All potential effects of airborne noise and vibration from offshore works (including cabling and landfall works below MHWS) are proposed to be scoped out of the assessment for offshore noise and vibration as it is considered that no significant adverse effects will arise.

24.3.4 Due to vessels transient nature, exposure would be minimal, only being in the vicinity of construction activities for a relatively short period of time. Considering existing sources of anthropogenic and natural airborne noise, effects of noise from piling on non-project personnel would be negligible. Furthermore, auxiliary construction noise is expected to be localised around the vessels being used for particular activities.

24.3.5 Noise emissions from cable laying operations are generally low and localised around the vessels undertaking the work. Cable laying operations are typically of short duration and transient in nature as the vessel moves along the route laying the cable. Noise relating to Landfall works will be localised, temporary, transient and of short duration and also 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. Moreover, an EMP will be in place to adequately manage low level airborne noise typical of construction and cable laying at landfall. As such, it is considered that works within the intertidal area (up to MHWS) will not result in a significant impact to receptors.

24.3.6 Blade movement will result in low levels of airborne noise, far below that emitted in construction. Furthermore, due to the distance of the turbine from receptors, it is unlikely to result in any significant impacts.

24.3.7 It is proposed all elements of offshore airborne noise and vibration are scoped out due to the lack of potential for significant impacts to arise, and Embedded Mitigation in the form of adherence to EMP.

Air Quality

24.3.8 Within this section, Air Quality refers specifically to particulate matter, Sulphur Oxides (SOx) and Nitrogen Oxides (NOx). Carbon-based emissions are considered within Section 22: Climate Change.

24.3.9 It is anticipated that potential minor impacts from residues and emissions on air quality may occur throughout the lifecycle of the Proposed Development. However, it is likely that the majority of such impacts would arise from the onshore construction, which is not covered by this Offshore Scoping Report.

24.3.10 Air quality impacts could arise from emissions from ships and helicopter movements. However, Defra's Local Air Quality Management Technical Guidance: LAQM.TG22 (Defra, 2022) advises the risk to air quality is only considered where there are in excess of 5,000 ship movements per year. Similarly, the Industrial Emissions Screening Tool referenced within the LAQM.TG22 only considers air quality impacts on receptors up to 2 km. Given that the total number of vessels used across the duration of the Proposed Development would be substantially fewer than 5,000 and that the Array Area is located 38 km, at its closest point, from the nearest coastline at Aberdeenshire, it is considered that such emissions would be unlikely to impact air quality.

24.3.11 Impacts to air quality from the Proposed Development would require consideration in areas where any impacts were considered likely to interact with Air Quality Management Areas (AQMA). The closest AQMA to the Proposed Development is located in Aberdeen City Centre. However, no AQMAs are present in the wider Aberdeenshire Area, including the vicinity of the proposed Landfall location at Benholm. In addition, any particulates released into the air as a result of the offshore works are anticipated to be minor. Therefore, due to the distance from any Air Quality Management Areas, none of these onshore areas will be impacted.

24.3.12 As a result, potential impacts to air quality from the Proposed Development have been deemed negligible, and therefore have been scoped out of the Offshore EIA process.

25 Offshore Wind Farm – Summary

25.1 Overview

25.1.1 The Applicant is proposing the development of the Bowdun OWF within the E3 POA. This Offshore Scoping Report covers the Option Lease Area that is located in the E3 POA detailed in the Scottish SMP (Scottish Government, 2020a), and the Export Cable Corridor. The Array Area is located 38 km offshore at its closest point, will cover an area of 187 km^2 and will comprise of Wind Turbines (either fixed or floating), IACs, OSPs, Interconnector Cables and any necessary scour/cable protection.

25.1.2 The Offshore Scoping Report has identified the potential for significant environmental effects associated with the construction, O&M, and decommissioning phases of the Proposed Development on a range of receptors. These receptors are detailed in Sections 7 to 23 of this Offshore Scoping Report, with each section including a proposed methodology to assessment.

25.1.3 The technical topics considered within this Offshore Scoping Report, and whether they have been scoped in/out of the Offshore EIA Report, are presented in Table 25.1.

25.2 Cumulative Effects Summary

25.2.1 A summary of the likely significant cumulative effects that are associated with the individual topics have been included in their respective sections of this Offshore Scoping Report. As well as the likely significant effects for individual topics, where cumulative effects are deemed to be unlikely, these have been scoped out with the reasons detailed in their respective topic section.

25.2.2 A detailed CEA will be carried out to support the Offshore EIA Report, as per Section 4: EIA Methodology.

25.2.3 An initial list of projects and activities which have the potential to act cumulatively with the Proposed Development will be produced. Projects and activities that will be considered for cumulative effects will include:

- energy projects (including offshore wind, wave and tidal projects (including INTOG projects), and associated cabling and infrastructure);
- oil and gas infrastructure;
- CCS;
- other forms of cabling (e.g. telecommunications and interlinks);
- shipping and navigation;
- marine aggregates extraction and dredge disposal;
- ports and harbours; and

- coastal developments.

25.3 Transboundary Impacts

25.3.1 A transboundary screening assessment has been carried out for the Proposed Development and can be found in Appendix B: Transboundary Screening.

25.3.2 The following topics have been screened in for further consideration of transboundary impacts:

- Shipping and Navigation (Section 14);
- Offshore Ornithology (Section 12); and
- Commercial Fisheries (Section 13).

25.4 Consultation

25.4.1 The proposed approach to stakeholder engagement throughout the pre-application phase is provided in Section 5: Consultation and Engagement. Although there are no statutory requirements for consultation during the pre-application stage for Section 36 Consent applications, the Applicant will follow the principles of the PAC Regulations for the Proposed Development.

25.4.2 Therefore, as part of further consultation through the pre-application phase; it is anticipated that at least two pre-application events will be held during 2024 to give the public, and stakeholders, a full understanding of both the Offshore and Onshore Infrastructure of the Project.

25.4.3 Further details on PAC events will be published in a local newspaper(s) at least six weeks prior to any public consultation event.

25.4.4 A report will be prepared detailing the PAC and will be submitted as part of the Marine Licence and Section 36 Applications for the Proposed Development. A summary will also be presented and included in the Offshore EIA Report, highlighting all the consultation undertaken throughout.

25.4.5 Due to the proposed staggered submission dates for the onshore and offshore elements, there is a potential requirement to hold separate onshore and offshore public events. It is considered that further consultation with key stakeholders (both statutory and non-statutory) would be beneficial to determine key technical assessment methods and ensure a robust Offshore EIA Report. Further information on the public events is covered in detail in Section 5: Consultation and Engagement.

25.4.6 It is considered that further consultation with key stakeholders (both statutory and non-statutory) would be beneficial to determine key technical assessment methods and ensure a robust Offshore EIA

Report, and where appropriate direct engagement will be undertaken through the pre-application phase.

Table 25.1: Overview of Technical Topics Considered Within this Offshore Scoping Report, Scoped In/Out Status and Justification

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
Offshore Physical Environment			
Physical Processes	✓	×	Physical Processes is proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report. The assessment will consider: • potential changes to SSCs, bed levels and sediment type during construction and decommissioning; • potential impacts to seabed morphology during construction, O&M and decommissioning; • potential impacts to landfall morphology during construction, O&M and decommissioning; • potential changes to the tidal, wave and sediment transport regime during operation; • potential changes to the wave regime during operation; • potential changes to the sediment transport regime during operation; • potential changes to stratification and frontal systems during operation; and • scour during operation.
Subsea Noise	✓	✓	The following subsea noise impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • clearance of UXO during construction; • geophysical and geotechnical surveys during construction, O&M and decommissioning;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• driven and drilled pile installations for the OSP foundations, fixed Wind Turbine foundations, and floating Wind Turbine moorings during construction; • vessel movements during construction, O&M and decommissioning; • Wind Turbine operation (including mooring lines) during operation; and • decommissioning activities. Effects of the particle motion element of underwater noise on marine mammals is proposed to be scoped out, the reasons for which are outlined in Table 8.2, Section 8: Subsea Noise.
Offshore Water Quality and WFD	×	✓	The following impacts are proposed to be scoped in for the assessment for WFD compliance and will be subject to a full detailed assessment in the Offshore EIA Report: • increased SSCs and associated deposition, and potential impact to physical features during construction, O&M and decommissioning; • the impact of habitat disturbance and its impact on the supporting hydromorphological conditions of water bodies during construction, O&M and decommissioning; • the impact of pollution caused by accidental spills/contaminant release during construction and decommissioning; • the impact of Invasive Non-Native Species (INNS) during construction, O&M and decommissioning; and • EMFs from cabling during the O&M phase. Table 23.5, Section 23: Offshore Water Quality also discusses the risk issue for impact assessments to specific water bodies for the following receptors: • hydromorphology;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• biology: habitats; • biology: fish; • water quality; • protected areas and • inns. The following impact is proposed to be scoped out of the assessment for WFD compliance: • Port Facilities to facilitate the construction and servicing of the Proposed Development. Table 23.7, Section 23: Offshore Water Quality and Water Framework Directive explains why this impact is proposed to be scoped out. Furthermore, when the Embedded Mitigation, outlined in Section 23.7, Section 23: Offshore Water Quality and Water Framework Directive are considered, the potential impact on water quality is unlikely to be significant. On this basis, and given the fact that these impacts on sensitive receptors will be considered in other sections of the Offshore EIA Report (e.g. Benthic Ecology and Fish and Shellfish Ecology) it is proposed to scope out the requirement for a dedicated water quality section in the Offshore EIA Report. The Offshore EIA Report will instead assess the impacts in the context of the Environmental Objectives of the water bodies likely to be affected in a dedicated WFD compliance assessment as a technical annex to the Offshore EIA Report. Therefore, the potential impacts outlined above are to be scoped into the Proposed Development assessment for WFD compliance.

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
Biological Environment			
Benthic Ecology	✓	✓	The following benthic ecology potential impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • temporary habitat loss and/or disturbance during construction, O&M and decommissioning; • long term habitat loss during construction, O&M and decommissioning; • increased SSCs and associated deposition during construction, O&M and decommissioning; • changes in physical processes during operation during O&M and decommissioning; • increased risk of introduction and spread of INNS during construction, O&M and decommissioning; • colonisation of hard structures during construction, O&M and decommissioning; • removal of hard substrates during decommissioning; and • impacts to benthic ecology due to EMF during O&M. The following potential benthic ecology impacts are proposed to be scoped out: • accidental pollution to the surrounding environment; • release of sediment-bound contaminants; • impacts to benthic ecology due to heat from subsea electrical cables. Table 9.5, Section 9: Benthic Ecology explains why these impacts are proposed to be scoped out.

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
Fish and Shellfish Ecology	✓	✓	The following potential impacts to fish and shellfish ecology are proposed to be scoped into the Offshore EIA Report and will be subject to a full detailed assessment in the Offshore EIA Report: • temporary habitat loss and/or disturbance during construction, O&M and decommissioning; • long term habitat loss during construction, O&M and decommissioning; • increased SSCs and associated deposition during construction, O&M and decommissioning; • subsea noise impacting fish and shellfish during construction, O&M and decommissioning; • introduction of artificial habitat and subsequent colonisation of hard structures during operation; • impacts to fish and shellfish due to EMF during operation; and • impacts to fish and shellfish species due to entanglement during operation. The following potential impacts to fish and shellfish ecology are proposed to be scoped out of the Offshore EIA Report: • accidental pollution to the surrounding environment; • release of sediment-bound contaminants; • subsea noise from vessels impacting fish and shellfish. Table 10.7, Section 10: Fish and Shellfish Ecology explains why these impacts are proposed to be scoped out.
Marine Mammals	✓	✓	The following potential marine mammal impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • injury and disturbance from subsea noise generated during piling during construction;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• injury and disturbance from subsea noise generated during UXO clearance during construction; • injury and disturbance from subsea noise generated during site investigation surveys during construction and O&M; • injury and disturbance from subsea noise generated by vessel use and other noise producing activities during construction, O&M and decommissioning; • injury and disturbance from subsea noise generated by Wind Turbine during O&M; • injury to marine mammals due to entanglement during operation; • impact of EMF from subsea cables during operation; • injury to marine mammals due to collision with vessels during construction, O&M and decommissioning; and • effects on marine mammals due to changes in prey availability during construction, O&M and decommissioning. The following potential impacts to marine mammals are proposed to be scoped out: • accidental pollution to the surrounding environment; and • increased SSCs and associated deposition. Table 11.8: Designated Sites within the UK Portion of the Regional Marine Mammal Study Area with Relevant Qualifying Features, Section 11: Marine Mammals explains why these impacts are proposed to be scoped out.
Offshore Ornithology	✓	✓	The following potential impacts to offshore ornithology are proposed to be scoped into the Offshore EIA Report and will be subject to a full detailed assessment in the Offshore EIA Report: • collision risk mortality due to collision with rotor blades during operation;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• distributional responses, displacement and barrier effects from Offshore Infrastructure during construction, O&M and decommissioning; • disturbance to birds from vessel movement during construction, O&M and decommissioning; • disturbance to prey species and their habitats during construction, O&M and decommissioning; • temporary habitat loss and disturbance during construction and decommissioning; • attraction to light during construction, O&M and decommissioning; and • entanglement during operation. The following potential impacts to offshore ornithology are proposed to be scoped out: • collision risk with substructure and underwater Offshore Infrastructure; • long term habitat loss; and • accidental release of contaminants. Table 12.6, Section 12: Offshore Ornithology explains why these impacts are proposed to be scoped out.
Human Environment			
Commercial Fisheries	✓	×	The following commercial fisheries impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • reduction in access to, or exclusion from established fishing grounds during construction, O&M and decommissioning;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• displacement leading to gear conflict and increased fishing pressure on adjacent grounds during construction, O&M and decommissioning; • disturbance of commercially important fish and shellfish resources leading to displacement or disruption of fishing activity during construction, O&M and decommissioning; • increased vessel traffic associated with the Proposed Development within fishing grounds leading to interference with fishing activity during construction, O&M and decommissioning; • additional steaming to alternative fishing grounds for vessels that would otherwise fish within the Proposed Development during construction, O&M and decommissioning; and • physical presence of Offshore Infrastructure and potential exposure of that Offshore Infrastructure leading to gear snagging during construction, O&M and decommissioning.
Shipping and Navigation	✓	×	The following shipping and navigation impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • deviation of commercial vessels during construction, O&M and decommissioning; • increased collision risk during construction, O&M and decommissioning; • increased contact/allision risk during construction, O&M and decommissioning; • increased grounding risk during construction, O&M and decommissioning; • impact to SAR capability during construction, O&M and decommissioning; • interference with Radar, communications and positioning systems during construction, O&M and decommissioning;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• reduction in Under Keel Clearance due to subsurface Offshore Infrastructure during construction, O&M and decommissioning; • towage operations during construction, O&M and decommissioning; • breakout or loss of station of a floating Wind Turbine during construction, O&M and decommissioning; • impact on port/harbours and nearshore operations during construction, O&M and decommissioning; • impact on small vessel activity (fishing/recreational) during construction, O&M and decommissioning; and • impact of cable systems and interactions with vessels at risk of snagging during construction, O&M and decommissioning.
Aviation and Radar	✓	✓	The following potential impacts to aviation and radar are proposed to be scoped into the Offshore EIA Report and will be subject to a full detailed assessment in the Offshore EIA Report: • potential impact on Aberdeen Airport IFPs during construction; • potential impact on NATS Perwinnes and Allanshill ATC PSRs during operation; • potential impact on MoD Buchan air defence PSR during operation; and • potential obstacle collision risk to Low Flying aircraft (including SAR) during construction. The following potential aviation and radar impacts are proposed to be scoped out: • creation of an obstruction: Offshore Export Cable Route on Civil and Military communication, navigation and surveillance equipment;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• creation of obstruction: Military Aerodrome IFPs (including communication, navigation and surveillance equipment); • impact on aviation radar systems: Military ATC PSR; • creation of an obstruction: HMRs; • creation of an obstruction: Offshore Helicopter Installations; • creation of an obstruction: Local Airspace Restrictions; (Prohibited/Restricted/Danger Areas and Military PEXAs); and • impact on aviation radar systems: Met Office Radar. Table 15.4, Section 15: Aviation and Radar explains why these impacts are proposed to be scoped out.
Infrastructure and Other Users	✓	✓	The following potential impacts to infrastructure and other sea users proposed are to be scoped into the Offshore EIA Report and will be subject to a full detailed assessment in the Offshore EIA Report: • Displacement of recreational activities (including recreational sailing, cruising and recreational fishing) during construction, O&M and decommissioning; • Impacts to early development cables or pipelines or restrictions on access to cables or pipelines during construction, O&M and decommissioning; and • Interference with offshore microwave fixed communication links during construction, O&M and decommissioning. The following potential impacts to infrastructure and other sea users are proposed to be scoped out of the Offshore EIA Report: • increased SSC and associated deposition affecting recreational diving sites; • increased SSC and associated deposition affecting aggregate extraction areas;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• alterations to sediment transport pathways affecting aggregate extraction areas; • impact on marine disposal sites; • reduction or restriction of oil and gas exploration activities (including surveys, drilling and the placement of infrastructure); • impacts on CCS; and • interference with the performance of REWS located on oil and gas platforms. Table 16.4, Section 16: Infrastructure and Other Users explains why these impacts are proposed to be scoped out.
Major Accidents and Disasters	×	✓	Major accidents and disasters is proposed to be scoped out but all identified hazards will be assessed within respective technical topic chapters or will be managed via adherence to industry requirements, RAMS, and/or management plans. The following potential MADS hazards are proposed to be scoped out: • collision risk: shipping and navigation; • collision risk: aviation (military and civil); • snagging risk: commercial fisheries; • risk of accident: cables and pipelines; • risk of accidents: extreme weather (and storm surge); • risk of accident: oil and gas infrastructure; • pollution of the marine environment (structures); • sabotage/terrorism events; • physical impacts (collision, allision); • UXOs;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• pollution of the marine environment (vessels); • fire at Wind Turbine or OSPs including from third-party interference); and • snagging risk – commercial fisheries. Table 17.3 and Table 17.4, Section 17: MADS explains why these hazards are proposed to be scoped out through the Proposed Development's vunderability to existing hazards and potential cause to MADS respectively.
Socio-Economics, Tourism and Recreation	✓	✓	The following potential socio-economic, tourism and recreational impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • increase in employment and GVA during construction, O&M and decommissioning; • demographic changes during construction, O&M and decommissioning; • changes to housing demand during construction, O&M and decommissioning; • changes to other local public and private services during construction, O&M and decommissioning; • changes to tourism receptors during construction, O&M and decommissioning; • changes to recreation receptors during construction, O&M and decommissioning; and • socio-cultural Impacts during construction and O&M. The following potential socio-economic, tourism and recreational impacts are proposed to be scoped out: • socio-cultural Impacts during the Decommissioning Phase; and • transboundary effects.

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			Table 18.5, Section 18: Socio-Economics, Tourism and Recreation explains why these impacts are proposed to be scoped out.
Marine Archaeology	✓	×	The following marine archaeology impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • Sediment disturbance and deposition leading to indirect impacts on marine archaeology receptors during construction, O&M and decommissioning; • Direct damage to maritime archaeology receptors (e.g. wrecks, debris, submerged prehistoric receptors (palaolandscapes and associated archaeological receptors)) during construction, O&M and decommissioning; • Direct damage to deeply buried marine archaeology receptors (e.g. palaeolandscapes and associated archaeological receptors) during construction, O&M and decommissioning; and • Alteration of sediment transport regimes during O&M.
Seascape, Landscape and Visual Impact	✓	✓	The following seascape, landscape and visual impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • Export Cable Corridor and Landfall Area– impacts on Seascape, Landscape and Visual resources during construction and decommissioning; • Offshore Wind Turbines and OSP – impacts on Seascape, Landscape and Visual resources. The following seascape and visual impacts are proposed to be scoped out: • temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the Array Area during construction;

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• long-term night-time impacts on coastal landscape character and visual amenity during O&M; and • temporary night-time impacts on coastal landscape character and visual amenity as a result of temporary lighting within the Array Area during decommissioning. Table 20.4, Section 20: Seascape, Landscape and Visual Impact explains why these impacts are proposed to be scoped out.
Cultural Heritage	✓	×	The following seascape, landscape and visual impacts are proposed to be scoped in and will be subject to a full detailed assessment in the Offshore EIA Report: • impacts (daytime) of the O&M of the offshore elements of the Proposed Development upon the identified cultural heritage receptors • impacts (night-time) of the O&M of the Proposed Development upon the identified cultural heritage receptors. The following cultural heritage impacts are proposed to be scoped out: • construction phase impacts relating to setting; • O&M phase impacts relating to the setting of nationally important cultural heritage assets within the Cultural Heritage Study Area not identified as cultural heritage receptors; • O&M phase impacts relating to the setting of cultural heritage assets of less than national importance (Category B and C Listed Buildings and Conservation Areas) within the Cultural Heritage Study Area; • O&M phase impacts relating to the setting of cultural heritage assets outside the Cultural Heritage Study Area; and • O&M phase impacts relating to the Offshore Export Cables.

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			• Decommissioning phase impacts relating to the setting of onshore cultural heritage assets. Table 21.5, Section 21: Seascape, Landscape and Visual Impact explains why these impacts are proposed to be scoped out.
Climate Change	✓	✓	The following potential impacts on climate change are proposed to be scoped in and will be subject to a qualitative assessment in the Offshore EIA Report: • the impact of GHG emissions arising from the construction and installation of the Proposed Development; • the impact of GHG emissions arising from the consumption of materials and activities required to facilitate the O&M phase and the impact of avoided emissions associated with the estimated abatement of UK Grid emissions due to the Proposed Development; • the impact of GHG emissions arising from the disturbance of blue carbon systems and seabed change, including benthic and subtidal/intertidal ecology, during the construction, O&M and decommissioning phases; • the impact of GHG emissions arising from decommissioning works (e.g. plant/equipment, fuel and vessel use) and the recovery (or disposal) of materials; and • climate resilience of the Proposed Development during O&M and decommissioning. The following potential climate change impacts are proposed to be scoped out: • Climate resilience of the Proposed Development – construction; and • ICCI. Table 22.3, Section 22: Climate Change explains why these impacts are proposed to be scoped out.

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
Human Health	×	✓	Human Health will not be included in the Offshore EIA Report as a stand-alone section, with its impacts at scoping level covered within topic specific sections, mainly Section 18: Socio-Economics, Tourism and Recreation and Section 20: Seascape and Visual Impact. Other sections that will consider indirect impacts on human health are Section 13: Commercial Fisheries, Section 14: Shipping and Navigation, Section 22: Climate Change and Section 23: Offshore Water Quality and Water Framework Directive. For this reason, human health is proposed to be scoped out of the Offshore EIA Report.
Waste	×	✓	Waste is proposed to be scoped out of the Offshore EIA Report as this will be considered within specific receptor sections where applicable. Furthermore, a WMP will be produced for the Proposed Development, which will lay out the processes for handling and managing any waste materials. The WMP will form part of the EMP and will be prepared prior to construction of the Proposed Development.
Other Residues and Emissions	×	✓	Other Residues and Emissions is proposed to be scoped out of the Offshore EIA Report as this will be considered within specific receptor sections where applicable. Sections that will cover other residues and emissions will be Section 20: Seascape and Visual Impact (light pollution), Section 8: Subsea Noise (vibrations), Section 10: Fish and Shellfish Ecology and Section 12: Offshore Ornithology (airborne noise). For this reason, other residues and emissions is proposed to be scoped out of the Offshore EIA Report.
Air Quality		✓	Air quality is proposed to be scoped out of the Offshore EIA Report as it is unlikely that the Proposed Development would result in significant effects on air quality. Any particulates released into the air as a result of the offshore works would be minor. Also, no Air Quality Management Areas and distance

Topic	Impacts Scoped In?	Impacts Scoped Out?	Justification for Scoping In/Out
			from Landfall. Impacts on climate as a result of carbon emissions will be assessed in the Offshore and Onshore EIA Reports

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Appendix A: Draft Schedule of Mitigation and Commitments

A1.1 Introduction

A1.1.1 This section summarises the mitigation measures for the Proposed Development proposed within this Offshore Scoping Report. Each of the measures listed in Table A1.1 are further detailed in each relevant topic section. The mitigation measures are organised into three categories:

- **Primary mitigation (P)** relates to the design of the Proposed Development, with mitigation implemented through adjusting the Proposed Development design (Section 3: Project Description).
- **Secondary mitigation (S)** refers to Additional Measures put in place to prevent, reduce, and/or offset adverse effects where they are considered to be significant and likely to arise throughout the Proposed Development's lifetime. They are also referred to as Additional Mitigation. They are commonly implemented where Embedded Mitigation measures are not able to prevent significant adverse environmental effects.
- **Tertiary mitigation (T)** often includes measures required to ensure compliance with existing legislative requirements or those that are industry standard or good practice and often address potential impacts that aren't specific to any one topic, such as preparation and adherence to Marine Pollution Plans.

A1.1.2 As stated in Section 4: EIA Methodology, primary and tertiary mitigation measures will be considered as Embedded Mitigation. Secondary mitigation will be referred to as Additional Mitigation.

A1.1.3 Each mitigation measure will apply to a specific phase(s) of the Proposed Development. A description of each Proposed Development phase is provided in Section 3: Project Description.

A1.1.4 The proposed mitigation measures in Table A1.1 will be implemented into the Environmental Impact Assessment (EIA) process. Future stakeholder engagement and the Scoping Opinion will inform the mitigation measures detailed within this Offshore Scoping Report. Therefore, the Schedule of Mitigation and Commitments is a 'live' document which will be updated throughout the EIA process.

Table A1.1: Proposed Development Schedule of Mitigation and Commitments

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																		Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
1	✓	×	×	Development and adherence to a Cable Specification and Installation Plan (CSIP) post consent.	E	✓		✓	✓			✓				✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for a CSIP
2	×	✓	×	Use of scour protection where there is potential for scour to develop around the Offshore Infrastructure, and it is appropriate to do so.	E	✓		✓				✓	✓			✓								Secured in the Section 36 Consent and Marine Licence
3	✓	×	×	Piling will include a combination of a slow start, soft start, ramp up or Acoustic Deterrent Devices (ADDs). This will be detailed in the Piling Strategy.	E		✓		✓	✓														Secured in the Section 36 Consent and Marine Licence, via the Piling Strategy
4	✓	✓	✓	Implementation, management and monitoring of cable protection, via burial or external protection where adequate burial depth is not feasible as per the Cable Burial Risk Assessment (CBRA) and the Cable Burial Assessment (CBA). Results of these assessments, and commitments to post construction monitoring, will be provided in the Cable Plan (CaP).	E			✓				✓	✓			✓						✓		Secured in the Section 36 Consent and Marine Licence, via the CBRA. CBA and CaP.
5	✓	✓	✓	Development of and adherence to an Environmental Management Plan (EMP), which will include a Marine Pollution Contingency Plan (MPCP), Marine Mammal Mitigation Plan (MMMP), the commitments to environmental monitoring and actions to minimise Invasive Non-Native Species (INNS).	E			✓	✓	✓	✓	✓	✓			✓					✓	✓	✓	Secured in the Section 36 Consent and Marine Licence, via the requirement for an EMP

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																	Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
6	✓	×	×	Development of, and adherence to a Construction Method Statement (CMS) along with a Code of Construction Practice (CoCP).	E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Secured in the Section 36 Consent and Marine Licence, via the requirement for a CMS
7	✓	✓	✓	All relevant Health and Safety Executive (HSE) procedures will be followed.	E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Required in accordance with relevant health and safety legislation
8	✓	✓	✓	Development of and adherence to a Vessel Management Plan (VMP) and Navigation Safety Plan (NSP).	E					✓	✓	✓	✓		✓	✓						✓		Secured in the Section 36 Consent and Marine Licence, via the requirement for an NSP and VMP
9	✓	✓	✓	Development of and adherence to a Fisheries Management and Mitigation Strategy (FMMS). The FMMS will set out the means of ongoing fisheries liaison and detail any mitigation to be put in place to limit effects on commercial fisheries activity.	E							✓				✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for an FMMS
10	✓	✓	✓	Appointment of a Fisheries Liaison Officer (FLO). The FLO will support ongoing liaison and ensure clear communication between the Applicant and commercial fishers.	E							✓				✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for an FMMS
11	✓	✓	✓	Advance warning and accurate location details of operations, associated Safety Zones and advisory passing distances will be given via Notice to Mariners (NtMs) and Kingfisher Bulletins.	E							✓	✓	✓	✓	✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for advance warnings

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																	Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
12	✓	✓	✓	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.	E							✓	✓	✓	✓	✓				✓				Secured in the Section 36 Consent and Marine Licence, via the requirement for an LMP.
13	✓	✓	✓	Adherence to good practice guidance with regards to fisheries liaison and procedures in the event of interactions between the Proposed Development and fishing activities (e.g. Fishing Liaison with Offshore Wind and Wet Renewables Group (FLOWW), 2014; 2015).	E							✓				✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for an FMMS.
14	✓	✓	✓	Participation in any fisheries working group to assist with liaison between the Applicant and the fishing community.	E							✓				✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for an FMMS
15	✓	✓	✓	Application for and use of Safety Zones of up to 500 m during construction, major repairs, and decommissioning phases.	E							✓	✓		✓	✓								Secured via an application for Safety Zones prior to construction commencing.
16	✓	✓	✓	Any objects dropped on the seabed during works associated with the Proposed Development will be reported in line with Marine Directorate - Licensing Operations Team (MD-LOT) procedures and objects will be recovered where they pose a hazard to other marine users and where recovery is possible.	E							✓			✓	✓								Secured in the Section 36 Consent and Marine Licence, via the Dropped Object Procedure
17	✓	✓	✓	All vessels working on the Proposed Development will meet the required certification standards and carriage requirements along with following international marine regulations.	E								✓			✓					✓			Secured in the Section 36 Consent and Marine Licence, via the requirement for a VMP

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																	Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
18	✓	×	×	The Offshore Infrastructure with heights greater than 91.4 m will be marked on nautical charts including an appropriate chart note and will be alerted to aircrews through the Notice To Aviation (NOTAM) system.	E								✓	✓	✓	✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for a VMP and LMP
19	✓	✓	✓	Suitable Aids to Navigation (AtoN) lighting and marking the Proposed Development will be implemented.	E								✓			✓								International Association of marine aids to navigation and Lighthouse Authorities (IALA) Recommendations G1162
20	✓	✓	✓	Wind Turbine design to have a minimum lower blade tip height of 22 m above Mean High Water Springs (MHWS), accounting for pitch and roll as per Marine Guidance Note (MGN) 654.	E						✓		✓			✓								Secured in the Section 36 Consent and Marine Licence.
21	✓	✓	✓	Hydrographic surveys will fulfil the requirements of the International Hydrographic Organisation (IHO) Order 1a standard.	E								✓			✓								Secured in the Section 36 Consent and Marine Licence
22	✓	✓	✓	Development of, and adherence to, an Emergency Response Cooperation Plan (ERCoP) in consultation with the Maritime & Coastguard Agency (MCA).	E								✓	✓		✓						✓		Secured in the Section 36 Consent and Marine Licence, via the requirement for an ERCoP
23	×	✓	×	Development and adherence to an Operation and Maintenance Programme (OMP).	E								✓	✓	✓	✓						✓		Secured in the Section 36 Consent and Marine Licence
24	✓	×	×	Wind Turbine layout plan to be consulted on with MCA and Northern Lighthouse Board (NLB) prior to construction.	E								✓		✓	✓								Secured in the Section 36 Consent and Marine Licence, via the requirement for a CMS
25	✓	×	×	Development of, and adherence to, a Development Specification and Layout Plan (DSLP).	E								✓			✓			✓					Secured in the Section 36 Consent and Marine Licence and the requirement for a DSLP.

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																		Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
26	✓	×	×	CAA will be informed of the locations, heights and lighting status of the Wind Turbines, including estimated and actual dates of construction and the maximum heights of any construction equipment to be used, prior to the start of construction.	E									✓		✓								Secured in the Section 36 Consent and Marine Licence
27	✓	✓	✓	Consultation with infrastructure and other user stakeholders, as required	E										✓	✓								Secured in the Section 36 Consent and Marine Licence
28	✓	✓	✓	The Applicant will work with other developers, Government, and key stakeholders to assist in addressing barriers to local supply chain participation.	E												✓							Supply Chain Development Statement (SCDS)
29	✓	✓	✓	The Applicant will engage with local supply chain as part of a developing strategy to lever oil and gas competencies and maximise local content as much as practicable for the Proposed Development.	E												✓							Supply Chain Development Statement (SCDS)
30	✓	✓	✓	The Strategic Investment Model (SIM) will be followed as a mechanism set up to support investment in major manufacturing and recycling/repurposing facilities and to enable infrastructure projects in Scotland.	E												✓							Supply Chain Development Statement (SCDS)
31	✓	✓	✓	The Energy Pathfinder will be followed to ensure complete visibility of the work programme and an opportunity for Scottish and UK suppliers to bid for work.	E												✓							Supply Chain Development Statement (SCDS)

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																	Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
32	✓	✓	✓	The identification and implementation of Archaeological Exclusion Zones (AEZs) around receptors identified as having a known archaeological potential.	E													✓						Secured in the Section 36 Consent and Marine Licence
33	✓	✓	✓	The development and implementation of Protocols for Archaeological Discoveries (PADs) and Written Schemes of Investigation (WSI).	E													✓						Secured in the Section 36 Consent and Marine Licence, via the requirement for a WSI and PAD
34	✓	×	×	Archaeological input into relevant site pre-construction geophysical and Remotely Operated Vehicle (ROV)/diver surveys with appropriate monitoring, if necessary.	E													✓						Secured in the Section 36 Consent and Marine Licence, via the requirement for a WSI
35	✓	×	×	Some of the components required for construction are likely to be fabricated at UK manufacturing sites, reducing potential carbon emissions from the transportation of materials compared to if procured overseas.	E																✓			Secured in the Section 36 Consent and Marine Licence, and through the Applicant's commitment required through the ScotWind Leasing process and in accordance with the Project SCDS.
36	✓	×	×	Additionally, Offshore Infrastructure is typically designed to be resilient to climate risks such as storms and waves with factors of safety incorporated into the design.	E																✓			Secured in the Section 36 Consent and Marine Licence
37	×	×	✓	Drafting and implementation of a decommissioning programme.	E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓			✓	✓		Secured in the Section 36 Consent and Marine Licence, via the requirement for a decommissioning plan.

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																		Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
38	✓	✓	✓	The development and adherence to an Entanglement Management Plan, or equivalent.	E					✓	✓													Secured in the Section 36 Consent and Marine Licence, via the requirement for an entanglement plan
39	✓	✓	✓	Adherence with HSE/MCA guidance “Regulatory expectations on moorings for floating wind and marine devices” as appropriate (HSE/MCA, 2017).	E								✓			✓								Secured in the Section 36 Consent and Marine Licence
40	✓	×	×	Entrance into cable crossing agreements, as required.	E										✓	✓								United Nations Convention on the Law of the Sea (UNCLOS)
41	✓	✓	×	Colouration of the Wind Turbines and blades will be to industry standard which reduces visibility of the Wind Turbines.	E														✓	✓				Secured in the Section 36 Consent and Marine Licence
42	✓	×	×	Achieve appropriate design and layout of Wind Turbines within the Array Area.	E	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓				Secured in the Section 36 Consent and Marine Licence
43	✓	×	×	Where possible, the use of low order disposal of Unexploded Ordnance (UXOs) will be implemented (i.e. deflagration).	E		✓		✓	✓														Secured in the Section 36 Consent and Marine Licence, via the requirement for an EMP
44	✓	×	×	Adoption of JNCC guidelines for minimising the risk of injury to marine mammals from geophysical surveys, piling noise and use of explosives if and where required.	E					✓														Secured in the Section 36 Consent and Marine Licence, via the requirement for an EMP
45	✓	✓	✓	Identification and implementation of Temporary Archaeological Exclusion Zones (TAEZs) around encounters of previously unknown archaeological sites.	E													✓						Secured in the Section 36 Consent and Marine Licence

Reference	Proposed Development Phase *			Mitigation Commitment	Mitigation Category**	Relevant Topics in the Offshore Scoping report																	Means of Implementation
	C	O	D			Physical Processes	Subsea Noise	Benthic Ecology	Fish and Shellfish Ecology	Marine Mammals	Offshore Ornithology	Commercial Fisheries	Shipping and Navigation	Aviation and Radar	Infrastructure and Other Users	Major Accidents and Disasters	Socio-Economics, Tourism and Recreation	Marine Archaeology	SLVIA	Cultural Heritage	Climate Change	Offshore Water Quality and Water Framework Directive	Other Environmental Topics (including Waste)	
46	✓	×	×	Micrositing of Offshore Infrastructure to avoid any known archaeological receptors identified in pre-construction surveys.	E													✓						Secured in the Section 36 Consent and Marine Licence
47	✓	×	×	Creation of a Waste Management Plan (WMP), which will describe the processes for handling and managing any waste materials.	E																		✓	Secured in the Section 36 Consent and Marine Licence, via the requirement for an EMP
48	✓	✓	✓	The Proposed Development will be marked on Admiralty charts including an appropriate chart note.	E								✓		✓	✓								Secured in the Section 36 Consent and Marine Licence
49	×	✓	×	Regular maintenance regime to check the Proposed Development Offshore Infrastructure.	E								✓			✓						✓		Secured in the Section 36 Consent and Marine Licence
50	✓	✓	✓	Compliance of project vessels with international marine regulations as adopted by the Flag State, including COLREGS (IMO, 1972) and SOLAS (IMO, 1974).	E								✓			✓								Secured in the Section 36 Consent and Marine Licence
51	✓	×	×	Archaeological input into specifications for and analysis of pre-construction geotechnical surveys. This might include the presence of a geoarchaeologist on board the survey vessel and provision for sampling, analysis and reporting of recovered cores. The results of all geoarchaeological investigations to be complied in a final report which includes a sediment deposit model.	E													✓						Secured in the Section 36 Consent and Marine Licence

* Proposed Development phase refers to construction (C), O&M (O) and decommissioning (D).

** mitigation category refers to Embedded (E) or Additional (A).

Appendix B: Transboundary Screening

B1.1 Introduction

B1.1.1 This section of this Offshore Scoping Report identifies the potential transboundary receptors of relevance to the Proposed Development and considers the potential impacts arising from the construction, Operation and Maintenance (O&M), and decommissioning of the Proposed Development.

B1.2 Background

B1.2.1 Transboundary effects have the potential to arise if an impact from a proposed development has the potential to affect the environment of an EEA State.

B1.2.2 Marine Scotland Consenting and Licensing Guidance for Offshore Wind, Wave, and Tidal Energy Applications (Scottish Government, 2018) advises that transboundary impacts in relation to offshore renewable energy projects in Scotland are likely to relate primarily to:

- projects that may have an impact on mobile species; and
- where projects are close to national boundaries or areas administered by other relevant authorities.

B1.2.3 The outcome of the transboundary screening assessment for the Proposed Development is set out below. Where a likely significant transboundary effect is identified, or cannot be ruled out, this will be considered further within the Offshore Environmental Impact Assessment (EIA) Report. Where no likely significant transboundary effects have been identified as part of the transboundary screening process, this is clearly stated.

B1.3 Legislative Context

B1.3.1 The United Nations Economic Commission for Europe (UNECE) Convention on EIA in a Transboundary Context (the Espoo Convention) (as amended) (UNECE, 2017), of which the UK is a Party, provides guidance on assessment of transboundary impacts with the aim of promoting "environmentally sound and sustainable development, while enhancing international cooperation in assessing environmental impacts of a proposed project". The Espoo Convention requires EIAs to consider potential impacts across national borders where an activity occurring in one country has the potential for significant effect in another country that is Party to the Convention.

B1.3.2 The UK is also a Party to the Convention on Access to Information, Public Participation in Decision-Making and Access to Justice in Environmental Matters (the Aarhus Convention) and its Protocol

(UNECE, 1998), which provide people with the rights to easily access information, participate effectively in decision-making in environmental matters and to seek justice if their rights are violated (The Planning Inspectorate, 2020; UNECE, 1998).

B1.3.3 European Union (EU) Directive 85/337/EEC (as amended) (the EIA Directive) implements both the Espoo and Aarhus Conventions in EU states (Council of Europe, 1985). This Directive is transposed into Scottish and UK law through the following applicable legislation (the 'EIA Regulations'):

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

Environmental Impact Assessment

B1.3.4 Under the EIA Regulations, Scottish Ministers are required to determine if a proposed development is likely to have significant effects on the receiving environment of other EEA states (i.e. a "transboundary impact"). Where it comes to the attention of the Scottish Ministers that works proposed to be carried out in Scotland are the subject of an EIA application and are likely to have significant effects on the environment of an EEA State, Scottish Ministers must:

- publish the information in a notice placed in The Edinburgh Gazette, indicating the address where further information is available;
- send to the EEA State, as soon as possible and no later than their date of publication in The Edinburgh Gazette, the particulars of the development (see paragraph B1.3.5 below); and
- give authorities of other EEA States a reasonable period of time in which to indicate whether it wishes to participate in the procedure for which these Regulations provide.

B1.3.5 The information required to be shared with other EEA States includes:

- a description of the works, together with any available information on their likely significant effect on the environment in the jurisdiction of the administration(s); and
- information on the nature of the decision which may be taken.

Habitats Regulations Appraisal

B1.3.6 The Habitats Directive has been transposed into UK law through:

- The Conservation (Natural Habitats &c.) Regulations 1994 (as amended);
- The Conservation of Habitats and Species Regulations 2017; and
- The Conservation of Offshore Marine Habitats and Species Regulations 2017 (which apply to Marine Licences and Section 36 applications within the Scottish Offshore region).

B1.3.7 Where Scottish Ministers are required to undertake an Appropriate Assessment (AA) of a project, it is required that the proposed projects' Habitats Regulations Appraisal (HRA) will provide the required information in relation to potential transboundary impacts and associated impacts on designated sites located in other EEA States.

B1.4 Consultation

B1.4.1 Once an EEA state has confirmed that they wish to participate in discussions on a potential transboundary assessment of a project, they must be consulted. Scottish Ministers must supply the required information as set out above. It is proposed that the authorities of the following EEA States may require consultation for the Proposed Development:

- Denmark;
- Germany;
- The Netherlands; and
- Norway.

B1.4.2 The participation of these EEA states is recommended based on the potential for transboundary impacts on offshore ornithology, commercial fisheries, and shipping and navigation as discussed in section B1.5 below.

B1.5 Screening of Transboundary Impact

B1.5.1 Figure B1.1 illustrates the proximity of the Proposed Development to the jurisdictions of other EEA States. The distance of the Proposed Development to other jurisdictions with which there may be the potential for transboundary impacts has been considered within this assessment. The distance of the Proposed Development to the jurisdictional boundaries of the nearest EEA State is presented in Table B1.1 and shown on Figure B1.1.

Table B1.1: Distances of EEA States from the Scoping Boundary

EEA State	Distance from Scoping Boundary (km)
Denmark	290.4
Germany	303.6
The Netherlands	312.4
Norway	209.7

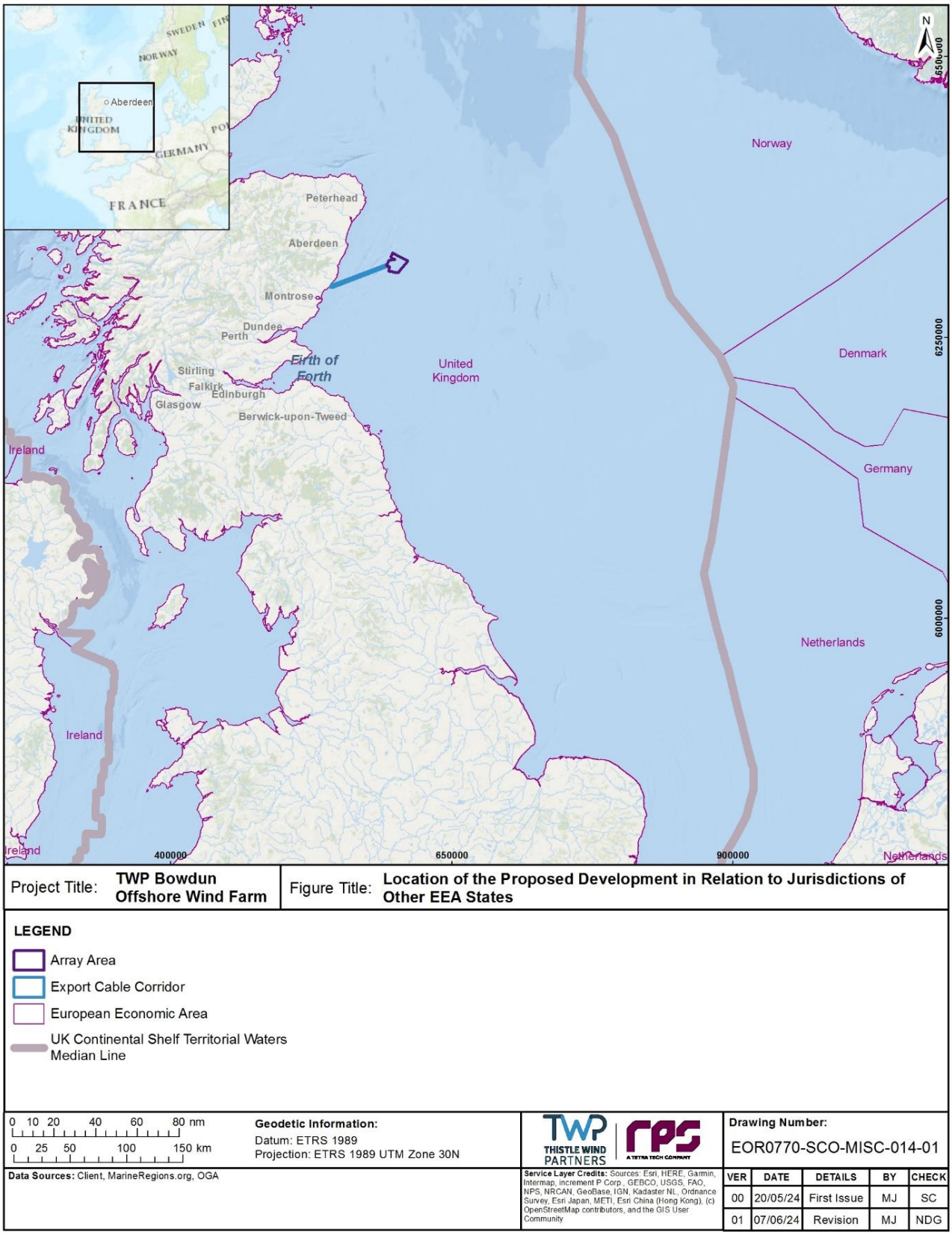


Figure B1.1: Location of the Proposed Development in Relation to Jurisdictions of Other EEA States

B1.5.2 A series of screening matrices for potential transboundary impacts associated with the Proposed Development are presented for the offshore physical and biological environment and the offshore human environment. These screening matrices have been based upon an initial understanding of the potential impacts arising from the Proposed Development on the basis of the information discussed in Section 3: Project Description. The screening matrix follows the suggested format outlined by The Planning Inspectorate (2020). Whilst the Advice Note has been prepared by The Planning Inspectorate and is therefore not applicable under the Scottish planning regime, it has been used as best practice to inform the transboundary screening exercise undertaken in this appendix.

B1.5.3 The screening matrices consider all potential transboundary impacts that may occur from all phases of the Proposed Development (construction, O&M, and decommissioning). The matrices also address the predicted spatial and temporal scale of potential transboundary impacts for those interests that are proposed to be screened into the assessment.

B1.5.4 Potential effects upon European designated sites within other states are considered separately within the screening process for the HRA.

B1.6 Offshore Transboundary Impacts

B1.6.1 Screening of the potential transboundary impacts has been completed for the offshore physical, biological and human environment topics relevant to the Proposed Development. The conclusions of the transboundary screening for each topic are presented below, along with supporting justification. The significance of any transboundary effects will be determined at the EIA stage and detailed within the Offshore EIA Report.

Physical and Biological Environment

Physical Processes

B1.6.2 This screening exercise identified that there is no potential for transboundary impacts upon physical processes as a result of construction, O&M and decommissioning impacts of the Proposed Development. This is determined on the basis that the potential Zone of Influence (ZoI) resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for physical processes have been screened out of further assessment.

Benthic Subtidal and Intertidal Ecology

B1.6.3 This screening exercise identified that there is no potential for transboundary impacts upon benthic ecology as a result of

construction, O&M and decommissioning impacts of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for benthic subtidal and intertidal ecology have been screened out of further assessment.

Fish and Shellfish Ecology

B1.6.4 This screening exercise identified that there is potential for transboundary impacts upon fish and shellfish ecology as a result of construction, O&M, and decommissioning impacts of the Proposed Development. These include:

- injury and disturbance from subsea noise generated during piling;
- injury and disturbance from subsea noise generated during UXO clearance;
- injury and disturbance from subsea noise generated during site investigation surveys;
- injury and disturbance from subsea noise generated by vessel use and other noise producing activities;
- injury and disturbance from subsea noise generated by Wind Turbine operation;

B1.6.5 However, due to the distance of the Proposed Development from the other administrative areas (see Figure B1.1) and considering migration ranges of fish species in the study area (see Section 10: Fish and Shellfish Ecology), any potential transboundary impacts have been deemed negligible, and therefore transboundary impacts for fish and shellfish have been screened out of further assessment.

Marine Mammals

B1.6.6 This screening exercise identified that there is potential for transboundary impacts upon marine mammals as a result of construction, O&M, and decommissioning impacts of the Proposed Development. These include:

- injury and disturbance from subsea noise generated during piling;
- injury and disturbance from subsea noise generated during UXO clearance;
- injury and disturbance from subsea noise generated during site investigation surveys;
- injury and disturbance from subsea noise generated by vessel use and other noise producing activities;
- injury and disturbance from subsea noise generated by Wind Turbine operation;
- injury to marine mammals due to collision with vessels; and

- effects on marine mammals due to changes in prey availability.

B1.6.7 Due to the distance of the Proposed Development from the other administrative areas (see Figure B1.1), and considering migration ranges of marine mammals species in the study area (see Section 11: Marine Mammals), any potential transboundary impacts have been deemed negligible, and therefore transboundary impacts for marine mammals have been screened out of further assessment.

Offshore Ornithology

B1.6.8 This screening exercise identified that there is potential for transboundary impacts upon offshore ornithology receptors as a result of construction, O&M, and decommissioning phases impacts of the Proposed Development. These include:

- collision risk mortality due to collision with rotor blades;
- distributional responses, displacement and barrier effects from Offshore Infrastructure;
- disturbance to birds from vessel movements;
- disturbance to prey species and their habitats;
- temporary habitat loss and/or habitat disturbance;
- attraction to light; and
- entanglement.

B1.6.9 Therefore, potential transboundary impacts for offshore ornithology has been screened in and will be considered in further detail as part of the Offshore EIA Report.

Human Environment

Commercial Fisheries

B1.6.10 This screening exercise identified that there is limited potential for transboundary impacts upon commercial fisheries.

B1.6.11 However, the potential impacts on commercial fisheries receptors will be confirmed in the Offshore EIA Report following further baseline data analysis and stakeholder engagement. Therefore, transboundary impacts for commercial fisheries have been screened in for further assessment.

Shipping and Navigation

B1.6.12 This screening exercise identified that there is potential for transboundary impacts upon Shipping and Navigation.

B1.6.13 Potential impacts on shipping and navigation receptors include:

- impact of cable systems and interactions with vessels at risk of snagging;
- deviation of commercial vessels;

- increased collision risk;
- increased contact/allision risk;
- increased grounding risk;
- impact to SAR capability;
- interference with radar, communications, and positioning systems;
- reduction in Under Keel Clearance due to subsurface Offshore Infrastructure;
- towage operations;
- breakout or loss of station of a floating Wind Turbine;
- impact on port/harbours and nearshore operations; and
- impact on small vessel activity (fishing/recreational).

B1.6.14 Therefore, transboundary impacts for shipping and navigation have been screened in for further assessment.

Aviation and Radar

B1.6.15 This screening exercise identified that there is no potential for transboundary impacts upon aviation and radar receptors as a result of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for aviation and radar have been screened out of further assessment.

Infrastructure and Other Users

B1.6.16 This screening exercise identified that there is no potential for transboundary impacts upon infrastructure and other users receptors as a result of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for infrastructure and other users have been screened out of further assessment.

Marine Archaeology

B1.6.17 This screening exercise identified that there is no potential for transboundary impacts upon marine archaeology receptors as a result of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for marine archaeology have been screened out of further assessment.

Socio-Economics

B1.6.18 This screening exercise identified that there is a potential for transboundary impacts relating to Socio-Economics. These include:

- supply chain expenditure;
- job creation; and,
- contribution to GVA.

B1.6.19 The economic impacts identified will be dependent on the properties of the national economies where such activities occur. However, at the time of the Offshore EIA Report submission, these countries will be unknown, and therefore it will not be possible to reliably model these impacts (see Section 18: Socio-Economics, Tourism and Recreation). It is therefore proposed to screen out socio-economic, tourism, and recreation transboundary effects from the EIA.

SLVIA

B1.6.20 This screening exercise identified that there is no potential for transboundary impacts upon SLVIA due to construction, O&M, and decommissioning impacts of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for SLVIA have been screened out of further assessment.

Cultural Heritage

B1.6.21 This screening exercise identified that there is no potential for transboundary impacts upon cultural heritage due to construction, O&M, and decommissioning impacts of the Proposed Development. This is determined on the basis that the potential ZoI resulting from the Proposed Development will not extend beyond Scottish Waters. Therefore, transboundary impacts for cultural heritage have been screened out of further assessment.

Climate Change

B1.6.22 Given the global nature of the atmosphere and climate impacts, the only feasible assessment is the comparison of the Proposed Development against Scotland's and the UK's carbon budgets and the related climate policies and objectives which are formulated to take into account the UK's global carbon reduction commitments.

B1.7 Summary

B1.7.1 This transboundary screening has been carried out considering the location of the Proposed Development and the current Proposed Development description. There is the potential for transboundary impacts associated with the Proposed Development for the following topics, which will be assessed in the Offshore EIA Report:

- offshore ornithology;
- commercial fisheries; and

- shipping and navigation.

Appendix C: Subsea Noise Modelling Method Statement

C1.1 Introduction

C1.1.1 Sound is readily transmitted into the underwater environment and there is potential for the sound emissions from the Proposed Development to affect marine mammals, fish and benthic receptors in different ways depending on its sound level and characteristics. Richardson *et al*. (1995) defined four zones of sound influence which vary with distance from the source and level. These are:

- **The zone of audibility**: this is the area within which the animal can detect the sound. Audibility itself does not implicitly mean that the sound will affect the marine life.
- **The zone of masking**: this is defined as the area within which sound can interfere with the detection of other sounds such as communication or echolocation clicks. This zone is very hard to estimate due to a paucity of data relating to how marine mammals detect sound in relation to masking levels (for example, humans can hear tones well below the numeric value of the overall sound level).
- **The zone of responsiveness**: this is defined as the area within which the animal responds either behaviourally or physiologically to the sound. The zone of responsiveness is usually smaller than the zone of audibility because, as stated previously, audibility does not necessarily evoke a reaction.
- **The zone of injury/hearing loss**: this is the area where the sound level is high enough to cause tissue damage in the ear. This can be classified as either Temporary Threshold Shift (TTS) or Permanent Threshold Shift (PTS). At even closer ranges, and for very high intensity sound sources (e.g. underwater explosions), physical trauma or even death are possible.

C1.1.2 For this study, it is the zones of injury and disturbance (i.e. responsiveness) that are under consideration (there is insufficient scientific evidence to properly evaluate masking). To determine the potential spatial range of injury and disturbance effects from subsea noise, a review has been undertaken of publicly available evidence, including international guidance and scientific literature. The following sections summarise the relevant thresholds for onset of effects and describe the evidence base used to derive them.

C1.1.3 This technical note provides details of the proposed noise modelling methodology for as part of the Proposed Development as follows:

- proposed injury and disturbance thresholds;
- source level determination;
- sound propagation modelling methodology; and
- sound exposure calculations.

C1.1.4 The results from the underwater sound modelling study will be used to inform the fish and shellfish ecology and marine mammal impact assessments. Consequently, the sensitivity of species, magnitude of impact and significance of effect from underwater sound associated with the Proposed Development will be addressed within the relevant Environmental Impact Assessment (EIA) topic chapters, separately to the underwater sound modelling study.

C1.2 Proposed Injury and Disturbance Thresholds

Marine Mammals

C1.2.1 Sound propagation models can be constructed to allow the received sound level at different distances from the source to be calculated. To determine the consequence of these received levels on any marine mammals which might experience such sound emissions, it is necessary to relate the levels to known or estimated potential impact thresholds. The auditory injury (PTS/TTS) threshold criteria proposed by Southall *et al*. (2019) are based on a combination of un-weighted peak pressure levels and marine mammal hearing weighted Sound Exposure Level (SEL).

C1.2.2 The hearing weighting function is designed to represent the frequency characteristics (bandwidth and sound level) for each group within which acoustic signals can be perceived and therefore assumed to have auditory effects. The proposed PTS and TTS thresholds to be employed for the Proposed Development are summarised in Table C1.1 for impulsive sounds such as pile driving and UXO clearance, and in Table C1.2 for non-impulsive (continuous) sources such as vessels.

Table C1.1: Summary of PTS and TTS Onset Acoustic Thresholds for Impulsive Sounds (Southall *et al.*, 2019)

Hearing Group	Parameter	Impulsive Thresholds	
		PTS	TTS
Low Frequency (LF) cetaceans	Peak, dB re 1 µPa unweighted	219	213
	SEL, dB re 1 µPa^{2}s LF weighted	183	168
High Frequency (HF) cetaceans	Peak, dB re 1 µPa unweighted	230	224
	SEL, dB re 1 µPa^{2}s HF weighted	185	170
Very High Frequency (VHF) cetaceans	Peak, dB re 1 µPa unweighted	202	196

Hearing Group	Parameter	Impulsive Thresholds	
		PTS	TTS
	SEL, dB re 1 μPa^2s VHF weighted	155	140
Phocid Carnivores in Water (PCW)	Peak, dB re 1µPa unweighted	218	212
	SEL, dB re 1μPa^2s PCW weighted	185	170
Other Marine Carnivores in Water (OCW)	Peak, dB re 1µPa unweighted	232	226
	SEL, dB re 1μPa^2s OCW weighted	203	188

Table C1.2: Summary of PTS and TTS Onset Acoustic Thresholds for Non-Impulsive Sounds (Southall *et al.*, 2019; Table 6)

Hearing Group	Parameter	Non-impulsive Thresholds	
		PTS	TTS
LF cetaceans	SEL, dB re 1μPa^2s LF weighted	199	179
HF cetaceans	SEL, dB re 1μPa^2s HF weighted	198	178
VHF cetaceans	SEL, dB re 1μPa^2s VHF weighted	173	153
PCW	SEL, dB re 1μPa^2s PCW weighted	201	181
OCW	SEL, dB re 1μPa^2s OCW weighted	219	199

C1.2.3 Disturbance to marine mammals will be assessed using a range of thresholds depending on the type of sound source. For sound generated by percussive piling, disturbance will be assessed using a combination of dose-response relationships (i.e. which assess the likelihood of disturbance at different sound levels) as well as fixed thresholds. For other sources of sound the assessment will primarily use fixed thresholds.

C1.2.4 Disturbance of marine mammals due to impulsive sound from piling activity will be assessed quantitatively by considering the proportional response of individuals exposed to decreasing sound levels with increasing distance from the sound source. Empirical evidence from piling studies at the Beatrice Offshore Wind Farm (OWF) (Graham *et al.*, 2019) and Horns Rev OWF (Brandt *et al.*, 2011)

demonstrated that the probability of occurrence of harbour porpoise Phocoena phocoena, (measured as porpoise positive minutes) increased exponentially moving further away from the source. Graham et al. (2019) showed a 100% probability of disturbance at an (un-weighted) SEL of 180 dB re 1 μ Pa2s, 50% at 155 dB re 1 μ Pa2s and dropping to approximately 0% at an SEL of 120 dB re 1 μ Pa2s and the data were subsequently used to develop a dose-response curve.

C1.2.5 Similarly, a telemetry study undertaken by Whyte *et al.* (2020) investigating the behaviour of tagged harbour seals Phoca vitulina, during pile driving at the Lincs OWF in the Wash found that the lowest measured sound at which a disturbance response was recorded was between 143 dB and 150 dB SELss, and that seal density was significantly reduced within 25 km of the piling.

C1.2.6 One approach to be employed for the Proposed Development for piling is therefore to plot un-weighted single pulse SELss contours in 5 dB increments and apply the appropriate dose-response curve (Graham *et al.*, 2019; Whyte *et al.*, 2020) to estimate the number of animals that would be disturbed by sound from the piling within each stepped contour.

C1.2.7 The approach proposed for assessing disturbance to marine mammals for all sources is summarised in Table C1.3.

Table C1.3: Summary of the Approach to the Modelling of Disturbance to Marine Mammals from All Sources

Sound source	Species	Approach	Source
Pile driving	Harbour porpoise	Dose-response (harbour porpoise) Very High Frequency (VHF) cetacean threshold 103 dB re 1 µPa $L_{p,125ms,HF}$	Graham *et al.* (2019) Tougaard *et al.* (2021)
Pile driving	Other cetacean species	Dose-response (harbour porpoise) Unweighted threshold 160 dB re 1 µPa (rms) (strong disturbance) Unweighted threshold of 140 dB re 1 µPa (rms) (mild disturbance)	Graham *et al.* (2019) NMFS (2005)
Pile driving	Grey seal, harbour seal	Dose-response (harbour seal) Unweighted threshold 160 dB re 1 µPa (rms) (strong disturbance)	Whyte *et al.* (2020) NMFS (2005)

Sound source	Species	Approach	Source
		Unweighted threshold of 140 dB re 1 µPa (rms) (mild disturbance)	
UXO	All marine mammal species	Unweighted SPL_{pk} and hearing weighted SEL_{cum} for TTS as a proxy for disturbance ('fleeing' response).	Southall *et al.* (2019)
Vessel sound	All marine mammal species	Unweighted threshold of 120 dB re 1 µPa (rms) dB re 1 µPa (rms) (strong disturbance)	NMFS (2005)
Site-investigation surveys (impulsive)	All marine mammals species	Unweighted threshold of 160 dB re 1 µPa (rms) (strong disturbance) Unweighted threshold of 140 dB re 1 µPa (rms) (mild disturbance)	NMFS (2005)
Site-investigation surveys (non-impulsive)	All marine mammals species	Unweighted threshold of 120 dB re 1 µPa (rms)	NMFS (2005)

Fish, Larvae and Sea Turtles

C1.2.8 The injury threshold criteria for fish, larvae and sea turtles used in this underwater sound assessment for impulsive piling are given in Table C1.4, for explosives in Table C1.5, and for non-impulsive sources in Table C1.6. In these tables, both peak and SEL criteria are un-weighted. Physiological effects relating to injury criteria are described below (Popper *et al.*, 2014; Popper and Hawkins, 2016):

- **Mortality and potential mortal injury**: either immediate mortality or tissue and/or physiological damage that is sufficiently severe (e.g. a barotrauma) that death occurs sometime later due to decreased fitness. Mortality has a direct effect upon animal populations, especially if it affects individuals close to maturity.
- **Recoverable injury**: Tissue and other physical damage or physiological effects, that are recoverable, but which may place animals at lower levels of fitness, may render them more open to predation, impaired feeding and growth, or lack of breeding success, until recovery takes place.
- **TTS**: Short term changes in hearing sensitivity may, or may not, reduce fitness and survival. Impairment of hearing may affect the ability of animals to capture prey and avoid predators, and

also cause deterioration in communication between individuals; affecting growth, survival, and reproductive success. After termination of a sound that causes TTS, normal hearing ability returns over a period that is variable, depending on many factors, including the intensity and duration of sound exposure.

Table C1.4: Criteria for Onset of Injury to Fish and Sea Turtles due to Impulsive Piling (Popper *et al.*, 2014)

Type of Animal	Parameter	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Group 1 Fish: no swim bladder (particle motion detection)	SEL, dB re 1 μPa²s	>219	>216	>>186
	Peak, dB re 1 μPa	>213	>213	-
Group 2 Fish: where swim bladder is not involved in hearing (particle motion detection)	SEL, dB re 1 μPa²s	210	203	>186
	Peak, dB re 1 μPa	>207	>207	-
Groups 3 and 4 Fish: where swim bladder is involved in hearing (primarily pressure detection)	SEL, dB re 1 μPa²s	207	203	186
	Peak, dB re 1 μPa	>207	>207	-
Sea turtles	SEL, dB re 1 μPa²s	210	(Near) High (Intermediate) Low (Far) Low	(Near) High (Intermediate) Low (Far) Low
	Peak, dB re 1 μPa	>207		
Eggs and larvae	SEL, dB re 1 μPa²s	>210	(Near) Moderate (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low

Table C1.5: Criteria for Injury to Fish due to Explosives (Popper *et al.*, 2014)

Type of Animal	Parameter	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Group 1 Fish: no swim bladder (particle motion detection)	Peak, dB re 1 µPa	229 - 234	(Near) High (Intermediate) Low (Far) Low	(Near) High (Intermediate) Moderate (Far) Low
Group 2 Fish: where swim bladder is not involved in hearing (particle motion detection)	Peak, dB re 1 µPa	229 - 234	(Near) High (Intermediate) High (Far) Low	(Near) High (Intermediate) Moderate (Far) Low
Group 3 and 4 Fish: where swim bladder is involved in hearing (primarily pressure detection)	Peak, dB re 1 µPa	229 - 234	(Near) High (Intermediate) High (Far) Low	(Near) High (Intermediate) High (Far) Low

Table C1.6: Criteria for Onset of Injury to Fish and Sea Turtles due to Non-Impulsive Sound (Popper *et al.*, 2014)

Type of Animal	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Group 1 Fish: no swim bladder (particle motion detection)	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low
Group 2 Fish: where swim bladder is not involved in hearing (particle motion detection)	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low

Type of Animal	Mortality and Potential Mortal Injury	Recoverable Injury	TTS
Groups 3 and 4 Fish: where swim bladder is involved in hearing (primarily pressure detection)	(Near) Low (Intermediate) Low (Far) Low	170dB re 1µPa (rms) for 48 hours	158dB re 1µPa (rms) for 12 hours
Sea turtles	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Moderate (Intermediate) Low (Far) Low
Eggs and larvae	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low	(Near) Low (Intermediate) Low (Far) Low

C1.2.9 It should be noted that there are no thresholds in Popper *et al*. (2014) in relation to sound from high frequency sonar (>10 kHz). This is because the hearing range of fish and sea turtles falls well below the frequency range of high frequency sonar systems. Consequently, the effects of sound from high frequency sonar surveys on fish or sea turtles is not proposed as part of this study, and also due to the lack of any suitable thresholds.

C1.3 Source Level Determination

Summary of General Concepts

C1.3.1 There is potential for sound to be generated by impact piling for the Offshore Substation Platform (OSP) foundations, floating Wind Turbine moorings and fixed Wind Turbine foundations.

C1.3.2 The sound generated and radiated by a pile as it is driven into the ground is complex, due to the many components which make up the generation and radiation mechanisms. Larger pile sizes can require a higher energy in order to drive them into the seabed, and different seabed and underlying substrate types can require use of different installation techniques including varying the hammer energies and the number of hammer strikes. In addition, the seabed characteristics can affect how sound propagates from the pile through the sub-surface geology, fundamentally affecting the acoustic field around the activity. The type of hammer method used (i.e. the force-impulse characteristics) can also affect the sound characteristics.

C1.3.3 Underwater sound source level is usually quantified using a dB scale with values generally referenced to 1 μPa pressure amplitude as if measured at a distance of 1 m from a hypothetical, infinitesimally small source (often referred to as the Source Level). This quantity is often referred to as an equivalent monopole source level. In practice, it is not usually possible to measure at 1 m from a large structure, which in reality is more akin to a distributed sound source, but the metric allows comparison and reporting of different source levels on a like-for-like basis. In reality, for a large sound source such as a monopile, this conceptual point at 1 m from the (theoretical, infinitesimally small) acoustic centre does not exist. Furthermore, the energy is distributed across the source and does not all emanate from this imagined acoustic centre point. Therefore, the stated Sound Pressure Level (SPL) at 1 m does not occur at any point in space for these large sources. In the acoustic near field (i.e. close to the source), the SPL will be significantly lower than the value predicted by the Source Level.

C1.3.4 A useful measure of sound used in underwater acoustics is the SEL. This descriptor is used as a measure of the total sound energy of an event or a number of events (e.g. over the course of a day) and is normalised to one second. This allows the total acoustic energy contained in events lasting a different amount of time to be compared on a like for like basis. The SEL is defined as:

$$SEL = 10log_{10}\left(\int_0^T \left(\frac{p^2(t)}{p_{ref}^2 t_{ref}}\right) dt\right)$$

C1.3.5 where T is the integration time of the sound "event", $p^2(t)$ is the squared sound pressure at a time t and $p_{ref}^2 t_{ref}$ is the reference time-integrated squared sound pressure of 1 μPa²s. For impulsive sounds it has become customary to utilise the T90 time period for calculating and reporting rms sound pressure levels. This is the interval over which the cumulative energy curve rises from 5% to 95% of the total energy and therefore contains 90% of the sound energy.

Proposed Source Modelling Methodology

C1.3.6 The estimation of source levels for sound propagation modelling of piling is an important aspect of the noise modelling methodology. Ideally, use can be made of noise data measurement for similar piles, installed using a similar hammer in similar conditions. However, since noise modelling for proposed wind farms often proposes the use of piles and hammers for which there is no currently available measured data, it is often necessary to utilise an alternative method to estimate the source level inputs to the model. It is proposed to utilise scaling of measured data during pile driving for similar operations to the Proposed Development in order to determine

source levels. This approach replaces the use of energy conversion factors, as applied to some previous noise modelling assessments, which involves estimating the proportion of the hammer energy which is transmitted into the water column as sound. The subject of sound generation due to impact piling is an active area of research and the evidence base is constantly being updated by new measurements, research and published papers (Wood *et al.*, 2023). It is therefore important to ensure that the methodology used for determining the source levels of piling take into account the most recent research.

C1.3.7 The scaling approach is based upon a peer-reviewed paper (von Pein *et al.*, 2022) which presents a methodology for the dependencies of the SEL on strike energy, diameter, ram weight, and water depth that can be used for scaling measured or computed SELs from one project to another. The method has been shown to be usable within practical ranges of accuracy (i.e. suitable for EIA stages of a project when detailed pile design and driveability data is not available), especially if the measurement uncertainties are taken into account. The paper suggests that scaling should be performed over either a small number of very similar piling situations or scaling over a larger data set and averaging the results. This is a recently published method for deriving the sound source level which provides a more scientifically robust method compared to using an energy conversion factor (the conversion factor method simply assumes that a percentage of the hammer energy is converted into sound irrespective of parameters such as pile size, water depth and hammer specifications). Since the von Pein *et al*. (2022) methodology takes into account several site-specific and pile-specific factors, in addition to hammer energy, and because it is based on a scientifically rigorous and peer reviewed study, it is therefore considered to be a significant improvement on the use of simple conversion factors alone. This methodology is further endorsed by the recent study undertaken by Jasco on behalf of the Marine Directorate (MD), which recommends use of scaling methods instead of those relying on conversion factors (Wood *et al.*, 2023).

C1.3.8 Using the equation below (von Pein *et a*l. 2022), a broadband source level value is calculated for the noise emitted during impact pile driving operation in each operation window.

$$SEL_1 = SEL_0 + 10log_{10}\left(\frac{E_1}{E_0}\right) + 16.7log_{10}\left(\frac{d_1}{d_0}\right) - 10log_{10}\left(\frac{m_{r,1}}{m_{r,0}}\right) + 750\left[\frac{10log_{10}(|R_0|^2)}{2\,cot(\varphi)}\left(\frac{1}{h_1} - \frac{1}{h_0}\right)\right]$$

C1.3.9 In this equation, E is the hammer energy employed in J, d is the pile diameter, m_r is the ram mass in kg, h is the water depth in m, $|R_0|$ is the reflection coefficient and φ is the propagation angle

(approximately 17° for a Mach wave generated by impact piling). The equation allows measured pile noise data from one site (denoted by subscript 0) to be scaled to another site (denoted by subscript 1).

C1.3.10 To account for the pile penetration and use of submerged piling rigs, a correction is applied through the piling sequence based on Lippert *et al*. (2017) by considering the quotient of wetted pile length L_w and water depth h_w using the following equation:

$$\Delta SEL = 8.3log_{10}(L_w/h_w)$$

C1.3.11 This methodology therefore takes into account the following factors:

- pile diameter;
- pile length;
- pile penetration;
- water depth;
- rated maximum hammer energy of the proposed hammer;
- hammer energy being used;
- ram mass for the hammer; and
- acoustical parameters of the soil and water.

C1.3.12 The peak SPL can be calculated from SEL values via the empirical fitting between pile driving SEL and peak SPL data, given in Lippert *et al*. (2015), as:

$$SPL_{pk} = 1.43 \times SEL - 44.0$$

C1.3.13 Rms sound pressure levels were calculated assuming a typical T90 pulse duration (i.e. the period that contains 90% of the total cumulative sound energy) of 100 ms. It should be noted that in reality the rms T90 period will increase significantly with distance which means that any ranges based on rms sound pressure levels at ranges of more than a few kilometres are likely to be significant overestimates and should therefore be treated as highly conservative.

C1.3.14 The piling scenarios for the Proposed Development have not yet been finalised, but it is envisaged that these will include the following phases:

- initiation (including slow-start);
- soft start;
- ramp up; and
- full power piling.

C1.3.15 Mitigation methods such as use of Acoustic Deterrent Devices (ADDs) and engineering means of reducing sound emissions will be investigated as part of the sound modelling exercise if required.

C1.4 Sound Propagation Modelling Methodology

Propagation Modelling Methodology for Piling

C1.4.1 In the case of offshore pile installation using an impact hammer, the sound source can be thought of as a “line source” extending through the water column (or in the case of installations using a submersible hammer, a line source through a lower portion of the water column).

C1.4.2 The hammer strike at the top of the pile produces a compression wave in the pile resulting in radial displacement of the pile walls which is transmitted into the surround media (water and sediments) as sound waves. These compressional waves travel through the pile at circa 5,000 m/s, resulting in a conically shaped wavefront.

C1.4.3 Underwater acoustic propagation modelling for piling of the Proposed Development will be undertaken using a combined distributed line-source array normal mode or parabolic equation model for low frequencies (<1 kHz) complimented by a line-source energy flux model for high frequencies (>1 kHz). The line source normal mode model is based on the KrakenC solver (Porter, 2001) implemented for a line array over the pile length, whereas the line source parabolic equation model is based on the RAMGeo solver (Collins, 1993). The line-source energy flux model is based on an implementation of the energy flux model for a directional source set out in de Jong *et al*. (2019).

C1.4.4 The normal-mode method involves solving a depth-dependent equation based on the assumption of a set of modes of vibration which are roughly akin to the modes of a vibrating string (Jensen, 1994). The complete acoustic field is constructed by summing up contributions of each of the modes weighted in accordance to the source depth. The KrakenC solver finds the normal modes in the complex wavenumber plane, which allows it to deal with elastic seabed layers, and to include the effects of leaky modes, making it a good choice for calculation of low frequencies for both close and long range sound fields. The method is, however, slow at higher frequencies and has therefore only been implemented for low-frequencies (<1 kHz). The parabolic equation method uses a range-dependent, parabolic equation solver for elastic seabed, derived from the RAM modelling routine for a fluid seabed. RAMGeo returns the complex transmission loss at each point within the grid of receivers (at different ranges and depths).

C1.4.5 The line-source energy flux model (de Jong *et al*. 2019) used for higher frequencies includes the effect of directionality of the cone shaped wavefront associated with piling noise (circa. 17°). This results in damped cylindrical spreading at shorter ranges and mode stripping behaviour at more distant ranges. At even more distant ranges, once the ‘mode stripping’ has eliminated the contribution of

all waveguide modes except the lowest mode, propagation is evaluated according to a single mode regime.

C1.4.6 For estimation of propagation loss of acoustic energy at different distances away from the sound source location (in different directions), the following steps were considered:

- Modelling points are selected based on a combination of factors, including the geoacoustic properties of the seabed, the bathymetry across the area, and the proximity to conservation areas.
- The bathymetry information around these chosen source points will be extracted from the General Bathymetric Chart of the Oceans (GEBCO) database in nominally 72 different transects.
- A geoacoustic model of the different seafloor layers in the survey region will be calculated based on the British Geological Survey (BGS) borehole database and Emodnet sediment database.
- A calibrated line-source propagation model will be employed to estimate the transmission loss matrices for different frequencies of interest (from 25 Hz to 80 kHz) along the different transects.
- Source levels for the line-source array will be determined based on a back-calculation from the received sound level and spectrum shape at 750 m, based on the scaling laws set out in von Pein *et al*. (2022).
- The calculated source level values will be combined with all transmission loss results to achieve a frequency and range dependant Received Noise Level (RL) of acoustic energy around the chosen source position based on all calculation points.
- The TTS and PTS potential impact distances for different marine mammal groups will be calculated using relevant metrics and weighting functions (from Southall *et al*. 2019) and by employing a simplistic animal movement model (directly away from the sound source) where appropriate.
- For assessing marine mammal disturbance using single pulse SEL or SPL_{rms}, and for assessing effects on fish, no frequency weighting is applied, except for harbour porpoise where the $L_{p,125ms,HF}$ threshold is used which is high-frequency cetacean weighted.

Acoustic Modelling of UXO Clearance

C1.4.7 Sound modelling for UXO clearance will be undertaken using the methodology described in Arons (1954), Soloway *et al.* (2014) and Weston (1960). The equation provides a simple relationship between distance from an explosion and the weight of the charge (or equivalent Trinitrotoluene (TNT) weight) but does not take into account bottom topography or sediment characteristics.

$$P_{peak} = 52.4 \times 10^{6} \left(\frac{R}{W^{1/3}} \right)^{-1.13}$$

C1.4.8 In this equation W is the equivalent TNT charge weight and R is the distance from source to receiver.

C1.4.9 Since the charge is assumed to be freely standing in mid-water, unlike a UXO which would be resting on the seabed and could potentially be buried, degraded or subject to other significant attenuation, this estimation of the source level can be considered conservative.

C1.4.10 According to Soloway *et al.* (2014), the SEL can be estimated by the following equation:

$$SEL = 6.14 \times log_{10} \left(W^{1/3} \left(\frac{R}{W^{1/3}} \right)^{-2.12} \right) + 219$$

C1.4.11 In order to compare to the marine mammal hearing weighted thresholds, it will be necessary to apply the frequency dependent weighting functions at each distance from the source. This will be accomplished by determining a transfer function between unweighted and weighted SEL values at various distances based on an assumed spectrum shape and taking into account molecular absorption at various ranges. Furthermore, if there is potential for more than one UXO clearance event per day then this will be taken into account in the exposure calculation.

C1.4.12 According to Robinson *et al*. (2020), low-order deflagration produces a much lower amplitude of peak sound pressure than high-order detonations. The study concluded that peak sound pressure during deflagration is due only to the size of the shaped disposal tool charge used to initiate deflagration and, consequently, that the acoustic output can be predicted for deflagration as long as the size of the disposal tool's shaped charge is known. Sound modelling for low order deflagration will therefore be based on the methodology described for detonations, using a smaller disposal tool charge size.

Acoustic Modelling of Sources other than Impact Piling and UXO

C1.4.13 A wealth of experimental data and literature-based information is available for quantifying the sound emission from different construction operations. This information review will be employed to determine the acoustic characteristics (i.e. source level and frequency content) of different source for use in the sound propagation modelling. For a large number of activities such as seabed preparation, trenching and rock placement, sound from the vessels themselves (e.g. propeller, thrusters and sonar, if used) dominates the emission level. For any sources or activities where no measurement data exists, estimates of the source level will be based

on a proxy for that source based on measurements of similar types of sources.

C1.4.14 It is proposed to undertake acoustic modelling for these sources using the Weston Energy Flux model (Weston 1971; 1976; 1980a; 1980b). The Weston Energy Flux methodology is openly available through peer-reviewed publications and has been subjected to comparative studies in a number of publications and peer reviewed-papers (e.g. Etter 2013; Toso *et al*. 2014).

C1.5 Sound Exposure Calculations

C1.5.1 As well as calculating the un-weighted instantaneous peak sound pressure levels, it is also necessary to calculate the received acoustic signal in terms of the SEL metric (where necessary and possible) for a marine mammal using the relevant hearing weighting functions. For different operations related sound sources, the numerical SEL value is equal to the SPL rms value integrated over a one second window as the sources are continuous and non-impulsive. These SEL values are employed for the calculation of SEL_{cum} (cumulative SEL) metric for different marine mammal groups to assess potential impact ranges. In the case of fish exposure, the exposure calculations are carried out using the unweighted cumulative SEL as per the threshold criteria.

C1.5.2 Simplified exposure modelling could assume that the animal is either static and at a fixed distance away from the sound source, or that the animal is swimming at a constant speed in a perpendicular direction away from a sound source. For fixed receiver calculations, it has generally been assumed (in literature) that an animal will stay at a known distance from the sound source for a period of 24 hours. As the animal does not move, the sound will be constant over the integration period of 24 hours (assuming the source does not change its operational characteristics over this time). This, however, would give an unrealistic level of exposure, as the animals are highly unlikely to remain stationary when exposed to loud sound, and are therefore expected to swim away from the source. The approximation used in these calculations, therefore, is that the animals move directly away from the source.

C1.5.3 It should be noted that the sound exposure calculations are based on the simplistic assumption that the sound source is active continuously (or intermittently based on source activation timings) over a 24 hour period. The real world situation is more complex. The SEL calculations presented in this study do not take any breaks in activity into account, such as repositioning of the piling vessel, and are therefore likely to be an overestimation.

C1.5.4 Furthermore, the sound criteria described in the Southall *et al*. (2019) guidelines assume that the animal does not recover hearing between periods of activity. It is likely that the intervals between operations

could allow some recovery from temporary hearing threshold shifts for animals exposed to the sound (Benda-Beckmann *et al*. 2022) and, therefore, the assessment of SEL is conservative.

C1.5.5 In order to carry out the moving animal calculation, it has been assumed that an animal will swim away from the sound source at the onset of activities. For impulsive sounds of pile driving the calculation considers each pulse to be established separately resulting in a series of discrete SEL values of decreasing magnitude (see Figure C1.1).

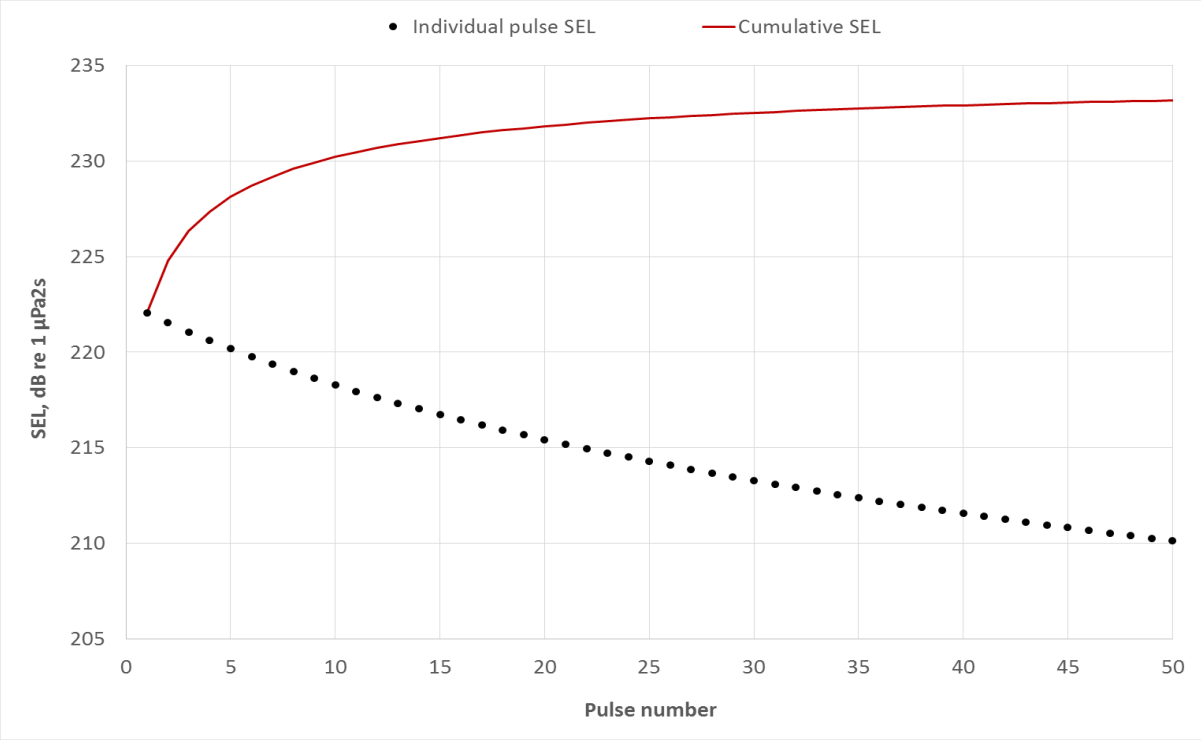


Figure C1.1: A Comparison of Discrete SEL Per Pulse, and Cumulative SEL Values

C1.5.6 As an animal swims away from the sound source, the sound it experiences will become progressively lower (more attenuated); the cumulative SEL is derived by logarithmically adding the SEL to which the mammal is exposed as it travels away from the source. This calculation will be used to estimate the approximate minimum start distance for an animal in order for it not to be exposed to sufficient sound energy to result in the onset of potential auditory injury. It should be noted that the sound exposure calculations are based on the simplistic assumption that the animal will continue to swim away at a conservative and fairly constant relative speed. The real-world situation is more complex, and the animal is likely to move in a more complex manner.

C1.5.7 The assumed swim speeds for marine mammal and fish species likely to be present across the Proposed Development Marine Mammal Study Area are set out in Table C1.7.

Table C1.7: Assessment Swim Speeds of Marine Mammals and Fish that are Likely to Occur Within the North Sea for the Purpose of Exposure Modelling

Species	Hearing group	Swim speed (m/s)	Source reference
Harbour seal *Phoca vitulina*	PCW	1.8	Thompson *et al.* (2015)
Grey seal *Halichoerus grypus*	PCW	1.8	Thompson *et al.* (2015)
Harbour porpoise *Phocoena phocoena*	Very High Frequency (VHF)	1.5	Otani *et al.* (2000)
Minke whale *Balaenoptera acutorostrata*	LF	2.3	Boisseau *et al.* (2021)
Bottlenose dolphin *Tursiops truncatus*	HF	1.52	Bailey *et al.* (2010)
White-beaked dolphin *Lagenorhynchus albirostris*	HF	1.52	Bailey *et al.* (2010)
Risso's dolphin *Grampus griseus*	HF	1.52	Bailey *et al.* (2010)
Basking shark *Cetorhinus maximus*	Group 1 fish	1.0	Sims *et al.* (2000)
All fish hearing groups* (excluding basking sharks and eggs and larvae)	Group 1 to 4 fish	0.5	Popper *et al.* (2014)

*Fish eggs and larvae are assumed to be stationary

C1.5.8 To perform the cumulative exposure calculation, the first step is to parameterise the m-weighted sound exposure levels (or unweighted in the case of fish) for single strikes of a given energy via the 95th percentile line of best fit against the calculated received levels from the model. This function is then used to predict the exposure level for each strike in the planned hammer schedule (periods of slow start, ramp up and full power).

C1.6 Conclusions and Next Steps

C1.6.1 This methodology note has set out the approach that is proposed for subsea noise modelling for the Proposed Development, including:

- Proposed injury and disturbance thresholds, which are based on the latest scientific consensus and peer reviewed papers.

- Pile sound level calculation methodology, which is based on a peer reviewed method taking into account pile parameters, including pile diameter, pile length, pile penetration depth, water depth, rated maximum hammer energy of the proposed hammer, hammer energy being used, ram mass for the hammer and acoustical parameters of the seabed soil and water.
- Sound propagation modelling methodology for piling, which is based on a line-source array detailed sound field model (normal mode or parabolic equation) for lower frequencies and a line source energy flux model for higher frequencies.
- Separate sound modelling methodologies for UXO and other sources (e.g. vessels) which is based on established peer reviewed methods.
- Sound exposure calculation methodology, including the proposed swim speeds, hearing weightings and metrics, all of which are based on the latest scientific evidence.

C1.6.2 Proposed next steps in terms of stakeholder engagement on the subsea noise modelling methodology are as follows:

- Stakeholders are requested to review this methodology note and provide any clarification questions or concerns.
- RPS and Seiche will then respond to any questions either during a call or by issuing a further clarification note.
- Assuming agreement with the approach is reached and any clarifications have been closed out, it is expected that the formal Marine Directorate - Licensing Operations Team (MD-LOT) Scoping Opinion will include a relevant statement with regards to the agreed approach.

Appendix D: Marine Protected Area Screening

D1.1 Introduction

Proposed Development Background

D1.1.1 This section of the Offshore Scoping Report presents the preliminary screening for Nature Conservation Marine Protected Areas (MPAs) within defined Zones of Influence (ZoI) from the Proposed Development with protected features that may be affected by the construction, Operation and Maintenance (O&M) or decommissioning phases of the Proposed Development. This MPA screening outlines those MPAs that are proposed to be carried forward for further consideration in the MPA Assessment Report as an Appendix to the Offshore Environmental Impact Assessment (EIA) Report. The methodology for the main MPA assessment is also outlined.

D1.1.2 The Scoping Boundary for the Proposed Development, comprising the Array Area and Export Cable Corridor, is illustrated in Figure D1.1.

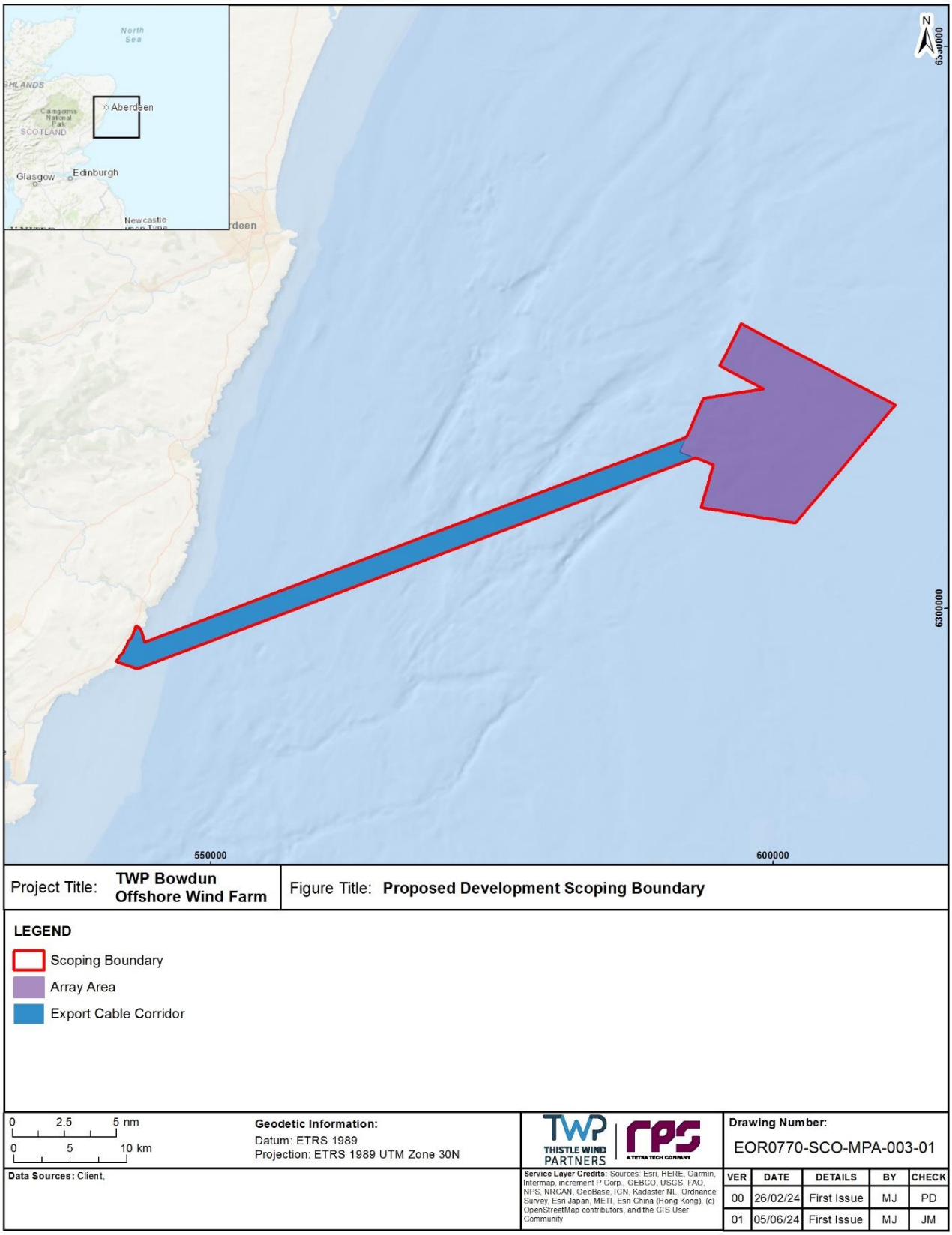


Figure D1.1: Proposed Development Scoping Boundary

Legislative Context

D1.1.3 The MCAA 2009 and the Marine (Scotland) Act 2010 introduced provisions to support the designation and management of MPAs. In Scotland, the MPA network includes sites for nature conservation, the protection of biodiversity, demonstrating sustainable management and protecting marine heritage.

D1.1.4 Under section 126 of the MCAA 2009 and Section 83 of the Marine (Scotland) Act 2010 the public authority (i.e. the Marine Directorate-Licensing Operations Team (MD-LOT)) operating on behalf of the Scottish Ministers) has specific duties in relation to the management and protection of MPAs. Public authorities are required to consider whether an activity that is the subject of an application (e.g. marine licensable activities subject to a Marine Licence application) can affect (other than insignificantly) the protected features of an MPA or any ecological or geomorphological processes on which the conservation of any protected feature in a MPA is dependent.

D1.1.5 MD-LOT must not grant authorisation for the activity unless the Applicant satisfies MD-LOT that there is no significant risk of the activity hindering the achievement of the conservation objectives of the MPA. If MD-LOT considers that there is, or may be, a significant risk of the activity hindering the achievement of the conservation objectives, then they must notify the appropriate Statutory Nature Conservation Bodies (NatureScot for MPAs within 12 nm or the Joint Nature Conservation Committee (JNCC) for MPAs outside 12 nm) of that fact.

D1.1.6 If MD-LOT consider that there is a significant risk of the licensable activity hindering the achievement of the conservation objectives, then approval will only be granted if:

- MD-LOT is satisfied that there are no other means of proceeding with the licensable activity that would create a substantially lower risk of hindering the achievement of those objectives.
- MD-LOT is satisfied that the benefit to the public of proceeding with the licensable activity clearly outweighs the risk of damage to the environment that will be created by proceeding with it.
- MD-LOT is satisfied that the person seeking the authorisation will undertake, or make arrangements for undertaking, measures of equivalent environmental benefit to the damage that the activity will, or is likely to have, in or on the MPA concerned.

D1.2 Methodology

Preliminary Screening Methodology

D1.2.1 In the first instance, an initial screening stage will be undertaken to identify impacts that can reasonably be predicted to occur because of the Proposed Development and whether such impacts could affect (other than insignificantly) a protected feature of an MPA.

D1.2.2 Firstly, it should be considered as to whether the activity of the Proposed Development is capable of affecting a protected feature(s) of the MPA. This can be determined by considering whether the activity will exert pressures to which the protected feature(s) is sensitive. This information is provided in the Advice on Operations document for each MPA, or from the Feature Activity Sensitivity Tool (FeAST) where MPA specific advice is not available.

D1.2.3 Secondly, if it is concluded that there is a capability of affecting an MPA, the focus will then be on considering whether the activity will affect the protected features of an MPA (other than insignificantly). Consideration of the degree of pressure that could be exerted by the activity on a spatial basis will help to establish what level of effect might occur. Where it is concluded that the act or function is capable of affecting (other than insignificantly) the protected features of an MPA, then a main assessment will be required considering the conservation objectives.

D1.2.4 To determine the capability of activities associated with the Proposed Development to affect the features of any MPA, the following spatial screening criteria are proposed:

- Does the Scoping Boundary overlap with the boundary of an MPA?
- Do any MPAs lie within the ZoI of the Proposed Development?
- The ZoIs for individual topics are as follows:
  - Benthic habitats/species and geodiversity features of MPAs – ZoI defined as one Tidal Ellipse ranging from 6.22 to 9.42 km around the Scoping Boundary (see Section 9: Benthic Ecology). A precautionary approach has been adopted for MPA screening and this buffer has been increased to 15 km.
  - Fish features of MPAs – ZoI defined as a 100 km radius around the Scoping Boundary. This ZoI was chosen due to the mobile nature of fish and shellfish species and to encompass the ZoI of all direct and indirect impacts associated with the Proposed Development.
  - Marine mammal features of MPAs - ZoI defined as the United Kingdom (UK) waters within the Regional Marine Mammal Study Area described in Section 11: Marine Mammals. This ZoI was informed by the Marine Mammal Management Units (MUs), which in this case broadly cover an area extending

from the centre of the North Sea at the southernmost point, following the coast of Scotland to the east and north-east of the Shetland Islands, and extending east to the coastlines of Denmark, Sweden, the Netherlands, and Germany.
- Ornithology features of MPAs – ZoI defined as a 100 km radius from the Scoping Boundary. This ZoI was chosen as it encompasses all of the MPAs with ornithological features in the region which may interact with the Proposed Development directly or indirectly.

D1.2.5 Noting that this is a preliminary exercise which will be revisited once the results of the EIA assessments are available (i.e. physical processes modelling and subsea noise modelling).

Main Assessment Methodology

D1.2.6 The main assessment (if required) will be presented as a standalone document submitted alongside the Offshore EIA Report and will consider the extent of the potential impact of the Proposed Development on the MPAs screened into the assessment in more detail. The main assessment stage focuses on determining whether there is, or may be, a significant risk of the Proposed Development hindering the achievement of the conservation objectives of the screened in MPA(s).

D1.2.7 As with the preliminary screening process described in paragraphs D1.2.1 to D1.2.5, aspects such as scale, timing and duration of the proposed activities are considered. However, whilst the initial screening focuses on the protected features, this main assessment will focus on the potential impact on achieving the conservation objectives of the protected features. Consideration of cumulative effects with other activities and functions will also be undertaken.

D1.2.8 The conservation objectives for MPA protected features are high level criteria describing the desired condition of the MPA protected feature. The conservation objectives of an MPA should ensure that its protected features:

- so far as already in favourable condition, remain in such condition; and
- so far as not already in favourable condition, be brought into such condition and remain in such condition.

D1.2.9 The MPA main assessment (if required) will, therefore, consider whether the Proposed Development could potentially affect these conservation objectives for each MPA screened into the assessment.

D1.3 Results of the Preliminary MPA Screening

D1.3.1 Based on the methodology described above in paragraphs D1.2.1 to D1.2.5, the results of the preliminary MPA screening exercise are presented below (Sections B1.1 to D1.4; Figure D1.2 and Figure D1.3). This will be reviewed and, if necessary, updated once the results of the Offshore EIA Report assessments are available (i.e. the full physical processes modelling and underwater sound modelling).

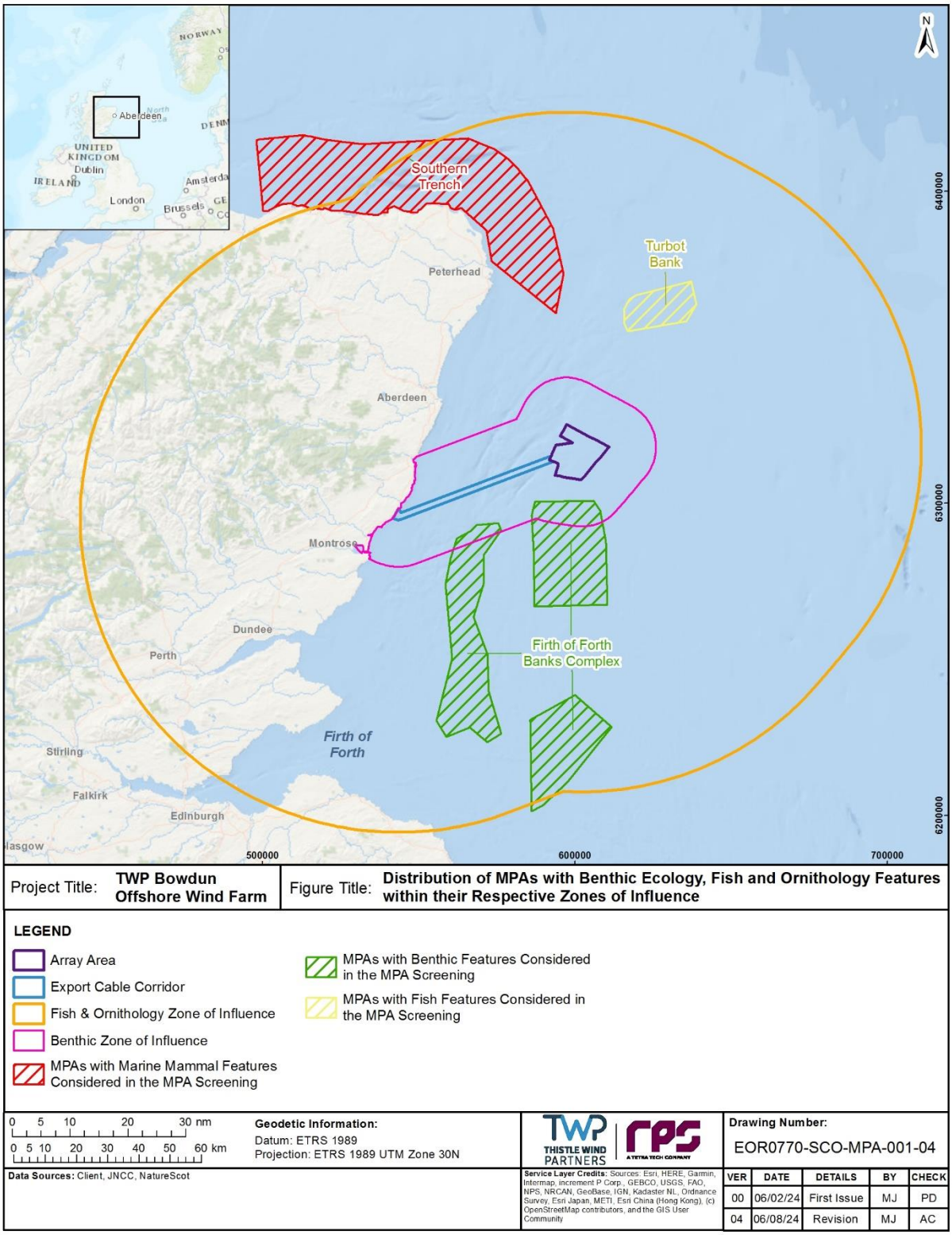


Figure D1.2: Distribution of MPAs With Benthic Ecology, Fish and Ornithology Features Within their Respective Zones of Influence

Preliminary Screening for MPAs with Benthic Habitats/Species and Geodiversity Features

D1.3.2 Direct impacts to benthic habitats and species, such as the impacts arising from temporary habitat disturbance, long term habitat loss, colonisation of hard structures, electromagnetic fields (EMF), and thermal effects from cabling, will be confined to within the Scoping Boundary. There is no physical overlap between the Scoping Boundary and any MPA designated for benthic and/or geodiversity features. As such, no MPAs are screened in for this criterion.

D1.3.3 There is the potential for indirect effects to MPAs designated for benthic features and geodiversity features within the 15 km ZoI. Indirect impacts on benthic features may be associated with increased Suspended Sediment Concentrations (SSC) arising from construction activities or changes to the hydrodynamic regime due to the presence of Offshore Infrastructure associated with the Proposed Development. A single MPA, the Firth of Forth Banks Complex MPA, has been identified within the 15 km screening buffer for benthic receptors.

Firth of Forth Banks Complex MPA

D1.3.4 The Firth of Forth Banks Complex MPA is located off the east coast of Scotland and partially overlaps with the Bowdun Offshore Wind benthic ZoI (Figure D1.2). The MPA is a composite site and the boundaries of each of the three areas (Berwick Bank, Scalp Bank and Wee Bankie, and Montrose Banks) were determined by the presence and extent of the important features contained within them. The MPA covers an area of 2,130 km^2 and was designated by Marine Scotland in 2014 for four protected features: ocean quahog *Arctica islandica* aggregations, offshore subtidal sands and gravels, shelf banks and mounds, and moraines (Table D1.1).

Table D1.1: Designated Features of the Firth of Forth Banks Complex MPA, Conservation Objectives and Condition

Designated Site	Protected features	Type of feature	Conservation objective (JNCC, 2018b)	View of condition
Firth of Forth Banks Complex MPA	Offshore subtidal sands and gravels	Habitat	Recover to favourable condition. With respect to the offshore subtidal sands and gravels within the MPA, this means that: • extent is stable or increasing; and • structures and functions, quality, and the composition of characteristic biological communities (which includes a reference to the diversity and abundance of species forming part of or living within the habitat) are such as to ensure that they remain in a condition which is healthy and not deteriorating. Any temporary deterioration in condition is to be disregarded if the habitat is sufficiently healthy and resilient to enable its recovery from such deterioration. Any alteration to that feature brought about entirely by natural processes is to be disregarded.	Unfavourable (JNCC, 2020)

Designated Site	Protected features	Type of feature	Conservation objective (JNCC, 2018b)	View of condition
	Ocean quahog aggregations	Low or limited mobility species	Recover to favourable condition. For the ocean quahog aggregations within the MPA, this means that: • The quality and quantity of its habitat and the composition of its population in terms of number, age and sex ratio are such to ensure that the population is maintained in numbers which enable it to thrive. Any temporary reduction of numbers is to be disregarded if the population of ocean quahog aggregations is sufficiently thriving and resilient to enable its recovery. Any alteration to that feature brought about entirely by natural processes is to be disregarded.	Unfavourable (JNCC, 2020)

Designated Site	Protected features	Type of feature	Conservation objective (JNCC, 2018b)	View of condition
	Shelf banks and mounds large-scale feature	Large scale feature	Maintain in favourable condition. With respect to the shelf banks and mounds large-scale feature within the MPA, this means that: • the extent, distribution and structure are maintained; • the function is maintained so as to ensure that it continues to support its characteristic biological communities (which includes a reference to the diversity of any species associated with the large-scale feature) and their use of the site for, but not restricted to, feeding, courtship, spawning, or use as nursery grounds; and • the processes supporting that feature are maintained. Any alteration to that feature brought about entirely by natural processes is to be disregarded.	Favourable (JNCC, 2020)

Designated Site	Protected features	Type of feature	Conservation objective (JNCC, 2018b)	View of condition
	Wee Bankie Key Geodiversity Area - moraines	Geomorphological	Maintain in favourable condition. For the Wee Bankie Key Geodiversity Area within the MPA, this means that: • the processes supporting that feature are maintained; • its extent, component elements and integrity are maintained; • its structure and functioning are unimpaired; and • its surface remains sufficiently unobscured for the purposes of determining whether the above criteria are satisfied. Any obscuring of that feature entirely by natural processes is to be disregarded. Any alteration to that feature brought about entirely by natural processes is to be disregarded.	Favourable (JNCC, 2020)

D1.3.5 The benthic ZoI is likely to overlap with the Montrose Bank and Scalp and Wee Bank sections of the MPA, with the extent of the potential overlap between the ZoI and the MPA equating to approximately 153.1 km^2 and 54.6 km^2 for the above sections respectively (Figure D1.3).

D1.3.6 Figure D1.3 illustrates the known distribution of designated features within the Firth of Forth Banks Complex MPA. It should be noted that the offshore subtidal sands and gravels feature, together with suitable habitat for the ocean quahog aggregations feature, are assumed to extend across the entirety of the Firth of Forth Banks Complex MPA (JNCC, 2018a). Figure 3 demonstrates that the shelf banks and mounds geodiversity feature lies well outside the modelled benthic ZoI, making it highly unlikely that this designated feature will be affected by changes in physical processes, such as increases in SSC and sediment deposition. Furthermore, as sedimentary features, it will not be affected by longer range impacts such as underwater sound. Therefore, this feature has been screened out of further assessment due to a lack of potential impact pathways.

D1.3.7 Figure D1.3 indicates that the ocean quahog aggregations, the offshore subtidal sands and gravels and the moraines features have the potential to overlap with the ZoI and, therefore, may be indirectly affected by the Proposed Development.

D1.3.8 In summary, indirect impacts on three benthic features (ocean quahog, offshore subtidal sands and gravels, and moraines) within the Firth of Forth Banks Complex MPA may occur, for example due to increases in SSC and associated deposition and changes in physical processes. Based on these conclusions, these three features of the Firth of Forth Banks Complex MPA are proposed to be screened in for further assessment.

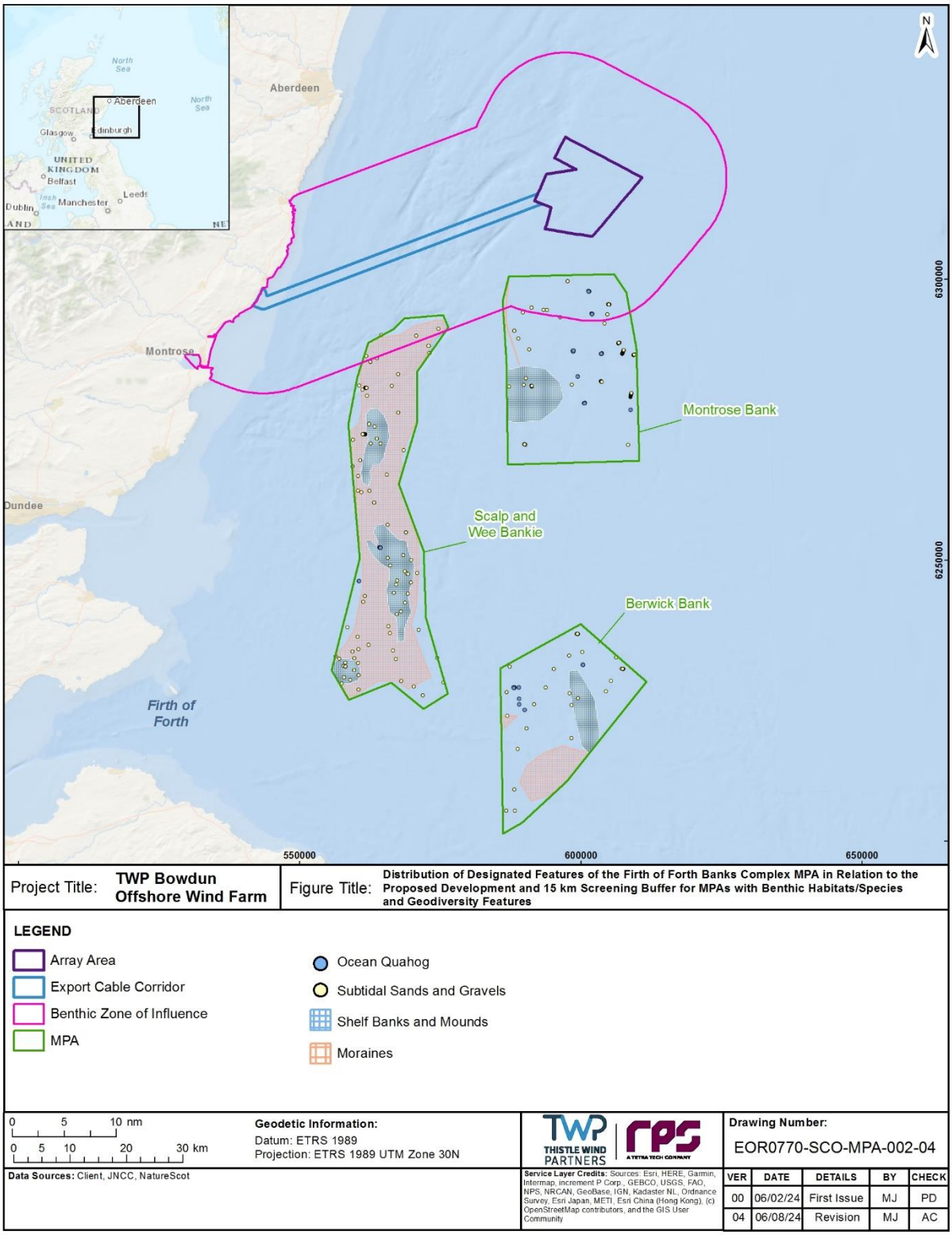


Figure D1.3: Distribution of Designated Features of the Firth of Forth Banks Complex MPA in Relation to the Proposed Development and 15 km Screening Buffer for MPAs with Benthic Habitats/Species and Geodiversity Features

Preliminary Screening for MPAs with Fish Features

D1.3.9 Direct impacts to fish features of MPAs, such as those arising from temporary habitat disturbance, long term habitat loss, colonisation of hard structures and EMF, will be confined to the area within the Scoping Boundary (Figure D1.1). There is no physical overlap between the Scoping Boundary and any MPA designated for fish features. As such, no MPAs are screened in for this criterion.

D1.3.10 However, direct impacts to fish features of MPAs (i.e. sandeels) may also occur because of increased underwater noise (i.e. from piling), with effects potentially extending beyond the Scoping Boundary. The 100 km radius ZoI for fish MPA features has been defined as the Fish and Shellfish Study Area described in Section 10: Fish and Shellfish Ecology.

Turbot Bank MPA

D1.3.11 A single MPA, the Turbot Bank MPA, which is designated for sandeels *Ammodytidae*, has been identified within this screening. The Turbot Bank MPA is located 35.6 km to the north-east of the Scoping Boundary. At this distance, and using experience gained on other OWF projects in the Firth of Forth, the MPA will be located outside the area within which mortality and recoverable injury to sandeels could potentially occur. The upper ranges hypothesised for particle motion levels which may result in adverse effects on marine organisms without a swimbladder, such as sandeels, are thought to be less than 1 km (Thomsen *et al.*, 2015, Miller *et al.*, 2016).

D1.3.12 The Turbot Bank MPA is also considered likely to be beyond the zone within which Temporary Threshold Shift (TTS, i.e. a temporary reduction in hearing sensitivity) may be experienced by sandeels, which is likely to be within less than 10 km. Regarding behavioural effects, at a distance of 35.6 km, the risk to sandeels from behavioural effects (e.g. a startle reaction, changes in schooling patterns and avoidance (Popper *et al.*, 2014)) is considered to be low. The extent of underwater noise contours associated with sound pressure levels above 150 dB re 1 μ Pa rms, the criterion typically used for indicating the extent of onset of potential behavioural effects due to impulsive piling, is considered unlikely to extend to the Turbot Bank MPA.

D1.3.13 Whilst these conclusions regarding underwater noise will be reviewed and confirmed through the underwater sound modelling undertaken as part of the Offshore EIA Report, for this preliminary screening it is concluded that underwater sound will not be capable of affecting (other than insignificantly) the protected sandeel feature of the Turbot Bank MPA (see Table D1.2). On this basis, no MPAs with fish as a protected feature are screened in for underwater noise

impact pathways, and overall no MPAs with fish as a protected feature are screened in.

Preliminary Screening for MPAs with Marine Mammal Features

D1.3.14 Direct impacts to marine mammal features of MPAs, such as the impact of temporary habitat disturbance, and long term habitat loss will be confined to the area within the Scoping Boundary. There is no physical overlap between the Scoping Boundary and any MPA designated for marine mammal features. As such, no MPAs are screened in for these criteria.

D1.3.15 However, direct impacts on marine mammal features of MPAs may also occur due to increased underwater noise, with effects potentially extending beyond the boundaries of the Proposed Development. The ZoI for potential impacts has been defined as the UK waters within the Regional Marine Mammal Study Area described in Section 11: Marine Mammals. A single MPA, the Southern Trench MPA designated for minke whale *Balaenoptera acutorostrata*, lies partly within this buffer.

Southern Trench MPA

D1.3.16 The Southern Trench MPA is located approximately 35.9 km to the north-west of the Scoping Boundary (Figure D1.3). At this distance, and using experience gained on other OWF projects in the Firth of Forth, the MPA will be located outside the area within which injury to minke whales could potentially occur. Minke whale are most often spotted around Scotland between July and September (NatureScot, 2023) when they migrate to higher latitudes to feed (Evans and Stirling, 2001). The minke whale have shown seasonal site fidelity to summer feeding grounds (Gill and Fairbainrns, 1995), and Hoelzel *et al*. (1989) documented individual foraging specialisations, which were associated with different habitat types. Furthermore, studies conducted in the north-west of Scotland have indicated that minke whales frequent the same sites, with one individual identified 27 times over the course of ten years (Gill and Fairbairns, 1995).

D1.3.17 Regarding behavioural effects, at a distance of 35.9 km, the risk to minke whales is considered low due to their site fidelity. The impact pathway with the greatest capability to affect marine mammals such as Minke whale at such a distance would be the impact of increased underwater noise. The extent of underwater noise contours associated with sound pressure levels above 140 dB re 1 μ Pa rms, the criterion typically used for indicating the extent of onset of potential low-level marine mammal disturbance effects from impulsive sound (NMFS, 2005), is considered unlikely to extend to the Southern Trench MPA. Whilst this will be reviewed and confirmed through the underwater noise modelling undertaken as part of the Offshore EIA

Report, for the purposes of this preliminary screening, it is concluded that underwater noise would, therefore, not be capable of affecting (other than insignificantly) the protected minke whale feature of the Southern Trench MPA (see Table D1.2).

D1.3.18 On this basis, no MPAs with marine mammal features are screened in for underwater noise impact pathways. This conclusion will be reviewed following the completion of the underwater noise modelling.

D1.3.19 Indirect impacts on marine mammal features of MPAs may occur as a result of changes in prey availability. The indirect effect of impacts such as SSC and sediment deposition on prey species (i.e. fish and shellfish) has been considered in Section D1.3. No MPAs with fish and shellfish features were screened in and, therefore, no MPAs with marine mammal features have been screened in on this basis. The indirect effect of increases in SSC and sediment deposition on fish and shellfish outside of MPAs will be considered in Section 10: Fish and Shellfish Ecology.

Preliminary Screening for MPAs with Ornithological Features

D1.3.20 There is no physical overlap between the Scoping Boundary or the 100 km ZoI and any MPA designated for ornithological features. No MPAs are screened in for this criterion.

D1.4 Summary of Preliminary MPA Screening Conclusions

D1.4.1 Three MPAs were considered in the MPA screening for the Proposed Development. This included those located within the ZoI for individual receptors, as outlined in Section D1.2. This screening has concluded that the Proposed Development is not capable of affecting (other than insignificantly) the fish, marine mammal or ornithological features of any MPAs, as summarised in Table D1.2.

D1.4.2 A single MPA, the Firth of Forth Banks Complex MPA, has been proposed to be carried forward for consideration in the MPA main assessment on the basis that the Proposed Development is deemed to be potentially capable of affecting (other than insignificantly) three of the protected features of the site: ocean quahog aggregations, offshore subtidal sands and gravels, and moraines (Table D1.2).

Table D1.2: Summary of screening conclusions for MPAs.

Designated Site	Distance to Scoping Boundary (km)	Feature	Potential Impact Pathway	Screening conclusion and justification
Firth of Forth Banks Complex MPA	6.5	Ocean quahog; Offshore subtidal sands and gravels; Shelf banks and mounds; moraines	Potential pathways identified: increases in SSC and associated deposition and changes in physical processes	Screened in – the Firth of Forth Banks Complex MPA does not spatially overlap with the Scoping Boundary. The site does, however, overlap with the ZoI associated with the indirect impacts on benthic ecology features. Based on current knowledge regarding the distribution of designated features within the Firth of Forth Banks Complex MPA, the offshore subtidal sands and gravels, ocean quahog aggregations and moraines features are considered to have the potential to occur in areas of the Firth of Forth Banks Complex MPA that overlap with the benthic ZoI. These three features of the Firth of Forth Banks Complex MPA are, therefore, proposed to be screened in to the main assessment. The remaining designated feature of the MPA (i.e. Shelf banks and mounds) is proposed to be screened out of the main MPA assessment.
Turbot Bank MPA	35.6	Sandeels	No potential pathways identified	Screened out – the Turbot Bank MPA does not spatially overlap with the Scoping Boundary. The site also falls outside the likely ZoI for injury or behavioural disturbance to sandeels, as outlined in Section B1.1. The Turbot Bank MPA also falls outside the 15 km ZoI identified for impact pathways associated with increased

Designated Site	Distance to Scoping Boundary (km)	Feature	Potential Impact Pathway	Screening conclusion and justification
				SSC that have the potential to affect fish features. The Turbot Bank MPA is, therefore, proposed to be screened out and is not considered likely to require a main assessment.
Southern Trench MPA	35	Minke whale[7]	No potential pathways identified	Screened out – the Southern Trench MPA does not spatially overlap with the Scoping Boundary. The site also falls outside the likely ZoI for injury or behavioural disturbance to minke whale, as outlined in Section B1.1. The Southern Trench MPA also falls outside the 15 km ZoI identified for impact pathways associated with increased SSC that have the potential to indirectly affect marine mammal features via impacts on their prey. The Southern Trench MPA is, therefore, proposed to be screened out and is not considered likely to require a main assessment.

[7] The Southern Trench MPA is also designated for three other biodiversity features: burrowed mud, fronts and shelf deeps (habitat) and geodiversity features: moraines, sub-glacial tunnel valleys, and slide scars from submarine mass movement. However, these are all outside the respective ZoIs applied in the preliminary screening (see Section D1.2).

Appendix E: Intertidal survey

E1.1 Introduction

E1.1.1 This Phase 1 Intertidal Walkover Survey Report provides a characterisation of the intertidal benthic baseline environment from Mean High Water Springs (MHWS) to approximately Mean Low Water Springs (MLWS), where accessible, for the Bowdun (E3) proposed export cable route landfall location (hereafter referred to as the Proposed Development).

E1.1.2 The results of this survey will inform the offshore Environmental Impact Assessment (EIA) being undertaken for the Proposed Development.

Study Area

E1.1.3 A Phase 1 intertidal walkover survey was undertaken at Benholm beach. This survey covered the width and length of the defined survey area boundary (Figure E1.1) which extended from approximately MLWS to MHWS in the littoral zone; the survey corridor width was 2.25 km. The coordinates of the survey area are presented below in Table E1.1, with these coordinates corresponding to the approximate start and end points.

Table E1.1: Survey Limits

	Easting (m)	Northing (m)
Start	542009.35	6295900.80
End	543274.94	6297533.21

Operational Summary

E1.1.4 Intertidal survey operations were undertaken at the Proposed Development from 30 August to 01 September 2023, with travel to and from site on 29 August and 02 September 2023, respectively (Table E1.2).

Table E1.2: Survey Operations

Date	Activity
29/08/2023	Travel to Montrose (0600 – 1800 hrs); Reconnaissance visit to Benholm to check accessibility
30/08/2023	Field intertidal survey, Transects TR_07 and TR_06 completed (0600 – 1400 hrs); Data entry

Date	Activity
31/08/2023	Field intertidal survey, Transects TR_05, TR_04 and TR_03 completed (0600 – 1400 hrs); Data entry
01/09/2023	Field intertidal survey, Transects TR_02 and TR_01 completed (0600 – 1400 hrs); Data entry
02/09/2023	Travel home/onward travel

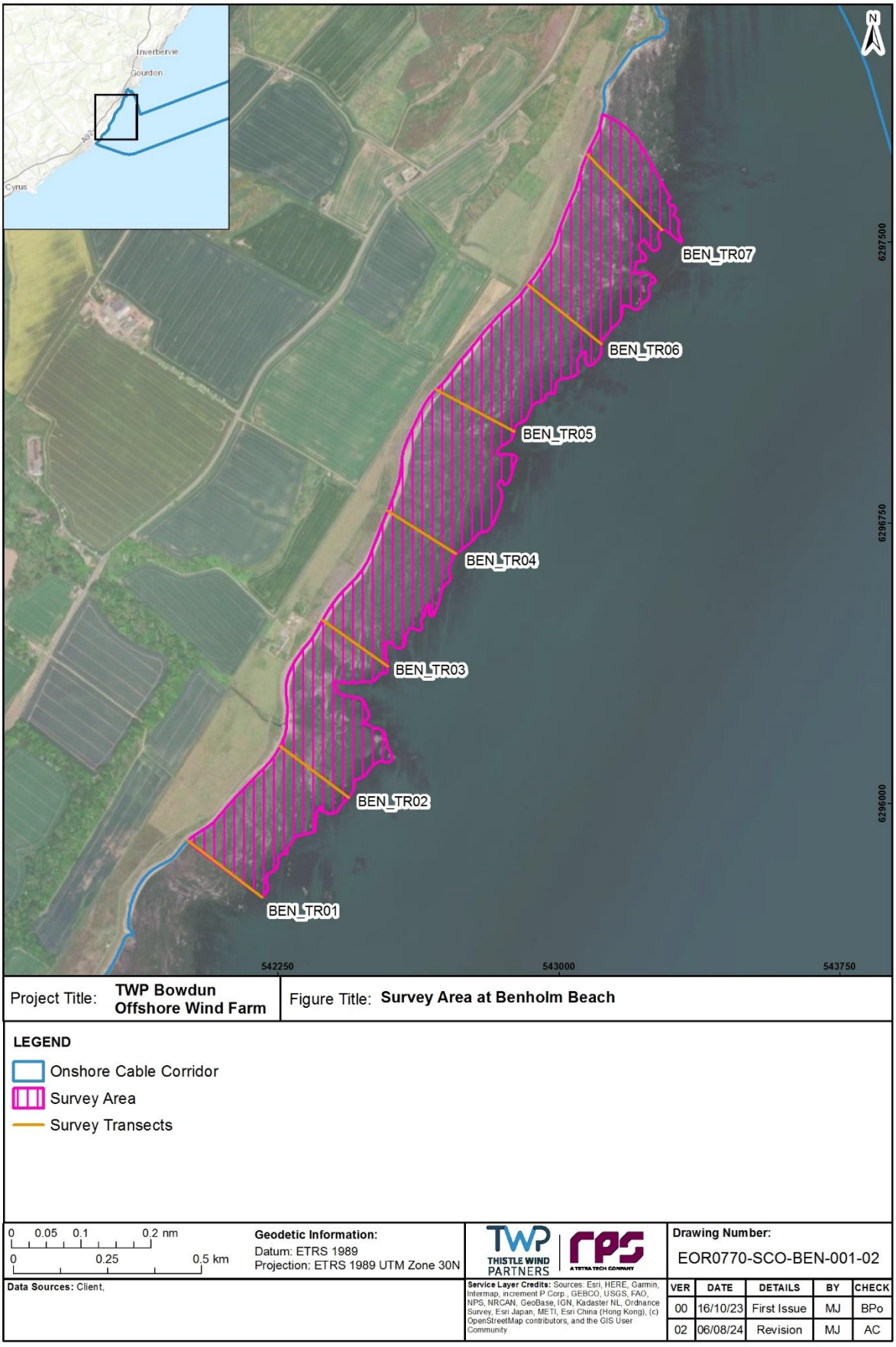


Figure E1.1: Survey Area at Benholm Beach

E1.2 Methodology

Field Methodology Review

Guidance

E1.2.1 The following guidelines were consulted to determine the intertidal survey methodology to be engaged for the Proposed Development:

- The Handbook for Marine Intertidal Phase 1 Biotope Mapping Survey (Wyn *et al*., 2006);
- The Procedural Guidance No 3-1 *in situ* Biotope Recording (Wyn and Brazier, 2001);
- The Joint Nature Conservation Committee (JNCC) Marine Monitoring Handbook (Davies *et al*., 2001); and
- Marine Nature Conservation Review (MNCR): Rationale and methods. Coasts and seas of the United Kingdom (Hiscock, 1996).

Field Survey Approach

E1.2.2 There were seven vertical transects sampled to ensure comprehensive coverage of the survey area. These were spaced 350 m apart, along the beach, as illustrated in Figure E1.1. The transects covered the entire beach between MHWS and as close to MLWS as possible, covering the strandline, upper shore, mid shore, and lower shore zones. The survey fell within a spring tide and was conducted at low tide to maximise access to the lower shore. Where possible, four quadrats per shore area were sampled and photographed to support a more detailed assessment in the future, if required. Visual walkover was conducted along each transect (where the terrain allowed it) and quadrats were used to provide quantitative assessment of algal coverage and epifaunal assemblages. No sedimentary areas were present on the shore to undertake dig-overs, therefore, the results are based upon walkover observations only. A sand veneer was observed in places, however, was not of sufficient thickness for sampling.

Calibrations

E1.2.3 Global Positioning System (GPS) readings were taken using a Garmin eTrex 10 handheld unit, with a Garmin GPSmap 62 retained as contingency. Test waypoints were collected during a reconnaissance visit to Benholm beach using a known location and plotted in Geographic Information System (GIS) software to confirm correct geodetics and operation of the GPS unit. No further calibrations were required.

Constraints

E1.2.4 As a large portion of the survey area was comprised of rocky shore and boulders, progress along the transects was slow to ensure safe traversing of slippery surfaces.

Data Processing

E1.2.5 Quadrat data collected along the transects were analysed using the Super Abundant, Abundant, Common, Frequent, Occasional, and Rare (SACFOR) Classification (Hiscock, 1996) (see Table E1.3). The SACFOR classification was based on percentage cover of dominant algal species. Biotopes were then assigned to each quadrat using the SACFOR results and records of presence and/or absence of other algae and fauna. The area of shore and the degree of exposure also factored into the final biotope assignment. Biotopes were assigned to both the European Nature Information System (EUNIS) 2008 and MNCR (JNCC) classifications.

E1.2.6 The full SACFOR data are presented in Appendix A: Draft Schedule of Mitigation and Commitments.

Table E1.3: SACFOR Classification (from Hiscock (1996))

% Cover	Growth Form	
	Crust/Meadow	Massive/Turf
>80%	S	S
40-79%	A	S
20-39%	C	A
10-19%	F	C
5-9%	O	F
1-5%	R	O
<1%	R	R

E1.3 Results

Overview

E1.3.1 The survey area was composed of rocky shore, made up of fucoids on exposed linear bedrock pavements, conglomerate rock, boulders and cobbles, as presented in Figure E1.2. The substrate composition reflected bedrock pavements within a conglomerate matrix (see Figure E1.2, Image C), with areas of loose boulders and cobbles representing erosional deposits, typically in tidal drainage channels (see Figure E1.2, Image D), suggesting tidal erosion of the conglomerate. Tidal drainage channels presented as steep-sided

features, with narrow or broad channels of cobbles and boulders, and small patches of sedimentary veneer. Vertical facies generally reflected high algal coverage, with the cobbles and boulders within the channel often sparsely colonised. Exposure across the shore ranged from low to moderate.

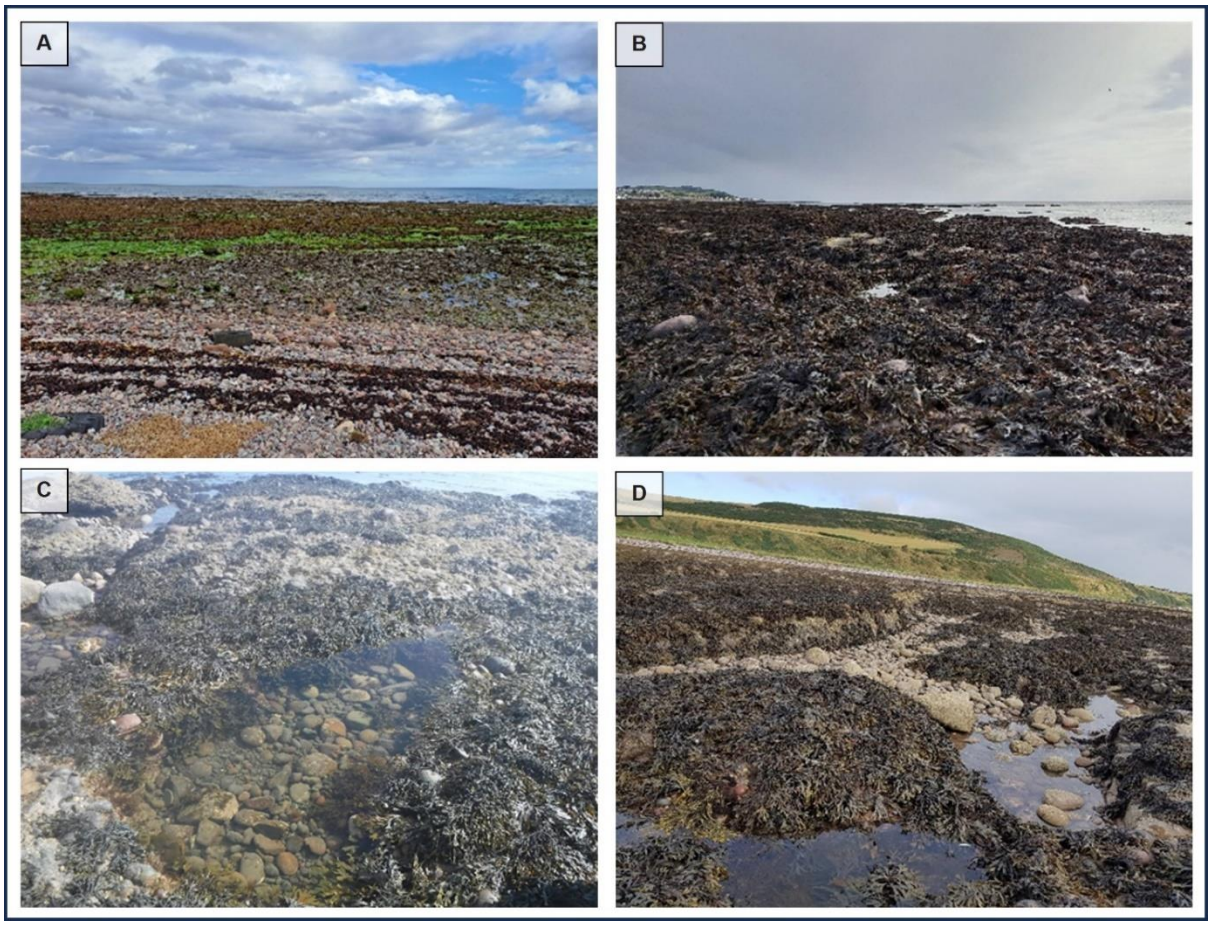


Figure E1.2: Representative Photographs of the Rocky Shore Environment of the Survey Area

Upper Shore and Strandline

E1.3.2 The strandline and upper shore generally comprised of cobbles and boulders. Igneous and conglomerate pavement were also present in the upper shore. Freshwater influence was observed in some areas and is reflected in the biotope "Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock" (MNCR: LR.FLR.Eph.Ulv: EUNIS 2008: A1.451). This biotope represented 33% of quadrats and is discussed in further detail in the paragraph E1.3.10 below.

E1.3.3 Including "Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock", a total of six biotopes were identified in the upper shore, using SACFOR for dominant algal cover and presence/absence records for individuals and colonial fauna and for algal species present beneath the surface canopy. The most frequent biotope was

"Fucus spiralis on sheltered upper eulittoral rock" (MNCR: LR.LLR.F.Fspi; EUNIS 2008: A1.312), which represented 58% of quadrats. This biotope is discussed in further detail in paragraphs E1.3.8 and E1.3.9 below. The remaining four biotopes identified in the upper shore zone were:

- "Fucus vesiculosus on mid eulittoral mixed substrata" (MNCR: LR.LLR.F.Fves.X; EUNIS 2008: A1.3132);
- "Barren littoral shingle" (MNCR: LS.LCS.Sh.BarSh; EUNIS 2008: A2.111);
- "Semibalanus balanoides, F. vesiculosus, and red seaweeds on exposed to moderately exposed eulittoral rock" (MNCR: LR.HLR.MusB.Sem.FvesR; EUNIS 2008: A1.1132); and
- "Littoral rock (and other hard substrata)" (MNCR: LR; EUNIS 2008: A1).

E1.3.4 These four biotopes were each only recorded in between 1 to 3% of quadrats, and thus do not represent a significant portion of the biotope mosaic of "F. spiralis on sheltered upper eulittoral rock" and "Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock" and are not discussed in further detail. Figure E1.3 shows a mosaic of these two biotopes at Transect 5. Representative images of all the biotopes recorded in the upper shore are presented in Figure E1.4.



Figure E1.3: Biotope Mosaic of "F. spiralis on Sheltered Upper Eulittoral Rock" and "Ulva spp. on Freshwater-Influenced and/or Stable Upper Eulittoral Rock" at Transect 5



Figure E1.4: Summary of the Upper Shore Zone at Bowdun

Strandline

E1.3.5 A total of two biotopes were identified in the strandline: "Talitrids on the upper shore and strand-line" (MNCR: LS.LSa.St.Tal; EUNIS 2008: A2.211; in 19 quadrats), and "Littoral coarse sediment" (MNCR: LS.LCS; EUNIS 2008: A2.1; in one quadrat). Across the transects, most strandlines were characterised by cobbles and desiccated fucoids. Varying levels of desiccation were recorded between transects, with representative images presented in Figure 3.4. Epibiota were scarce, except for Talitrid amphipods and unidentified white polychaetes (which were recorded in Transect 7).



Figure E1.5: Summary of the Strandline at Bowdun

F. spiralis on sheltered upper eulittoral rock (MNCR: LR.LLR.F.Fspi)

E1.3.6 A total of 30 quadrats corresponded to the biotope "F. spiralis on sheltered upper eulittoral rock" in the upper shore zone. Representative images for this biotope are presented in Figure E1.6. The spiral wrack F. spiralis represented the dominant cover within the images captured, with channelled wrack Pelvetia canaliculata and gutweed Ulva intestinalis also present in some quadrats with occasional to common coverage on the SACFOR scale. The knotted wrack Asophyllum nodosum and the common green branched weed Cladophora rupestris, were also observed in some quadrats, at frequent to common levels on the SACFOR scale. The crustose coralline alga Lithophyllaceae sp. was also present on some boulders and rock, below the canopy of F. spiralis and other aforementioned algae. Characteristic epifauna included common periwinkle Littorina littorea, common flat periwinkle Littorina obtusata, limpets Patella spp., and common rock barnacle S. balanoides, which were all commonly observed.

E1.3.7 The substrate was characterised by bedrock (both igneous pavement in Transects 1, 2, and 6, and conglomerate in Transect 4) and cobbles and boulders (all transects).

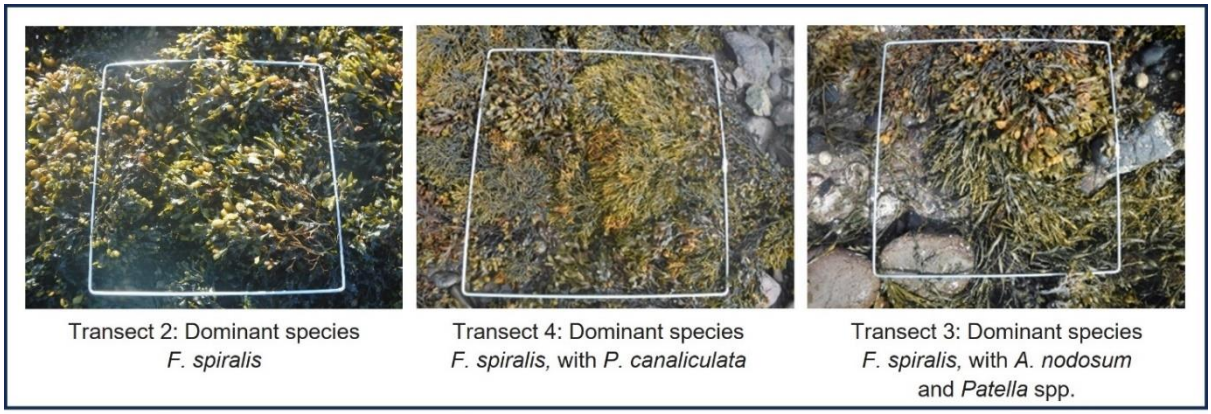


Figure E1.6: Summary of Biotope "F. spiralis on Sheltered Upper Eulittoral Rock (LR.LLR.F.Fspi)" in the Upper Shore Zone

Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock (MNCR: LR.FLR.Eph.Ulv)

E1.3.8 A total of 17 quadrats corresponded to the biotope "Ulva spp. on freshwater-influenced and/or stable eulittoral rock" in the upper shore zone. Representative images for this biotope are presented in Figure E1.7. U. intestinalis provided the dominant cover within the images captured, followed by P. canaliculata. U. intestinalis was abundant to super abundant on the SACFOR scale in the quadrat imagery, while P. canaliculata was occasional to abundant in some images. This biotope is typically devoid of fauna, which was observed in the survey. Unidentifiable amphipods were present at two

quadrats and S. balanoides in one, although both were in low numbers.

E1.3.9 The substrate was characterised by boulders, cobbles, coarse sand and shell fragments, and silt. In Transects 6 and 7, there was a shallow anoxic layer just below the sedimentary surface veneer, which was characterised by the presence of black sediment and a sulphurous odour. The bedrock consisted of conglomerate and exposed igneous pavement.

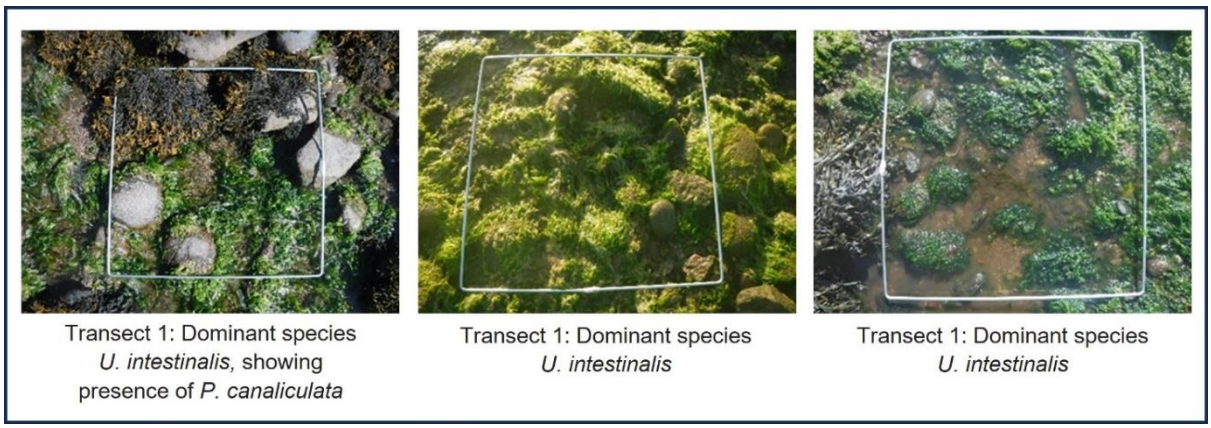


Figure E1.7: Summary of Biotope "Ulva spp. on Freshwater-Influenced and/or Stable Upper Eulittoral Rock (LR.FLR.Eph.Ulv)" in the Upper Shore Zone

Upper Shore Tidal Pools

E1.3.10 Tidal or rock pools in the upper shore were sparse and generally shallow and characterised by the presence of dense coverage of F. spiralis and U. intestinalis (see Figure E1.8); these were observed in Transects 2 and 5. In Transect 2, A. nodosum was present at the fringes and the substrate comprised cobbles, boulders, gravel, silt, and coarse sand with shell fragments. In a tidal pool along Transect 5, there was a shallow anoxic layer just below the sedimentary surface veneer, which was characterised by the presence of black sediment and a sulphurous odour. The bedrock consisted of conglomerate and igneous pavement. Epifauna observed were S. balanoides and polychaete casts.

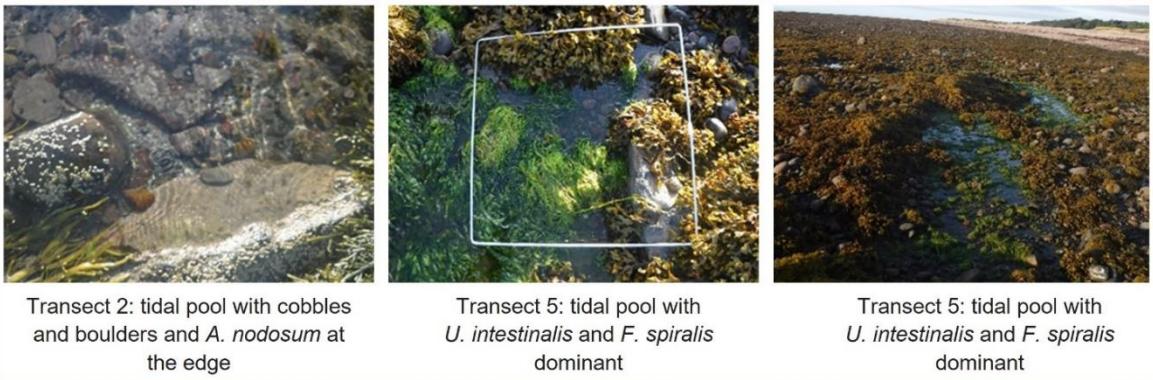


Figure E1.8: Summary of Upper Shore Tidal Pools

Mid Shore

E1.3.11 This area of the shore generally comprised of bedrock, cobbles, boulders, coarse sand and shell fragments, and silt. The bedrock consisted of conglomerate and igneous pavement. In contrast to the upper shore, freshwater influence was not observed.

E1.3.12 A total of eight biotopes were identified in the mid shore zone; the two dominant biotopes were "F. vesiculosus on moderately exposed to sheltered mid eulittoral rock" (MNCR: LR.LLR.F.Fves; EUNIS 2008: A1.3131) and "F. spiralis on sheltered upper eulittoral rock" (MNCR: LR.LLR.F.Fspi; EUNIS 2008: A1.312). These two biotopes represented 60% and 18%, respectively, of the biotopes identified from the quadrat imagery, and are discussed in further detail in paragraphs E1.3.17 and E1.3.18 below. The latter biotope was typical of transition zones into areas more dominated by F. vesiculosus.

E1.3.13 The remaining six biotopes identified in the mid shore zone were:

- "A. nodosum on full salinity mid eulittoral rock" (MNCR: LR.LLR.F.Asc.FS; EUNIS 2008: A1.3141);
- "F. serratus on sheltered lower eulittoral rock" (MNCR: LR.LLR.F.Fserr; EUNIS 2008: A1.315);
- "S. balanoides, F. vesiculosus, and red seaweeds on exposed to moderately exposed eulittoral rock" (MNCR: LR.HLR.MusB.Sem.FvesR; EUNIS 2008: A1.1132);
- "S. balanoides and Littorina spp. on exposed to moderately exposed eulittoral boulders and cobbles" (MNCR: LR.HLR.MusB.Sem.LitX; EUNIS 2008: A1.1133);
- "Littoral mixed sediment" (MNCR: LS.LMx; EUNIS 2008: A2.4);
- "F. serratus on moderately exposed lower eulittoral rock" (MNCR: LR.MLR.BF.Fser; EUNIS 2008: A1.214).

E1.3.14 These six biotopes were each only recorded in between 2 to 9% of quadrats, and thus do not represent a significant portion of the biotope mosaic of F. vesiculosus and F. spiralis and are not discussed

in further detail. Representative images of all the biotopes recorded in the mid shore are presented in Figure E1.9.

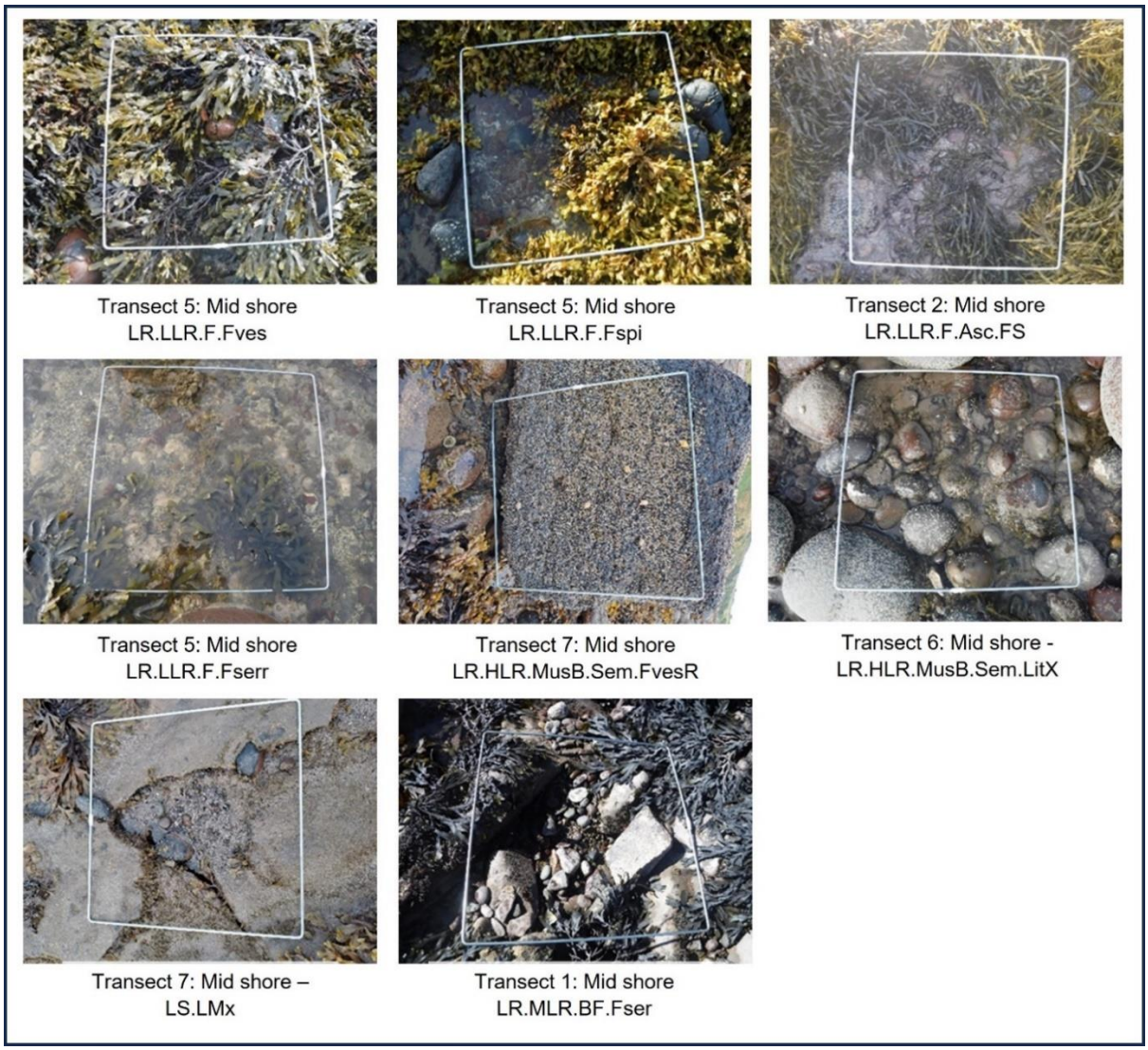


Figure E1.9: Summary of the Mid Shore Zone at Bowdun

F. vesiculosus on moderately exposed to sheltered mid eulittoral rock (MNCR: LR.LLR.F.Fves)

E1.3.15 A total of 27 quadrats corresponded to the biotope "F. vesiculosus on moderately exposed to sheltered mid eulittoral rock" in the mid shore zone. The substrate was characterised by boulders, gravel, and silty coarse sand with shell fragments. The bedrock consisted of conglomerate and igneous pavement. Characteristically, the bladder wrack F. vesiculosus provided the dominant cover within the images captured and were abundant and super abundant on the SACFOR scale. The toothed wrack F. serratus and F. spiralis were also present in some areas, at occasional to common abundance on the SACFOR scale, suggesting that these quadrats were in a transition zone (Perry and d'Avack, 2015). The coral weed Corallina officianalis and A.

nodosum were also present in some quadrats at rare to occasional abundances on the SACFOR scale. Lithophyllaceae sp. was also present on some boulders and rock, below the canopy of F. vesiculosus. Representative images of this biotope are presented in Figure E1.10.

E1.3.16 Characteristic epifauna included L. littorea and L. obtusata, dog whelk Nucella lapillus, Patella spp., and S. balanoides, which were present in most quadrats. Polychaetes tubes (likely to be Spirorbinae spp.) were also recorded in some quadrats, affixed to the fucoid algae fronds, but were less frequently observed than the aforementioned fauna. Of the characteristic epifauna, N. lapillus is included on the OSPAR list of threatened and/or declining species.

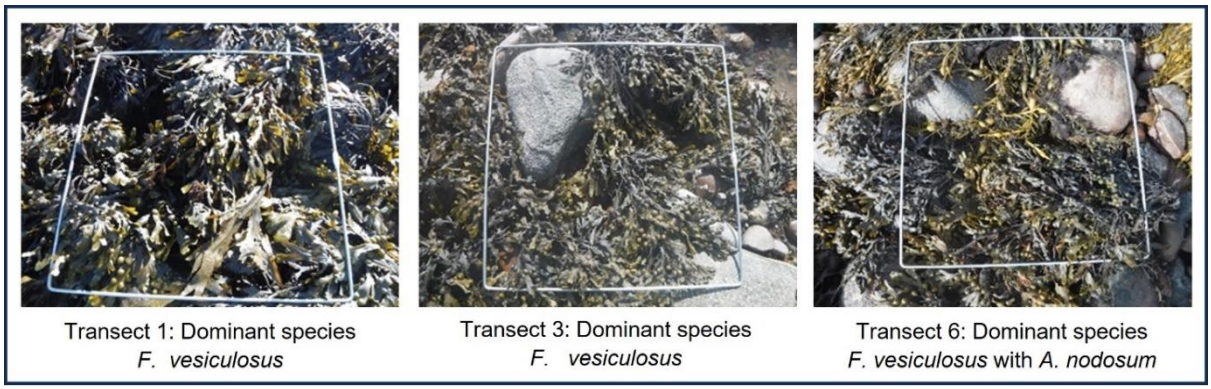


Figure E1.10: Summary of Biotope "F. vesiculosus on Moderately Exposed to Sheltered Mid Eulittoral Rock" (LR.LLR.F.Fves) in the Mid Shore Zone

F. spiralis on sheltered upper eulittoral rock (MNCR: LR.LLR.F.Fspi)

E1.3.17 A total of eight quadrats corresponded to the biotope "F. spiralis on sheltered upper eulittoral rock" in the mid shore zone. The substrate was characterised by cobbles, boulders and bedrock; the bedrock consisted of conglomerate and exposed igneous pavement. F. spiralis provided the dominant cover within the images captured (typically super abundant on the SACFOR scale), followed by C. rupestris and A. nodosum which were present at a common level on the SACFOR scale. U. intestinalis was occasionally recorded in some quadrats at a rare abundance level on the SACFOR scale. Characteristic epifauna were S. balanoides, Patella spp., and L. littorea and L. obtusata. Representative images of this biotope are presented in Figure E3.11.

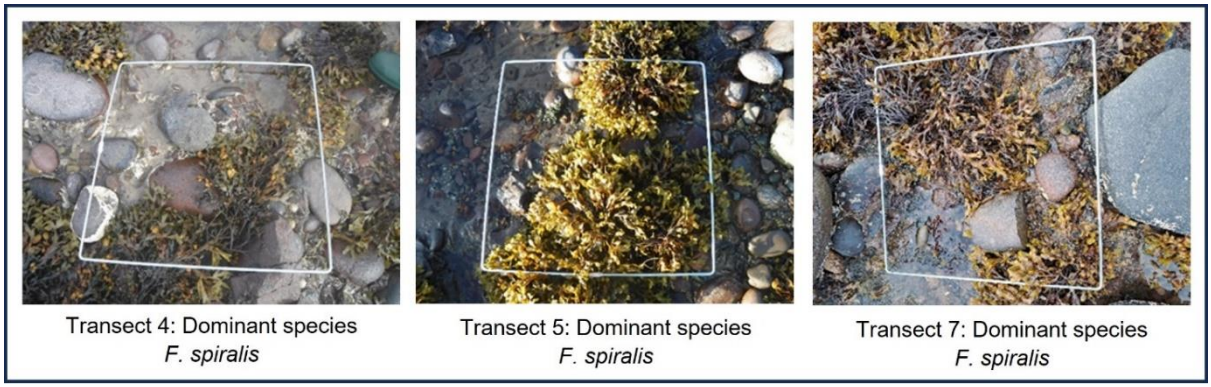


Figure E1.11: Summary of Biotope "F. spiralis on Sheltered Upper Eulittoral Rock" (LR.LLR.F.Fspi) in the Mid Shore Zone

Mid Shore Tidal Pools

E1.3.18 Tidal or rock pools in the mid shore were observed in Transect 2 and Transect 5 (See Figure E1.12). The tidal pools at Transect 2 were characterised by conglomerate bedrock and erosional channels. Those at transect 5 were characterised by silt, coarse sand with shell fragments, and gravel overlying conglomerate bedrock. They were generally shallow and characterised by the presence of dense coverage of F. spiralis, and some fringes of F. serratus and A. nodosum. Other algae present were Corallina officinalis, Lithophyllaceae sp., C. rupestris, sea oak Halidrys siliquosa, and the brown filamentous species Scytosiphon lomentaria. Epifauna observed included hermit crabs Paguridae spp., L. littorea, Patella spp., and Nucella lapillus. A singular Blenniddae sp. was recorded, likely to be a shanny Lipophrys pholis.



Figure E1.12: Summary of Mid Shore Tidal Pools

Lower Shore

E1.3.19 This area of the shore generally comprised bedrock, boulders, cobbles, coarse sand and shell fragments, and silt. The bedrock consisted of conglomerate matrix and exposed igneous pavement. There was no freshwater influence observed.

E1.3.20 A total of seven biotopes were identified in the lower shore; the three dominant biotopes were "F. serratus on sheltered lower eulittoral rock" (MNCR: LR.LLR.F.Fserr; EUNIS 2008: A1.315), "Laminaria hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock" (MNCR: IR.MIR.KR.Lhyp.Ft; EUNIS 2008: A3.2141), and "F. serratus on moderately exposed lower eulittoral rock" (MNCR: LR.MLR.BF.Fser; EUNIS 2008: A1.214). The lowest accessible areas of the shore were represented by L. hyperborea dominance, including within erosional channel features. The rock exposures elevated between erosional channels were sparsely colonised on the surface in places, with vertical facies and some surfaces showing dense algal cover, and sponges such as Halichondria panicea. These biotopes represented 31%, 27%, and 17% of the quadrats, respectively, and are discussed in further detail in paragraphs E1.3.23 and E1.3.27 below.

E1.3.21 The remaining four biotopes identified in the lower shore zone were:

- "F. serratus and red seaweeds on moderately exposed lower eulittoral rock" (MNCR: LR.MLR.BF.Fser.R; EUNIS 2008: A1.2141);
- "F. vesiculosus on moderately exposed to sheltered mid eulittoral rock" (MNCR: LR.LLR.F.Fves; EUNIS 2008: A1.313);
- "S. balanoides and Littorina spp. on exposed to moderately exposed eulittoral boulders and cobbles" (MNCR: LR.HLR.MusB.Sem.LitX; EUNIS 2008: A1.1133); and
- "Osmundea pinnatifida on moderately exposed mid eulittoral rock" (MNCR: LR.HLR.FR.Osm; EUNIS 2008: A1.126).

E1.3.22 These four biotopes were each recorded in ≤10% of quadrats, and thus do not represent a significant portion of the biotope mosaic formed by F. serratus and L. hyperborea and are not discussed in further detail. Representative images of all the biotopes recorded in the lower shore are presented in Figure E1.13.

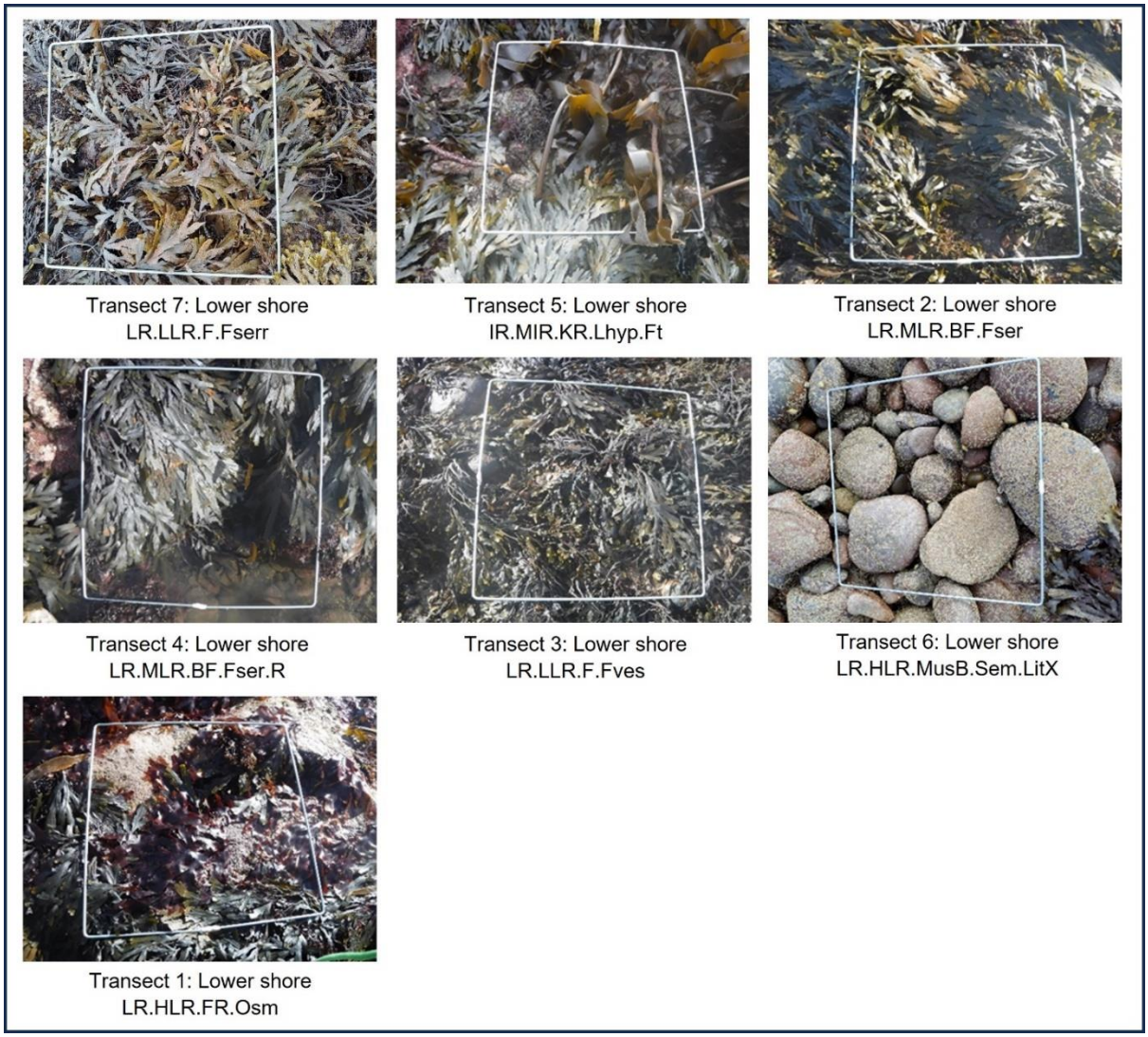


Figure E1.13: Summary of the Lower Shore Zone at Bowdun

F. serratus on sheltered lower eulittoral rock (MNCR: LR.LLR.F.Fserr)

E1.3.23 A total of eight quadrats corresponded to the biotope "F. serratus on sheltered lower eulittoral rock" in the lower shore zone. The substrate was characterised by bedrock and boulders and the bedrock consisted of conglomerate and exposed igneous pavement. F. serratus provided the dominant cover within the images captured and was typically abundant to super abundant on the SACFOR scale. F. vesiculosus and L. hyperborea were also recorded in some quadrats with coverage ranging from occasional to common on the SACFOR scale, suggesting a transition or mosaic between biotopes. C. officinalis was also present in some quadrats at occasional to common abundances on the SACFOR scale. Encrusted Lithophyllaceae sp. was recorded on the substrate, and epifauna observed included S. balanoides, brown crab Cancer pagurus, velvet swimming crab Necora puber, Paguridae sp., beadlet anemone Actinia equina, L. littorea, N. lapillus, Patella spp., and breadcrumb

sponge H. panicea. Representative images of this biotope are presented in Figure E1.14.

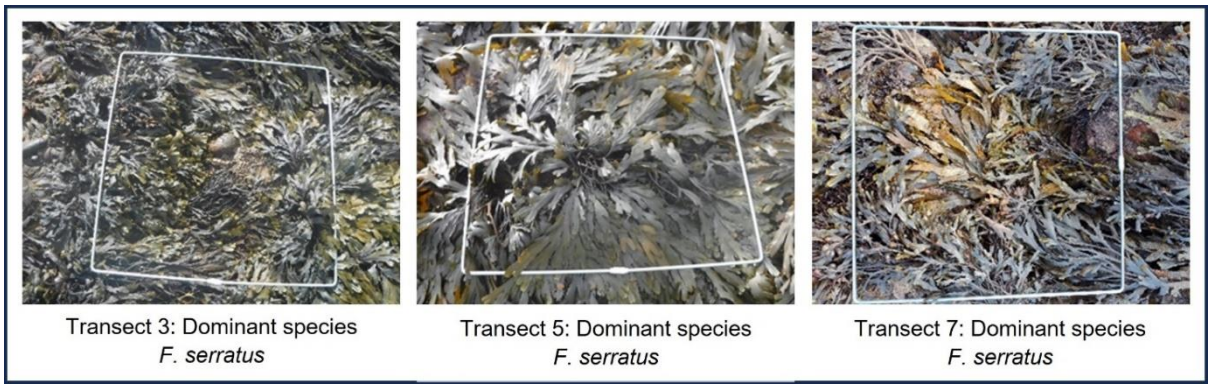


Figure E1.14: Summary of Biotope "F. serratus on Sheltered Lower Eulittoral Rock" (LR.LLR.F.Fserr) in the Lower Shore Zone

L. hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock (MNCR: IR.MIR.KR.Lhyp.Ft)

E1.3.24 A total of 13 quadrats corresponded to the biotope "L. hyperborea forest and foliose red seaweeds on moderately exposed upper infralittoral rock" in the lower shore zone. The substrate was characterised by bedrock, boulders, cobbles, coarse sand and shell fragments, and silt. The bedrock consisted of conglomerate matrix and exposed igneous pavement. L. hyperborea provided the dominant cover within the images captured, typically super abundant on the SACFOR scale. Foliose red algae recorded from common to frequent on the SACFOR scale were C. officinalis and O. pinnatifida. Filamentous red algae of the genus Polysiphonia was also recorded as frequent on the SACFOR scale in some images. Lithophyllaceae sp. was recorded on the substrate in most quadrats.

E1.3.25 Quadrats were typically high in epifaunal richness, with N. lapillus, Patella spp., L. littorea, L. obtusata, S. balanoides, A. equina, and H. panicea commonly recorded. The common starfish Asterias rubens, N. puber, C. pagurus, and common shore crab Carcinus maenas were also recorded in places at low abundances, as was an encrusting bryozoan and the gastropod Gibbula cineraria. Sponges (Myxilla incrustans and Hymeniacidon perlevis) were also recorded on the vertical rock facies within this biotope complex. Representative images of this biotope are presented in Figure E1.15.

E1.3.26 This biotope is considered to reflect the Priority Marine Feature of "Kelp Beds".

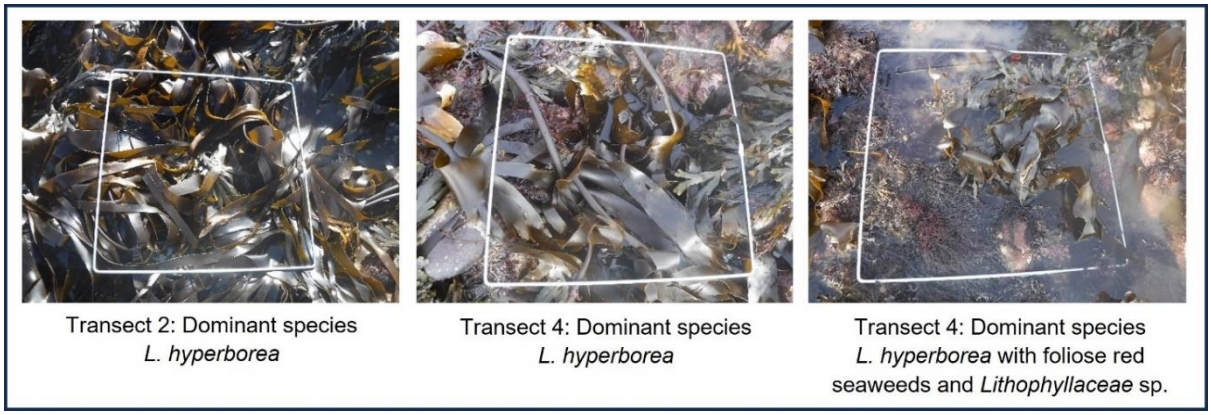


Figure E1.15: Summary of Biotope "L. hyperborea Forest and Foliose Red Seaweeds on Moderately Exposed Upper Infralittoral Rock" (IR.MIR.KR.Lhyp.Ft) in the Lower Shore Zone

F. serratus on moderately exposed lower eulittoral rock (MNCR: LR.MLR.BF.Fser)

E1.3.27 A total of eight quadrats corresponded to the biotope "F. serratus on moderately exposed lower eulittoral rock" in the lower shore zone. This biotope was only recorded in Transects 1 and 2. The substrate was characterised by bedrock and boulders and the bedrock consisted of conglomerate and exposed igneous pavement. F. serratus provided the dominant cover within the images captured, and was typically super abundant on the SACFOR scale. The red algae C. officinalis and O. pinnatifida were also recorded as frequent on the SACFOR scale in some images. Characteristic epifauna in most quadrats were S. balanoides, L. littorea, L. obtusata, Patella spp., and N. lapillus. Less frequently recorded fauna were Paguridae sp., H. panicea, and an unidentified gastropod mollusc. Representative images of this biotope are presented in Figure E1.16.

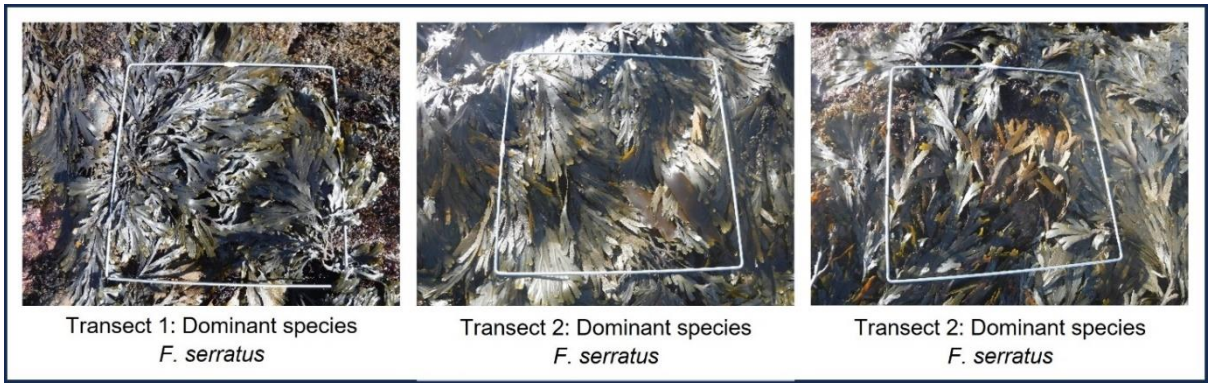
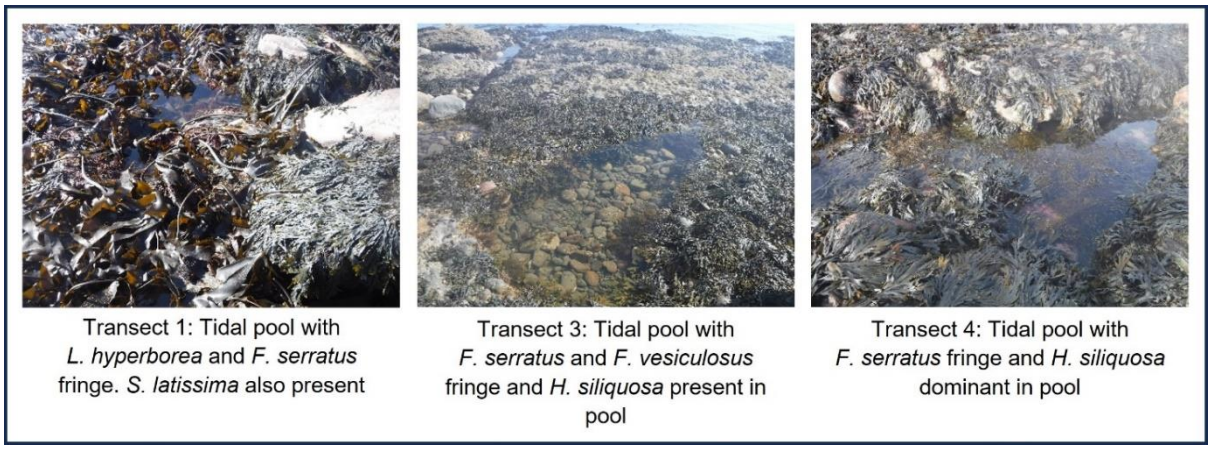


Figure E1.16: Summary of Biotope "F. serratus on Moderately Exposed Lower Eulittoral Rock" (LR.MLR.BF.Fser) in the Lower Shore Zone

Lower Shore Tidal Pools

E1.3.28 Tidal or rock pools in the lower shore were generally shallow and characterised by the presence of dense coverage of F. serratus and/or L. hyperborea. Tidal pools were recorded in Transects 1, 3 and 4 in the lower shore zone. The bedrock was exposed igneous pavement or conglomerate matrix, and the surrounding substrate consisted of erosional boulders and cobbles. Sugar kelp Saccharina latissima, Patella sp., an encrusting bryozoan (possibly Electra pilosa; on algal fronds) were also present in the tidal pool in Transect 1. In the tidal pools in Transect 3 and 4, dense H. siliquosa was present. Representative images of the lower shore tidal pools are presented in Figure E1.17.



Transect 1: Tidal pool with *L. hyperborea* and *F. serratus* fringe. *S. latissima* also present

Transect 3: Tidal pool with *F. serratus* and *F. vesiculosus* fringe and *H. siliquosa* present in pool

Transect 4: Tidal pool with *F. serratus* fringe and *H. siliquosa* dominant in pool

Figure E1.17: Summary of Lower Shore Tidal Pools

E1.4 Summary

E1.4.1 Overall, a total of 17 biotopes were identified during the survey at Benholm, with two or three dominant biotopes per shore area, and many discrete biotopes forming part of larger mosaic in their respective areas of the shore (Figure E1.18 and Table E1.4). The mosaic of biotopes and species recorded is typical of a sheltered to moderately exposed rocky shore environment, with general algal characteristics of:

- Upper Shore: Dominance of F. spiralis and ephemeral green algae such as U. intestinalis;
- Mid Shore: Dominance of F. vesiculosus;
- Lower Shore: F. serratus dominance, transitioning to L. hyperborea dominance in the lowest reaches of the intertidal zone, and shallow subtidal areas.

E1.4.2 A biotope map of the shore is presented in Figure E1.18. Fucoids were the dominant algae throughout the shore areas, with Ulva spp., also prominent in the upper shore zone. An area of freshwater input was recorded in the upper shore, corresponding with the presence of the

biotope Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock (LR.FLR.Eph.Ulv) (Figure E1.18). In the lowest reaches of the intertidal zone, the presence of dense L. hyperborea correspond to the Priority Marine Feature "Kelp beds". The fucoid and kelp dominated areas of the shore are also considered to correspond to the Priority Marine Feature of "Tide-swept algal communities".

E1.4.3 Fauna recorded were typical of a rocky shore, including S. balanoides, L. littorea and L. obtusata, N. lapillus, Patella spp., A. equina, sponges (including H. panicea, M. incrustans and H. perlevis) and various crabs (such as N. puber, C. pagurus, and C. maenus). N. lapillus is included on the OSPAR list of threatened and/or declining species. Representative images (where available) of all flora and fauna recorded are presented in Section E1.3.

E1.4.4 No other potentially sensitive or protected habitats were observed directly within the intertidal survey area. It should be noted however that where areas of rock exposure or high-density coverage of stable boulders and cobbles extend subtidally and conform to the description of an Annex I rocky or stony reef (Annex I habitat 1170 Reefs) (Golding *et al*., 2020, Irving, 2009), the intertidal extent of such features can be included within this classification where they directly connect to the subtidal component.

E1.4.5 Annex I stony or rocky reefs are highly variable in form and in the communities which they can support, with features including vertical rock faces, horizontal ledges, sloping or flat bed rock, broken rock, boulder fields, and high-density cobbles (JNCC, 2023b). Reef features are characterised by attached algal communities and invertebrates (both sessile and mobile), and fish species (JNCC, 2023b). The community composition can vary widely in line with factors such as the rock type, turbidity, habitat complexity, and tidal, wave and current exposure (JNCC, 2023b). Based on the absence of *in situ* subtidal habitat data and through using publicly available aerial imagery to track the rock exposures into the subtidal zone, the rock features observed can be considered potential Annex I rocky and stony reef.

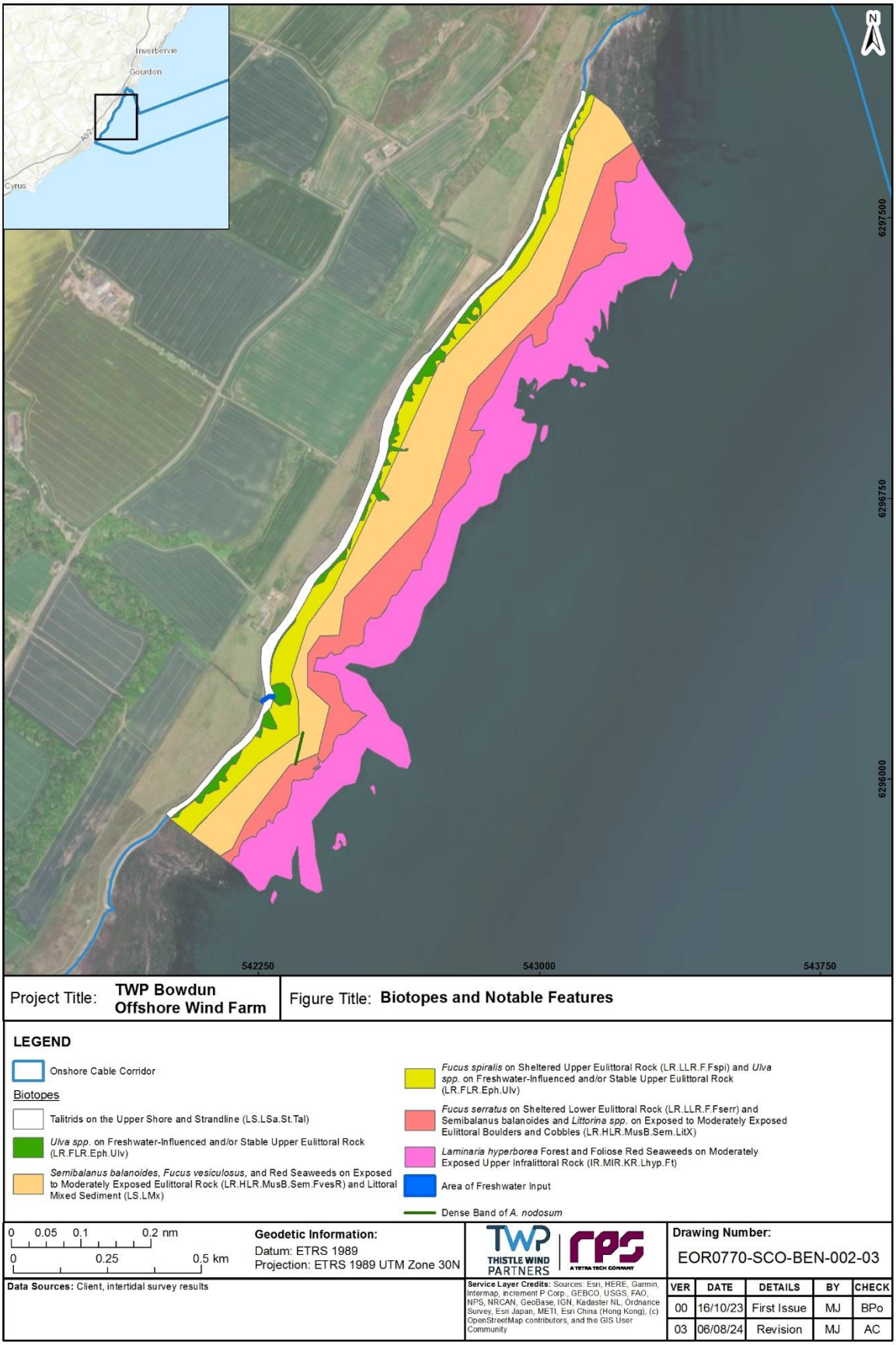


Figure E1.18: Summary of Dominant Biotopes and Notable Features

Table E1.4: Summary of Biotopes Identified per Shore Area

Shore Area	MNCR Biotope	EUNIS (2008) Biotope	Percentage Composition (%)
Strandline	Talitrids on the upper shore and strandline (LS.LSa.St.Tal)	Talitrids on the upper shore and strandline (A2.211)	95.00
	Littoral coarse sediment (LS.LCS)	Littoral coarse sediment (A2.1)	5.00
Upper	*Fucus spiralis* on sheltered upper eulittoral rock (LR.LLR.F.Fspi)	*Fucus spiralis* on sheltered upper eulittoral rock (A1.312)	57.69
	Ulva spp. on freshwater-influenced and/or stable upper eulittoral rock (LR.FLR.Eph.Ulv)	*Enteromorpha* spp. on freshwater-influenced and/or unstable upper eulittoral rock (A1.451)	32.69
	Fucus vesiculosus on mid eulittoral mixed substrata (LR.LLR.F.Fves.X)	*Fucus vesiculosus* on mid eulittoral mixed substrata (A1.3132)	3.85
	Barren littoral shingle (LS.LCS.Sh.BarSh)	Barren littoral shingle (A2.111)	1.92
	Littoral rock (and other hard substrata) (LR)	Littoral rock and other hard substrata (A1)	1.92
	Semibalanus balanoides, Fucus vesiculosus, and red seaweeds on exposed to moderately exposed eulittoral rock (LR.HLR.MusB.Sem.FvesR)	*Semibalanus balanoides, Fucus vesiculosus,* and red seaweeds on exposed to moderately exposed eulittoral rock (A1.1132)	1.92
Mid	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (LR.LLR.F.Fves)	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (A1.3131)	60.00

Shore Area	MNCR Biotope	EUNIS (2008) Biotope	Percentage Composition (%)
	Fucus spiralis on sheltered upper eulittoral rock (LR.LLR.F.Fspi)	*Fucus spiralis* on sheltered upper eulittoral rock (A1.312)	17.78
	Asocphyllum nodosum on full salinity mid eulittoral rock (LR.LLR.F.Asc.FS)	*Asocphyllum nodosum* on full salinity mid eulittoral rock (A1.3141)	8.89
	Fucus serratus on sheltered lower eulittoral rock (LR.LLR.F.Fserr)	*Fucus serratus* on sheltered lower eulittoral rock (A1.315)	4.44
	Semibalanus balanoides, Fucus vesiculosus, and red seaweeds on exposed to moderately exposed eulittoral rock (LR.HLR.MusB.Sem.FvesR)	*Semibalanus balanoides, Fucus vesiculosus,* and red seaweeds on exposed to moderately exposed eulittoral rock (A1.1132)	2.22
	Semibalanus balanoides and *Littorina spp.* on exposed to moderately exposed eulittoral boulders and cobbles (LR.HLR.MusB.Sem.LitX)	*Semibalanus balanoides* and *Littorina spp.* on exposed to moderately exposed eulittoral boulders and cobbles (A1.1133)	2.22
	Littoral mixed sediment (LS.LMx)	Littoral mixed sediment (A2.4)	2.22
	Fucus serratus on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser)	*Fucus serratus* on moderately exposed lower eulittoral rock (A1.214)	2.22
Lower	*Fucus serratus* on sheltered lower eulittoral rock (LR.LLR.F.Fserr)	*Fucus serratus* on sheltered lower eulittoral rock (A1.315)	31.25
	Laminaria hyperborea forest and foliose red	*Laminaria hyperborea* forest	27.08

Shore Area	MNCR Biotope	EUNIS (2008) Biotope	Percentage Composition (%)
	seaweeds on moderately exposed upper infralittoral rock (IR.MIR.KR.Lhyp.Ft)	and foliose red seaweeds on moderately exposed upper infralittoral rock (A3.2141)	
	Fucus serratus on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser)	*Fucus serratus* on moderately exposed lower eulittoral rock (A1.214)	16.67
	Fucus serratus and red seaweeds on moderately exposed lower eulittoral rock (LR.MLR.BF.Fser.R)	*Fucus serratus* and red seaweeds on moderately exposed lower eulittoral rock (A1.2141)	10.42
	Fucus vesiculosus on moderately exposed to sheltered mid eulittoral rock (LR.LLR.F.Fves)	*Fucus vesiculosus* on moderately exposed to sheltered mid eulittoral rock (A1.313)	10.42
	Semibalanus balanoides and *Littorina* spp. on exposed to moderately exposed eulittoral boulders and cobbles (LR.HLR.MusB.Sem.LitX)	*Semibalanus balanoides* and *Littorina* spp. on exposed to moderately exposed eulittoral boulders and cobbles (A1.1133)	2.08
	Osmundea pinnatifida on moderately exposed mid eulittoral rock (LR.HLR.FR.Osm)	*Osmundea pinnatifida* on moderately exposed mid eulittoral rock (A1.126)	2.08

Appendix F: Gazetteers of Marine Archaeology

Table F1.1: Maritime Archaeology Identified in the Marine Archaeology Study Area

ID	Name	Easting (WGS84 Decimal Degrees)	Northing (WGS84 Decimal Degrees)	Description
UKHO: 3059 NRHE: 101879 HER: NO86NE0002	*Baku Standard*	- 2° 12.912'	56° 48.522'	Built in 1893 and owned at time of loss by John I Jacobs and Co Ltd. Two boilers, triple expansion engine of 293Nhp, Single Shaft. Torpedoed by UC 58 on 11 February 1918 during passage from Clyde to the Firth of Forth with a cargo of crude oil. The wreck appears broken and degraded, with surrounding scour.
UKHO: 70430 NRHE: 324317	HMS *Repro*	- 2° 7.662'	56° 49.482'	A requisitioned steel trawler *Repro* refitted as a minesweeper. Mined off Todhead Point on 26 April 1917 by the German submarine UC-41 (a UC II type, under the command of Kptlt. Kurt Bernis). There were 13 casualties. 2 UKHO records, one dead (3064). The wreck appears upright and intact.
UKHO: 3057 NRHE: 101764 HER: NO86NW0031	*Hornby*	- 2° 18.594'	56° 47.826'	Recorded in Canmore and Aberdeenshire HER as Hawnby, a steel steamship stranded near the entrance to Johnshaven harbour in 1914.
UKHO: 58703 NRHE: 323794	*Karianda*	- 1° 35.616'	56° 56.622'	Took on water after developing an electrical fault. An EPIRB alert issued and the crew of 2 rescued from dingy after the vessel had sunk. The wreck appears intact, with the bow to the south-east.

ID	Name	Easting (WGS84 Decimal Degrees)	Northing (WGS84 Decimal Degrees)	Description
UKHO: 3176 NRHE: 101889 HER: NP07NE0001	*Sandvik* (possibly)	- 1° 53.766'	56° 54.036'	Built in 1901 and owned at time of loss by Tizona, fredrikstad. It is a one boiler, triple expansion engine of 132 hp, single shaft. Sunk by a torpedo from uc-77 during passage from London for Christiana with a cargo of coke.
UKHO: 3171 NRHE: 101888/31319 HER: NP07SW0002	Tanevik	- 1° 55.44'	56° 51.378'	A one boiler, triple expansion engine, single shaft vessel. It was owned by the royal navy as a barrage balloon vessel. Foundered under tow while on passage from Methil for Buckie. The wreck appears intact with the bow possibly to the west.
UKHO: 3174 NRHE: 322382	Unknown	- 1° 44.448'	56° 54.924'	The upright and intact remains of an unknown wreck. Bow to the north-east.
UKHO: 3175 NRHE: 322383	Unknown	- 1° 47.394'	56° 54.852'	The intact remains of an unknown wreck with the bow to the north-west. The remains appear to be collapsing.
UKHO: 3180 NRHE: 322387	Unknown	- 1° 59.808'	56° 53.28'	Sank while under tow of Icelandic trawler *Solpakur* together with three other fishing vessels while on passage for Grimsby for scrapping. The wreck is with mast removed but otherwise upright and intact, with the bow to the south.
UKHO: 73769 NRHE: 324455	Unknown	- 1° 53.616'	56° 52.2'	The highly degraded remains of an unknown wreck.

ID	Name	Easting (WGS84 Decimal Degrees)	Northing (WGS84 Decimal Degrees)	Description
UKHO: 71167 NRHE: 101761 HER: NO87SW0140	Unknown	- 2° 15.036'	56° 49.56'	The intact remains of an unknown wreck atop a rocky seabed. The bow is to the east.
UKHO: 3056 NRHE: 201961 HER: NO86NE0006	Unknown	- 2° 10.89'	56° 47.832'	The intact remains of an unknown wreck. The bow is to the east-north-east.
UKHO: 73761 NRHE: 324452	Unknown	- 1° 30.024'	56° 58.362'	The upright and intact remains of an unknown wreck. Bow to the south-east.

Table F.2: Recorded Losses within the Desktop Data

ID	Name	Description
NRHE: 328314	Unknown aircraft	Aircraft wreckage trawled up 12 mls off Stonehaven in September 1936. It appears to have spent a long time in sea. Marks N,F8,86,69
NRHE: 198611	Adelaide: Gourdon, North Sea	A wooden brigantine that sank on 05 March 1881.
NRHE: 199705/199384	Agnes And Mary Anne	A 19th century lugger that sank on 26 March 1897.
NRHE: 285443	Agnes: North Sea	A 19th century sloop that sank on 08 December 1866. The crew were saved.
NRHE: 290938	Albion	A 19th century wooden schooner that sank on 14 February 1865.
NRHE: 198702	Alice Burnyeat: North Sea	A 19th century wooden brigantine that sank on 07 March 1881 with seven lives lost.
NRHE: 198599	Amoret: Johnshaven, North Sea	A 19th century wooden brigantine that sank on 05 March 1881 with no lives lost.
NRHE: 198405	Argus: North Sea	A 19th century schooner that sank on 27 December 1876 with a cargo of barley.
NRHE: 313232	Arrow	A 19th century smack that sank in August 1829.
NRHE: 313202	Athole	A 20th century steel steam trawler that was mined on 17 December 1916.

ID	Name	Description
NRHE: 250223	Augvald	A 19th century schooner that sank on 30 June 1899 with six lives lost.
NRHE: 121225	Balmoral	A 19th century iron vessel that sank on 26 September 1891 with a cargo of jute.
NRHE: 200654	Beaumanoir: North Sea	A 20th century lugger that sank on 14 April 1905.
NRHE: 208259	Ben Lawers	A 20th century steam trawler that sank after a collision on 30 April 1930.
NRHE: 313288	Blantyre: North Sea	A 20th century smack that sank on 09 January 1919.
NRHE: 313293	Brothers: Johnshaven, North Sea	A 19th century vessel that sank on 20 March 1801.
NRHE: 199617	C Karl	A 19th century wooden brig that sank on 14 January 1895 with a cargo of coal.
NRHE: 201960	Caroline Agnes	A 20th century barque that sank on 14 November 1876 with seven lives lost.
NRHE: 313234	*Cedron*	A 20th century auxiliary ketch that sank on 24 November 1932.
NRHE: 313277	*Cheah Meal*	A 19th century lugger that sank on 21 August 1886.

ID	Name	Description
NRHE: 313264	*Chestnut*	A 20th century drifter that was mined on 30 November 1940.
NRHE: 284131	*Commerce*	A 19th century brig that sank on 20 September 1858
NRHE: 255923	*Cora*	A 19th century schooner that sank on 24 October 1868 with six lives lost.
NRHE: 270518	*Countess Of Cardigan*	A 19th century vessel that sank on 15 December 1809 with no lives lost.
NRHE: 201073	*Daniel*	A 20th century smack that sank on 21 February 1914.
NRHE: 313816/325906	*Dreadnought* (possibly)	An unclassified vessel that sank on 06 November 1903.
NRHE: 199421	*Die Gute Erwartung*	A 19th century wooden smack that sank on 06 April 1891.
HER: NO86NW0040	*Dinorah*	A 19th century vessel that sank on 07 March 1881 with all lives lost.
NRHE: 313239	*Dutiful*	A 20th century motor vishing vessel that sank on 05 December 1931.
NRHE: 206278	Eleanor	A 19th century vessel that sank on 16 March 1831 with all lives saved.

ID	Name	Description
NRHE: 207490/313193	Ethelbert (possibly)	A 20th century steam trawler that sank on 23 June 1911.
NRHE: 313272	*Euphemia*	A 19th century brig that sank on 02 February 1823.
NRHE: 325825	*Finance*	A 19th century brig that sank on 09 January 1854.
NRHE: 250280	*Freia*	A 19th century brigantine that sank on 20 October 1889.
NRHE: 285061	*Freischutz*	A vessel of unknown date or type; two name boards, one marked *Susan and Henry* and the other *Freischutz* were picked up on 30 November 1860 near Johnshaven.
NRHE: 208079	*Galatia*	A steam trawler reportedly sunk by submarine 30 miles south-south-east of Buchan Ness.
NRHE: 267400	*Gem Of The Ocean*	A 19th century schooner that ran aground on 22 March 1878. This wreck was possibly recovered and towed to port.
NRHE: 198441	*Gem*	A 19th century schooner that became stranded on 20 April 1878 with two lives lost when their dinghy swamped.
NRHE: 200348	*Gudrun*	A 20th century smack that sank on 30 July 1902.
NRHE: 286413	*Harriet*	A 19th century smack that sank on 20 April 1870.

ID	Name	Description
NRHE: 313214	*Helena*	A 17th century vessel that sank in January 1752.
NRHE: 285005	*Henrietta*	A 19th century schooner that sank on 21 November 1860 with no lives lost.
NRHE: 313276	*Hood*	A 20th century steam trawler that sank on 12 August 1938.
NRHE: 200387	*Hope*	A 20th century lugger that sank on 12 June 1903 after a collision.
NRHE: 121229	*Inbervervie*	A wrecked vessel.
NRHE: 313287	*Isabella*	A 20th century lugger that sank on 31 December 1936.
NRHE: 328129	*James (Me 186)*	A 20th century lugger that sank on 07 April 1869.
NRHE: 199676	*Jane Marie*	A 19th century schooner that sank on 30 November 1895.
NRHE: 282968	*Janets And Isabella*	A 19th century vessel that sank on 26 November 1852 with all lives lost.
NRHE: 200695	*Johan Allan*	A 20th century smack that sank on 02 August 1906.

ID	Name	Description
NRHE: 313219	*John*	An 18th century smak that sank on 02 January 1800.
NRHE: 328212	*Lady Abercombie*	A 19th century sloop that sank on 17 February 1836.
NRHE: 252283	*Lady Cathcart*	A 19th century steamship that sank on 21 April 1889.
NRHE: 271999	*Leslie*	A 19th century vessel that sank on 23 February 1844 with all lives lost.
NRHE: 208561	*Lilie*	A wrecked vessel.
NRHE: 261095	*Little Alice*	A 19th century steamship that sank on 04 February 1874.
NRHE: 200326	*Lord Clyde*	A 19th century schooner that sank on 26 January 1902.
NRHE: 196877	*Lord of the Isles*	A 19th century vessel that sank on 19 January 1838.
NRHE: 258925	*Louisa Caroline*	A 19th century schooner that sank on 25 January 1880.
NRHE: 272949	Maine	A 19th century vessel that ran aground on 10 March 1852. The vessel may have been recovered.

ID	Name	Description
NRHE: 313291	Mally	An 18th century vessel that sank on 14 September 1768.
NRHE: 282431	*Mansfield*	A 19th century schooner that sank on 08 January 1849.
NRHE: 260898	*Maren*	A 19th century schooner that sank on 07 December 1882 with six lives lost.
NRHE: 272622	*Margaret And Ann*	A 19th century cutter that on 17 December 1847 with all lives saved.
NRHE: 270330	*Margaret Reid*	A 19th century schooner that sank on 05 December 1882.
NRHE: 257681	*Maria*	A 19th century schooner that sank on 04 March 1875 with no lives lost.
NRHE: 250125	*Marie*	A 19th century schooner that sank on 20 October 1898.
NRHE: 313255	*Marjorie Brown*	A 20th century auxiliary lugger that sank on 7 Jnauary 1930.
NRHE: 283153	*Martha Helena*	A 19th century brig that ran aground on 16 November 1854. It may have been successfully recovered.
NRHE: 313035	*Mary*	The Mary was reported as having been abandoned and sunk off Stonehaven on 06 December 1853.

ID	Name	Description
NRHE: 313268	*Mayflower*	A 19th century lugger that sank on 02 November 1911.
NRHE: 265520	*Mercur*	A 19th century schooner that sank on 21 October 1875.
NRHE: 256582	Mereur	A 19th century schooner that ran aground on 21 October 1875. The vessel may have been successfully recovered.
NRHE: 268869	*Mina*	A 19th century vessel that ran aground on 02 February 1823. The vessel may have been successfully recovered.
NRHE: 200820	*Morning Light*	A 19th century lugger that sank on 22 October 1909.
NRHE: 197226	*Mould*	A 19th century schooner that sank on 10 January 1854 with all lives lost.
NRHE: 313218	*Nancy*	An 18th century vessel that sank on 02 January 1800.
NRHE: 206199	*Nelly*	A 19th century schooner that sank on 23 March 1819.
NRHE: 313223	*Nelly*	An 18th century vessel that sank on 27 January 1776.
NRHE: 256445	*Northern City*	A 19th century steamship that sank on 23 January 1875.

ID	Name	Description
NRHE: 325657	*Northern Star*	A 19th century vessel that sank on 16 June 1841.
NRHE: 208078	*Nova*	A 20th century steamship that sank on 27 March 1917.
NRHE: 313221	*Peggy*	A 19th century sloop that sank on 25 February 1816.
NRHE: 266399	*Penelope*	A 19th century brig that sank on 22 December 1876 with no lives lost.
NRHE: 201937	*Petrel*	A 19th century brig that sank on 17 November 1876 with no lives lost.
NRHE: 313316	*Pevensey Castle*	A 20th century steam drifter that sank on 09 June 1924 after a collision.
NRHE: 199384	*Pride Of Scotland*	A 19th century lugger that sank on 27 February 1890.
NRHE: 201120	*Queen Alexandra*	A 20th century steam trawler that was mined on 13 June 1915.
NRHE: 196883	*Rival*	A 19th century vessel that sank on 02 March 1838.
NRHE: 255871	*Robert*	A 19th century brig that sank on 26 March 1867 with no lives lost.

ID	Name	Description
NRHE: 199599	*Sarah*	A 19th century steamship that sank on 07 February 1894.
NRHE: 199405	*Scottish Maid*	A 19th century wooden lugger that sank on 15 December 1890 with four lives lost.
NRHE: 201125	*Skibladner*	A 20th century schooner that sank on 24 December 1915.
NRHE: 121228	*Soar*	A 20th century steam trawler that sank on 18 March 1940.
NRHE: 198281	*Speculation*	A 19th century brig that sank on 14 November 1876 with seven lives lost.
NRHE: 313034	*Sportsman*	A 19th century schooner that sank 10 September 1859.
NRHE: 285060	*Susan and Henry*	A vessel of unknown date or type; two name boards, one marked *Susan and Henry* and the other *Freischutz* were picked up on 30 November 1860 near Johnshaven.
NRHE: 313259	*Tarbet Ness*	A 20th century steam trawler that sank on 03 December 1939.
NRHE: 101762	*Tarvartness*	A 20th century steam trawler that ran aground at an unknown date. The vessel may have been recovered.
NRHE: 273287	*Thomas And James*	A 20th century vessel that sank on 14 December 1844.

ID	Name	Description
NRHE: 256558	*Tullochgorm*	A 19th century lugger that sank on 19 November 1875.
NRHE: 201968	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 201967	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 201964	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 201962	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 324676	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 200071	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 200111	Unknown	The reported location of a wrecked vessel of unknown name or age.
NRHE: 329567	Unknown 1768	A vessel of unknown type that sank on 14 September 1768.
NRHE: 328949	Unknown 1786	A vessel of unknown type that sank on 06 January 1786.

ID	Name	Description
NRHE: 328420	Unknown 1809	A brig that sank on 15 December 1809.
NRHE: 327729	Unknown 1815	A fishing vessel that sank on 09 January 1815 with five lives lost.
NRHE: 327865	Unknown 1820	A 19th century lugger that sank on 16 December 1820 while smuggling brandy and gin.
NRHE: 327634	Unknown 1925	Remains of a wrecked vessel reported on 09 September 1925.
NRHE: 325120	Unknown 9999	Remains of a flare stack frame that was destroyed on 09 September 1975.
NRHE: 265869	Unknown	Fragmentary remains of a wrecked vessel collected on 15 November 1875.
NRHE: 274612	Unknown	Report of fragmentary remains of multiple vessels washing ashore at Montrose in January 1838.
NRHE: 313297	Unknown	An unknown vessel that sank on 06 January 1786
NRHE: 313273	Unknown	A brig that sank on 15 December 1809.
NRHE: 313294	Unknown	A vessel that sank on 14 September 1768.

ID	Name	Description
NRHE: 313262	Unknown	A 20th century steamship that sank on 27 September 1941.
NRHE: 313229	Unknown aircraft	An aircraft that was reported down on 27 February 1942.
NRHE: 286339	*Vulcan*	A 19th century brig that sank on 24 October 1868 with six lives lost.
NRHE: 329044/313295	*William*	A vessel that sank in April 1804.
NRHE: 313217	*William Findley*	A 20th century steam ship that sank on 26 May 1921.
NRHE: 265845	*Zeemeuw*	A nameboard washed ashore on 01 November 1875.
NRHE: 313228	*Greenwich*	A vessel that sank on 19 December 1803.
NRHE: 313240	Robin	A steel steam trawler that sank on 19 December 1911.
NRHE: 199386	Sarah Anderson	A 19th century lugger that sank on 04 March 1890.
NRHE: 200347	*Brothers*	A 20th century lugger that sank on

ID	Name	Description
NRHE: 199697	*Alice and Isabella*	A 19th century lugger that sank on 27 February 1897.
NRHE: 200128	*Southesk*	A 19th century lugger that sank on 31 July 1900.
NRHE: 200460	*Brimming River*	A 19th century lugger that sank on 09 March 1904.
NRHE: 199441	*Rose Bank*	A 19th century lugger that sank on 18 February 1892.
NRHE: 257939	*Fisher Lassie*	A 19th century lugger that sank after a collision with *Ann Wylie* on 14 October 1875 with five lives lost.
NRHE: 256575	*Ann Wylie*	A 19th century lugger that sank after a collision with *Fisher Lassie* on 14 October 1874. The vessel may have been recovered.
NRHE: 261070	*Earl of Clarendon*	A 19th century schooner that sank on 27 January 1884.
NRHE: 285490	*Pallas*	
NRHE: 313241	*Williamina*	A 19th century schooner that sank on 21 May 1868.
NRHE: 313242	*Guiding Star*	A 20th century smack that sank on 9 December 1923.

ID	Name	Description
NRHE: 313243	*Experiment*	A 19th century vessel that sank on 31 January 1814.
NRHE: 313244/325694	*Two Brothers*	A 19th century vessel that sank in 1811.

Appendix G: Water Framework Directive Assessment

G1.1 Cout's Rock to Scurdie Ness Coastal Waterbody

G1.1.1 Use this template to record the findings of the scoping stage of your Water Framework Directive (WFD) assessment for an activity in an estuary or coastal water.

G1.1.2 If your activity will:

- take place in or affect more than one water body, complete a template for each water body; and
- include several different activities or stages as part of a larger project, complete a template for each activity as part of your overall WFD assessment.

Table G1.1: Activity Details

Your activity	Description, notes or more information
Applicant name	Bowdun Offshore Wind Farm Limited
Application reference number (where applicable)	N/A
Name of activity	Bowdun Offshore Wind Farm
Brief description of activity	Trenching and laying of Offshore Export Cable
Location of activity (central point XY coordinates or National Grid reference)	British National Grid 464017, 5900320 (easting, northing).
Footprint of activity (ha)	The Offshore Infrastructure footprint within the water body is 45 ha. This accounts for 0.06% of the waterbody's area. Figure 23.1, Section 23: Offshore Water Quality and Water Framework Directive, illustrates the location of this water body.
Timings of activity (including start and finish dates)	Construction programme of approximately 12 months for all offshore elements this water body. The Proposed Development to become operational by 2032.
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	The capacity of the Export Cables are 220 kV to 275 kV. The Offshore Infrastructure will consist of up to four Export Cables of High Voltage Alternating Current (HVAC) buried in four trenches (or alternatively laid on the seabed with cable protection) to allow the power to be transferred to the National Grid via the onshore National Grid substation

Your activity	Description, notes or more information
Use or release of chemicals (state which ones)	Chemicals used will be fuel for the cable laying vessel and associated plant, however there will be no direct release of chemicals. There is the potential for accidental or unintentional release of chemicals through pollution incidents or frac-out during Horizontal Directional Drilling (HDD) operations at the Landfall.

Table G1.2: Water Body Details

Water body[8]	Description, notes or more information
WFD water body name	Cout's Rock to Scurdie Ness
Water body ID	200084
River Basin District (RBD) name	Scotland
Water body type (estuarine or coastal)	Coastal
Water body total area (ha)	9160
Overall water body status (2022)	Good
Ecological status	Good
Chemical status	Pass
Target water body status and deadline	Good (2027)
Hydromorphology status of water body	High
Heavily modified water body and for what use	No
Higher sensitivity habitats present	Saltmarsh is present within the water body which is unlikely to be impacted by the Proposed Development.
Lower sensitivity habitats present	Sane dune vegetation, subtidal soft sediment (sand, mud and mixed), subtidal rock reef (infralittoral and circalittoral reef rock)

[8] Water body information can be found in the SEPA water classification hub and the water body summary table. Magic maps provide additional information on habitats and protected areas. Links to these information sources can be found in the WFD assessment guidance for estuarine and coastal waters.

Water body[8]	Description, notes or more information
Phytoplankton status	High
History of harmful algae	No historical event of harmful algae
WFD protected areas within 2km	No WFD protected areas within 2 km

Specific Risk Information

G1.1.3 Consider the potential risks of your activity to each of these receptors: hydromorphology, biology (habitats and fish), water quality and protected areas. Also consider Invasive Non-Native Species (INNS).

Section 1: Hydromorphology

G1.1.4 Consider if hydromorphology is at risk from your activity.

G1.1.5 Use the water body summary table to find out the hydromorphology status of the water body if it is classed as heavily modified and for what use.

G1.1.6 Record the findings for hydromorphology and go to Section 2: Biology.

Table G1.3: Hydromorphology

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The ecological status of Couts Rock to Scurdie Ness water body Good Ecological Status (GES).
Could significantly impact the hydromorphology of any water body	✓		Yes, whilst there may be temporary impacts for the coastal waterbodies traversed by the Export Cable Corridor, the Proposed Development has the potential to impact on this water and other coastal water bodies within one Spring Tidal Excursion ellipse of the Export Cable Corridor. Marine processes modelling will be undertaken to assess impact on hydromorphology. In addition, the Landfall has the potential to impact on the morphology of the shoreline of this coastal water body, particularly if open cut methods are used.

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Is in a water body that is heavily modified for the same use as your activity		✓	The Cout's Rock to Scurdie Ness coastal waterbody is not designated as a Heavily Modified Water Body (HMWB) and is currently 'good' status.

Section 2: Biology (Habitats)

G1.1.7 Consider if habitats are at risk from your activity.

G1.1.8 Use the water body summary table and Magic maps, or other sources of information if available, to find the location and size of these habitats.

Table G1.4: Habitats

Higher sensitivity habitats[9]	Lower sensitivity habitats[10]
Saltmarsh	Sand dune Vegetation
	Subtidal Soft Sediment (Sand, Mud and Mixed)
	Subtidal Rock Reef (Infralittoral and Circalittoral Reef rock)

Table G1.5: Biology

Consider if the footprint[11][12] of your activity is:	Yes	No	Biology habitats risk issue(s)
0.5 km2 or larger		✓	No. The footprint of the works associated with the Offshore Infrastructure in this water body is <0.5 km2 (50 ha). The Export Cable Corridor footprint within the water body is 0.45 km2 (45 ha). This is based on the total trench footprint of 25 m.

[9] Higher sensitivity habitats have a low resistance to, and recovery rate, from human pressures.

[10] Lower sensitivity habitats have a medium to high resistance to, and recovery rate from, human pressures.

[11] Note that a footprint may also be a temperature or sediment plume. A footprint is 1.5 times the dredge area.

[12] Water body area taken from SEPA Water Environment Hub which presents Scotland's water environment covering Scotland's river basin management plan. https://www.sepa.org.uk/data-visualisation/water-environment-hub/

Consider if the footprint[1112] of your activity is:	Yes	No	Biology habitats risk issue(s)
			This also accounts for the generation of sediment plume from trenching works.
1% or more of the water body's area		✓	The Proposed Development does not have a significant impact on the waterbody. The total area of the waterbody is 91.6 km2 (9,160 ha)13 and footprint area covers 0.06% of this waterbody. The footprint of the activity in this waterbody is <1% of the waterbody's area.
Within 500 m of any higher sensitivity habitat		✓	Works not taking place within 500 m of any higher sensitive habitat within this waterbody.
1% or more of any lower sensitivity habitat		✓	The Export Cable Corridor will transverse lower significant habitats in this waterbody but not greater than 1% of the area.

Section 2: Biology (Fish)

G1.1.9 Consider if fish are at risk from your activity, but only if your activity is in an estuary or could affect fish in or entering an estuary.

[13] Water body area taken from SEPA Water Environment Hub which presents Scotland's water environment covering Scotland's river basin management plan. https://www.sepa.org.uk/data-visualisation/water-environment-hub/

Table G1.6: Fish

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No: Construction works for the Offshore Infrastructure will take place within Cout's Rock to Scurdie Ness coastal waterbody, however, works will take place away from the Montrose Basin transitional waterbody and will not affect fish migration to this waterbody.
Could impact on normal fish behaviour like movement, migration, or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	✓		Works will not create any physical barrier nor prevent normal fish behaviour from occurring. However, the potential impact of impairment of fish migration and navigation from Electromagnetic Fields (EMF) needs to be considered.
Could cause entrainment or impingement of fish		✓	Works will not cause entrainment or impingement of fish.

G1.1.10 Record the findings for biology habitats and fish and go to Section 3: Water Quality.

Section 3: Water Quality

G1.1.11 Consider if water quality is at risk from your activity.

G1.1.12 Use the water body summary table to find information on phytoplankton status and harmful algae.

Table G1.7: Water Quality

Consider if your activity:	Yes	No	Water quality risk issues (s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)		✓	A broad range of potential pollutants, such as hydrocarbons i.e. fuels and HDD drilling fluids, should a frac-out occur, can accumulate in surfaces waters. This can arise from accidental spillages and in collisions between marine plant during the proposed works.

Consider if your activity:	Yes	No	Water quality risk issues (s)
			Water clarity could be impacted due to increased turbidity caused by the seabed disturbance from the cable trenching and cable laying process. The Dissolved Inorganic Nitrogen (DIN) and Dissolved Oxygen (DO) levels for this water body are high. Particulate bound nutrients could interact with this coastal water body. However, the proposed works should not result in a deterioration of these statuses. With Embedded Mitigation measures outlined in Section 23.6: Offshore Water Quality and the Water Framework Directive, the construction, Operation and Maintenance (O&M) and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely significant effects with regards to pollution.
Is in a water body with a phytoplankton status of moderate, poor, or bad		✓	Phytoplankton classification is high. However, the construction, O&M and decommissioning phases of the Proposed Development are unlikely to present significant sources of nutrients and should not result in a deterioration of this status.
Is in a water body with a history of harmful algae		✓	The bathing water profiles for the nearby Montrose bathing waters note that algal blooms is not an issue. (https://www.sepa.org.uk/media/39853/montrose-bathing-water-profile.pdf) Algal growth typically produces a cream or brown coloured scum along the water's edge, but is otherwise harmless. It is assumed for the purpose of this assessment that harmful algal blooms are therefore not a common occurrence in this coastal water body.

G1.1.13 Consider if water quality is at risk from your activity through the use, release, or disturbance of chemicals.

Table G1.8: Impact of Chemicals on Water Quality

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list		✓	During the construction phase, there is a potential for sediment disturbance to release chemicals contained within the seabed. A broad range of potential pollutants, such as hydrocarbons (i.e. fuels oils and lubricants and HDD drilling fluids should a frac-out occur during construction of the landfall can accumulate in surfaces waters). This can arise from accidental spillages and in the unlikely event of collisions between marine plant during the proposed works. They may arise in the construction and O&M phase of the Proposed Development. Wjth the Embedded Mitigation measures outlined in Section 23.6. The construction, O&M and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely significant effects with regards for pollution
It disturbs sediment with contaminants above Cefas Action Level 1	✓		During the construction and decommissioning phases, there is a potential for sediment disturbance to release chemicals contained within the seabed. At this time it is unknown if sediments that will be disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1

Table G1.9: Mixing Zone

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s)
The chemicals released are on the EQSD list		✓	There will be no direct discharges of chemicals into the coastal water body and no associated mixing zone.

G1.1.14 Record the findings for water quality go on to Section 4: WFD Protected Areas.

Section 4: Water Framework Directive Protected Areas

G1.1.15 Consider if WFD protected areas are at risk from your activity. These include:

- Special Areas of Conservation (SAC);
- Special Protection Areas (SPA);
- nutrient sensitive areas;
- bathing waters;
- shellfish waters.

G1.1.16 Use Magic maps to find information on the location of protected areas in your water body (and adjacent water bodies) within 2 km of your activity.

Table G1.10: WFD Protected Areas

Consider if your activity is:	Yes	No	Protected areas risk issue(s)
Within 2 km of any WFD protected areas[14]		✓	There are no protected areas within 2 km of the proposed works

G1.1.17 Record the findings for WFD protected areas and go to Section 5: Invasive Non-Native Species.

[14] Note that a regulator can extend the 2km boundary if your activity has an especially high environmental risk.

Section 5: Invasive Non-Native Species

G1.1.18 Consider if there is a risk your activity could introduce or spread INNS.

G1.1.19 Risks of introducing or spreading INNS include:

- Materials or equipment that have come from, had use in or travelled through other water bodies; and
- Activities that help spread existing INNS, either within the immediate water body or other water bodies.

Table G1.11: INNS Risk

Consider if your activity could:	Yes	No	INNS risk issue(s)
Introduce or spread INNS		✓	The adverse effects of INNS has been risk assessed as part of the third Scottish River Basin Management Plan (RBMP). The latest status of this waterbody is High for INNS, which are therefore not an issue for this water body. However, the addition of new infrastructure in the marine environment has the potential to act as a substrate for new INNS. Vessel movements into the Offshore Water Quality Study Area may act as vectors facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent increased available habitat for INNS to colonise in the O&M phase Potential interactions with INNS is unlikely and an INNS Management Plan will be implemented. The plan will outline measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines.

Section 6: Summary

G1.1.20 Summarise the results of scoping here.

Table G1.12: Summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	Yes	Whilst there may be temporary impacts for the coastal waterbodies traversed by the Export Cable Corridor, the Proposed Development has the potential to impact on this water and other coastal water bodies within one Spring Tidal Excursion ellipse of the Export Cable Corridor. Marine physical processes modelling will be undertaken to assess impact on hydromorphology. In addition the landfall has the potential to impact on the morphology of the shoreline of this coastal water body, particularly if open cut methods are used.
Biology: habitats	No	The footprint of the Export Cable Corridor within the water body is 0.3 km^2 (30 ha) and the footprint of the activity is <1% of the water body's area. Lower sensitivity and higher sensitivity habitats are present within the waterbody. The threshold for scoping in this biological element is 0.5 km^2 footprint
Biology: fish	Yes	The Export Cable and landfall will not create any physical barrier which would prevent normal fish behaviour from occurring. However the potential impact the impairment of fish migration and navigation from EMFs needs to be considered.
Water quality	Yes	With the Embedded Mitigation measures outlined in Section 23.6: Offshore Water Quality and Water Framework Directive, the impact on water quality from the construction, O&M and decommissioning of the Export Cable and landfall is not likely to be significant. However, water quality has been scoped in to the WFD Assessment as it is currently unknown if sediments that will be

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
		disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1.
Protected areas	No	WFD protected areas are considered not at risk from the Proposed Development as there are no protected areas with 2 km of the works
Invasive non-native species	No	The Proposed Development is unlikely to result in the spread of INNS in the coastal water body, particularly with the implementation of the INNS management plan and therefore it is not considered further in this assessment.

G1.1.21 If you haven't identified any receptors at risk during scoping, you don't need to continue to the impact assessment stage and your WFD assessment is complete.

G1.1.22 If you've identified one or more receptors at risk during scoping, you should continue to the impact assessment stage.

G1.1.23 Include your scoping results in the WFD assessment document you send to your activity's regulator as part of your application for permission to carry out the activity.

G1.2 Big Rob's Cove to Couts Rock (Inverbervie) Coastal Waterbody

G1.2.1 Use this template to record the findings of the scoping stage of your WFD assessment for an activity in an estuary or coastal water.

G1.2.2 If your activity will:

- take place in or affect more than one water body, complete a template for each water body; and
- include several different activities or stages as part of a larger project, complete a template for each activity as part of your overall WFD assessment.

Table G1.13: Activity Details

Your activity	Description, notes or more information
Applicant name	Bowdun Offshore Wind Farm Limited
Application reference number (where applicable)	N/A
Name of activity	Bowdun Offshore Wind Farm
Brief description of activity	Trenching and laying of Offshore Export Cable by cable laying vessels
Location of activity (central point XY coordinates or National Grid reference)	British National Grid: 385471, 769688 (easting, northing)
Footprint of activity (ha)	The Offshore Infrastructure footprint within the water body is 72 ha. This accounts for <1% of the waterbody's area
Timings of activity (including start and finish dates)	Construction programme of approximately 12 months for all offshore elements within this water body. Proposed Development to become operational by 2032.
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	The capacity of the Offshore Export Cables are 220 kV to 275 kV. The Offshore Infrastructure will consist of up to four export cables of HVAC buried in four trenches (or alternatively laid on the seabed with cable protection) to allow the power to be transferred to the National Grid via the onshore National Grid substation.
Use or release of chemicals (state which ones)	Chemicals used will be fuel for the cable laying vessel and associated plant, however there will be no direct release of chemicals. There is the potential for accidental or unintentional release of chemicals through pollution incidents or frac-out during HDD operations at the Landfall.

Table G1.14: Water Body Details

Water body[1]	Description, notes or more information
WFD water body name	Big Rob's Cove to Couts Rock (Inverbervie)
Water body ID	200087
River Basin District (RBD) name	Scotland
Water body type (estuarine or coastal)	Coastal
Water body total area (ha)	2380
Overall water body status (2022)	Good
Ecological status	Good
Chemical status	Pass
Target water body status and deadline	Good (2027)
Hydromorphology status of water body	High
Heavily modified water body and for what use	No
Higher sensitivity habitats present	No higher sensitivity habitat present within the water body
Lower sensitivity habitats present	Subtidal rocky reef (infralittoral and circalittoral rock), subtidal soft sediment (sand, mud and mixed) and gravels and cobbles (intertidal and subtidal coarse sediment) are all lower sensitivity habitats present within the waterbody
Phytoplankton status	High (2022)
History of harmful algae	No historical event of harmful algae
WFD protected areas within 2 km	No WFD protected areas within 2 km

[1] Water body information can be found in the Environment Agency's catchment data explorer and the water body summary table. Magic maps provide additional information on habitats and protected areas. Links to these information sources can be found in the WFD assessment guidance for estuarine and coastal waters.

Specific Risk Information

G1.2.3 Consider the potential risks of your activity to each of these receptors: hydromorphology, biology (habitats and fish), water quality and protected areas. Also consider INNS.

Section 1: Hydromorphology

G1.2.4 Consider if hydromorphology is at risk from your activity.

G1.2.5 Use the water body summary table to find out the hydromorphology status of the water body if it is classed as heavily modified and for what use.

G1.2.6 Record the findings for hydromorphology and go to section 2 biology.

Table G1.15: Hydromorphology

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status		✓	The hydromorphological status of this water body is high which is a contributing element of the overall ecological status of good.
Could significantly impact the hydromorphology of any water body	✓		Yes, the Proposed Development has the potential to impact on the hydromorphology of other water body. A large portion of the Export Cable Corridor is located within the Big Rob's Cove to Couts Rock (Inverbervie) coastal water body. This requires further assessment.
Is in a water body that is heavily modified for the same use as your activity		✓	Big Rob's Cove to Couts Rock (Inverbervie) coastal waterbody is not designated as a Heavily Modified Water Body (HMWB).

G1.2.7 Record the findings for hydromorphology and go to Section 2: Biology.

Section 2: Biology (Habitats)

G1.2.8 Consider if habitats are at risk from your activity.

G1.2.9 Use the water body summary table and Magic maps, or other sources of information if available, to find the location and size of these habitats.

Table G1.16: Habitats

Higher sensitivity habitats[2]	Lower sensitivity habitats[3]
n/a	Subtidal Rocky Reef (infralittoral and circalittoral rock)
	Subtidal Soft Sediment (sand, mud and mixed)
	Gravels, Cobbles and Shingle (intertidal and subtidal coarse sediment)

Table G1.17: Biology

Consider if the footprint[4] of your activity is:	Yes	No	Biology habitats risk issue(s)
0.5 km^2 or larger	✓		No. The footprint of the works associated with the Offshore Infrastructure in this water body is >0.5 km2. The footprint of the Export Cable Corridor within the water body is 0.72 km2. This is based on the total trench footprint of 25 m. This also accounts for the generation of sediment plume from trenching works.

[2] Higher sensitivity habitats have a low resistance rate, from human pressures.

[3] Lower sensitivity habitats have a medium to high resistance to, and recovery rate from human pressures.

[4] Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5 times the dredge area.

[5] Water body area taken from SEPA Water Environment Hub which presents Scotland's water environment covering Scotland's river basin management plan. https://www.sepa.org.uk/data-visualisation/water-environment-hub/

Consider if the footprint[4] of your activity is:	Yes	No	Biology habitats risk issue(s)
1% or more of the water body's area		✓	The Proposed Development will not have a significant impact on the waterbody. The total area of the waterbody is 23.8 km2 (2,380 ha)5 therefore the footprint of the activity associated with the Proposed Development in this water body is <1% of the water body's area.
Within 500 m of any higher sensitivity habitat		✓	Works are not taking place within 500 m of any higher sensitive habitat.
1% or more of any lower sensitivity habitat		✓	Works will be taking place within or near to any lower significant habitat but not more than 1% of the area.

Section 2: Biology (Fish)

G1.2.10 Consider if habitats are at risk from your activity.

G1.2.11 Use the water body summary table and Magic maps, or other sources of information if available, to find the location and size of these habitats.

Table G1.18: Fish

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish form entering it or could affect fish migrating through the estuary		✓	No: The works are taking place solely within the Export Cable Corridor within the wider context of the Big Rob's Cove to Couts Rock (Inverbervie) coastal waterbody
Could Impact on normal fish behaviour like movement, migration, or spawning (for example creating a physical barrier ,noise, chemical change or a change in depth or flow)	✓		Works will not create any physical barrier nor prevent normal fish behaviour from occurring. However, the potential impact of impairment of fish migration and navigation from Electromagnetic Fields (EMF) needs to be considered.

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Could cause entrainment or impingement of fish		✓	Works will not cause entrainment or impingement or fish

G1.2.12 Record the findings for biology habitats and fish and go to Section 3: Water Quality.

Section 3: Water Quality

G1.2.13 Consider if water quality is at risk from your activity.

G1.2.14 Use the water body summary table to find information on phytoplankton status and harmful algae.

G1.2.15 Consider if water quality is at great risk from your activity through the use, release, or disturbance of chemicals.

Table G1.19: Water Quality

Consider if your activity:	Yes	No	Water quality risk issues (s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients, or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	✓		A broad range of potential pollutants, such as hydrocarbons i.e. fuels and HDD drilling fluids, should a frac-out occur, can accumulate in surfaces waters. This can arise from accidental spillages and in collisions between marine plant during the proposed works. Water clarity will be impacted from the cable trenching and cable laying process. Interactions between marine plant and marine sediment will be scoped into further assessments. Water temperatures within the waterbody is likely to increase caused by the generation of heat from cable laying vessel among other associated machinery. This will be scoped in for further assessment. The DIN and DO levels for this water body are high. Particulate bound nutrients could find a pathway to this coastal water body through Hydrological links. The proposed works should not result in a deterioration of these status.

Consider if your activity:	Yes	No	Water quality risk issues (s)
			With embedded mitigation measures outlined in Section 23.6, the construction, O&M and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely significant effects with regards to pollution.
Is in a water body with a phytoplankton status of moderate, poor, or bad		✓	Phytoplankton classification is high. However, the construction, O&M and decommissioning phases of the development are unlikely to present significant sources of nutrients and should not result in a deterioration of this status.
Is in a water body with a history of harmful algae		✓	The bathing water profiles for the nearby Montrose bathing waters note that algal blooms have not been or currently is an issue. (https://www.sepa.org.uk/media/39853/montrose-bathing-water-profile.pdf) Algal growth typically produces a cream or brown coloured scum along the water's edge but is otherwise harmless. It is assumed for the purpose of this assessment that harmful algal blooms are therefore not a common occurrence in this coastal water body.

G1.2.16 Consider if water quality is at risk from your activity through the use, release, or disturbance of chemicals.

Table G1.20: Impact of Chemicals on Water Quality

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
The chemicals are on the Environmental Quality Standards Directive (EQSD)	✓		During the construction phase, there is a potential for sediment disturbance to release chemicals contained within the seabed. A broad range of potential pollutants, such as hydrocarbons i.e. fuels oils

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
			and lubricants can accumulate in surfaces waters. This can arise from accidental spillages and in the unlikely event of collisions between marine plant during the proposed works. They may arise in the construction and O&M phase of the Proposed Development. With the embedded mitigation measures outlined in Section 23.6 of the Offshore Water Quality section of the Offshore Scoping Report. The construction, O&M and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely significant effects with regards to pollution.
It disturbs sediment with contaminants above Cefas Action Level 1	✓		During the construction and decommissioning phases, there is a potential for sediment disturbance to release chemicals contained within the seabed. At this time, it is unknown if sediments that will be disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1.

Table G1.21: Mixing Zone

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s)
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list		✓	There will be no direct discharges of chemicals into the coastal water body and no associated mixing zone.

G1.2.17 Record the finding for water quality go on to Section 4: WFD Protected Areas.

Section 4: Water Framework Directive Protected Areas

G1.2.18 Consider if WFD protected areas are at risk from your activity. These include:

- SAC;
- SPA;
- Shellfish waters;
- Bathing waters; and
- Nutrient sensitive areas.

G1.2.19 Use Magic maps to find information on the location of protected areas in your water body (and adjacent water bodies) within 2 km of your activity.

Table G1.22: WFD Protected Areas

Consider if your activity is[6]:	Yes	No	Protected areas risk issue(s)
Within 2 km of any WFD protected area		✓	There are no protected areas within 2 km of the proposed works

G1.2.20 Record the findings for WFD protected areas and go to Section 5: Invasive Non-Native Species.

Section 5: Invasive Non-Native Species

G1.2.21 Consider if there is a risk if your activity could introduce or spread INNS.

G1.2.22 Risks of introducing or spreading INNS include:

- Materials or equipment that have come from, had use in or travelled through other water bodies.
- Activities that help spread existing INNS, either within the immediate water body or other water bodies

[6] Note a regulator can extend the 2 km boundary if your activity has an especially high environmental risk.

Table G1.23: INNS Risk

Consider if your activity could:	Yes	No	INNS risk issue(s)
Introduce or spread INNS		✓	The adverse effects of INNS has been risk assessed as part of the third Scottish River Basin Management Plan (RBMP). The latest status of this waterbody is High for INNS, which are therefore not an issue for this water body. However, the addition of new infrastructure in the marine environment has the potential to act as a substrate for new INNS. Vessel movements into the Offshore Water Quality Study Area may act as vectors facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent increased available habitat for INNS to colonise in the O&M phase. Potential interactions with INNS is unlikely and an INNS Management Plan will be implemented. The plan will outline measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines.

G1.2.23 Record the findings for INNS and go to the summary section.

Section 6: Summary

G1.2.24 Summarize the results of scoping here.

Table G1.24: Summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	Yes	Whilst there may be temporary impacts for the coastal waterbodies traversed by the Export Cable Corridor, the Proposed Development has the potential to impact on this water and other coastal water bodies within one Spring Tidal Excursion ellipse of the Export Cable Corridor. Marine processes modelling will be undertaken to assess impact on hydromorphology. In addition, the landfall has the potential to impact on the morphology of the shoreline of this coastal water body, particularly if open cut methods are used.
Biology: habitats	Yes	The footprint of the Export Cable Corridor within the water body is 0.72 km^2 and the footprint of the activity associated with the Proposed Development in this water body is <1% of the water body's area. The Export Cable Corridor transverse lower sensitivity habitats.
Biology: fish	Yes	The Export Cable and landfall will not create any physical barrier which would prevent normal fish behaviour from occurring. However, the potential impact the impairment of fish migration and navigation from EMFs needs to be considered.
Water quality	Yes	With the Embedded Mitigation measures outlined in Section 23.6: Offshore Water Quality and Water Framework Directive, the impact on water quality from the construction, O&M and decommissioning of the Export Cable and landfall is not likely to be significant. However, water quality has been scoped into the WFD Assessment as it is currently unknown if sediments that will be disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1.

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Protected areas	No	There are no protected areas with 2 km of the works.
Invasive non-native species	No	The Proposed Development is unlikely to result in the spread of INNS in the coastal water body, particularly with the implementation of the INNS management plan and therefore it is not considered further in this assessment

G1.2.25 If you haven't identified any receptors at risk during scoping, you don't need to continue to the impact assessment stage and your WFD assessment is complete.

G1.2.26 If you've identified one or more receptors at risk during scoping, you should continue to the impact assessment stage.

G1.2.27 Include your scoping results in the WFD assessment document you send to your activity's regulator as part of your application for permission to carry out the activity.

G1.3 Downie Point to Big Rob's Cove Coastal Waterbody

G1.3.1 Use this template to record the findings of the scoping stage of your WFD assessment for an activity in an estuary or coastal water.

G1.3.2 If your activity will:

- take place in or affect more than one water body, complete a template for each water body; and
- include several different activities or stages as part of a larger project, complete a template for each activity as part of your overall WFD assessment.

Table G1.25: Activity Details

Your activity	Description notes or more information
Applicant name	Bowdun Offshore Wind Farm Limited
Application reference number (where applicable)	N/A
Name of activity	Bowdun Offshore Wind Farm
Brief description of activity	Trenching and laying of Offshore Export Cables by cable laying vessels

Your activity	Description notes or more information
Location of activity (central point XY coordinates or National Grid reference)	British National Grid 389876, 777844 (easting, northing)
Footprint of activity (ha)	The Offshore Infrastructure footprint within the water body is 39 ha. Figure 23.1, Section 23: Offshore Water Quality and Water Framework Directive illustrates the location of this water body. This accounts for 0.04% of the waterbody's area.
Timings of activity (including start and finish dates)	Construction programme of approximately 12 months for all offshore elements within this water body. Development to become operational by 2032.
Extent of activity (for example size, scale frequency, expected volumes of output or discharge)	The capacity of the export cables are 220 kV to 275 kV. The Offshore Infrastructure will consist of up to four Export Cables of HVAC buried in four trenches (or alternatively laid on the seabed with cable protection) to allow the power to be transferred to the National Grid via the onshore National Grid substation
Use or release of chemicals (state which ones)	Chemicals used will be fuel for the cable laying vessel and associated plant, however there will be no direct release of chemicals to the environment. There is the potential for accidental or unintentional release of chemicals through pollution incidents or frac-out during HDD operations at the Landfall.

Table G1.26: Water Body Details

Water body[1]	Description, notes or more information
WFD water body name	Downie Point to Big Rob's Cove
Water body ID	200092
River Basin District (RBD) name	Scotland
Water body type (estuarine or coastal)	Coastal
Water body total area (ha)	8540

[1] Water body information can be found in the Environment Agency's catchment data explorer and the water body summary table. Magic maps provide additional information on habitats and protected areas. Links to these information sources can be found in the WFD assessment guidance for estuarine and coastal waters.

Water body[1]	Description, notes or more information
Overall water body status (2022)	High
Ecological status	High
Chemical status	Pass
Target water body status and deadline	High (2027)
Hydromorphology status of water body	High
Heavily modified water body and for what use	No
Higher sensitivity habitats present	No higher sensitivity habitat present within the water body
Lower sensitivity habitats present	Subtidal rocky reef (infralittoral and circalittoral rock), subtidal soft sediment (sand, mud and mixed) and gravels and cobbles (intertidal and subtidal coarse sediment) are all lower sensitivity habitats present within the waterbody
Phytoplankton status	High (2022)
History of harmful algae	No historical event of harmful algae
WFD protected areas within 2 km	No WFD protected areas within 2 km

Specific Risk Information

G1.3.3 Consider the potential risks of your activity to each of these receptors: hydromorphology, biology (habitats and fish), water quality and protected areas. Also consider INNS.

Section 1: Hydromorphology

G1.3.4 Consider if hydromorphology is at risk from your activity.

G1.3.5 Use the water body summary table to find out the hydromorphology status of the water body if it is classed as heavily modified and for what use.

G1.3.6 Record the findings for hydromorphology and go to section 2: biology.

Table G1.27: Hydromorphology

Consider if your activity:	Yes	No	Hydromorphology risk issue(s)
Could impact on the hydromorphology (for example morphology or tidal patterns) of a water body at high status	✓		The overall ecological status to which hydromorphology is a contributing element is high therefore there is the potential that the water body status could deteriorate if the hydromorphological supporting conditions are adversely affected by the Proposed Development.
Could significantly impact the hydromorphology of any water body	✓		Yes, the Proposed Development has the potential to impact on the hydromorphology of other water body. A large portion of the Export Cable Corridor is located within the nearby Big Rob's Cove to Couts Rock (Inverbervie) coastal water body and travels through a small portion of the Downie Point to Big Rob's Cove coastal waterbody. This requires further assessment.
Is in a water body that is heavily modified for the same use as your activity		✓	Downie Point to Big Rob's Cove coastal waterbody is not designated as a Heavily Modified Water Body (HMWB).

Section 2 Biology (Habitats)

G1.3.7 Consider if habitats are at risk from your activity.

G1.3.8 Use the water body summary table and Magic maps, or other sources of information if available, to find the location and size of these habitats.

Table G1.28: Habitats

Higher sensitivity habitats[2]	Lower sensitivity habitats[3]
Subtidal Kelp Beds	Subtidal Rocky Reef (infralittoral and circalittoral rock)
	Subtidal Soft Sediment (sand, mud and mixed)
	Gravels, Cobbles and Shingle (intertidal and subtidal coarse sediment)

Table G1.29: Biology

Consider if the footprint[4] of your activity is:	Yes	No	Biology habitats risk issue(s)
0.5 km^2 or larger		✓	No. The footprint of the works associated with the Offshore Infrastructure in this water body is <0.5 km2. The footprint of the Export Cable Corridor within the water body is 0.39 km2. This is based on the total trench footprint of 25 m. This also accounts for the generation of sediment plume from trenching works.
1% or more of the water body's area		✓	The Proposed Development does not have a significant impact on the waterbody. The total area of the waterbody is 85.4 km2 (8,540 ha) and the footprint area within the coastal waterbody is 3.6 km2. Therefore, the footprint of the activity associated with the Proposed Development in this water body is <1% of the water body's area. The area of the works within the waterbody is 0.04%.
Within 500 m of any higher sensitivity habitat		✓	Works not taking place within 500 m of any higher sensitive habitat.

[2] Higher sensitivity habitats have a low resistance rate, from human pressures.

[3] Lower sensitivity habitats have a medium to high resistance to, and recovery rate from human pressures.

[4] Note that a footprint may also be a temperature or sediment plume. For dredging activity, a footprint is 1.5 times the dredge area.

Consider if the footprint[4] of your activity is:	Yes	No	Biology habitats risk issue(s)
1% or more of any lower sensitivity habitat		✓	Works will be taking place within or near to any lower sensitivity habitat.

Section 2 Biology (Fish)

G1.3.9 Consider if fish are at risk from your activity, but only if your activity is in an estuary or could affect fish in or entering an estuary.

Table G1.30: Fish

Consider if your activity:	Yes	No	Biology fish risk issue(s)
Is in an estuary and could affect fish in the estuary, outside the estuary but could delay or prevent fish entering it or could affect fish migrating through the estuary		✓	No: The works are taking place within the Export Cable Corridor which crosses a small portion of the Downie Point to Big Rob's Cove coastal waterbody. There are no estuaries present within this waterbody.
Could impact on normal fish behaviour like movement, migration, or spawning (for example creating a physical barrier, noise, chemical change or a change in depth or flow)	✓		Works will not create any physical barrier nor prevent normal fish behaviour from occurring. However, the potential impact of impairment of fish migration and navigation from Electromagnetic Fields (EMF) needs to be considered.
Could cause entrainment or impingement of fish		✓	Works will not cause entrainment or impingement of fish.

G1.3.10 Record the findings for biology habitats and fish and go to Section 3: Water Quality.

Section 3: Water Quality

G1.3.11 Consider if water quality is at risk from your activity.

G1.3.12 Use the water body summary table to find information on phytoplankton status and harmful algae.

Table G1.31: Water Quality

Consider if your activity:	Yes	No	Water quality risk issue(s)
Could affect water clarity, temperature, salinity, oxygen levels, nutrients or microbial patterns continuously for longer than a spring neap tidal cycle (about 14 days)	✓		A broad range of potential pollutants, such as hydrocarbons i.e. fuels and HDD drilling fluids, should a frac-out occur, can accumulate in surfaces waters. This can arise from accidental spillages and in collisions between marine plant during the proposed works. Water clarity will be impacted from the cable trenching and cable laying process. Interactions between marine plant and marine sediment will be scoped into further assessments. Water temperatures within the waterbody is likely to increase caused by the generation of heat from cable laying vessel among other associated machinery. This will be scoped in for further assessment. The DIN and DO levels for this water body are high. Particulate bound nutrients could find a pathway to this coastal water body through Hydrological links. The proposed works should not result in a deterioration of these statuses With embedded mitigation measures outlined in Section 23.6, the construction, O&M and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely significant effects with regards to pollution.
Is in a water body with a phytoplankton status of moderate, poor, or bad		✓	The bathing water profiles for the nearby Montrose bathing waters note that algal blooms have not been or currently is an issue. (https://www.sepa.org.uk/media/39853/montrose-bathing-water-profile.pdf) Algal growth typically produces a cream or brown coloured scum along the water's edge but is otherwise harmless. It is assumed for the purpose of this assessment that harmful algal blooms are therefore not a common occurrence in this coastal water body.

Consider if your activity:	Yes	No	Water quality risk issue(s)
Is in a water body with a history of harmful algae		✓	It is assumed for the purpose of this assessment that harmful algal blooms are not a common occurrence in this coastal water body. Furthermore, Stonehaven Bathing Waters is located north of this water body which states there has been no occurrences of harmful algae in the past. (Available at: https://www.sepa.org.uk/media/40139/stonehaven-bathing-water-profile.pdf)

G1.3.13 Consider if water quality is at risk from your activity through the use, release, or disturbance of chemicals.

Table G1.32: Impact of Chemicals on Water Quality

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
The chemicals are on the Environmental Quality Standards Directive (EQSD) list	✓		During the construction phase, there is a potential for sediment disturbance to release chemicals contained within the seabed. A broad range of potential pollutants, such as hydrocarbons (i.e. fuels oils and lubricants and HDD drilling fluids should a frac-out occur during construction of the landfall can accumulate in surfaces waters). This can arise from accidental spillages and in the unlikely event of collisions between marine plant during the proposed works. They may arise in the construction and O&M phase of the Proposed Development. With the embedded mitigation measures outlined in Section 23.6 of the Offshore Water Quality section of the Offshore Scoping Report. The construction, O&M and decommissioning activities are unlikely to generate contaminants and thus there will be low potential for likely

If your activity uses or releases chemicals (for example through sediment disturbance or building works) consider if:	Yes	No	Water quality risk issue(s)
			significant effects with regards to pollution.
It disturbs sediment with contaminants above Cefas Action Level 1	✓		During the construction and decommissioning phases, there is a potential for sediment disturbance to release chemicals contained within the seabed. At this time it is unknown if sediments that will be disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1.

G1.3.14 Record the findings for water quality go on to Section 4: WFD Protected Areas.

Table G1.33: Mixing Zone

If your activity has a mixing zone (like a discharge pipeline or outfall) consider if:	Yes	No	Water quality risk issue(s)
The chemicals released are on the Environmental Quality Standards Directive (EQSD) list		✓	There will be no direct discharges of chemicals into the coastal water body and no associated mixing zone.

Section 4: Water Framework Directive Protected Areas

G1.3.15 Consider if WFD protected areas are at risk from your activity. These include:

- SACs;
- SPAs;
- nutrient sensitive areas;
- bathing waters; and
- shellfish waters.

G1.3.16 Use Magic maps to find information on the location of protected areas in your water body (and adjacent water bodies) within 2 km of your activity.

Table G1.34: WFD Protected Areas

Consider if your activity is:	Yes	No	Protected areas risk issue(s)
Within 2 km of any WFD protected area[6]		✓	There are no protected areas within 2 km of the proposed works. Within this waterbody, the Fowlsheugh SPA is present, however it is not transversed by the Export Cable Corridor. This SPA is located in the northern part of the waterbody.

G1.3.17 Record the findings for WFD protected areas and go to Section 5: Invasive Non-Native Species.

Section 5: Invasive Non-Native Species

G1.3.18 Consider if there is a risk your activity could introduce or spread INNS.

G1.3.19 Risks of introducing or spreading INNS include:

- materials or equipment that have come from, had use in or travelled through other water bodies; and
- activities that help spread existing INNS, either within the immediate water body or other water bodies.

G1.3.20 Record the findings for INNS and go to the summary section.

Table G1.35: INNS Risk

Consider if your activity could:	Yes	No	INNS risk issue(s)
Introduce or spread INNS		✓	The adverse effects of INNS has been risk assessed as part of the third Scottish River Basin Management Plan (RBMP). The latest status of this waterbody is High for INNS, which are therefore not an issue for this water body. However, the addition of new infrastructure in the marine environment has the potential to act as a substrate for new INNS. Vessel movements into the Offshore Water Quality Study Area may act as vectors

[6] Note that a regulator can extend the 2 km boundary if your activity has an especially high environmental risk.

Consider if your activity could:	Yes	No	INNS risk issue(s)
			facilitating the spread of INNS. In addition, the installation of artificial hard structures (such as foundations, scour protection, and cable protection) may represent increased available habitat for INNS to colonise in the O&M phase Potential interactions with INNS is unlikely and an INNS Management Plan will be implemented. The plan will outline measures to ensure vessels comply with the International Maritime Organisation (IMO) ballast water management guidelines.

Section 6: Summary

G1.3.21 Summarise the results of scoping here.

Table G1.36: Summary

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Hydromorphology	Yes	Whilst there may be temporary impacts for the coastal waterbodies traversed by the Export Cable Corridor, the Proposed Development has the potential to impact on this water and other coastal water bodies within one Spring Tidal Excursion ellipse of the Export Cable Corridor. Marine processes modelling will be undertaken to assess impact on hydromorphology. In addition, the landfall has the potential to impact on the morphology of the shoreline of this coastal water body, particularly if open cut methods are used.

Receptor	Potential risk to receptor?	Note the risk issue(s) for impact assessment
Biology: habitats	No	The footprint of the Export Cable Corridor within the water body is 39 ha (0.39 km^2) and the footprint of the activity associated with the proposed development in this water body is <1% of the water body's area. The Export Cable Corridor transverses lower sensitivity habitats listed in Biology: habitats section.
Biology: fish	Yes	The Export Cable and landfall will not create any physical barrier which would prevent normal fish behaviour from occurring. However, the potential impact the impairment of fish migration and navigation from EMFs needs to be considered.
Water quality	Yes	With the Embedded Mitigation measures outlined in Section 23.6: Offshore Water Quality and Water Framework Directive, the impact on water quality from the construction, O&M and decommissioning of the Export Cable and landfall is not likely to be significant. However, water quality has been scoped in to the WFD Assessment as it is currently unknown if sediments that will be disturbed as a result of cable laying process are likely to contain contaminants above Cefas Action Level 1.
Protected areas	No	There are no protected areas with 2 km of the works. One SPA designed site is located within the waterbody but not in the path of the Export Cable Corridor.
Invasive non-native species	No	The Proposed Development is unlikely to result in the spread of INNS in the coastal water body, particularly with the implementation of the INNS management plan and therefore it is not considered further in this assessment

G1.3.22 If you haven't identified any receptors at risk during scoping, you don't need to continue to the impact assessment stage and your WFD assessment is complete.

G1.3.23 If you've identified one or more receptors at risk during scoping, you should continue to the impact assessment stage.

G1.3.24 Include your scoping results in the WFD assessment document you send to your activity's regulator as part of your application for permission to carry out the activity.