TotalEnergies E&P North Sea UK Ltd

Culzean - Floating Offshore Wind Turbine Pilot Project

HRA Report including HRA Screening and RIAA

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XODUS

TotalEnergies

Aberdeen

The Capitol Building
431 Union Street,
EC2AB116DA . UK

T +44 1224 219 955
E
deborah.morgan@xodusgroup.com
www.xodusgroup.com

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ACRONYMS AND ABBREVIATIONS

ACRONYM/ABBREVIATION	DEFINITION
AA	Appropriate Assessment
AEOSI	Adverse Effects on Site Integrity
AHV	Anchor Handling Vessel
AIS	Automatic Identification System
AON	Apparently Occupied Nests
AOWFL	Aberdeen Offshore Wind Farm Limited
ATON	Aids to Navigation
BAT	Best Available Technique
BEIS	Department for Business, Energy & Industrial Strategy
BWM	Ballast Water Management
CA	Comparative Assessment
CAA	Civil Aviation Authority
CAP	Cable Plan
CBRA	Cable Burial Risk Assessment
CEMP	Construction Environmental Management Plan
CES	Crown Estate Scotland
CJEU	Court of Justice of the European Union
CMS	Construction Method Statement
CNS	Central North Sea
CoCP	Code of Construction Practice
ColRegs	International Regulations for the Prevention of Collision at Sea
CPF	Central Processing Facility Platform
cSAC	Candidate Special Area of Conservation
DAS	Digital Aerial Survey
DGC	Defence Geographic Centre
DP	Dynamic Positioning
DSLP	Development Specification and Layout Plan
DTU	Technical University of Denmark
E&P	Exploration and Production
FLO	Fisheries Liaison Officer
eDNA	Environmental Deoxyribonucleic Acid
EEA	European Economic Area
EEC	European Economic Community

ACRONYM/ABBREVIATION	DEFINITION
EEZ	Exclusive Economic Zone
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPS	European Protected Species
ERCoP	Emergency Response Cooperation Plan
ERRV	Emergency Rescue and Response Vessel
EU	European Union
FPV	Fall Pipe Vessel
GW	Gigawatt
HPAI	Highly Pathogenic Avian Influenza
HRA	Habitats Regulations Appraisal
HSE	Health, Safety and Environment
IALA	International of Marine Aids to Navigation and Lighthouse Authorities
IAMMWG	Inter-Agency Marine Mammal Working Group
IMO	International Maritime Organization
INNS	Invasive Non-Native Species
INTOG	Innovation and Targeted Oil and Gas
IPF	Initial Plan Framework
IROPI	Imperative Reasons for Overriding Public Interest
ISO	International Standards Organization
JNCC	Joint Nature Conservation Committee
KM	Kilometre
kV	Kilovolt
LCV	Light Construction Vessel
LiDAR	Light Detecting and Ranging
LMP	Lighting and Marking Plan
LSE	Likely Significant Effects
M	Metres
MARPOL	The International Convention for the Prevention of Pollution from Ships
MASTS	Marine Alliance for Science and Technology for Scotland
MAX/MM	Maximum / Mean Max
MCA	Maritime and Coastguard Agency
MD-LOT	Marine Directorate – Licensing Operations Team
MDS	Maximum Design Scenario

ACRONYM/ABBREVIATION	DEFINITION
MGN	Marine Guidance Note
MHWS	Mean High-Water Springs
mm	millimetre
MM+SD	Mean Max + Standard Deviation
MoD	Ministry of Defence
MSL	Mean Sea Level
MU	Management Unit
MW	Megawatt
MWL	Mean Water Level
NLB	Northern Lighthouse Board
NM	Nautical Mile
NNS	Northern North Sea
NS	North Sea
NSP	Navigational Safety Plan
NSTA	North Sea Transition Authority
OEM	Original Equipment Manufacturer
OEMP	Operational Environmental Management Plan
OPRED	Offshore Petroleum Regulator for Environment and Decommissioning
OREI	Offshore Renewable Energy Installation
PDE	Project Design Envelope
PEMP	Project Environmental Monitoring Programme
pSPA	Proposed Special Protection Area
R&D	Research and Development
RIAA	Report to Inform Appropriate Assessment
ROV	Remote Operated Vehicle
SAC	Special Area of Conservation
SAR	Search and Rescue
SCI	Sites of Community Importance
SF6	Sulphur Hexafluoride
SNCB	Statutory Nature Conservation Body
SNH	Scottish Natural Heritage
SOPEP	Shipboard Oil Pollution Emergency Plans
SPA	Special Protection Area
SSSI	Sites of Special Scientific Interest
TEPNSUK	TotalEnergies E&P North Sea UK Ltd

ACRONYM/ABBREVIATION	DEFINITION
Te	Tonnes
TOG	Targeted Oil and Gas
TRUK	TotalEnergies Renewables UK Limited
UK	United Kingdom
UKHO	UK Hydrographic Office
UKCS	United Kingdom Continental Shelf
ULQ	Utilities and Living Quarter Platform
UXO	Unexploded Ordnance
VMP	Vessel Management Plan
WGS84	World Geodetic System 1984.
WHP	Wellhead Platform
WTG	Wind Turbine Generator
ZoI	Zone of Influence

GLOSSARY OF TERMS

ACONYM	DEFINITION
Annex I habitat	A habitat listed under Annex I of the Habitats Directive (Council Directive 92/43/EEC). Annex I habitats can be designated as a qualifying feature of a Special Area of Conservation (SAC), to ensure the conservation of these habitats. The protection of Annex I habitats within SACs persists in United Kingdom (UK) law following European Union (EU) Exit.
Annex II species	A species listed under Annex II of the Habitats Directive (Council Directive 92/43/EEC). Annex II species can be designated as a qualifying feature of a SAC to ensure the conservation of these species. The protection of Annex II species within SACs persists in UK law following EU exit.
Culzean Floating Offshore Wind Pilot Project ('the Project')	The entire Development including all offshore components and all project phases from pre-construction to decommissioning.
European site	SAC, Special Protection Areas (SPAs) and Sites of Community Importance (SCI) that were originally designated under EU legislation. Prior to the UK's withdrawal from the EU, the UK's European sites contribute to the Natura 2000 and were referred to as Natura 2000 sites. They now are part of the UK's National Site Network.
Habitats Regulations	Collectively the term used to refer to the Conservation (Natural Habitats, &c.) Regulations 1994 (as amended) – applicable to Marine Licence applications out to the 12 nm (NM), limit, the Conservation of Offshore Marine Habitats and Species Regulations 2017 – applicable to Marine Licence applications between the 12 and 200 NM limits, and the Conservation of Habitats and Species Regulations 2017 (as amended – applicable to Section 36 Consent applications. For the Project, the Conservation of Offshore Marine Habitats and Species Regulations 2017 is applicable.
Habitats Regulations Appraisal	Process of the identification and assessment of the potential for a development to have an adverse effect on site integrity of a European site, in line with the Habitats Regulations.
LSE	Any effect of a plan or project that may affect the conservation objectives of the qualifying features for a European site which cannot be ruled out on the basis of objective information, either individually or in combination with other plans and projects (Tyldesley *et al*, 2015).
Marine Licence Application ('the Application')	A Marine Licence is granted under either the Marine and Coastal Access Act 2009 for projects between 12-200 Nautical Miles (nm) from shore, or the Marine (Scotland) Act 2010 for projects between Mean High-Water Springs (MHWS) out to 12 nm from shore. As the Project is beyond 12 NM only the former regulation applies. The Application includes the Environmental Impact Assessment Report (EIAR), HRA-supporting documentation, an application letter and the Marine Licence application form.

1 INTRODUCTION

1.1 Company Background

TotalEnergies E&P North Sea UK Ltd (TEPNSUK) within the wider TotalEnergies UK portfolio is one of the largest energy companies on the United Kingdom Continental Shelf (UKCS), with three main asset groups in Scottish Offshore Waters:

- West of Shetland – four producing fields with further exploration potential;
- Northern North Sea (NNS)– a core production hub with growth opportunities; and
- Central North Sea (CNS) – including the Culzean Field (which came onstream in 2019) and Elgin Franklin Field.

TotalEnergies (TEPNSUK's parent company), is targeting installation of 35 Gigawatts (GW) of renewables by 2025 and 100 GW by 2030 worldwide. TotalEnergies is developing a portfolio of offshore wind projects in the UK through TotalEnergies Renewables UK Limited (TRUK). TEPNSUK and TRUK are both based in Aberdeen and work closely together.

TEPNSUK is eager to secure relevant permissions for the construction and deployment of the Culzean Floating Offshore Wind Turbine Pilot Project hereafter referred to as 'the Project', in Scottish Offshore Waters, demonstrating TEPNSUK's commitment to support the growth of cleaner energy production and its ability to deliver it, and to meet the North Sea Transition Authority (NSTA) net zero targets (BEIS, 2021).

1.2 Innovation and Targeted Oil and Gas Decarbonisation Leasing Approach

The Innovation and Targeted Oil and Gas (INTOG) Initial Plan Framework (IPF) set out a spatial plan to which the INTOG leasing process was aligned. Under the INTOG process, seabed lease rights were awarded to offshore wind farm projects that provided low carbon electricity to power oil and gas installations (to help to decarbonise the sector) or to small-scale innovation projects. The spatial planning exercise was confirmed in August 2020 and initial information on the leasing process was published in February 2022 along with the IPF for a Sectoral Marine Plan for INTOG (Marine Scotland, 2022); seabed lease applications were submitted to Crown Estate Scotland (CES) in November 2022. There were two lease types available:

- IN - Small scale innovation projects of less than 100 Megawatts (MW); and
- TOG - Projects connected directly to oil and gas infrastructure to support the decarbonisation of the oil and gas sector (no minimum or maximum capacity per TOG project; the maximum total installed capacity across all TOG projects is up to 5.7 GW).

An Exclusivity Agreement was awarded to TEPNSUK in March 2023 under TOG.

1.3 Project overview

TEPNSUK is proposing to demonstrate the possibility of electrifying existing oil and gas assets in the North Sea via the installation of a floating Wind Turbine Generator (WTG), which would connect to the existing oil and gas platform (Culzean Field). The Culzean Field is in the CNS, in an area of ongoing oil and gas activities, approximately 222 kilometres (km) east of Aberdeen in UKCS Block 22/25a. The Project is within the offshore wind INTOG lease area E-a (see Figure 1-1).

The Project has two primary objectives:

1. Qualify a new semi-submersible floating substructure WTG concept,
2. Perform a hybridisation test on an Exploration and Production (E&P) asset.

The Culzean Field facilities comprise a Wellhead Platform (WHP), a Central Processing Facility Platform (CPF) and a separate Utilities and Living Quarter Platform (ULQ). It is proposed that the floating WTG will be linked to the CPF via a 2 km export cable route (see Figure 1-1).

TEPNSUK will combine the knowledge gained through its stakes in Seagreen and the West of Orkney offshore wind projects to test and develop the feasibility of electrification for platforms in UK offshore waters but also worldwide. The Project does not require a grid connection to shore, and the Project will be entirely within the offshore region between 12 nm and the Exclusive Economic Zone (EEZ) boundary.

The rationale of the Project is to trial the new floater technology using a readily available WTG design. This new technology will deliver opportunities for significant cost savings, industrialisation of larger projects, and provide TEPNSUK with valuable experience in the hybridisation of assets; with the Culzean Field providing an additional opportunity to pilot the integration of a floating WTG with an oil and gas installation for the provision of power. The water depth at Culzean facilities (approximately 90 metres (m)) provides an ideal environment to trial the pilot floating technology. Furthermore, TEPNSUK has extensive knowledge of the Culzean Field and surrounding area which will facilitate rapid deployment.

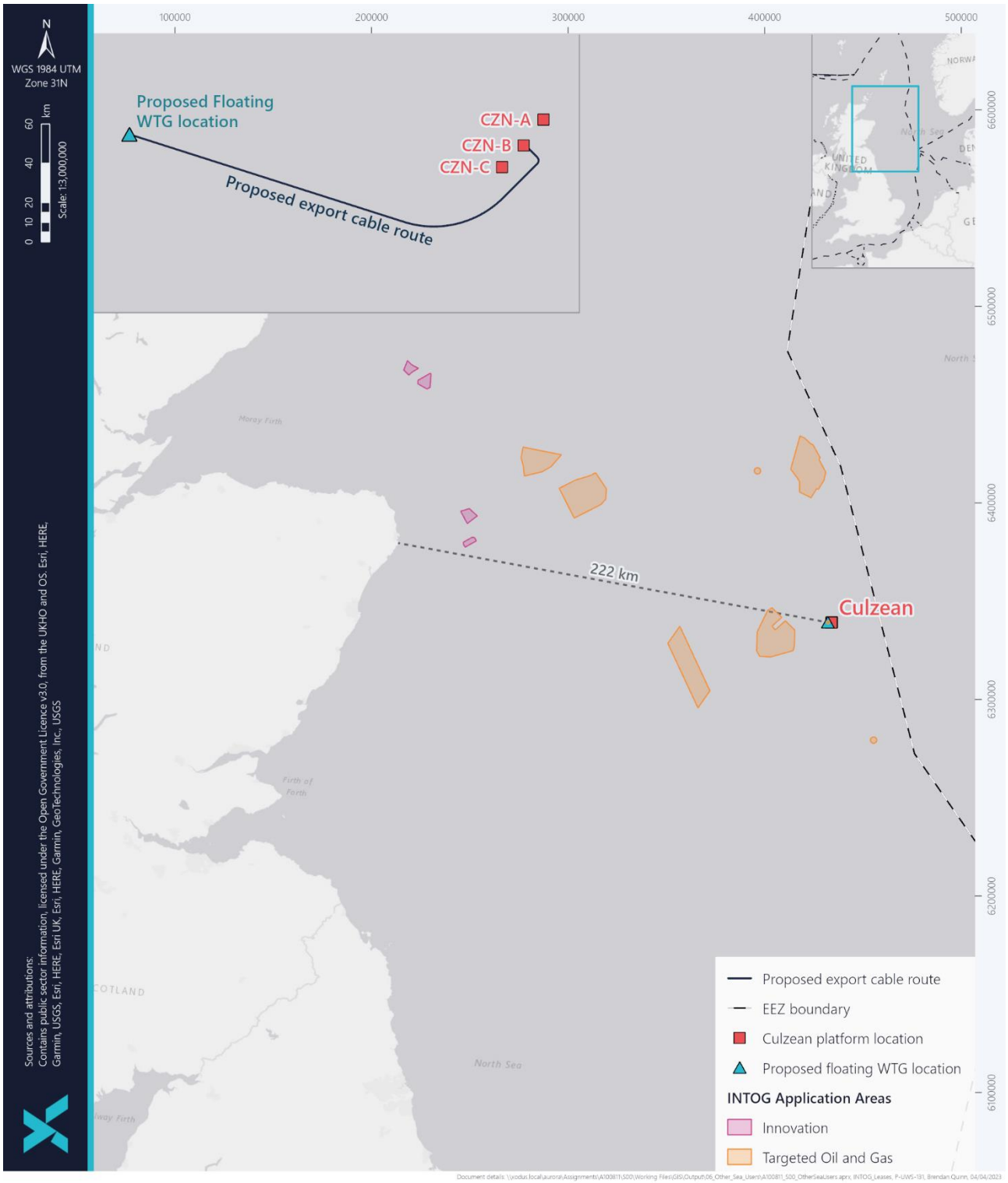

Figure 1-1 Location of the Project and INTOG Lease Areas

1.4 Research and development programme

In parallel to the primary objectives, the project will utilise the pilot to implement a scientific Research and Development (R&D) programme in conjunction with the Technical University of Denmark (DTU) and the Marine Alliance for Science and Technology for Scotland (MASTS). This programme will provide knowledge and experience on offshore wind turbine construction, integration, installation, operations and maintenance. It will also qualify new equipment and perform data assessment to support methodologies and processes to be used on larger offshore wind farms. An overview of the sub-projects to be included is provided in Figure 1-2. These cover the themes of:

- Environmental Deoxyribonucleic Acid (eDNA) based monitoring development;
- Biodiversity and ecosystem indicators; and
- Active acoustics and optics monitoring development.

For example, the Project's Scientific Programme will:

- Estimate the biodiversity footprint of platforms and its consequences for local ecosystems through the use of autonomous eDNA laboratories, wide-band echo sounder and optical water quality sensors;
- Use bird and drone detection radar systems to monitor bird activity;
- Investigate wake effects using Light Detecting and Ranging (LiDAR) equipment and associated metocean sensors to validate wind turbine performance and calibrate simulation tools;
- Study WTG activity using special sensors fixed directly along the blades, to better understand the resistance of the wind turbine in a moving environment;
- Investigate floating substructure technology and qualification and provide feedback for the manufacturing and assembly processes;
- Study the application of anti-fouling paint to study the impact of different coatings on the overall floatability;
- Assess offshore technician transfer feasibility on board the WTG according to weather and sea state conditions, correlated by real-time measurements.

In summary, the Project will provide a basis from which to assess the functionality of the floating WTG and the overall design of the project in the environmental setting of the CNS, which will inform similar developments in the future. The pilot also provides an opportunity for environmental monitoring in the offshore environment. TEPNSUK are also currently investigating participation in ongoing academic projects as part of the R&D programme, with the potential to provide the Project as a test site for several further environmental monitoring projects.

TEPNSUK believes establishing an innovative, net zero transition flagship project in the UK will demonstrate the commitment to energy transition and unlock further development potential. This project would enable proof of the concept, support cost reduction initiatives, foster cross sector learnings and reinforce the offshore wind net zero ambition whilst further developing Scotland as a centre for innovation and technical excellence.

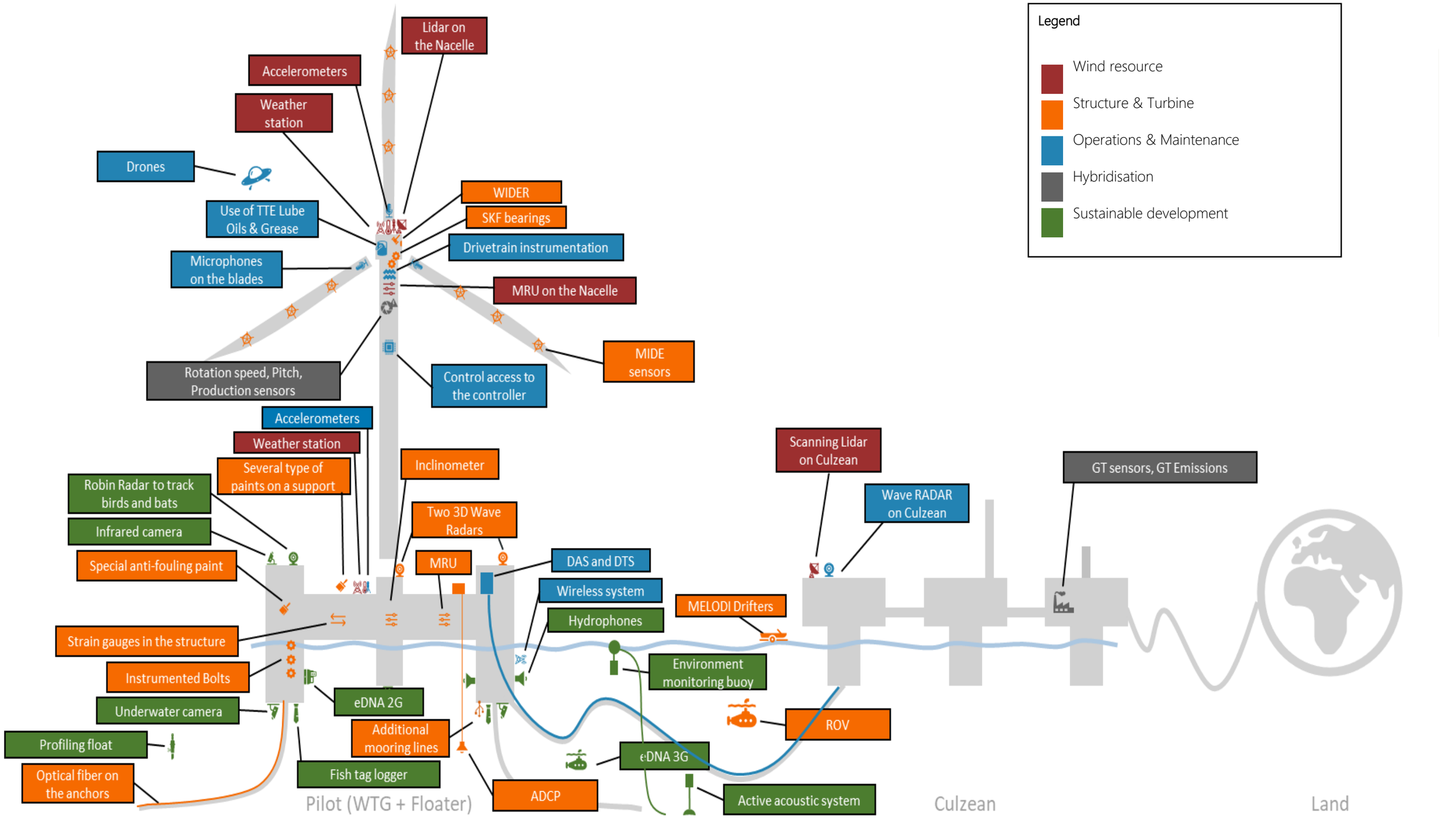

Figure 1-2 Culzean R&D Programme

1.5 Purpose of this report

This HRA Report contains the Habitats Regulations Appraisal (HRA) Screening and Report to Inform Appropriate Assessment (RIAA) to inform an assessment under the Habitats Regulations for the Project.

The information provided by the HRA Report enables HRA Screening with respect to the potential Likely Significant Effects (LSE) the Project may have on European sites assessed. Where it can be concluded that there is no potential for LSE from the Project on a European site, the European site is screened out for further assessment. Where it was not possible to conclude no potential for LSE on a European site within the HRA Screening proportion of this document, a subsequent RIAA assessment has been included within this HRA Report to provide a more detailed assessment of adverse effects. This combined HRA Report has been submitted along with the Marine Licence application to the Competent Authority. The approach to undertake a combined HRA Screening and RIAA was agreed in consultation with Marine Directorate – Licensing Operations Team (MD-LOT) and NatureScot.

The potential effects from the Project during construction, operation and maintenance and decommissioning are considered within this HRA Report. The assessments within this HRA Report are based on the existing understanding of the baseline environment and the Project activities, including marine surveys undertaken to date.

The following specialists have contributed to the assessments presented within this HRA Report:

- Xodus Group Ltd – Upfront Sections and HRA Screening Assessments (Sections 1 – 8)
- Xodus Group Ltd & Atlantic Ecology Ltd – RIAA (Section 9)
- Atlantic Ecology – Ornithology Modelling (Annex A: Kittiwake Collision Risk Modelling & Annex B Kittiwake Displacement Analysis).

2 THE HRA PROCESS

2.1 Legislation

The requirement to consider the potential effects of plans and projects on European sites falls under the following piece of legislation ('The Habitats Regulations')[1] for this Project:

- The Conservation of Offshore Marine Habitats and Species Regulations 2017 – applicable to Marine Licence applications between the 12 and 200 NM limits.

The Habitats Regulations require consideration of whether projects or plans are likely to have a significant effect on a European site and its conservation objectives, including Special Areas of Conservation (SACs), candidate SACs (cSACs), Special Protection Areas (SPAs), proposed SPAs (pSPAs), Sites of Community Importance (SCI) and Ramsar sites[2]. An HRA must be carried out to determine the potential for a development to result in a LSE on European sites, either individually or in-combination with other plans or projects. Sites of Special Scientific Interest (SSSIs) are not protected under the Habitats Regulations and do not form part of the HRA process.

The Habitats Regulations are in place to protect European sites. As the UK is no longer part of the European Union (EU), amendments were made to the Habitats Regulations in Scotland to ensure that they continue to work in the same manner. The amendments made are minor and technical in nature, for example references to European Economic Area (EEA) states are corrected to exclude the UK and the European sites located within the UK now form part of the UK's National Site Network and are no longer part of the Natura 2000 network. The policies and procedures under the HRA Regulations remain unchanged. These amendments were made through The Conservation (Natural Habitats, &c.) (EU Exit) (Scotland) (Amendment) Regulations 2019 and the Conservation of Habitats and Species Amendment (EU Exit) Regulations 2019 (the "EU Exit Regulations"). Guidance on the implications of EU Exit on the HRA regulations is available through the Scottish Government website (Scottish Government, 2020).

The Habitats Regulations contain the procedural requirements to undertake HRAs in order to assess the potential implications of plans / projects for European sites (Scottish Government, 2020). The objectives in relation to the UK Site Network include:

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

[1] The Habitats Regulations transpose the European Union (EU) Habitats Directive (Council Directive 92/43 /EEC) and the EU Birds Directive (Council Directive 2009/147/EC) into Scottish law.

[2] It is Scottish Government policy to consider Ramsar sites as part of the HRA. However, Ramsar sites are not considered separately if they overlap with SACs and/or SPAs.

2.2 HRA process

The European Commission's (2021) guidance identifying a staged process for the assessment of plans or projects is relevant for this assessment. The four stages are commonly categorised as the following:

- Stage One: HRA Screening;
- Stage Two: Appropriate Assessment (AA) carried out by the Competent Authority and informed by the RIAA;
- Stage Three: Assessment of Alternative Solutions; and
- Stage Four: Assessment of 'Imperative Reasons of Overriding Public Interest' (IROPI).

The HRA Screening proportion of this HRA Report (Sections 4 to 8) have been prepared to address Stage One of the HRA process. Section 9 of this HRA Report includes the RIAA assessment to aid Stage 2 of the HRA process.

2.2.1 Stage one: HRA screening

The purpose of HRA Screening is to identify aspects of the Project for which it is not possible to rule out the risk of significant effects on a European site (referred to as potential LSE), either alone or in-combination with other plans or projects. An LSE is one that cannot be ruled out on the basis of objective information.

2.2.2 Stage two: Appropriate Assessment (AA)

European sites and features subject to an AA are those for which a potential LSE could not be ruled out during the screening exercise. A European site is progressed to Stage Two: Appropriate Assessment, where it is not possible to exclude potential LSE to one or more qualifying features of that site in view of the Conservation Objectives. A project is required to provide a RIAA, which considers the effects of a project, alone and in-combination with other plans and projects, on the integrity of a designated site, with regard to the European site's structure and function and its Conservation Objectives. The Competent Authority is then required to carry out an AA on the implications for a European site with respect of that site's Conservation Objectives, before deciding to undertake or give any consent, permission, or other authorisation for, a plan or project.

The need for an AA extends to plans or projects out with the boundary of a European site in order to determine the implications for the features for which the site is designated.

2.2.3 Stage three: assessment of alternative solutions

If the Competent Authority cannot conclude no adverse effect on the integrity of a European site, alternative solutions should be identified and assessed (e.g. changes to project design, location, or the option of not developing the project at all i.e. the 'do nothing' scenario).

2.2.4 Stage four: assessment of 'imperative reasons of overriding public interest' (IROPI)

If there are no alternative solutions to the development that would result in the conclusion of no adverse effect on the integrity of a European site, the development may not proceed unless it satisfies the criteria of IROPI, relating to: human health, public safety or beneficial consequences of primary importance to the environment, or any other reasons, provided that the Competent Authority has had regard to the opinion of the Scottish Ministers in satisfying itself that there are such reasons.

Where a development satisfies the principles of IROPI, compensatory measures must be implemented to maintain the coherence of the UK Site Network. These measures should be developed to offset the adverse effects caused to the European site.

2.2.5 Application of Mitigation

Following the judgement of the European Court of Justice in the People Over Wind and Sweetman case in 2018 (Case C323/17), NatureScot (then Scottish Natural Heritage (SNH)) provided guidance to clarify what stage mitigation can be considered in the HRA process for Scottish developments (SNH, n.d.).

NatureScot interpreted the judgement from the European Court of Justice as stating that mitigation measures that intend to avoid or reduce harmful effects to a European site cannot be considered at the screening stage. However, embedded mitigation measures which are not designed to avoid or reduce effects on a European site, but do so incidentally, can be considered. Therefore, there must be a distinction between these two types of mitigation.

In response to this guidance, the HRA Screening proportion of this HRA Report does not consider mitigation measures that are specifically implemented to reduce or avoid effects on a European site. Embedded mitigation measures, that incidentally reduce or avoid effects on European sites are considered for undertaking screening for no potential LSE. These include post-consent plans for accidental release of hazardous substances, such as the Environmental Management Plan (EMP) and Shipboard Oil Pollution Emergency Plans, that would be in place regardless of the possible effects on European sites.

2.3 Guidance

Relevant guidance documents for conducting HRA's for offshore wind developments in Scotland include:

- Habitats Regulations Appraisal: Guidance for Plan-making Bodies in Scotland (Tyldesley *et al.*, 2015);
- The handling of mitigation in Habitats Regulations Appraisal – the People Over Wind Court of Justice of the European Union (CJEU) judgement (SNH, n.d.);
- Marine Scotland (Consenting and Licensing Guidance for Offshore Wind, Wave and Tidal Energy Applications (Scottish Government, 2018); and
- EU Exit: habitats regulations in Scotland (Scottish Government, 2020).

These documents have been considered throughout this HRA Report

3 PROJECT DESCRIPTION

3.1 Introduction

This Section provides a summary description of the current parameters for the Project relevant to the HRA. Full details of the Project description are provided in Chapter 4: Project Description of the Environmental Impact Assessment Report (EIAR). The summary presented herein sets out the design and components for the Project infrastructure, as well as the main activities associated with the construction, operation, and maintenance, and decommissioning of the Project. As mentioned in Section 1.1, the Project is proposing to connect a single floating turbine to the CPF and has no onshore component.

The objectives of the project design are to:

- Operate with low maintenance and maximum availability.
- Industrialise with minimum redevelopment of existing local infrastructure.
- Base the design on a commercial floating WTG with:
  - Low hull weight;
  - Flexibility for quayside handling; and
  - Quick assembly features for offshore installation

In accordance with best practice, the Project will utilise a design envelope approach to inform the assessments presented within this HRA Report. A design envelope approach allows a range of parameter values to be presented for each Project aspect, allowing some flexibility to be maintained in the Project design to recognises rapid and frequent advances in the offshore renewable industry.

The Project Design Envelope (PDE) parameter values represent the Maximum Design Scenario (MDS) for the assessments presented. This approach ensures that the scenario that would have the greatest impact (e.g., largest footprint, longest exposure, or tallest dimensions, depending on the topic) is assessed for each relevant receptor; it can then be assumed that any other (lesser) scenarios will have an impact that is no greater than that assessed.

3.2 Project boundary

The floating WTG will be located approximately 2 km west of the Culzean facilities. An export cable of approximately 2.5 km will be connected to the CPF via an existing J-tube [3]on the platform (Figure 3-1).

The Project will have an installed capacity of around 3 MW and comprise of the following components and parameters (see Table 3-2):

- One WTG;
- One floating substructure;

[3] *J-Tubes are located on the platform and allow for cables to be connected to the installation. Typically they consist of steel tube, and are called J tubes due to the shape*

- Up to six mooring lines
- Up to six drag anchors (or an alternative scenario of three drag and three plate anchors);
- One approximately 2.5 km long export cable; and
- Associated scour and cable protection (if required).

To comply with the spatial parameters set out at the leasing application stage, all Targeted Oil and Gas (TOG) decarbonisation projects were required to be within designated areas based on IFP requirements (see Chapter 3: Site Selection and Consideration of Alternatives of the EIAR for more information). This Project falls within the area E-a. The coordinates of the key infrastructure associated with the Project are provided in Table 3-1.

Table 3-1 Project infrastructure coordinates

KEY INFRASTRUCTURE	LATITUDE (WGS84)		LONGITUDE (WGS84)	
	DEGREES, MINUTES, SECONDS	DECIMAL DEGREES	DEGREES, MINUTES, SECONDS	DECIMAL DEGREES
WTG	57° 11′ 29.3″ N	57.1914 N	1° 52′ 35.3″ E	1.8764 E
CFP	57° 11′ 39.8″ N	57.1903 N	1° 54′ 46.0″ E	1.9079 E

The 'Project Area' is referred to throughout this HRA Report and can be defined as the immediate area surrounding the floating WTG and cable route and is shown in Figure 3-1.

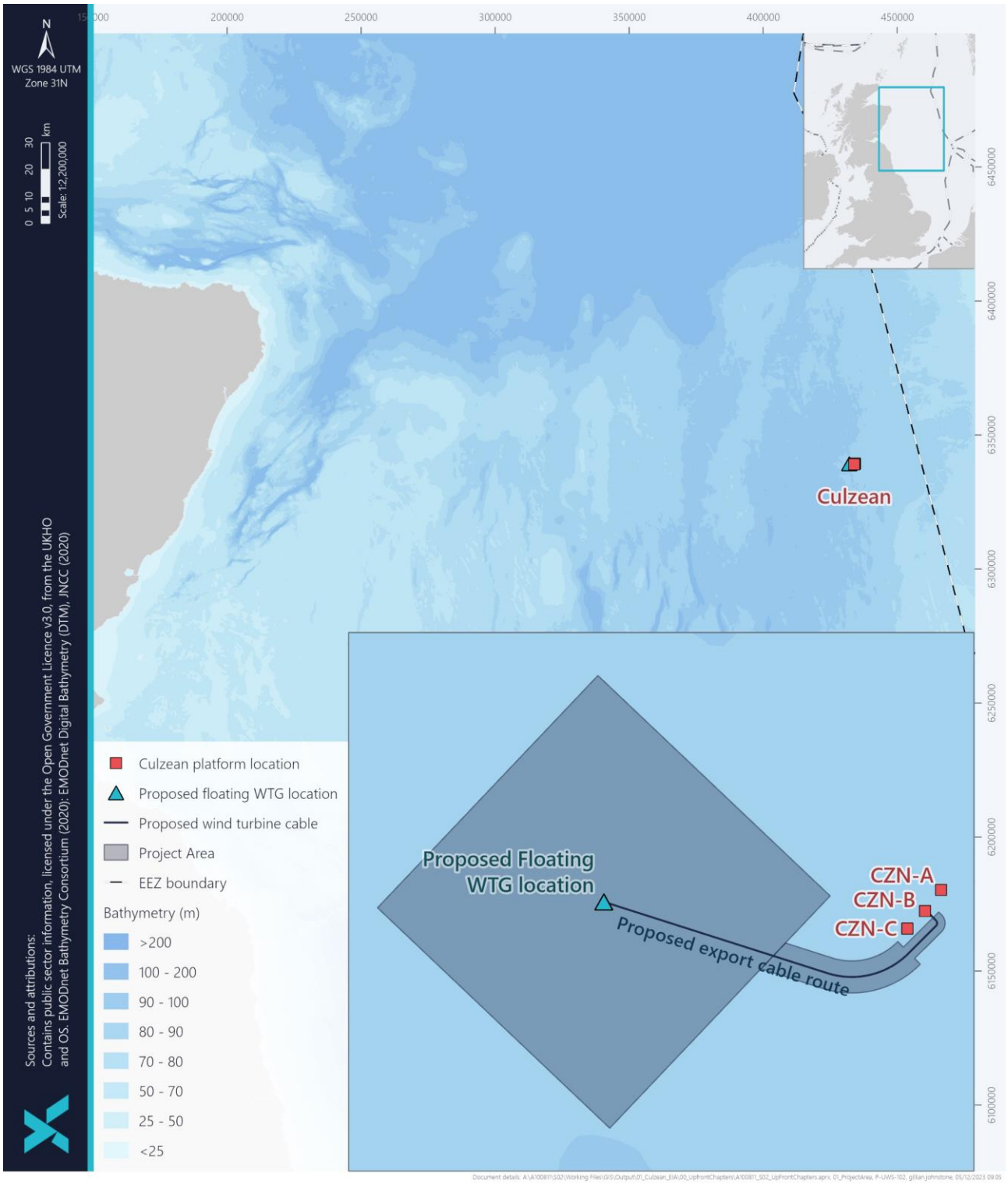

Figure 3-1 Project Area

3.3 Infrastructure

3.3.1 Wind turbine generator

TEPNSUK has secured a refurbished Vestas V112 3 MW floating WTG which would be expected to last (in offshore conditions) for up to 20 years. Nonetheless, the marine licence is only sought for a period of 10 years and this has been the basis for assessments presented within this HRA Report. The nacelle and hub are in excellent condition, the blades were manufactured in 2017 and have never been used. A new tower will be built, specifically designed for the Project location, metocean conditions, and the loads induced by the floater motions.

This model has been chosen for the following reasons:

- Immediate availability; and
- Proven track record:
  - The model has been successfully operated onshore since 2013.
  - More than 385 bottom-fixed offshore units are currently in operation.

The MDS for the floating WTG is outlined below in Table 3-2.

Table 3-2 MDS for the floating WTG

PARAMETER	MDS
Maximum number of WTGs	1
Total installation capacity	3 MW
Minimum blade clearance from sea-level	22 m above Mean Sea Level (MSL)
Hub height	78 m above MSL
Rotor diameter	112 m
Tip height	134 m above MSL
Turbine lighting requirements	Not yet fully defined but will be designed and constructed to satisfy the safety requirements of the Maritime and Coastguard Agency (MCA) Civil Aviation Authority (CAA) and the Northern Lighthouse Board (NLB)
Substances contained within WTG components	• Grease; Synthetic oil / hydraulic oil; ·Nitrogen;·Sulphur Hexafluoride (SF6); and Water / glycerol. • To minimise the impact from an unlikely leak of any of these fluids, the nacelle, tower, and rotor are designed and constructed to contain leaks thereby reducing the risk of spillage into the marine environment.

3.3.1.1 Installation

The WTG will be installed on the substructure at a quayside on the east coast of Scotland using a crane. Quayside pre-commissioning will take place to reduce offshore operations to a minimum. The WTG and floating substructure will be transported by sea from the quayside. The same port is likely to be used for marshalling the other Project components such as the anchors and cables.

Upon the arrival of the floating assembly at the Project site, the substructure will be manoeuvred into the correct location using tugboats to steer the substructure into position / orientation whilst the previously installed mooring lines are connected to the floating substructure.

3.3.2 Floating substructure

The WTG will be supported by a floating (semi-submersible) substructure, a buoyancy stabilised platform which floats semi-submerged on the surface of the ocean whilst anchored to the seabed. The structure gains its stability through the buoyancy force associated with its large footprint and geometry which ensures the wind loadings on the structure and WTG are countered / dampened by the equivalent buoyancy force on the opposite side of the structure.

The substructure for this Project will be a triangular OCG-WIND substructure, designed and commercialised by Ocergy, a company formed to develop new competitive floating substructure designs. OCG-WIND is a semi-submersible design with four columns. The WTG is installed on the centre column. The three outer columns are connected to the central column through a frame composed of top and bottom tubular beams interconnected by V-shaped braces. The outer columns contribute to the stability of the unit and are linked by tendons, which are designed to stiffen the structure, reduce the fatigue, and optimise the structural weight. The modules are assembled using mechanical connections based on compact flanges.

The connection point for all mooring line types will be located at the base of the substructure. The floating substructure may offset from its design coordinate (excursion) depending on the magnitude and direction of wind, sea swell and current conditions. The extent of excursion differs depending on several design factors but predominantly mooring configuration and type. Under normal operation (i.e. a fully intact mooring system), substructure excursions will be up to a maximum of 34 m.

The MDS for the floating substructure is provided below in Table 3-3.

Table 3-3 MDS for the floating substructure.

DESIGN PARAMETER	MDS
Floating substructure type	Semi-Submersible – Ocergy OCG-WIND design
Floating substructure height	Maximum 23 m height of outer columns
Floating substructure area	approx. 2,500 m^2
Hull weight	975 Tonnes (Te)
Maximum height above MWL	Maximum 9.4 m freeboard above Mean Water Level (MWL) +Idling draft of 13.6 m
Extent of excursion	34 m

3.3.3 Mooring lines

Floating offshore WTGs need to maintain their position even during the most extreme events or storms. The mooring and anchoring systems are responsible for the station-keeping of the floating structure.

The final mooring system design is still under consideration owing to the need to consider new technologies under development by TEPNSUK. As such, the Project will initially utilise a typical catenary mooring design. This system will comprise of steel chains, polyester rope, and mooring connectors whose weight in the water column provides the restoring force that holds the floating platform in place. A large section of the mooring chain rests on the seafloor removing any vertical load to the anchors and enabling conventional and more cost-effective anchor types (drag anchors) to be used. The maximum length encountering the seabed will be a maximum of 490 m per line (approximately 80% of the line length). These systems typically have large footprints, but can be reduced through the attachment of clump weight and/or heavy chain sections to, predominantly, the sections of chain that rest on the seabed. It is anticipated that the maximum average lateral movement will be 10 m.

Approximately one year into the Project, TEPNSUK plan to install one of the following additional mooring systems to trial new, innovative and low-impact mooring techniques with the aim to assess their feasibility for future electrification projects:

- A taut mooring system utilising synthetic segment (Dyneema, polyester or nylon), elastomer inserts and steel wires or chain segments. The restoring force brought by this mooring system comes from the taut mooring line elasticity. The maximum length of each mooring line would be approximately 205 m whilst under tension with a maximum of 20 m of steel chain in contact with the seabed. It is anticipated that the maximum average lateral movement will be 10 m. This mooring system would be secured with either drag or plate anchor options; or
- A semi-taut mooring system utilising a combination of synthetic (nylon) segments and steel wire or chain segments, where the nylon segment elasticity provides the restoring and wire / chain section is used for anchor connection. The maximum length of each mooring line would be approximately 610 m with a maximum of 110 m of steel chain in contact with the seabed. It is anticipated that the maximum average lateral movement will be 10 m. This mooring system would be secured with either drag or plate anchor options.

Either option would reduce the seabed impact of a mooring system in comparison to the more traditional catenary mooring systems. The new mooring lines will be installed within 5° of the original catenary mooring lines.

Full details of the design parameters for each of the mooring line configurations are provided in Chapter 4: Project Description of the EIAR.

The MDS, based on the three mooring system options under consideration is provided in Table 3-4.

Table 3-4 MDS for mooring lines

DESIGN PARAMETER	CATENARY MOORING SYSTEM MDS	ADDITIONAL SEMI TAUT/TAUT MOORING SYSTEM MDS	TOTAL MDS
Number of mooring line(s)	3	3	6
Mooring line length per line (m)	600	610	610
Mooring line length total (m)	1,800	1,830	3,630
Length mooring line(s) on the seabed per line (m)	490	110	490
Length of mooring line on seabed total (m)	1,470	330	1,800
Area of impact total (m^2) based on 10 m corridor	14,700	3,300	18,000
Material of mooring lines	• Steel chains / polyester rope (catenary system) • Synthetic fibres (Dyneema, polyester or nylon), elastomer inserts and steel wires or chain segments (taut system) • Synthetic fibres (nylon) / steel wire or chain (semi-taut system)		

Clump weights are likely to be required to add mass to the catenary mooring line and dampen the lateral movement of the floating WTG and reduce the seabed impact of the mooring lines. These weights would be attached to each of the mooring lines and will be in the form of a casing around the mooring line where it meets the seabed (the touch-down point) with further clump weights spread out along the grounded portion of the mooring chain. The maximum length of the casing with clump weights is expected to be 100 m per mooring line with up to 11 clump weights spread evenly along the casing, resulting in one clump weight approximately every 9 m. The clump weight footprint will be within the 10 m seabed footprint corridor which accounts for the lateral movement of the mooring lines. This also accounts for any lateral movement during the installation of the clump weights.

3.3.4 Anchors and scour protection

The initial catenary mooring system will utilise drag anchors. Once the semi-taut or taut system is in place this will be secured with either drag or plate anchors. In line with the mooring systems, it is anticipated that the WTG and substructure will require a maximum of one anchor per mooring line, resulting in a maximum of 6 anchors required[4].

The size of a drag anchor can vary, with larger and heavier anchors able to generate a greater holding capacity. This approach might be required to withstand the extreme environmental conditions at the Project Area. For the purposes of this assessment, calculations have been based on Stevpris Mk5 drag anchors with maximum dimensions of approximately 11.2 m long by 11.2 m wide by 6 m high (based on a worst case 65 tonne (Te) anchor). The maximum seabed footprint immediately following installation would be 125 m^2 per anchor, not accounting for the impacts of subsequent drag which would be expected to extend for 50 m and cover an area of 3,360 m^2.

There may also be a requirement to install scour protection for the drag anchors (most likely rock) post-installation to prevent the anchors from being undermined by seabed erosion. The requirement for scour protection may be included in reaction to the identification of an issue as part of a post-installation surveys or following periodic inspections undertaken during operation and maintenance. The maximum seabed footprint per anchor would be 70 m^2, protruding approximately 1 m above the seabed. Based on a worst-case quantity of 1.6 Te per m^3, for the stipulated seabed footprint and height of the rock, this would represent a total of 112 Te of rock per anchor.

Plate anchors are designed to allow uplift at the anchor point, which is required in semi-taut or taut leg mooring systems. For the purposes of this assessment, calculations have been based on 20 m^2 surface guide and a suction pile with dimensions of 20 m (length) by a maximum of 6 m diameter. The worst- case direct seabed footprint for each plate anchor installation would be 48 m^2 (20 m^2 for the surface support and 28 m^2 for the suction pile). For the purpose of the assessment the worst-case scenario calculation is based on the drag anchor as shown in Table 3-5.

Table 3-5 MDS parameters for anchoring system

DESIGN PARAMETER	MDS PER ANCHOR	TOTAL MDS
Number of anchors	6	
Anchor type	Drag anchor	
Anchor Dimensions	11.2 m long by 11.2 m wide by 6 m high	
Direct area of impact (m^2)	125	750
Area of drag (m^2)	560	3,360
Scour protection areas (m^2)	70	420
Scour protection weight (Te)	112	672

[4] *The initial catenary mooring lines and anchors will be retained following deployment of the new mooring configuration as back-up lines to ensure a higher reliability level.*

3.3.4.1 Installation

To ensure efficient installations and avoid any simultaneous vessel operations, the mooring system will be pre-installed and wet-stored prior to the floating assembly arriving in the Project Area and will be marked by the Culzean platform's dual purpose Emergency Rescue and Response Vessel (ERRV). A general installation sequence will involve anchor installation prior to mooring installation. The location of the anchors on the seabed will be informed by detailed analysis of the site specific geophysical and geotechnical surveys undertaken in the 2013 and 2023 surveys.

Drag embedment anchors are designed to penetrate approximately 10 m to 15 m into the seabed, subject to seabed conditions. The anchors will be installed by an Anchor Handling Vessel (AHV) which will lower the anchor to the seabed and then drag it into the required position and depth.

Plate anchors will be installed into the seabed, without need for seabed preparation or scour protection. Plate anchors would be installed using a follower such as a suction pile. A follower is used to set the anchor at target penetration depth and removed after installation of the anchor. A support structure would be laid on the seabed, to which the mooring cables would be attached. The sub seabed anchor would then be pulled into position as the mooring lines are connected to the floating substructure. Vessel activity for this additional installation is also anticipated to be carried out by AHV. Moorings will then be hooked to these pre-installed anchors and if required, hooked up to buoys which will act as future installation aids for the floating substructure and WTG hook-up.

There may also be a requirement to install scour protection post-installation for some anchor solutions to prevent the structure from being undermined by seabed erosion. This is achieved either through a fall-pipe from a rock placement vessel (most efficient method and generally used in water depths greater than 10 m). Graded rock is used with grain sizes being tailored to achieve the necessary protection. The impacts of anchoring and scour protection on the seabed have been quantified in Table 3-5.

3.3.5 Export cable

The export cable will collect the power from the WTG and connect to the CPF via an existing J-tube on the platform.

From the point where no movement in the cable is expected on the seabed (the static cable) the cable will be trenched and buried. The cable will be trenched and buried to a minimum target depth of 0.6 m. Burial is expected to be achievable within the seabed conditions, and a target of 100% burial will be aimed for. In the unlikely instance that burial is not achievable, rock protection will be placed over the top of the cable. As a worst-case scenario, it is estimated that up to 50% of the cable length (approximately 1,000 m) on the seabed may require additional remedial cable protection in the form of rock placement. It should be noted that this is a worst-case estimate and during detailed design the requirement for cable protection will be reviewed, to reduce cable protection volumes where possible. The maximum width of cable protection along the cable route will be 7 m, which equates to a worst-case maximum seabed footprint of 7,000 m^2. The height above the seabed that this protection may protrude is approximately 1 m. Based on a worst-case quantity of 1.6 Te per m^3, for the stipulated seabed footprint and height of the rock, this would represent a total of 11,200 Te of rock.

The MDS for the export cable is provided in Table 3-6.

Table 3-6 MDS parameters for export cable

DESIGN PARAMETER	MDS
Number of export cables	1
Export cable voltage (kV)	52.5
Export cable diameter (mm)	107 ± 2
Length of export cable (m)	2,500
Length of export cable in the water column (m)	455
Length of export cable on the seabed (m)	2,045
Cable trenching corridor width (m)	15
Cable protection	Rock covered over 1000 m (~50 % of cable length on seabed)
Cable protection width (m)	7
Cable protection height (m)	1
Total cable protection seabed footprint (m^2)	7,000
Total cable protection weight (Te)	11,200

3.3.5.1 Installation

Installation of the export cable will take place once the floating substructures and WTG have been installed, using a Light Construction Vessel (LCV).

A pre-lay grapnel run (2 m wide along the length of the cable route) would be undertaken to hook any linear debris; if any debris is hooked, it will be recovered to the vessel for onwards disposal / recycling ashore. The LCV will transit to the site of the pre-installed floating structure where the cable is pulled into the floating structure and secured. The cable (with buoyancy modules) is then deployed into the water column. The second end of the cable will then be deployed and pulled and secured into the J-tube at the Culzean CPF.

Several different approaches are available for installation of the export cable laid on the seabed and these include:

- Pre-lay trenching using a displacement plough to create a pre-lay trench which the cable is then installed into. A separate backfill plough may then be used to push the spoil heaps created by trenching over the cable, thus creating the required cable cover;
- Post-lay trenching using a variety of tools including:
  - Jet trenchers (either self-propelled or mounted as skids onto Remote Operated Vehicles (ROVs) which inject water at high pressure into the sediment surrounding the cable. The seabed is temporarily fluidised and the cable is lowered to the required depth. Displaced material is suspended in the water and then resettles over the cable. This process is controlled, to ensure that sediment is not displaced too far from the cable;
  - Mechanical trenchers which bury the cable by lifting the laid cable whilst excavating a trench below, and then replacing the cable at the base of the trench and allowing the soil to naturally backfill behind the trencher;

- Non-displacement ploughs which simultaneously lift a share of seabed whilst depressing the cable into the bottom of the trench. As the plough progresses, the share of the seabed is replaced on top of the cable; and
- Simultaneous cable lay and burial, using a jet trencher or non-displacement plough.

A combination of the above methods may be used for export cable installation, depending on the ground conditions.

3.4 Project stages

3.4.1 Construction

3.4.1.1 Schedule

It will take approximately one month for the pre-construction, construction and installation of the WTG, moorings and cable Installation activities which are proposed to take place in Q3, 2025. Timescales are subject to the Project securing all relevant permits and licences, as well as the finalisation of procurement and supply chain contracts.

TEPNSUK will be applying for a 10-year Marine Licence to cover the design life of the WTG.

3.4.1.2 Construction vessels

It is anticipated during the construction of the Project, that a variety of vessels and vehicles will be used for installation, support and transport of equipment and infrastructure to the Project Area. The vessel requirements will be determined by the installation contractor post-consent, and this will depend on vessel availability. To account for uncertainly (including weather constraints), conservative assumptions have been made on the vessel activities for the construction period and these are presented in Table 3-7. It is expected that several vessels may work in parallel during various construction phases, with a maximum of four vessels on site at the same time during mooring line hook-up (Table 3-7). All vessels will use Dynamic Positioning (DP).

3.4.1.3 Surveys

Site-specific geophysical and geotechnical surveys were undertaken in Spring 2023 to inform detailed design and layout. Additionally, No Unexploded Ordnance (UXO) were detected during site-specific surveys with a magnetometer or during any other surveys undertaken within the Culzean Field over the last 15 years. The 2023 surveys also confirmed that that boulder movement will not be required prior to anchor installation.

Pre-installation surveys will be undertaken in 2024/25. These will consist of visual inspections (using ROVs) of the mooring locations and cable routes to confirm the exact routing and determine the need for any seabed preparation. These surveys are likely to take up to a day. All survey equipment will utilise ultra-short baseline positioning equipment to ensure precise subsea locations.

Table 3-7 Estimated vessel requirements during the construction period

CONSTRUCTION PHASE	ACTIVITIES	VESSEL(S)	NUMBER OF VESSELS	DURATION (DAYS)		
				MOB / DEMOB	TRANSIT	WORKING
Pre-lay surveys	Check for hazards and obstacles potentially missed in initial survey	ROV Loaded onto LCV	1	2	2	1
Mooring line pre-lay	ROV surveys, Anchor and mooring line deployment	AHV with ROV capability	1	1	1	12
Mooring line hook up to floating substructure	ROV Surveys, connection of mooring lines to floating substructure	AHV with ROV capability	1	1	1	10
		2 Anchor Handling Tugs	2	4	4	10
Export cable hook up to floating substructure and initial cable lay	ROV Surveys, hook up and cable lay	LCV with installation cable reel and ROV capability	1	1	1	5
Completion of cable lay and hook up at Culzean J-Tube.	ROV Surveys, hook up and cable lay	LCV with installation cable reel and ROV capability	1	1	1	5
Cable trenching and remediation	Trenches and burial of the cable	Trenching vessel	1	2	2	8
	Installation of rock or gravel to protect and ensure a firm installation of the cable.	Fall Pipe Vessel (FPV)	1	2	2	2
Post - installation survey	Check if cable is buried correctly	ROV Loaded onto LCV	1	2	2	1
Total				**16**	**16**	**54**

3.4.2 Operations and maintenance

Once commissioned, the Project is expected to remain in operation for up to 10 years. During the operations period, the following classifications of maintenance may be required:

- Routine maintenance: activities that are carried out on a regular basis based on the Original Equipment Manufacturer (OEM) recommendations and good industry practice, for example inspections, testing investigation of minor faults;
- Unscheduled maintenance: activities that may be required to carry out repairs or remedial works to return the asset to serviceable condition; and
- Major component replacement / repair: Faults that could trigger repairs requiring large component replacements and extensive remedial works.

The overall in-service inspection, maintenance, and monitoring of the WTG will be carried out in accordance with the service requirements provided by the WTG manufacturer.

The access strategy anticipates the use of a dual-purpose ERRV rigged with a compensated gangway for personnel transfer. The ERRV will support Culzean operations and will be used for transferring personnel between Culzean and the WTG. Given the proximity of the Culzean platforms and the WTG, the use of a dual-purpose ERRV has been confirmed acceptable provided adaptation of procedures and final vessel requirements will be agreed as per the Project Navigational Safety Plan (NSP) and/or Vessel Management Plan (VMP). The ERRV will deploy its compensated gangway on landing points on Culzean ULQ platform and on the WTG.

It is anticipated that an additional 24 days per year of supply vessel activity will be required over the duration of the Project operations. This is to account for an extended stay on site of approximately 2 days per month to account for ongoing maintenance activity required for the WTG. Unmanned, remotely operated or autonomous vessels and drones may also be required for inspection.

Further details of operation and maintenance activities are provided in Chapter 4: Project Description of the EIAR.

3.4.3 Decommissioning

Under Section 105 of the Energy Act 2004 (as amended) (UK Parliament, 2004), developers of offshore renewable energy projects are required to prepare a Decommissioning Programme for approval by Scottish Ministers.

In developing a Decommissioning Programme, TEPNSUK will seek to maximise the re-use of materials and will pay full regard to the 'waste-hierarchy'. To ensure that commercial viability is maintained, the Best Available Technique (BAT) will be used and Cost-effective decommissioning solutions will be sought. When decommissioning the Project, TEPNSUK will seek to minimise the influence on land transportation and where practicable, will plan transportation between the coast and respective waste management facilities to reduce safety issues and disturbance to traffic.

In line with the Scottish Government's default position for the decommissioning of Offshore Renewable Energy Installations (OREI), the starting presumption is that at the end of the Project's operation and maintenance phase, there will be a requirement for all offshore components (above and below seabed) to be completely removed to

shore for re-use, recycling, incineration with energy recovery, or disposal at a licensed site. As the Project's anticipated lifetime is up to 10 years from full commissioning, there may have been advances in technological capabilities for decommissioning and/or changes to legislation by this time, therefore decommissioning best practices and legislation will be applied at that time. Under international standards such as those published by the International Maritime Organization (IMO), there is the potential to consider decommissioning components in situ, however, it is understood that this would require a robust and compelling justification to be presented to MD-LOT to be granted approval. In this instance, a Comparative Assessment (CA) would be undertaken to provide a recommendation, based on the performance against five main criteria: Safety, Environmental, Societal, Technical Feasibility and Economic.

Throughout the Project's life cycle, the Decommissioning Programme will be reviewed and updated every five years. It is anticipated that the final revision process will commence two years prior to the initiation of decommissioning activities

Further details of decommissioning activities are provided in Chapter 4: Project Description of the EIAR.

1.1 Residues, emissions and waste

1.1.1 Hazardous substances

The key potential sources of hazard substances associated with the Project include:

- Oils, fuels and effluence necessary for the operation of the WTG; and
- Accidental releases of hazardous substances from vessels associated with the Project.

Measures will be adopted to reduce any potential discharge of hazardous substances associated with the Project. Oils, fuels and effluents will be necessary for the operation of the WTG. These will be stored and managed in line with best practice (e.g. bunded storage tanks) to reduce any potential spillage into the marine environment. Anti-corrosion paints on steelwork vulnerable to corrosion will follow relevant best practice measures and regulations (e.g. ISO 12944 and ISO 8501-3).

Vessels associated with the construction, operation and maintenance and decommissioning of the Project will also contain hazardous materials. However, the risk and impact of accidental releases of hazardous substances will be reduced through the implementation of the Environmental Management Plans, including measures for compliance with international requirements of the International Convention for the Prevention of Pollution from Ships (MARPOL) and best practice for works in the marine environment (e.g. preparation of Shipboard Oil Pollution Emergency Plans (SOPEP)).

1.1.2 Waste

All wastes (e.g. oil wastes and wastewater) will be contained and recovered for disposal onshore by an approved waste management company. Waste management procedures will also be developed for contractors and personnel working at the offshore Project. All vessels will be equipped with waste disposal facilities (sewage treatment or waste storage) to MARPOL Annex IV Prevention of Pollution from Ships standards. Ballast water discharges from vessels

will be managed under International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Ballast Water Management (BWM) Convention).

1.1.3 Underwater noise

Since the Scoping Report was submitted in April 2023, pin piling has now been removed from the design envelope of this Project and this is therefore not considered as a potential noise source. The Project Area and surrounding area of seabed is well known to the developer, with multiple years of survey data. One UXO was discovered and detonated in 2017 under a Marine Licence issued by the Offshore Petroleum Regulator for Environment and Decommissioning (OPRED). No further UXOs were discovered during the 2013 or 2023 geophysical surveys. Other noise sources will also be associated with the pre-construction, construction, operation, maintenance and decommissioning of the Project. These sources may include cable laying, trenching, rock placement for seabed preparation, vessel movements (including acoustic positioning systems) and operational WTG noise.

Should further noisy operations be required at any time following installation, these will be subject to a separate marine licence and associated European Protected Species (EPS) licence application, if required.

1.1.4 Lighting and marking

The WTG and floating substructure will be designed and constructed to satisfy the safety requirements of the MCA including the OREI Requirements, (MCA, 2021) and the International Lighthouse Association (IALA) Guidance G1162 and G1065 (IALA, 2021a; 2021b) as well as the marking, lighting, and fog-horn specifications of the CAA, NLB and MCA. The use of Automatic Identification System (AIS) Aids to Navigation (ATON) will be discussed with the NLB. Indicative information is provided below, however, the specific requirements for marking and lighting the Project will be determined post consent in consultation with the relevant stakeholders.

At present, whilst not a regulatory requirement it is industry best practice that the WTG is marked with lights that are visible from 3 km (2 nautical miles(nm)) and from all angles during activities at the offshore site. When in operation, the floating substructure will be marked and visible from all sides and comply with applicable requirements of Marine Guidance Note (MGN) 654 (MCA, 2021) For aviation purposes, any unique identification characters will be visible from the air in accordance with the CAA CAP 764 - CAA Policy and Guidelines on Wind Turbines (CAA, 2016). Lighting requirements will be finalised as part of detailed design within the Lighting and Marking Plan (LMP).

1.2 Embedded mitigation and management plans

The Project design includes embedded mitigation measures and various management plans that will further mitigate potential impacts. These management plans will form conditions to the marine licence, should it be granted.

Embedded mitigation is that which has been recognised as having benefits in reducing impact significance and is contained within the design of the Project. These mitigations form part of the application and will be described in detail during the condition discharge stage, should the marine licence be granted.

A summary of the embedded mitigations and management plans committed to by the Project is presented in Table 3-8. Those relevant to consider within the assessment, as discussed in Section 2.2.5, have been taken into account when undertaking the assessments presented in this HRA Report.

Table 3-8 Embedded mitigation and management plans

EMBEDDED MITIGATION AND MANAGEMENT PLANS	DESCRIPTION
MITIGATION	
Minimum air gap	Minimum air gap from mean sea level will be equal to or greater than the minimum 22m required to comply with Search and Rescue (SAR) requirements. This is to reduce potential risks to ornithological receptors.
Micro-siting of WTG and associated offshore infrastructure including cable route	The final Project layout will be presented within the Cable Plan (CaP) and Development Specification and Layout Plan (DSLP) and conditions of the marine licence. The final placement of anchors and export cable will be informed through micro siting based on available site survey data to ensure avoidance of sensitive habitats, archaeological and other structures where possible. Where this is not possible, the route will take the shortest distance possible through the sensitive areas to reduce environmental effects.
Reducing localised habitat loss	Best practice will be followed to ensure that potential habitat loss is minimised throughout the proposed works (e.g. Micro-siting and minimising the benthic footprint of the Project). The amount of rock used to protect the offshore export cable or as scour protection will be kept to a minimum where possible.
Removal of marine growth	The substructure will be designed to accommodate marine growth; however, to manage weight / drag-induced fatigue, growth levels will be inspected regularly, and subsequent removal of this growth will be undertaken using water jetting tools if substantial accumulation is in evidence.
Removal of debris from floating lines and cables	Mooring lines and the floating cable will be inspected with a risk-based frequency during the operational life cycle of the Project, starting at a higher frequency and likely declining after several years, based on evidence gathered during inspections. Any inspected or detected debris on the floating lines and cable will be recovered based on a risk assessment which considers impact on environment, risk to asset integrity and cost of intervention.
Application of scour protection	The PDE includes the installation of scour protection around the anchors. This will therefore negate the introduction of scour during the Project operation stage. The potential scale and requirement for scour protection will be informed by ongoing inspection surveys and the selected anchor solution.

EMBEDDED MITIGATION AND MANAGEMENT PLANS	DESCRIPTION
MITIGATION	
Charting requirements	Prior to construction, the position and final height of the WTG will be provided to the UK Hydrographic Office (UKHO), Ministry of Defence (MoD), and Defence Geographic Centre (DGC) for aviation and nautical charting purposes. The height will be charted on aeronautical charts and reported to the DGC, which maintains the UK's database of tall structures (digital vertical obstruction file) at least ten weeks prior to construction. The Project infrastructure, including the cable, mooring lines, anchoring points, as well as the WTG and floating substructure, will be plotted and provided to other sea users to be uploaded on their charts.
Promulgation of information as per marine licence requirements and standard industry practice.	As per required marine licence conditions, the details of the Project's activities will be promulgated in advance of, and during, construction via channels such as notices to mariners and kingfisher bulletins to ensure shipping and navigation users are informed about ongoing and upcoming works.
Fisheries Liaison Officer (FLO)	A TEPNSUK FLO will be appointed to establish effective communications surrounding the Project with local fishermen and other sea users. The FLO will distribute information on the safe operations of fishing activities at the site and will be a contact for fishermen and other sea users during the lifetime of the Project.
Target depth of lowering	Static cables will be trenched and buried to a minimum target depth of 0.6 m. Where this cannot be achieved, remedial cable protection will be applied. The cable burial target depth will be informed by a Cable Burial Risk Assessment (CBRA) and implemented through the CaP produced post-consent.
Nacelle, tower, and rotor design	The nacelle, tower, and rotor are designed and constructed to contain leaks thereby reducing the risk of spillage into the marine environment.
Marine Guidance Note (MGN) 654 compliance	The Project will comply with MGN 654 and its annexes as per its marine licence conditions to ensure that impacts on navigational safety and emergency response are considered, assessed, and mitigated where necessary. This includes post-consent completion of the search and rescue checklist which includes the completion of an Emergency Response Cooperation Plan (ERCoP).
Any temporary obstacles associated with wind farms which are of more than 91.4 m in height are to be alerted to aircrews through the NOTAM system.	Consultation with the CAA will be required to ensure that temporary obstacles of more than 91.4 m are identified to aircrews by NOTAM. Notification of temporary obstacles will be a condition of the marine licence. Measures will be adopted to ensure that the potential risk of aircraft collision with construction, operation and maintenance, and decommissioning infrastructure is minimised.
Post-consent application for safety zones	The floating WTG is being treated as a supplementary unit under the Health, Safety and Environment (HSE) Offshore Installations and Pipeline Works (Management and Administration) Regulations 1995 and as such, Total are applying for a 500 m safety

EMBEDDED MITIGATION AND MANAGEMENT PLANS	DESCRIPTION
MITIGATION	
	exclusion zone centred around the WTG. In addition, a 500 m advisory safety zone will also be requested around project vessels (e.g. During cable-laying).
Adherence with the International Convention for the Control and Management of Ships' Ballast Water and Sediments, 2004 (Ballast Water Management (BWM) convention)	Ballast water discharges from vessels will be managed under the BWM Convention which aims to prevent the spread of harmful aquatic organisms from one region to another, by establishing standards and procedures for the management and control of ships' ballast water and sediments. Measures will be adopted to ensure that the risk of invasive non-native species introduction during construction, operation and maintenance, and decommissioning is minimised.
Procedures for dropped objects and claim processes for loss / damage to fishing gear / vessels.	Protocols and procedures for dropped objects will be adhered to in order to minimise the risk to navigation from large, dropped objects associated with the Project.
International Regulations for the Prevention of Collision at Sea (ColRegs) and the International Regulations for the Safety of Life at Sea (SOLAS).	All vessels will comply with the provisions of the ColRegs and the SOLAS, including the display of appropriate lights and shapes such as when vessels are restricted in their ability to manoeuvre.
Adherence to the International Convention for the Prevention of Pollution from Ships (MARPOL)	All vessels will operate in adherence with MARPOL requirements. Accordance with this will help to ensure that the potential for release of pollutants is minimised during operations.
MANAGEMENT PLANS	
Environmental Management Plan (EMP)	The EMP will provide the over-arching framework for on-site environmental management during the phases of development as follows: • All construction as required to be undertaken before the commissioning of the Project • The operational lifespan of the Project from Commissioning until the cessation of electricity generation (environmental management during decommissioning is addressed by the Decommissioning Programme). The EMP will be in accordance with the Application insofar as it relates to environmental management measures. The EMP will set out the roles, responsibilities and chain of command in respect of environmental management for the protection of environmental interests during the construction and operation of the Project. It will address (but not be limited to) the following overarching requirements for environmental management during construction: • Mitigation measures as identified in the Application, pre-consent and pre-construction monitoring or data collection • A pollution prevention and control method statement, including contingency plans;

EMBEDDED MITIGATION AND MANAGEMENT PLANS	DESCRIPTION
MITIGATION	
	• Management measures to prevent the introduction of Invasive Non-Native Species (INNS); • A site waste management plan (dealing with all aspects of waste produced during the construction period), including details of contingency planning in the event of accidental release of materials which could cause harm to the environment. Wherever possible the waste hierarchy of reduce, reuse and recycle will be referred to; and • The reporting mechanisms that will be used to provide the Scottish Ministers and relevant stakeholders with regular updates on construction activity, including any environmental issues that have been encountered and how these have been addressed. The EMP will be regularly reviewed by the Company at intervals agreed by the Scottish Ministers and will be updated based on current information on construction methods and operations. The EMP will be informed, so far as is reasonably practicable, by the baseline monitoring or data collection undertaken as part of the Application and the Project Environmental Monitoring Programme (PEMP) to ensure that all construction and operation activities are carried out in a manner that minimises their impact on the environment, and that mitigation measures contained in the Application, or as otherwise agreed are fully implemented.
Project Environmental Monitoring Programme (PEMP)	A PEMP will be developed to provide further evidence to support the conclusions of the Environmental Impact Assessment (EIA) and to provide information on the environmental research initiatives for the Project to allow information to be obtained for future offshore wind farm developments.
Construction Method Statement (CMS)	A CMS will be developed in accordance with the EMP and detail how project activities and plans identified within the EMP will be carried out, whilst also highlighting any possible dangers / risks associated with specific Project activities. The CMS will include the Code of Construction Practice (CoCP) which will set out the approach to how construction activities will be managed and controlled in order to deliver the commitments and mitigation arising from Project.
ERCoP	An ERCoP will be in place for the Project. The ERCoP will detail the key roles and responsibilities and protocols to be established in the event of an emergency during the lifetime of Project related activities.
CaP and CBRA	A CaP will be provided for the Project which will detail the location, duration / route and cable laying techniques of the export cable and detail the methods for cable surveys during its operational life. This will be supported by survey results from the geotechnical, geophysical, and benthic surveys. The CaP will also detail the electromagnetic fields of the cables deployed.

EMBEDDED MITIGATION AND MANAGEMENT PLANS	DESCRIPTION
MITIGATION	
	A CBRA will also be undertaken and included within the CaP which will detail cable specifications, cable installation, cable protection, target burial depths / depth of lowering and any hazards the cable will present during the lifetime of the cable.
VMP	A VMP will be prepared for the Project which will detail the number, type and specification of vessels utilised during construction and operation. This will also detail how vessel management is coordinated and the ports and transit corridors proposed.
NSP	A NSP will be developed for the Project which will detail all navigational safety measures, construction exclusion zones if required, notices to mariners and radio navigation warnings, anchoring areas, lighting and marking requirements and emergency response procedures during all phases of the project.
LMP	A LMP will be developed for the Project. This will provide that the Project site be lit and marked in accordance with the current CAA and MoD aviation lighting policy and guidance. The LMP will also detail the navigational lighting requirements detailed in IALA R139 and G1162.
Decommissioning Programme	A Decommissioning Programme will be provided pre-construction to address the principal decommissioning measures for the Project, this will be written in accordance with applicable guidance and detail the management, environmental management, and schedule for decommissioning.

4 HRA SCREENING METHODOLOGY

4.1 Screening process

4.1.1 Overview

This Section outlines the HRA screening process which has been used throughout the HRA Screening proportion of this HRA Report (Sections 5-8). The approach follows a stepwise approach and has been used consistently throughout the below receptor specific topic assessments:

- Section 5 – European sites designated for Annex I habitats;
- Section 6 – European sites designated for Diadromous fish features;
- Section 7 – European sites designated for Marine mammals; and
- Section 8 – European sites designated for Offshore ornithology features.

4.1.2 Identification of European sites and features with connectivity

This first step identifies European sites and features with connectivity to the Project. The identification of European sites is undertaken with reference to the qualifying interests / features in line with the following process:

- Identifying the range of effects that the Project could have on qualifying feature(s) of a European site (i.e. establishing pathways for LSE); and
- Determining connectivity with the sites (e.g. if a qualifying interest / feature of the European site may overlap with the boundary of the Project or the wider Zone of Influence (ZoI)).

Connectivity depends on a number of factors including life cycle, foraging, behavioural, breeding, and migratory characteristics of these qualifying features associated with a particular European site and the characteristics and potential effects of the Project. Each particular receptor topic has defined the relevant criteria used to determine connectivity. The outcome of this step is a list of European sites and features for which there is connectivity with the Project. It should be noted that any distances measured between the Project and European sites to determine connectivity have been measured from the outer boundary of the Project (as shown in Figure 1-1) to the outer boundary of the European site.

4.1.3 Determination of no LSE

Where it is identified that there is connectivity between the Project and the qualifying interests of a European site, further appraisal is required to determine whether, as a result of this connectivity, no potential LSE can be concluded.

In order to determine no potential LSE, it is necessary to:

- Determine whether that qualifying feature(s) would, by virtue of its behavioural and foraging characteristics, be affected by a particular effect (species sensitivity); and

- Where a qualifying feature is likely to be affected by an effect, identify whether or not this is likely to have a significant effect on the conservation objectives for the site (conclusion of no potential LSE or not).

The assessment of no potential LSE combines information on effect pathways and characteristics of qualifying interests as part of a high-level appraisal to determine whether or not there is potential for any of the conservation objectives relating to the qualifying interests of a site to be undermined on the basis of the potential effects. Where there is no potential for the conservation objective to be undermined, no potential LSE is concluded and it is therefore proposed that this is screened out from Stage Two of the HRA process.

4.2 Stakeholder consultation to date

An Environmental Impact Assessment (EIA) Scoping Report for the Project was submitted to MD-LOT in April 2023. Consultation responses on the EIA Scoping Report that are relevant to the HRA have been considered for the assessments presented within this HRA Report, these comments are provided in Table 4-1.

Through meetings with consultees to discuss specific details of the approach to EIA and HRA, in particular with NatureScot, further advice has been provided on the approach to HRA Screening which has been taken into account within this HRA Report. These comments are summarised in Table 4-2.

Table 4-1 Scoping Opinion comments relevant to the HRA

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
Scoping Opinion Responses (July 2023)		
Scottish Ministers (via MD-LOT)	The Scottish Ministers note the need to carry out an assessment under The Conservation (Natural Habitats, &c.) Regulations 1994. This assessment must be coordinated with the EIA in accordance with the EIA Regulations.	This document presents an assessment of the Project under the Habitats Regulations. As agreed with MD-LOT and NatureScot (See Table 4-2 below), this document presents both the Stage 1: HRA Screening (as detailed in Sections 5 to 8) and the RIAA to inform Stage 2 of the HRA process (see Section 9).
	The Scottish Ministers strongly advise the production of a HRA screening report for the Proposed Development and recommend that this should be submitted for comment at the earliest opportunity and in advance of the submission of the EIA Report in order to fully inform the HRA advice for the Proposed Development.	As agreed with MD-LOT and NatureScot (See Table 4-2 below), this document presents both the Stage 1: HRA Screening (as detailed in Sections 5 to 8) and the RIAA to inform Stage 2 of the HRA process (see Section 9).
NatureScot	An HRA Stage 1 LSE screening report has not been provided alongside the Scoping Report, this will be submitted separately. We provide advice within our technical appendices (as discussed below) to assist in the consideration of screening and assessment requirements for sites / features under HRA.	As agreed with MD-LOT and NatureScot (See Table 4-2 below), this document presents both the Stage 1: HRA Screening (as detailed in Sections 5 to 8) and the RIAA to inform Stage 2 of the HRA process (see Section 9).
	Ornithology Section 7.4.7 refer to the use of tracking data to discount a number of colonies for far ranging species (namely, fulmar, gannet, great skua and manx shearwater). We caution against discounting too early as it guards against pre-judging species and impacts. Instead, an initial long list of SPAs for consideration under Habitats Regulations Appraisal (HRA) should be developed using the foraging ranges as described above to determine theoretical connectivity. Biological reasoning can then be applied to refine this list, such as considering at sea distances or consideration of tracking studies where there is clear segregation of foraging behaviour – no evidence is provided within the Scoping Report of these tracking studies so we cannot advise further at this stage.	For each ornithology species considered within this HRA, foraging ranges during the breeding season have been used to assess theoretical connectivity to the Project, where appropriate a long list of SPAs has been included as detailed further in Section 8 of this document.

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	Once analysis of the one-year digital aerial survey campaign is complete, further refinement of this list can then reflect what species are found when and in what density, and what impacts they may be vulnerable too. We therefore expect that Table 7-14 will be updated to reflect this iterative process and will provide further advice during the consultation on the Stage 1 LSE Screening Report, which should also include justification of use of any tracking studies. Given the offshore location and distance to colonies, it also may be helpful to consider flight direction from the digital aerial surveys.	The findings from the one-year digital aerial surveys have been used to inform the HRA Screening assessment and to refine the scope of the assessment (see Section 8.2). Where appropriate, any supplementary information used to add justification to the conclusions of the assessments is referenced.
	SPA connectivity - As above, we are unclear why 300 and 400km buffers have been used when considering connectivity to SPAs. Connectivity during the breeding season should be based on Woodward *et al* (2019) or BDMPS (Furness, 2015) in the non-breeding season (with exceptions detailed in our guidance note, e.g. for guillemot).	Theoretical connectivity during the breeding season has been assessed based on the NatureScot (2023a) Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds – Identifying theoretical connectivity with breeding site SPAs using breeding season foraging ranges. The recommended foraging ranges from Woodward *et al* (2019) within this guidance have been used within the assessment (see Section 8.3). It should also be noted that it was agreed during consultation with NatureScot on the HRA Screening (see Table 4-2) that the HRA assessment should focus on the breeding season only, with non-breeding season assessments conducted within the associated EIAR chapter (Chapter 11: Ornithology).
	Key impact pathways to consider- We broadly agree with Table 7-16 of the Scoping Report that summarises the impacts proposed to be scoped in and out of the assessment. However, we advise there are elements that require further consideration as outlined below. Disturbance and displacement - We note that vessel activity, construction noise, lighting and the presence of the WTG leading to disturbance or displacement is scoped out during the construction, decommissioning and O&M phase. While we wish to be proportionate to the scale of the development proposed, we are unable to agree with this approach until we can review the analysed data from the full 12 months of DAS to better understand bird usage of the site. As such, we advise against scoping these out at this stage.	Impacts from disturbance and displacement have also been assessed within this HRA Report for ornithology features (Section 8).
	Approach to impact assessment - Overall, we are content with the approach outlined in section 7.4.12 of the Scoping Report for impact assessment. With regards to HPAI, we are still reviewing the impact on seabird populations in Scotland and cannot yet quantify the impact from these mass mortality events. We can provide more detail on this as our advice develops.	Further advice provided by NatureScot during the HRA Screening approach consultation is discussed below in Table 4-2.

Table 4-2 Consultation comments on HRA Screening approach from consultation meeting with NatureScot held on the 29th January 2024

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
Email correspondence with MD-LOT received 6th February 2024, following NatureScot Consultation.		
MD-LOT	Regarding your email dated 30 January concerning the submission of the HRA screening assessment, MD-LOT notes that TotalEnergies will submit a single combined HRA Report for the Culzean project along with the EIA submission. MD-LOT notes that this approach has been agreed with NatureScot. MD-LOT is content with this approach but request that the HRA screening is easily identifiable when TotalEnergies submit its EIA submission documents. This will enable the documents to be read alongside the RIAA.	As agreed, this HRA Report presents both the HRA Screening and RIAA Sections. Sections 5-8 of this report cover the HRA Screening (Stage 1), whilst Section 9 of this HRA Report presents the RIAA for SPAs where no potential LSE could not be ruled out during the HRA screening assessments.
Formal advice received from NatureScot 8th February 2024, following NatureScot Consultation.		
NatureScot	Thank you providing meeting minutes from our call to discuss the HRA Screening Approach for Culzean (held on the 29 January 2024). In the meeting we agreed to follow up with advice on the topics discussed, this advice is provided below and indicates our expectations for assessment under HRA as well as EIA. The Culzean Ornithological and Marine Mammal Baseline Characterisation Surveys Final Report (version 1.2) was provided by email on 17 January 2024. Please see our advice on this report which we include within Annex 1.	The advice outlined below has been considered for the HRA.
	Annex 1 habitats: HRA requirements We are content that there is no likely significant effect (LSE) from this proposed development on any Annex I habitats for any Special Area of Conservation, including Scanner Pockmark SAC. We have reached this view, due to the distance from designated sites and lack of any impact pathway. As such, we agree that Annex I habitats can be screened out and require no further consideration under HRA.	As discussed in Section 5 of this HRA Report, all European sites designated for Annex I habitats have been screened out in line with the advice provided.

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	Diadromous fish: HRA requirements We note that for diadromous fish species there is limited knowledge of distribution and behaviour of these species in the marine environment. For example, the precise migration routes of adult or juvenile Atlantic salmon or direction taken by emigrating adult European eels is not fully known. Published information indicates that European smelt and River lamprey are primarily, though probably not exclusively, associated with estuarine environments. Shad might also prefer estuarine environments. The ScotMER evidence map process for diadromous fish confirms the evidence gaps particularly with respect to spatial and temporal distribution as well as uncertainty around migration routes and connectivity to protected sites. This current inability to fully understand connectivity to and within individual rivers to development areas currently prohibits an informed assessment of the impact on individual site integrity. This is a necessary step within HRA assessment process. Based on evidence currently available to us at this point, we have concluded that it is not possible for us to carry out an assessment of diadromous fish to the level required under HRA. This may change in the future as more evidence becomes available. We are content to screen out diadromous fish from further consideration under HRA due to: • Scale of development with short installation duration; • Offshore location with no landfall; • Limited understanding of spatial and temporal distribution of migratory species; • Lack of evidence to inform impact pathways; and • Lack of reference population figures which prevents impact apportioning to SACs.	As discussed in Section 6 of this HRA Report, all European sites designated for Diadromous fish have been screened out in line with the advice provided.
	Diadromous fish: EIA requirements Given the scale of the proposed development combined with lack of evidence as described above, we are also content that no further assessment is required for diadromous fish under EIA.	Noted, however, as this chapter had been sufficiently progressed prior to the advice received, the EIA chapter does consider impacts on diadromous fish. Nonetheless, all impacts have been assessed as not significant in EIA Terms.

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	Marine mammals Pin piling was initially considered within the project design envelope, however we note this noisy activity is no longer being considered. Other potential noise emitting activities (e.g. vessel and anchoring activities) during construction will be both localised and temporary. As such, we do not consider there to be any impact pathways of concern to marine mammal interests.	Noted, no further response required.
	Marine mammals: HRA requirements Due to the distance from designated sites and the lack of any impact pathways, we are content that there is no likely significant effect from this proposed development on the seal or cetacean qualifying features of any Special Area of Conservation. As such, we agree that marine mammals can be screened out and require no further consideration under HRA.	As discussed in Section 7 of this HRA Report, all European sites designated for Marine mammals have been screened out in line with the advice provided.
	Marine mammals: EIA requirements Given the scale of the development combined with lack of impact pathway, we are also content that no further assessment is required for marine mammals under EIA.	Noted, however, as this chapter had been sufficiently progressed prior to the advice received, the EIA does undertake an assessment of underwater noise on marine mammals for other noise emitting activities such as vessels and cable installation. Nonetheless, the EIA concludes no significant impacts in EIA terms for these elements of the Project.
	Marine mammals: European Protected Species (EPS) licensing As discussed during the meeting held on 29 January 2024, it is unlikely that any noise emitting work will be required. However, we consider if geophysical activities or unexploded ordnance clearance activities are to be carried out, there could be potential impacts to marine mammals - we advise that these impacts can be addressed through the EPS licensing process – should they be required.	At this point in time further geophysical surveys or UXO clearance activities are not required. Should this change, any future geophysical or UXO activities would be carried out under a separate EPS licensing process.

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	Ornithology We have reviewed the Culzean Ornithological and Marine Mammal Baseline Characterisation Surveys Final Report (version 1.2, provided by email on 17 January 2024). Due to the scale of the project and the generally low numbers of birds present we consider a single year of surveys to be adequate. Our advice on the final Digital Aerial Survey (DAS) findings and Baseline Characterisation Surveys Final Report is provided in Annex 1 of this letter. At the meeting on 29 January 2024 slides were presented showing the approach taken for HRA screening for ornithology. Slides 9 to 13 included information on bird densities and collision risk modelling (CRM) used to inform the approach - with regard to these slides we note the following: Slide 11 presented the conclusions from CRM. We note that rates used were different from those in our Guidance Note 7 we advise all input parameters are checked to ensure those identified in our guidance are used. A matrix table is used to consider potential connectivity and determine LSE (as per slide 12). This approach to screening LSE using a matrix is not an approach we endorse. Please see our published suite of ornithology guidance notes 'Guidance to Support Offshore Wind Applications: Marine Ornithology' which is available online for further information. Further project specific advice is outlined below.	CRM has been updated within the assessments to ensure alignment with those identified within the NatureScot (2023b) Guidance Note 7. See Annex A: Kittiwake Collision Risk Modelling, of this HRA Report for details. The matrix approach has not been used within this HRA report, potential for LSE has been based on theoretical connectivity, impact pathways and density abundance of species identified within the APEM DAS findings, as detailed in Section 8.1 of this HRA Report.
	Breeding Season: HRA requirements Our assessment of Likely Significant Effect (LSE), based on recommended foraging ranges, bird abundance at the site and impact pathways is provided below for the breeding season.	In line with this advice only SPAs with kittiwake features which have theoretical connectivity to the Project during the breeding season have been screened in for further assessment. All other species have been screened out for further assessment in line with the advice provided. The detailed assessment of SPAs screened in for kittiwake is presented in Section 9 of this HRA Report.

SPECIES	THEORETICAL CONNECTIVITY TO SPA BREEDING POPULATIONS	IMPACT PATHWAYS	LSE
Fulmar	Yes	No, low vulnerability to collision and displacement	No. The extensive foraging range of fulmar means that displacement associated with a single turbine will have a negligible impact. Fulmar flight

CONSULTEE	COMMENT / SUMMARY OF ADVICE			APPLICANT RESPONSE
				behaviour and turbine parameters make collision risk low.
	Puffin	Yes	Displacement	No, numbers recorded are sufficiently low to screen out this species
	Gannet	Yes	Collision / displacement	No, numbers recorded are sufficiently low to screen out this species
	Kittiwake	Yes	Collision / displacement	Yes – although numbers are not high, declining SPA populations, coupled with existing cumulative impacts on kittiwake populations resulting in Adverse Effect on Site Integrity at some sites, mean this species should be taken forward for assessment
	Guillemot	No	N/A	No, development is beyond foraging range for all SPAs
	Razorbill	No	N/A	No, development is beyond foraging range for all SPAs
	Great black-backed gull	No	N/A	No, development is beyond foraging range for all SPAs
	Herring gull	No	N/A	No, development is beyond foraging range for all SPAs
	Common gull	No	N/A	No, development is beyond foraging range for all SPAs

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	As per the table above, we are content to screen out all the species listed except for kittiwake. For assessing potential impacts on kittiwake both collision and displacement impact pathways need to be considered. Advice on displacement assessment can be found in our Guidance note 8. Please note that in our guidance note on seasonal definitions the kittiwake breeding season is from mid-April – end of August. While it is likely that the impacts on kittiwake from the project alone effects will be very low and the contribution from the project to cumulative impacts with other wind farms minimal, it is none the less important to provide an assessment of potential impacts and to explain and justify any conclusions reached. References should be cited to evidence conclusions.	A detailed assessment of screened in SPAs with theoretical connectivity to the Project during the breeding season has been undertaken in Section 9 of this HRA Report. The assessment considers both collision risk and displacement impact pathways from the Project alone and in-combination with other plans and projects. The assessment is aligned with the applicable NatureScot guidance.
	Non-breeding season – Guillemot Guillemot numbers recorded in the Baseline Characterisation Surveys Final Report were high in the non-breeding season, especially in October with a peak abundance of 4677 birds.	Noted, no further response required.
	Non-breeding season – Guillemot: HRA requirements In terms of HRA, for guillemot in the non-breeding season we usually advise the use of breeding season populations within foraging range, rather than BDMPS populations, as they tend to stay in vicinity of Scottish breeding colonies. For this development, there are no SPAs within foraging range so there is no need for an HRA assessment for guillemot in the non-breeding season.	Non-breeding season impacts on guillemot have not been considered in this HRA Report, in line with the advice provided.
	Non-breeding season – Guillemot: EIA requirements A basic displacement assessment using the UK North Sea & Channel BDMPS population, without SPA apportionment, should be presented with justification for any conclusions	A basic displacement assessment of non-breeding season impacts on guillemot have been considered in the EIA, in line with the advice provided.
	Non breeding season – Razorbill: HRA requirements In terms of HRA, for razorbill in the non-breeding season we usually advise the use of breeding season populations within foraging range, rather than BDMPS populations, as they tend to stay in vicinity of Scottish breeding colonies. For this development, there are no SPAs within foraging range so there is no need for an HRA assessment for razorbill in the non-breeding season.	Non-breeding season impacts on razorbill have not been considered in this HRA Report, in line with the advice provided.

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	Non breeding season – Razorbill: EIA requirements Razorbill are present throughout the non-breeding season with a peak abundance in October of 289 birds. As such, we advise a basic displacement assessment using the UK North Sea & Channel BDMPS population should be presented with justification for any conclusions.	A basic displacement assessment of non-breeding season impacts on razorbill have been considered in the EIA, in line with the advice provided.
	Non-breeding season – other species: HRA requirements With respect to those other species recorded in the non-breeding season, including puffin, gannet, common gull, herring gull, great black backed gull, kittiwake and fulmar. The lack of impact pathways and/or low numbers recorded is such that we are content that no further assessment in the non-breeding season is required.	Non-breeding season impacts for all species identified during the APEM DAS have not been considered in this HRA Report, in line with the advice provided.
	Stage 1 LSE Screening and Report to Inform Appropriate Assessment Kittiwake is the only species to be screened into the HRA. As such, we are content with the proposed approach of combining the Stage 1 LSE Screening and Report to Inform Appropriate Assessment (RIAA) and presenting these together alongside your forthcoming application. In our view this approach is both pragmatic and proportionate to the scale of development, however, please confirm that this approach is acceptable with MD-LOT.	This HRA Report provides the combined HRA Screening and RIAA. The approach was also confirmed acceptable with MD-LOT.
	Annex 1: NatureScot advice on Ornithological and Marine Mammal Baseline Characterisation Surveys Final Report – Culzean Platform We have reviewed the Ornithological and Marine Mammal Baseline Characterisation Surveys Final Report (project reference: P00010265, version: 12/01/24, V1.2) and provide advice below.	Noted, the advice below has been considered where appropriate.
	Ornithology: Methodology APEM were contracted to carry out Digital Aerial Surveys (DAS), their standard practices have been followed which are generally acceptable. We have the following comments: • A full year of monthly surveys have been carried out, with no missed months. The dates, timings and weather conditions were all appropriate. • Due to the scale of the project and the generally low numbers of birds/species present we consider a single year of surveys to be adequate. • 10% of data has been analysed - this is at the lower limit of our requirements.	In terms of the seasonality definitions, within this HRA Report, the breeding season for all species, with the exception of guillemot and razorbill, has been aligned with NatureScot (2020) Guidance Note 9: Guidance to support Offshore Wind Applications: Seasonal periods for Birds in the Scottish Marine Environment. For both razorbill and guillemot, the month of August has been omitted from the breeding season, as at the

CONSULTEE	COMMENT / SUMMARY OF ADVICE	APPLICANT RESPONSE
	• Within the analysis presented, unidentified birds have been apportioned and availability bias for auks has been included. Density estimates are design-based. As bird numbers are generally low it would not be possible to use a model-based, MRSea, approach. • Flight heights have been calculated from the survey data, current generic data from Johnston *et al* (2014) are also presented, which we recommend. APEM acknowledge that the sample size of suitable flying birds captured within these surveys is small and unlikely to be indicative of the wider population, therefore limiting the usability of the calculated flight heights. • Seasonal definitions do not follow our guidance note.	time of the survey during this month, both species have long since vacated their colonies.
	Survey results The number of species present and the number of birds recorded were generally low, this is not unexpected for a project so far offshore (222km east of the Scottish coastline). The most abundant species recorded were guillemot, fulmar, razorbill, great-black backed gull and kittiwake. There was a notable peak in guillemot numbers in October/November. We note that a survey of breeding birds on the Culzean platform was carried out in July 2023 (Culzean Ornithology Surveys 2023, Document Number: A-303826-S00-A-REPT-001). Surveys took place across three days in mid-July and no nesting birds were found.	Abundance densities for key species sighted within the APEM DAS and Culzean Platform Surveys are summarised in Section 8.2.
	Marine Mammals / Megafauna: Survey results and density estimates We note that harbour porpoise (16 individuals) and unidentified dolphin/porpoise (one individual) were recorded in the one year of surveys. One basking shark was also recorded.	Noted, no further response required.
	An abundance estimate and density estimate is provided for basking shark, based on a single sighting. Given the likely low abundance of basking shark in this area, we advise only carrying out a qualitative assessment and not trying to assess impacts to this species quantitatively.	Basking sharks are not considered within the HRA, nonetheless, they have been considered qualitatively within the EIA.
	A relatively small number of individual harbour porpoise were seen (16 in total). This may be due to surveys being carried out in conditions in which it would be difficult to see harbour porpoise (up to 26 knot winds, and sea state of 3). However, the density estimates are not dissimilar to those in SCANS surveys (SCANS III and IV). We advise using the most precautionary estimate for any quantitative assessments.	The most conservative density estimates for harbour porpoise have been used to underpin the assessments presented in the HRA Report (see Section 7.2.2) and within the EIA.

5 EUROPEAN SITES DESIGNATED FOR ANNEX I HABITATS

5.1 Initial screening criteria

As per the HRA Screening process detailed in Section 4, this Section provides the HRA Screening assessment in order to identify European sites with relevant Annex I habitats to be taken forward to the RIAA (Section 9 of this HRA Report), in order to aid the AA (Stage 2 of the HRA Process).

The initial screening criteria utilised to identify European sites with relevant Annex I habitats considered in the screening assessment are outlined below:

- The site boundaries of the Project overlap with one or more European sites;
- The European site is located within the ZoI of effects associated with the Project, which is considered as extending up to a maximum of 5 km from the boundaries of the Project. In the context of Annex I habitats disturbance generated during offshore works may result in adverse effects on water quality and generate smothering effects where sediments resettle. These effects may extend beyond the boundaries of the offshore Project. The buffer selected for the Project was based on the extent of the tidal excursion in the area and was rounded up to 5 km to account for any extreme events.

5.2 Identification of European sites and features with connectivity

The nearest European sites to the Project Area are listed in Table 5-1 and potential pathways for LSE on these sites are discussed further in this Section. Figure 5-1 shows the location of these European sites in the context of the Project.

Based on the criteria described in Section 5.1, there are no European sites with relevant Annex I habitats that have connectivity to the Project, due to the distance to these sites (i.e., located > 5 km from the Project, with no pathway for effect identified).

Table 5-1 Nearest European sites designated for Annex I habitats to the Project Area

SITE NAME	QUALIFYING INTEREST/FEATURES	DISTANCE TO PROJECT AREA (KM)
Scanner Pockmark SAC	Submarine structures made by leaking gases	132
Braemer Pockmarks SAC	Submarine structures made by leaking gases	190
Dogger Bank SAC	Sandbanks which are slightly covered by seawater all the time	199

5.3 Determination of LSE

There are no European sites that meet the screening criteria outlined in Section 5.1. All European sites designated for Annex I habitat are considered not to have connectivity with the Project. The nearest European site is Scanner

Pockmark SAC; located approximately 132 km from the Project (see Figure 5-1). Given these distances, there is no pathway to result in the potential for LSE from direct or in-direct impacts. Therefore, these European sites have been screened out of Stage Two of the HRA process. These conclusions were also agreed during consultation with NatureScot on the scope of the HRA Screening assessment (see Section 4.2).

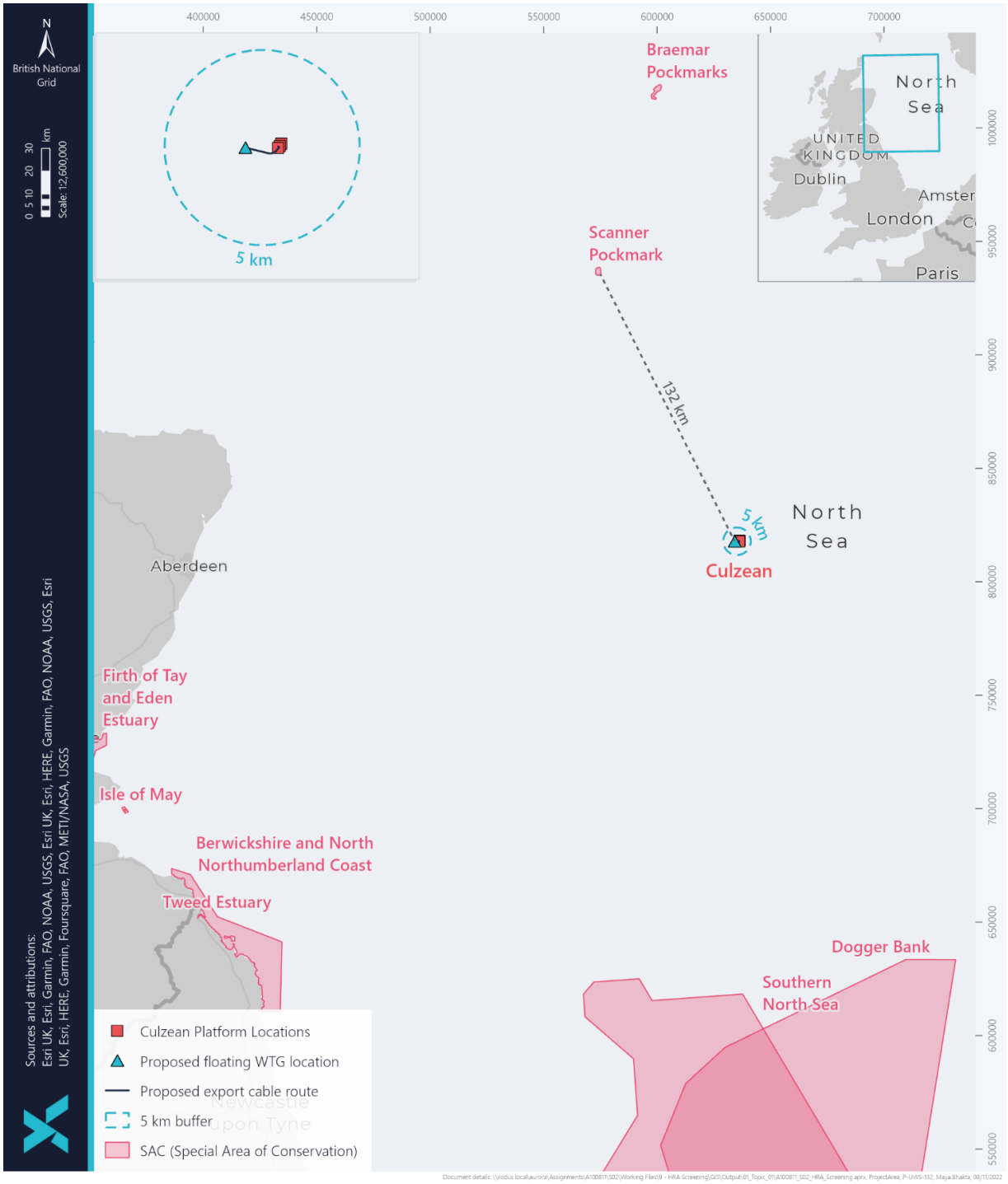

Figure 5-1 European site designated for Annex I habitats within the vicinity of the Project

6 EUROPEAN SITES DESIGNATED FOR DIADROMOUS FISH FEATURES

6.1 Initial screening criteria

As per the HRA Screening process detailed in Section 4, this Section provides the HRA Screening assessment in order to identify European sites with relevant diadromous fish (i.e., fish that migrate between freshwater and marine environments) to be taken forward to the RIAA (Section 9 of this HRA Report), in order to aid the AA (Stage 2 of the HRA Process).

The initial screening criteria utilised to identify European sites with relevant diadromous fish species considered in the screening assessment are outlined below:

- European sites that overlap with the offshore Project boundary; and
- European sites designated for diadromous fish with migratory routes that are likely to cross the offshore Project (see Section 6.2.1).

6.2 Identification of sites and features with connectivity

No European sites for diadromous fish species overlap with the Project boundary due its distance from any coastline. The nearest European site is the River Dee SAC designated for Atlantic salmon (*Salmo salar*) and freshwater pearl mussel (*Margaritifera margaritifera*), located 238 km from the Project Area (Figure 6-1). A list of the closest European sites within the vicinity of the project is provided in Table 6-1.

Table 6-1 Nearest European sites designated for diadromous fish features to the Project Area

SITE NAME	QUALIFYING INTEREST/FEATURES	DISTANCE FROM THE PROJECT AREA (KM)
River Dee SAC	Atlantic salmon Freshwater pearl mussel	238
River Tay SAC	Atlantic salmon	288
River Tweed SAC	Atlantic salmon	290
River Spey SAC	Atlantic salmon Freshwater pearl mussel Sea lamprey (*Petromyzon marinus*).	303
Berriedale and Langwell SAC	Atlantic salmon	338
River Thurso SAC	Atlantic salmon	356
River Evelix SAC	Freshwater pearl mussel	364
River Oykel SAC	Atlantic salmon Freshwater pearl mussel	380

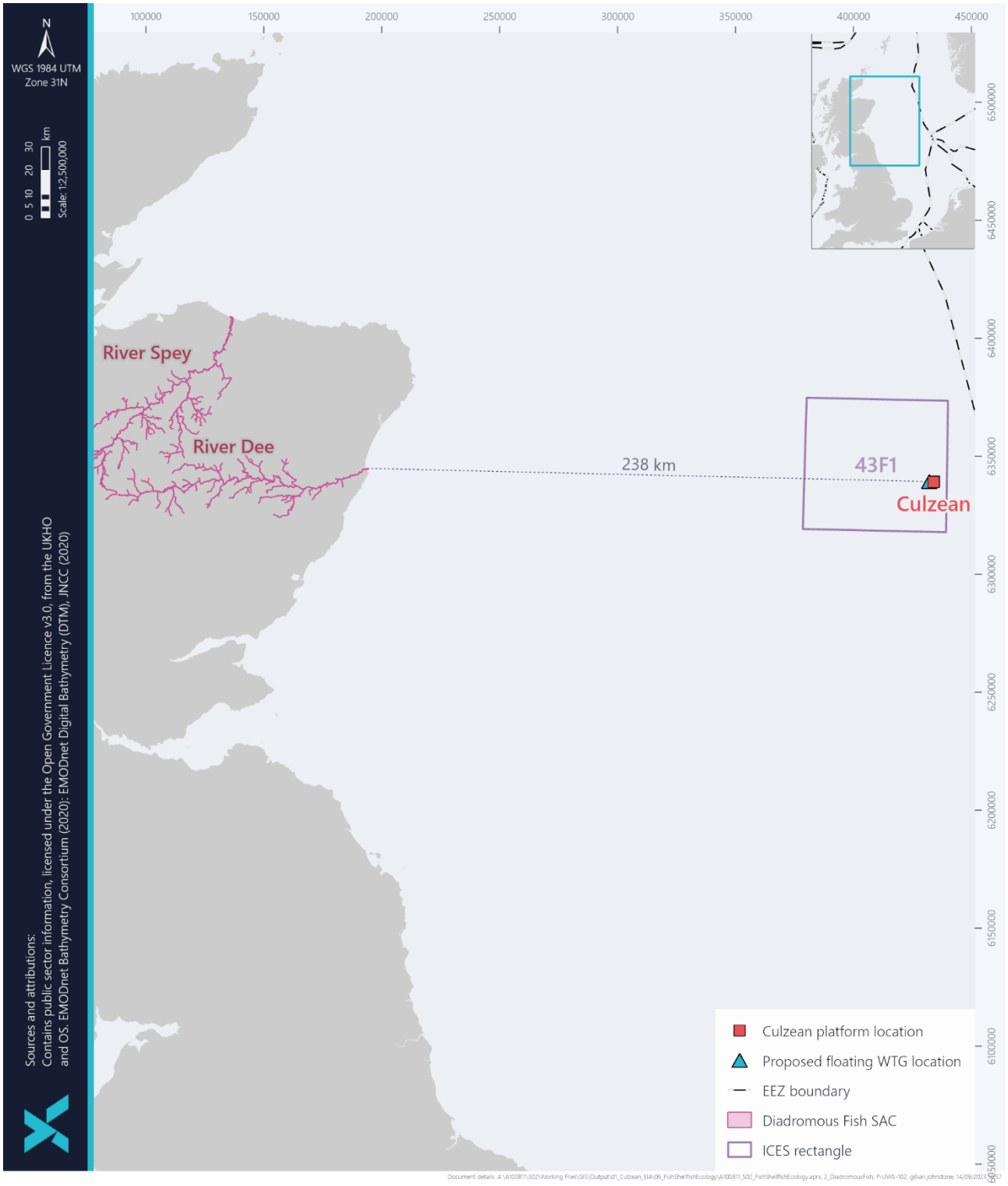

Figure 6-1 Distance from the Project to the nearest SAC designated for diadromous fish features

6.2.1 Migration routes and connectivity

In line with NatureScot advice (see Section 4.2), the ScotMER evidence map process for diadromous fish confirms that the precise migration routes of diadromous fish are not fully known, particularly with respect to spatial and temporal distribution, as well as uncertainty around migration routes and connectivity to protected sites. Currently, there is a lack of reference population figures to allow for apportioning impacts to SACs (Scottish Government, 2023).

This current inability to fully understand connectivity to and within individual rivers to development areas currently prohibits an informed assessment of the impact on individual site integrity. Based on evidence currently available it is not possible to undertake an informed assessment of potential LSE on European Sites based on potential migratory pathways of diadromous fish features.

6.3 Determination of LSE

Due to the offshore location of the Project, no European Sites designated for diadromous fish overlap the Project Area. The nearest European Site is the River Dee SAC designated for Atlantic salmon and freshwater pearl mussel, located 238 km from the Project Area. Given these distances, and the limited understanding of spatial and temporal distribution of migratory species, it is not possible to undertake an assessment based on migratory routes and connectivity, or the ability to apportion potential impacts to a specific European Site. Furthermore, given the scale of the Project and distance from the coast, impacts on diadromous fish are not considered to be significant. As such, in agreement with consultation undertaken with NatureScot on the HRA Screening assessment (see Section 4.2), all European sites designated for diadromous fish features are screened out of Stage Two of the HRA process.

7 EUROPEAN SITES DESIGNATED FOR MARINE MAMMAL FEATURES

7.1 Initial screening criteria

As per the HRA Screening process detailed in Section 4, this Section provides the HRA Screening assessment in order to identify European sites with relevant Marine Mammal features to be taken forward to the RIAA (Section 9 of this HRA Report), in order to aid the AA (Stage 2 of the HRA Process).

There are five marine mammal species which are listed in Annex II of the Habitat Directive and have therefore been considered in the LSE screening assessment. These are:

- Grey seal (*Halichoerus grypus*);
- Harbour seal (*Phoca vitulina*);
- Harbour porpoise (*Phocoena phocoena*);
- Bottlenose dolphin (*Tursiops truncatus*); and
- European otter (*Lutra lutra*).

The screening criteria utilised to identify European sites with relevant Annex II marine mammal species (SACs), which have connectivity to the offshore Project are outlined below:

- European sites which spatially overlap with the boundary of the offshore Project; and
- European sites which are located within the range (foraging range or management unit) of the Annex II marine mammal species for which they are designated).

7.2 Identification of sites and features of connectivity

7.2.1 Pinnipeds

The spatial parameters for determining theoretical connectivity for pinnipeds which in turn have been used to determine the search area for European sites are outlined in Table 7-1.

Table 7-1 Search area used to identify SACs with potential connectivity to the offshore Project

SPECIES	JUSTIFICATION	SEARCH AREA
Harbour seal	Seal tracking studies indicate that harbour seal typically forage within coastal regions, although longer travel distances do occur (e.g., Carter *et al.*, (2022)) gives a maximum recorded distance from a haul-out as 273 km). NatureScot general advice is that protected areas for harbour seals within 50 km should be considered for connectivity.	50 km (at sea distance)
Grey seal	Grey seals have been observed travelling larger distances than harbour seals, with some grey seal individuals travelling hundreds of kilometres away from their haul-out sites (Carter *et al.*, 2022) gives a maximum recorded distance from a haul-out as 448 km). NatureScot general advice is that protected areas for grey seals within 20 km should be considered for connectivity.	20 km (at sea distance)

No European sites designated for the protection of seals as a primary conservation feature overlap the Project Area, with all European sites are located over 100 km away. The closest SAC with seals as a qualifying feature is the Berwickshire and North Northumberland Coast SAC, located approximately 266 km to the southwest, followed by Firth of Tay and Eden Estuary SAC and Isle of May SAC, located 290 and 293 km away from the Project Area, respectively (Figure 7-1). As such it is considered there is no potential for connectivity to seal features within these sites and therefore, they have been screened out for further assessment. This was agreed in consultation with NatureScot (see Section 4.2).

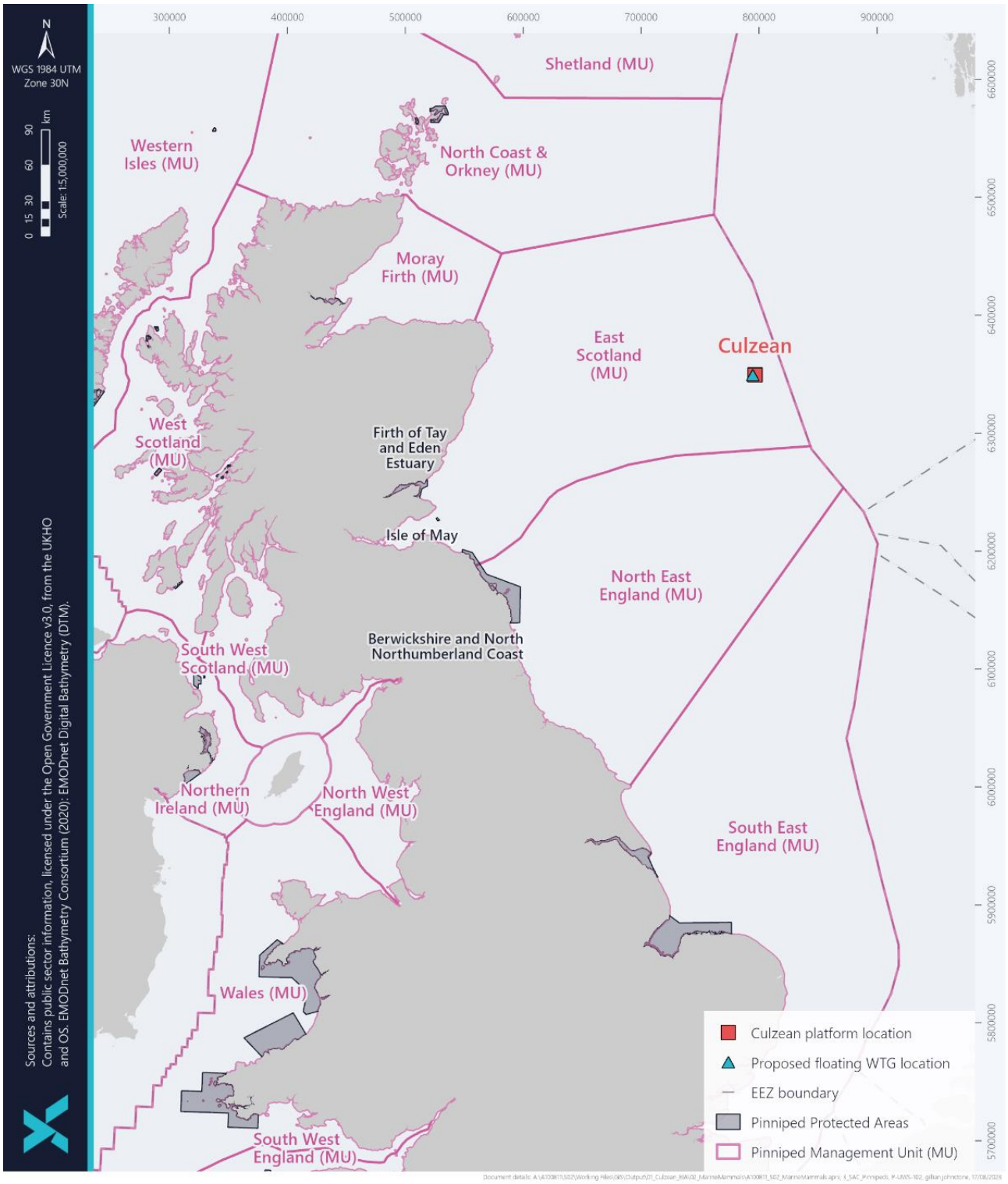

Figure 7-1 SACs with pinniped features

7.2.2 Cetaceans

Bottlenose dolphins and harbour porpoise are listed under Annex II of the Habitats Directive and therefore have been considered within the HRA screening assessment. Figure 7-2 presents all the SACs for bottlenose dolphin and harbour porpoise.

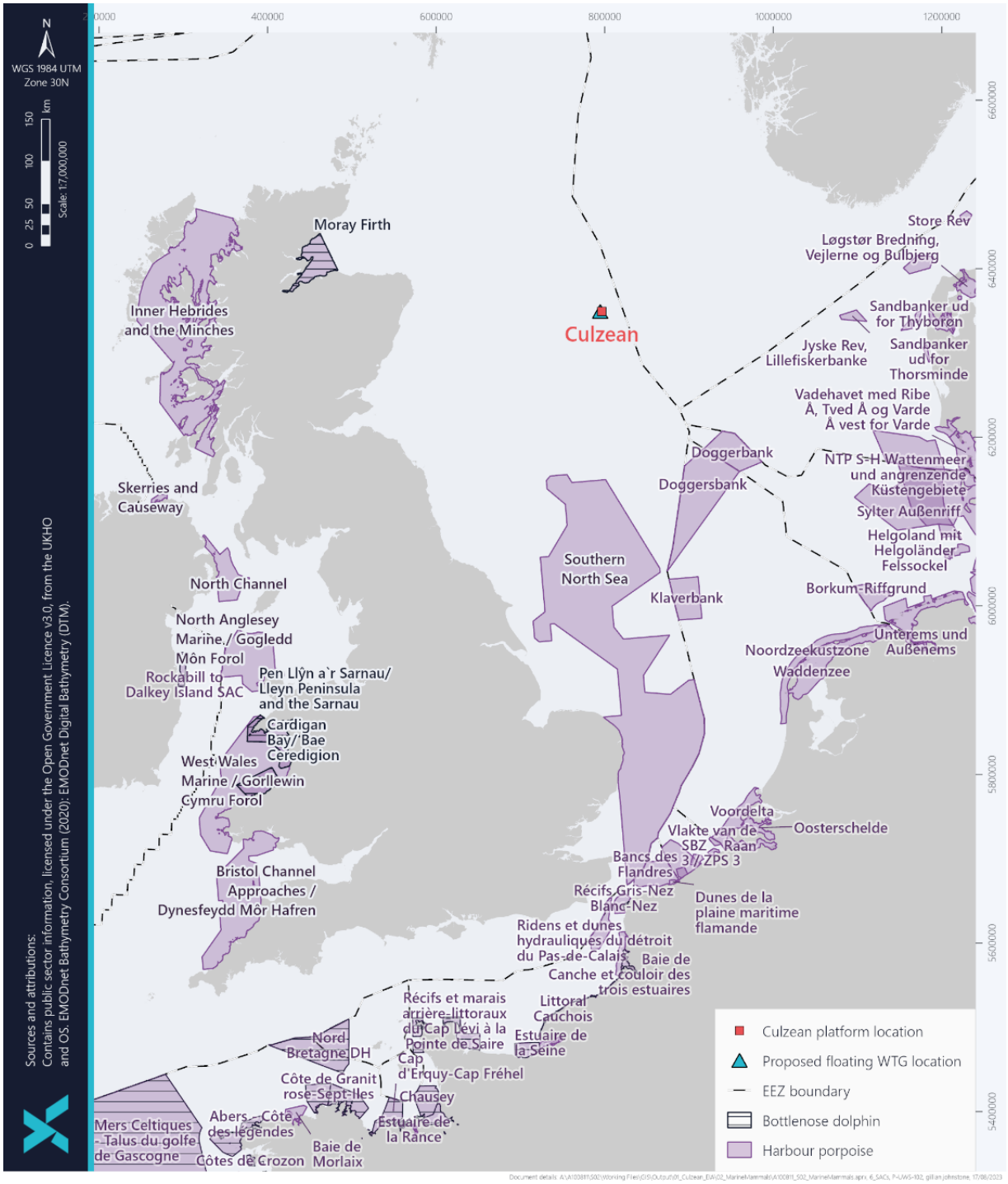

Figure 7-2 SACs with cetaceans as a qualifying feature

7.2.2.1 Harbour porpoise

Harbour porpoises are the most abundant cetacean species in UK waters and are generally observed in small groups of one to three individuals (Reid *et al.*, 2003). They are the most frequently sighted cetacean along the east coast of Scotland where they are present year-round (NMPi, 2023; Reid *et al.*, 2003; Hague *et al.*, 2020). Sightings records peak for this species during the summer months (Evans, 2011). These small cetaceans favour shallow continental shelf waters of approximately 150 m or less and areas with highly sloped topographic features, where prey species, such as (but not limited to) sandeels *Ammodytes marinus*, herring *Clupea harengus* and sprat *Sprattus Sprattus*, may be concentrated (Santos and Pierce, 2003; Booth *et al.*, 2013; Ransijn *et al.*, 2019).

Calving is estimated to take place in Scottish waters between April and June, with a subsequent weaning period of up to 12 months, during which sensitivity to disturbance is expected to be elevated for mothers and calves (Evans, 2011). Within UK waters individuals are concentrated mainly in the Southern North Sea, from the coastline skirting Northumberland down to Norfolk (Hammond *et al.*, 2021). Density estimates for this species decrease further north, with low to very low densities estimated for the north and north-east coasts of Scotland (Hammond *et al.*, 2021). This reflects substantive changes in populations over recent years whereby the core distribution of this species has moved from the northern to the southern North Sea.

Management Unit (MU)

The MU identified for this species is the North Sea (NS) MU with estimated abundance of 346,601 individuals, with 159,632 individuals estimated to occur within the UK portion of this MU (Inter-Agency Marine Mammal Working Group (IAMMWG), 2022)). The results of the recent SCANS IV survey, carried out during 2022, indicate no changing trend in the abundance in the North Sea population and a continuing increase in sightings in the southern part of North Sea (Gilles *et al.*, 2023).

Density Data

Table 7-2 outlines the density estimates for harbour porpoise across the Project Study Area and the surrounding waters.

Table 7-2 Available density estimates for harbour porpoises covering the Project Study Area

DATA SOURCE	AREA	TEMPORAL SCALE	DENSITY (NO. INDIVIDUALS/KM^2)
Gilles *et al.* (2023)	NS-D NS-G	Summer 2022	0.599 1.039
Lacey *et al.*, (2022)	Project Area	Summer 2016	0.77
Waggitt *et al.* (2020)	Project Area	Data collected between 1980 and 2018	Jan: 0.250 Jul: 0.420

Harbour porpoises were sighted in very low numbers during the site-specific APEM surveys (16 observations in total). July was the month where most of the sightings were made, consisting of seven individuals (see EIAR, Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)).

The SCANS-IV survey was undertaken in Summer 2022. Surveys Block NS-D which overlaps the Project Area contained of a total of 1,703.8 km of primary search effort. The most abundant species sighted was harbour porpoise with an estimated abundance of 38,577 individuals in block NS-D (95% CI: 18,017 to 76,361) with an estimated density of 0.599 individuals/km^2 (Gilles *et al.*, 2023). The estimated abundance and density for adjacent to Project Area block NS-G (primary search effort of 1264.7 km) was 51,646 individuals (95% CI: 30,773 to 79,506) and 1.039 individuals/km^2 respectively, being the highest density prediction within the SCANS IV survey area.

Waggitt *et al.* (2020) collated multiyear sighting data to generate annual density and distribution estimates of cetaceans in the North Sea. The density estimates provided in Waggitt *et al.* (2020) show interannual variations of harbour porpoise presence in the North Sea with animal distribution extending further north in the summer (density estimates of 0.379 individuals/km^2, within the Project Area in July and 0.210 individuals/km^2 in January). As noted by the authors, density maps should be used as a general overview of relative densities and broad-scale distribution of a species over years rather than absolute densities or fine scale abundance estimates. Therefore, they are not considered to be suitable density estimates for use in quantitative assessment.

The SCANS-IV density estimates are expected to be the most representative baseline data available on harbour porpoise occurrence within the Project Area. As the abundance and density estimates vary significantly for block NS-D and NS-G, in order to provide most conservative approach data provided for block NS-G have been used.

7.2.2.2 European sites

Of the European sites located within the NS MU, the closest and largest designated European site for Harbour porpoise in UK waters is the Southern North Sea SAC at 197 km from the Project Area (see Figure 7-2). This site includes key winter and summer habitat for this species and was the largest SAC in UK and European waters at the point of designation in 2019. Located to the east of England, this SAC stretches from the CNS (north of Dogger Bank) to the Straits of Dover in the south, covering an area of 36,951 km^2 (Joint Nature Conservation Committee (JNCC), 2021).

Both, the Doggerbank in Germany and the Doggersbank in Netherlands, located respectively 203 and 204 km away from the Project Area, are designated for harbour porpoise and seals. Jyske Rev, Lillefiskerbanke in Denmark is the fourth closest SAC with harbour porpoise as a designated feature (approximately 284 km away from the Project Area).

All other UK and international SACs with harbour porpoise features are located more than 300 km from the Project Area, as detailed below in Table 7-3. For the purpose of considering the potential for LSE on a European site, it is considered there would be no potential for LSE on SACs located over 300 km away due to the scale and size of the Project and that impact would be highly localised around the Project Area.

Table 7-3 Summary of European sites for harbour porpoise within the NS MU

SITE NAME	DISTANCE FROM THE PROJECT AREA (KM)	TAKEN FORWARD FOR FURTHER CONSIDERATION OF POTENTIAL LSE
Southern North Sea	197	Yes
Doggerbank (Germany)	203	Yes
Doggersbank (Netherlands)	204	Yes
Jyske Rev, Lillefiskerbanke	284	Yes
Klaverbank	328	No
Sydlige Nordsø¸	353	No
Thyborøn Stenvolde	357	No
Gule Rev	364	No
Sylter Außenriff	374	No
Sandbanker ud for Thyborøn	374	No
Sandbanker ud for Thorsminde	386	No
Agger Tange, Nissum Bredning, Skibsted Fjord og Agerø¸	393	No
SPA Östliche Deutsche Bucht	397	No
Vadehavet med Ribe Å, Tved Å og Varde Å vest for Varde	420	No
Store Rev	442	No
Borkum-Riffgrund	443	No
NTP S-H Wattenmeer und angrenzende Küstengebiete	450	No
Lønstrup Rødgrund	464	No
Noordzeekustzone	467	No
Løgstør Bredning, Vejlerne og Bulbjerg	468	No
Skagens Gren og Skagerak	484	No
Knudegrund	484	No
Nationalpark Niedersøchsisches Wattenmeer	486	No
Helgoland mit Helgoländer Felssockel	499	No
Steingrund	504	No
Waddenzee	506	No
Unterems und Außenems	531	No

Hamburgisches Wattenmeer	537	No
Unterelbe	566	No
Unterweser	570	No
Voordelta	594	No
Kosterfjorden-Väderöfjorden	603	No
Vlaamse Banken	632	No
Vlakte van de Raan (NL)	633	No
Vlakte van de Raan (BE)	637	No
SBZ 3 / ZPS 3	651	No
SBZ 2 / ZPS 2	653	No
Bancs des Flandres	656	No
SBZ 1 / ZPS 1	667	No
Dunes de la plaine maritime flamande	680	No
Westerschelde & Saeftinghe	684	No
Récifs Gris-Nez Blanc-Nez	702	No
Ridens et dunes hydrauliques du détroit du Pas-de-Calais	713	No
Falaises du Cran aux Oeufs et du Cap Gris-Nez, Dunes du Chatelet, Marais de Tardinghen et Dunes de Wissant	714	No
Baie de Canche et couloir des trois estuaires	749	No
Estuaires et littoral picards (baies de Somme et d'Authie)	770	No
Littoral Cauchois	811	No
Estuaire de la Seine	921	No
Baie de Seine orientale	921	No
Récifs et marais arrière-littoraux du Cap Lèvi à Pointe de Saire	939	No
Baie de Seine occidentale	940	No
Récifs et landes de la Hague	982	No

7.2.2.3 Bottlenose dolphin

Bottlenose dolphins are one of the most cosmopolitan delphinid species in the world, occupying inshore and offshore waters across a large range of temperate and tropical latitudes. Two ecotypes characterise global bottlenose dolphin populations: (1) a larger, more gregarious offshore ecotype which is wide-ranging and occurs in both open-ocean waters and along continental shelf edges; and (2) a coastal ecotype which predominantly forms small groups as subsets of a larger, residential population occupying bays, inlets, and estuaries (Louis *et al.*, 2014).

In Scotland, coastal bottlenose dolphins appear to have a wide but patchy distribution, with three distinct populations separated across the east and west coasts (Cheney *et al.*, 2013). The main bottlenose dolphin population on the east coast of Scotland resides between the Moray Firth and Fife (Cheney *et al.*, 2013). These bottlenose dolphins are highly mobile and do move offshore in smaller numbers (Cheney *et al.*, 2013; NMPi, 2023) It should be noted that even though this species is highly mobile, it is unlikely that they will occur as far offshore as the Project Area. The north

coast of Scotland is the most northerly known extent of the coastal bottlenose dolphin ecotype in the Atlantic coasts of Western Europe. Bottlenose dolphins encountered further north and off the shelf edge, are likely to be the offshore ecotype (Cheney *et al.*, 2013; Hague *et al.*, 2020).

Bottlenose dolphins breed throughout the year in UK waters (Anderwald *et al.*, 2010), and appear to be generalist predators. Historical data suggests a peak in summer occupancy within the shallow inner Moray Firth by resident individuals of the Celtic and Greater North Seas MU (CES MU) (Wilson *et al.*, 1997). This is likely a reflection of seasonal changes in prey availability and not due to reproductive behaviour (Wilson *et al.*, 1997; Thompson *et al.*, 2011).

Management Unit

There are seven bottlenose dolphin MUs within UK waters. The Project Area falls within the boundaries of Greater North Sea MU for this species, with abundance estimated at 2,022 individuals (95% CI: 548 to 7453), (UK portion: 1,885 individuals).

Density Data

Table 7-4 outlines the density estimates for bottlenose dolphin across the Project Area and the surrounding waters.

Table 7-4 Available density estimates for bottlenose dolphin within the Project Study Area

DATA SOURCE	AREA	TEMPORAL SCALE	DENSITY (NO. INDIVS/KM^2)
Hammond *et al.* (2021)	Block R /Block Q	Summer 2016	0.030 / No data
Lacey *et al.*, (2022)	Project Area	Summer 2016	0.000-0.001
Waggitt *et al.* (2020)	Project Area	Data collected between 1980 and 2018	Jan: 0.001 / Jul: 0.001

Throughout the 12-month survey period unknown porpoise / dolphin individuals were observed on two occasions in October during the APEM surveys (see EIAR, Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)).

Data gathered during SCANS IV surveys did not allow for a calculation of reliable abundance and density estimates for bottlenose dolphins in survey blocks in the north part of the Northern Sea, thus available data from SCANS III survey were used to inform this HRA Report. Block R covering Project Area comprised a total of 2,178.7 km of primary search effort. Bottlenose dolphin abundance was estimated as 1,924 individuals (95% CI: 0 to 5,048) with an estimated density of 0.0298 individuals/km^2. No estimates were given for adjacent block Q (Hammond *et al.*, 2021).

Density estimates provided by Waggitt *et al.* (2020) should be used as a general overview of relative densities and broad-scale distribution of a species over years rather than absolute densities or fine scale abundance estimates. Therefore, they are not considered to be suitable density estimates for use in the assessment.

The SCANS-III density estimates are expected to be most representative baseline data on bottlenose dolphin occurrence within the Project Area and have, therefore, been considered in the assessment.

7.2.2.4 European sites

There are no European sites which overlap the Greater North Sea MU, where the Project is located. The closest European site with bottlenose dolphin as a qualifying feature is the Moray Firth SAC which is located 315 km from the Project Area, within the Coastal East Scotland MU (see Figure 7-2). As such, in line with the scale and size of the Project, and the very small densities of bottlenose dolphin anticipated within the Project Area, and the uncertain sightings of only two porpoise/dolphins during the APEM surveys, it is considered there is no potential for LSE on any European site with bottlenose dolphin as a qualifying feature and therefore, this feature is not considered further. This conclusion was agreed with NatureScot during consultation (see Section 4.2).

7.2.3 Otter

European otter have been screened out for further assessment as there is considered to be no potential for LSE on this species resulting from the Project works as the Project has no onshore or intertidal aspects.

7.3 Potential pathways for LSE

The potential pathways for adverse effects on marine mammal qualifying features of European sites with potential connectivity with the Project have been identified, in line with those agreed during scoping with key consultees. The only impact pathway screened into the assessment is for during the construction stage of the Project is:

- Noise-related impacts to marine mammals associated with construction noise including the risk of injury and disturbance / displacement.

Since submission of the EIA Scoping Report, the requirement for pin-piling has been removed from the PDE. Given this, the only impact pathways related to underwater noise are those from vessels and cable installation activities.

Additionally, there are no further planned geophysical surveys or UXO clearance activities anticipated for the Project. As such these impacts are not considered within this assessment. If this requirement changes for the Project, these activities would be subject to a separate marine licence for which a separate EPS licence would also be applied for.

7.4 Determination of no potential LSE

Given the above information only European sites designated for harbour porpoise have been considered for the determination of whether there is potential for LSE. European Sites designated for bottlenose dolphin, grey seal, harbour seal and otter were excluded from consideration, as detailed in Section 7.2.

Table 7-5 below presents the screening assessment for SACs with harbour porpoise features within 300 km of the Project Area and provides a justification as to whether no potential LSE can be concluded, and therefore if the site can be screened out for further assessment. As shown below it was concluded there was no potential for LSE on any SAC assessed. As such, no further assessment is required, this has been agreed with NatureScot during consultation (see Section 4.2).

Table 7-5 Determination of LSE for European sites designated for harbour porpoise features

SAC	DISTANCE TO PROJECT AREA (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Southern North Sea	197	Noise-related impacts to marine mammals associated with construction noise including the risk of injury and disturbance / displacement	No	Given the significant distance of this SAC to the Project Area (197 km) and small density of individuals identified within the Project Area (0.5 -1 individual per km^2 (Gilles *et al.* 2023)) and the small number of individuals observed during APEM surveys (EIAR; Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)), the Project is unlikely to constitute an important area or foraging ground for harbour porpoise using this SAC. Harbour porpoise are wide ranging and forage over very large areas. Given the scale of the Project, and that piling is no longer proposed for installation of the anchors, and construction works will be undertaken over a short duration, effects from underwater noise are also expected to be localised and are unlikely to hinder the harbour porpoise feature of this SAC. Therefore, there is no potential for LSE. This conclusion was agreed with NatureScot during consultation (see Section 4.2).
Doggerbank (Germany)	203	Noise-related impacts to marine mammals associated with construction noise including the risk of injury and disturbance / displacement	No	Given the significant distance of this SAC to the Project Area (203 km) and small density of individuals identified within the Project Area (0.5 -1 individual per km^2 (Gilles *et al.* 2023)) and the small number of individuals observed during APEM surveys (EIAR; Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)), the Project is unlikely to constitute an important area or foraging ground for harbour porpoise using this SAC. Harbour porpoise are wide ranging and forage over very large areas. Given the scale of the Project, and that piling is no longer proposed for installation of the anchors, and construction works will be undertaken over a short duration, effects from underwater noise are also expected to be localised and are unlikely to hinder the harbour porpoise feature of this SAC. Therefore, there is no potential for LSE. This conclusion was agreed with NatureScot during consultation (see Section 4.2).

SAC	DISTANCE TO PROJECT AREA (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Doggersbank (Netherlands)	204	Noise-related impacts to marine mammals associated with construction noise including the risk of injury and disturbance / displacement	No	Given the significant distance of this SAC to the Project Area (204 km) and small density of individuals identified within the Project Area (0.5 -1 individual per km^2 (Gilles *et al.* 2023)) and the small number of individuals observed during APEM surveys (EIAR; Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)), the Project is unlikely to constitute an important area or foraging ground for harbour porpoise using this SAC. Harbour porpoise are wide ranging and forage over very large areas. Given the scale of the Project, and that piling is no longer proposed for installation of the anchors, and construction works will be undertaken over a short duration, effects from underwater noise are also expected to be localised and are unlikely to hinder the harbour porpoise feature of this SAC. Therefore, there is no potential for LSE. This conclusion was agreed with NatureScot during consultation (see Section 4.2).
Jyske Rev, Lillefiskerbanke	284	Noise-related impacts to marine mammals associated with construction noise including the risk of injury and disturbance / displacement	No	Given the significant distance of this SAC to the Project Area (284 km) and small density of individuals identified within the Project Area (0.5 -1 individual per km^2 (Gilles *et al.* 2023) and the small number of individuals observed during APEM surveys (EIAR; Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)), the Project is unlikely to constitute an important area or foraging ground for harbour porpoise using this SAC. Harbour porpoise are wide ranging and forage over very large areas. Given the scale of the Project, and that piling is no longer proposed for installation of the anchors, and construction works will be undertaken over a short duration, effects from underwater noise are also expected to be localised and are unlikely to hinder the harbour porpoise feature of this SAC. Therefore, there is no potential for LSE. This conclusion was agreed with NatureScot during consultation (see Section 4.2).

8 EUROPEAN SITES DESIGNATED FOR ORNITHOLOGICAL FEATURES

8.1 Initial screening criteria

As per the HRA Screening process detailed in Section 4, this Section provides the HRA Screening assessment in order to identify European sites (SPAs) or Ramsar sites with relevant ornithological features to be taken forward to the RIAA (see Section 9 of this HRA Report), in order to aid the AA (Stage 2 of the HRA Process).

The initial screening criteria utilised to identify European sites with relevant ornithological features considered in the screening assessment are outlined below:

- European sites (SPAs) or Ramsar sites designated for ornithology features that overlaps with the Project Area;
- European sites (SPAs) or Ramsar sites designated for breeding seabird features with theoretic connectivity to the Project Area based on breeding foraging ranges as per NatureScot Guidance Note 3 (NatureScot, 2023a); and
- European sites (SPAs) or Ramsar sites designated for breeding seabird features with connectivity to the Project Area during the non-breeding season as per NatureScot Guidance Note 4 (NatureScot, 2023c).

The APEM 12 month DAS findings have also been used to rationalise the SPAs and Ramsar site qualifying features considered within this Screening assessment. Full details of the DAS are provided in the EIAR; Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024).

8.2 Survey findings

8.2.1 APEM Digital Aerial Surveys

Over a one-year period, between September 2022 and September 2023, a number of digital aerial surveys of the Project Area were undertaken by APEM Ltd.

As part of this survey campaign, high-resolution digital still images were captured across the survey area and raw counts of seabirds and marine mammals were collected. In total, 1002 birds counted across the 12 month survey period. Nonetheless, most sightings occurred between September 2022 to February 2023. A total of 882 birds were record within the survey area during this period, with peak counts recorded during the months of October and November, 74 were also sighted between March and July and 46 between August and September.

A summary of bird utilisation during the 12 month surveys is provided below in Table 8-1 (breeding season) and for Table 8-2 (non-breeding season).

Full information on the survey methodology and details of the findings are provided within the EIAR (Appendix F: Ornithological and Marine Mammal Baseline Characterisation (2024)), submitted alongside the Application.

Table 8-1 Baseline utilisation of the Project Area during the seabird breeding season based on the results DAS survey. Estimates of density and abundance within the 2 km buffer around the WTG are derived from the numbers of birds recorded in flight and sitting on the sea in the wider Culzean Survey Area. Abundance values are rounded to nearest integer value.

SPECIES	TOTAL COUNTS	ESTIMATED PEAK DENSITY (Birds/km^2)	ESTIMATED PEAK ABUNDANCE WITHIN 2 KM BUFFER (No. birds)	ESTIMATED AVERAGE DENSITY (Birds/km^2)	ESTIMATED AVERAGE ABUNDANCE WITHIN 2 KM BUFFER (No. birds)	ESTIMATED ABUNDANCE/ DENSITY CATEGORY*
Fulmar (*Fulmarus glacialis*)	29	1.29	16	0.31	4	Low
Gannet (*Morus bassanus*)	3	0.13	2	0.03	<1	Negligible
Kittiwake (*Rissa tridactyla*)	10	0.25	3	0.13	2	Low
Great-black backed gull (*Larus marinus*)	5	0.19	2	0.06	<1	Very Low
Herring gull (*Larus argentatus*)			*Not Recorded*			Negligible
Common Gull (*Larus canus*)	2	0.13	2	0.03	<1	Negligible
Common guillemot (*Uria aalge*)	32	1.26	16	0.62	8	Moderate
Razorbill (*Alca torda*)	1	0.07	1	0.02	<1	Negligible
Puffin (*Fratercula arctica*)			*Not Recorded*			Negligible
'Commic'[5] Tern (*Sterna hirunda / Sterna paradisaea*)	1	0.06	1	0.012	<1	Negligible
Unidentified shearwater			*Not Recorded*			Negligible

Average density across breeding season:
***Negligible** =Not Recorded-<0.05/km^2; **Very Low** = 0.05-0.1/km^2; **Low** = 0.1 -0.5/km^2; **Moderate** = 0.5-5/km^2; **High** = >5/km2*

[5] *'Commic' refers to common and / or Arctic tern*

Table 8-2 Baseline utilisation of the Project Area during the seabird non-breeding season based on the results DAS survey. Estimates of density and abundance within the 2 km buffer around the WTG are derived from the numbers of birds recorded in flight and sitting on the sea in the wider Culzean Survey Area. Abundance values are rounded to nearest integer value.

SPECIES	TOTAL COUNTS	ESTIMATED PEAK DENSITY (Birds/km^2)	ESTIMATED PEAK ABUNDANCE WITHIN 2 KM BUFFER (No. birds)	ESTIMATED AVERAGE DENSITY (Birds/km^2)	ESTIMATED AVERAGE ABUNDANCE WITHIN 2 KM BUFFER (No. birds)	ESTIMATED ABUNDANCE/ DENSITY CATEGORY*
Fulmar	15	0.31	4	0.14	2	Low
Gannet			*Not Recorded*			Negligible
Kittiwake	2	0.13	2	0.02	<1	Negligible
Great black-backed gull	13	0.19	2	0.11	1	Low
Herring gull	6	0.19	2	0.05	1	Very Low
Common Gull			*Not Recorded*			Negligible
Common Guillemot	798	21.7	273	5.96	75	High
Razorbill	39	1.11	14	0.25	3	Low
Puffin	2	0.15	2	0.02	<1	Negligible
'Commic' Tern			*Not Recorded*			Negligible
Unidentified shearwater	1	0.07	1	0.012	<1	Negligible

***Negligible** =Not Recorded- <0.05/km^2; **Very Low** = 0.05-0.1/km^2; **Low** = 0.1 -0.5/km^2; **Moderate** = 0.5-5/km^2; **High** = >5/km2*

8.2.2 Culzean Platform Survey

Xodus undertook a bird census on the Culzean Platforms for three days in July 2023 (18 – 20 July 2023) in order to identify which bird species utilise the asset. The purpose of the survey was to locate potential nest sites or bird hotspots (areas of increased bird activity – identified by large amounts of guano, food remains and or roosting sites).

Each accessible deck was systematically studied over the three days. No nesting birds or potential nest locations were observed during the walkaround surveys conducted on the Culzean Platforms.

A resident flock of great black-backed gull were identified as utilising the Culzean Platforms. Nonetheless, no evidence was found of nesting great black-backed gull on the platforms during the surveys.

No other species of bird were recorded on the Platforms during the survey period. One passerine was noted but not identified due to distance. Given the timing of the survey, it is not expected that migrant birds would be present on the platforms during the survey period.

Full details of the survey is provided within the EIAR; Appendix G: Culzean Topsides Ornithology (Nesting Bird) Surveys (2023), submitted alongside the Application.

8.3 Theoretical connectivity

8.3.1 Breeding season

In order to determine theoretical connectivity of the Project to European sites (SPAs) or Ramsar sites designated for breeding seabird species, recommended breeding foraging ranges have been used as per NatureScot Guidance Note 3: Guidance to support Offshore Wind applications: Marine Birds - Identifying theoretical connectivity with breeding site Special Protection Areas using breeding season foraging ranges (NatureScot, 2023a). These foraging ranges are derived from Woodward *et al* (2019) and indicate which metrics are advised, and have been used, for determining connectivity.

Table 8-3 Seabird species identified during APEM DAS and breeding foraging ranges for seabirds based of NatureScot (2023a) Guidance.

SPECIES	FORAGING RANGE (KM)	METRIC
Kittiwake	300.6	MM+SD
Common Gull	50	Max/MM
Great black-backed gull	73	Max/MM
Herring gull	85.6	MM+SD
Commic Tern	26.9 (Common tern) 40.5 (Arctic tern)	MM+SD
Guillemot*	153.7	MM+SD
Razorbill*	164.6	MM+SD
Puffin	265.4	MM+SD
Fulmar	1200.2	MM+SD
Gannet*	590 (Forth Islands SPA) 516.7 (Grassholm SPA) 709 (St Kilda SPA)	Max
Manx Shearwater	2365.5	MM+SD

8.3.2 Non-breeding season

As per NatureScot (2023c) Guidance Note 4, for all non-breeding seabird qualifying features of marine SPAs, impact pathways need to be considered within 15 km of the marine SPA.

For the majority of breeding seabirds from SPAs during the non-breeding season, to determine which colony SPAs have connectivity to the Project Area, Furness (2015) Non-breeding season populations of seabirds in UK waters: Population sizes for Biologically Defined Minimum Population Scales (BDMPS), is used to ascertain connectivity.

For guillemot and razorbill, as per NatureScot advice (see Section 4.2), NatureScot recommend the use of breeding season populations within foraging range (as per NatureScot Guidance Note 3), rather than BDMPS populations, as they tend to stay in vicinity of Scottish breeding colonies.

8.4 Potential pathways for LSE

The potential pathways for adverse effects on ornithology qualifying features of European sites (SPAs) or Ramsar sites with potential connectivity with the Project have been identified, in line with those agreed during scoping with key consultees. They are as follows:

- Collision risk from WTG rotors to flying birds leading to bird mortality; and
- Vessel activity, construction noise, lighting and the presence of the WTG leading to disturbance seabirds and or their displacement of from foraging habitat.

It should be noted that displacement and disturbance impacts were initially scoped out of the EIA and HRA, nonetheless, through consultation with NatureScot (see Section 4.2) this impact has been retained for assessment.

8.5 Determination of no potential LSE

Given the above information, an initial screening assessment of potential receptors, and by proxy SPAs or Ramsar sites with these qualifying features, has been undertaken in the following Sections.

As there were no herring gull, puffin or shearwater species identified during the breeding season in either the APEM surveys or the Xodus Culzean Platform Surveys, in agreement with NatureScot (see Section 4.2), these features have not been considered further within the HRA Screening assessment presented herein.

8.5.1 European sites with kittiwake qualifying features

Kittiwake were identified in low densities (Peak density: 0.25 birds/km^2; Average density 0.13 birds/km^2) within the breeding season during the APEM surveys. The foraging range for kittiwake during the breeding season is 300.6 km (MM + SD) (NatureScot, 2023a). SPAs with kittiwake qualifying feature within this foraging range, and therefore with theoretical connectivity to the Project, are shown in Table 8-4.

European sites (SPAs) or Ramsar sites within breeding foraging range have been screened for potential LSE, a justification is provided as to whether no potential for LSE can be concluded for the impact pathways considered, and therefore whether further assessment is required as per Stage 2 of the HRA process.

In line with NatureScot advice (see Section 4.2), no assessment is required for non-breeding season impacts on kittiwake due to negligible densities recorded during the breeding season (average density 0.02 birds/km^2) during the non-breeding season.

Table 8-4 Assessment of no potential LSE for European Sites with kittiwake as a qualifying feature

SPA[6]	DISTANCE TO PROJECT (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Buchan Ness to Collieston Coast SPA	223	Collision Risk	Yes	Although densities of kittiwake during the breeding season are low for the Project Area, as shown through site surveys, populations of kittiwake have been declining in SPA colonies (JNCC, 2023) and may be under pressure from in-combination impacts from offshore windfarms. This concern was raised by NatureScot during consultation (see Section 4.2) and as such, further assessment of breeding season impacts (collision risk and displacement) is required in order to ascertain potential effects on these SPA colonies. As such, it is not possible to conclude no potential for LSE and SPAs designated for kittiwake with theoretical connectivity to the Project have been screened in for further assessment (see Section 9).
		Disturbance and Displacement	Yes	
Fowlsheugh SPA	249	Collision Risk	Yes	
		Disturbance and Displacement	Yes	
Troup, Pennan and Lion's Heads SPA	254	Collision Risk	Yes	
		Disturbance and Displacement	Yes	
St Abb's Head to Fast Castle SPA	285	Collision Risk	Yes	
		Disturbance and Displacement	Yes	
Forth Islands SPA	294	Collision Risk	Yes	
		Disturbance and Displacement	Yes	

8.5.2 European sites with gull qualifying features

Common gull and great black-backed gull were identified in negligible to very low densities (CG average density 0.03 birds/km^2; GBBG average density 0.06 birds/km^2) within the breeding season during the APEM surveys. Great black-backed gulls were also identified as utilising the Culzean platforms during the Culzean Platform Surveys in July 2023, although no nesting was established. The breeding foraging range for gulls identified in the Project Area range are 50 km (Max/MM) for common gull and 73 km (Max/MM) for great black-backed gull.

There are no European sites (SPAs or Ramsar Sites) designated for great black-backed gulls or common gulls located within foraging range during the breeding season. The nearest European site for these features is the Outer Firth of Forth and St Andrews Bay Complex SPA, designated for common gull (breeding), located 245 km southwest of the Project. Given this, due to the low densities observed and no theoretical connectivity to the Project Area, it is concluded that there is no potential for LSE for any European sites designated for gulls and as such SPAs designated for these species are screened out for further assessment. This was agreed in consultation with NatureScot (see Section 4.2).

[6] *No Ramsar sites for kittiwake features identified.*

Additionally, in line with NatureScot advice (see Section 4.2), no assessment is required for non-breeding season impacts on gulls due to the very low to low densities of both herring (0.05 birds/km^2) and great black backed gull (0.11 birds/km^2) recorded during this period, with common gull not recorded during the non-breeding season.

8.5.3 European sites with 'commic' tern qualifying features

A 'Commic' tern i.e., common and/or Arctic tern, was spotted on a single occasion within the breeding season during the APEM surveys. The breeding foraging range for tern identified in the Project Area 26.9 km and 40.5 km (MM+SD) for common and Arctic tern, respectively.

There are no European sites (SPAs) or Ramsar sites designated for tern located within foraging range during the breeding season. The nearest European site for these features is the Ythan Estuary, Sands of Forvie and Meikle Loch SPA designated for common tern (breeding) located 230 km northwest of the Project. Given this, there is no theoretical connectivity to the Project Area and it is concluded there is no potential for LSE for any European sites designated for common or Arctic tern. As such, SPAs designated for these species have been screened out for further assessment. This was agreed in consultation with NatureScot (see Section 4.2).

Additionally, in line with NatureScot advice (see Section 4.2), no assessment is required for non-breeding season impacts on terns, as no terns were sighted in the non-breeding season during the surveys.

8.5.4 European sites with guillemot qualifying features

Guillemot were identified in moderate densities (average density 0.62 birds/km^2) within the breeding season during the APEM surveys. The breeding foraging range for guillemot during the breeding season is 153.7 km (MM+SD) (NatureScot, 2023a). This metric is also applied for the non-breeding season as per Section 8.3.2.

There are no European sites (SPAs) or Ramsar sites designated for guillemot located within breeding foraging range. The nearest European site for these features is the Buchan Ness to Collieston Coast SPA located 223 km northwest of the Project. Given this, there is no theoretical connectivity to the Project Area and it is concluded there is no potential for LSE for any European sites designated for guillemot. As such, SPAs designated for this species have been screened out for further assessment. This was agreed in consultation with NatureScot (see Section 4.2).

Nonetheless, it should be noted that guillemot were sighted in high densities (5.96 birds/km2) during the non-breeding season, with a total of 798 birds sighted. As such, and in agreement with NatureScot, a basic assessment of potential impacts on guillemot during the non-breeding season has been undertaken within Chapter 11: Ornithology, of the EIAR.

8.5.5 European sites with razorbill qualifying features

Only a single sighting of razorbill was recorded within the breeding season during the APEM surveys. The foraging range for razorbill during the breeding season is 164.6 km (MM+SD) (NatureScot, 2023a). This metric is also applied for the non-breeding season as per Section 8.3.2.

There are no European sites (SPAs) or Ramsar sites designated for razorbill located within breeding foraging range. The nearest European site for these features is the Fowlsheugh SPA located 249 km west of the Project.

Given the above, there is no theoretical connectivity to the Project Area it is concluded there is no potential for LSE for any European sites designated for razorbill. As such, SPAs designated for this species have been screened out for further assessment. This was agreed in consultation with NatureScot (see Section 4.2).

Nonetheless, it should be noted that similar to guillemot, razorbill were sighted in slightly elevated densities during the non-breeding season (39 birds sighted), as such and in agreement with NatureScot, a basic assessment of potential impacts on razorbill during the non-breeding season has been undertaken within Chapter 11: Ornithology, of the EIAR.

8.5.6 European sites with fulmar qualifying features

Fulmar were identified in low densities (average density of 0.31 birds/km^2) within the breeding season during the APEM surveys. The foraging range for fulmar during the breeding season is 1200.2 km (MM+SD) (NatureScot, 2023a).

European sites (SPAs) or Ramsar sites with fulmar as a qualifying feature within this breeding foraging range, and therefore with theoretical connectivity to the Project, are shown in Table 8-5. The European sites have been screened for potential LSE, a justification is provided as to whether no potential for LSE can be concluded for the impact pathways considered, and therefore whether further assessment is required as per Stage 2 of the HRA process.

In line with NatureScot advice (see Section 4.2), no assessment is required for non-breeding season impacts on fulmar due to the low densities (0.14 birds/ km^2) recorded during the non-breeding season and lack of valid impact pathways for this species (as discussed in Table 8-5 below).

Table 8-5 Assessment of no potential LSE for SPAs with fulmar as a qualifying feature within breeding foraging range of the Project Area

SPA[7]	DISTANCE TO PROJECT (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Buchan Ness to Collieston Coast SPA	223	Collision Risk	No	Fulmars are generally considered to be at low risk of collision as they spend limited time at collision risk height (Garthe and Hüppop, 2004, Cook *et al.*, 2012, Fijn *et al.*, 2012, Krijgsveld, 2014, Leopold *et al.*, 2014, Harwood *et al.*, 2018). Due to this, and in conjunction with the Project containing only a single turbine, and commitments to maintaining at least a 22 m air gap, it is considered that there is no potential for LSE for fulmar with respect to collision risk. In terms of disturbance and displacement impacts e.g. from vessel or infrastructure presence, the foraging range during the breeding season for this species is large (1200 km), and given the scale of the development, only utilising a single turbine and the very short construction timelines, it is not expected that the Project vessels or infrastructure would impact their foraging behaviours. As such, there is no valid pathway for which could result in potential LSE for any European site designated for fulmar and as such these sites have been screened out for further assessment. These conclusions were also agreed with NatureScot during consultation (see Section 4.2).
		Disturbance and Displacement	No	
Fowlsheugh SPA	249	Collision Risk	No	
		Disturbance and Displacement	No	
Troup, Pennan and Lion's Heads SPA	254	Collision Risk	No	
		Disturbance and Displacement	No	
Forth Islands SPA	294	Collision Risk	No	
		Disturbance and Displacement	No	
Copinsay SPA	329	Collision Risk	No	
		Disturbance and Displacement	No	
Fair Isle SPA	331	Collision Risk	No	
		Disturbance and Displacement	No	
East Caithness Cliffs SPA	333	Collision Risk	No	
		Disturbance and Displacement	No	
Sumburgh Head SPA	348	Collision Risk	No	

[7] *No Ramsar sites for Fulmar features identified*

SPA[7]	DISTANCE TO PROJECT (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
		Disturbance and Displacement	No	
North Caithness Cliffs SPA	352	Collision Risk	No	
		Disturbance and Displacement	No	
Hoy SPA	358	Collision Risk	No	
		Disturbance and Displacement	No	
Calf of Eday SPA	360	Collision Risk	No	
		Disturbance and Displacement	No	
Rousay SPA	366	Collision Risk	No	
		Disturbance and Displacement	No	
Noss SPA	368	Collision Risk	No	
		Disturbance and Displacement	No	
West Westray SPA	369	Collision Risk	No	
		Disturbance and Displacement	No	
Foula SPA	400	Collision Risk	No	
		Disturbance and Displacement	No	
Cape Wrath SPA	430	Collision Risk	No	
		Disturbance and Displacement	No	
Hermaness, Saxa Vord and Valla Field SPA	434	Collision Risk	No	
		Disturbance and Displacement	No	

SPA[7]	DISTANCE TO PROJECT (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Handa SPA	483	Collision Risk	No	
		Disturbance and Displacement	No	
North Rona and Sula Sgeir SPA	500	Collision Risk	No	
		Disturbance and Displacement	No	
Shiant Isles SPA	564	Collision Risk	No	
		Disturbance and Displacement	No	
St Kilda SPA	673	Collision Risk	No	
		Disturbance and Displacement	No	
Mingulay and Berneray SPA	708	Collision Risk	No	
		Disturbance and Displacement	No	
Rathlin Island SPA	873	Collision Risk	No	
		Disturbance and Displacement	No	

8.5.7 European sites with gannet qualifying features

Gannet were identified in negligible densities (average density of 0.03 birds/km^2) within the breeding season during the APEM surveys. The recommended foraging range in the breeding season for gannet is generally 509.4 km (MM+SD), nonetheless, exceptions to this foraging range are applied for three SPAs where the maximum metric is recommended: Forth Islands (590 km), Grassholm SPA (516.7 km) and St Kilda (709 km) (NatureScot, 2023a).

European sites (SPAs) or Ramsar sites with gannet as a qualifying feature within these recommended breeding foraging ranges, and therefore with theoretical connectivity to the Project, are shown in Table 8-6. These European sites have been screened for potential LSE, a justification is provided as to whether no potential for LSE can be concluded for the impact pathways considered, and therefore whether further assessment is required as per Stage 2 of the HRA process.

Additionally, in line with NatureScot advice (see Section 4.2), no assessment is required for non-breeding season impacts on gannet as they were not recorded during the non-breeding season surveys.

8.5.8 Summary of European sites taken forward for further assessment

As per the above HRA Screening assessments, the following European sites (SPAs) designated for kittiwake have been taken forward for further assessment (see Section 9 below) of collision risk and disturbance and displacement effects within the breeding season, as potential LSE could not be ruled out during Screening:

- Buchan Ness to Collieston Coast SPA;
- Fowlsheugh SPA;
- Troup, Pennan and Lion's Heads SPA;
- St Abb's Head to Fast Castle SPA;
- Forth Islands SPA;
- Copinsay SPA;
- East Caithness Cliffs SPA;
- Flamborough and Filey Coast SPA; and
- Marwick Head SPA.

Table 8-6 Assessment of no potential LSE for SPAs with gannet as a qualifying feature within breeding foraging range of the Project Area

SPA[8]	DISTANCE TO PROJECT (KM)	IMPACT PATHWAY	POTENTIAL FOR LSE	JUSTIFICATION
Outer Firth of Forth and St Andrews Bay Complex SPA	245	Collision Risk	No	Densities for gannet within the Project Area are assigned as negligible. Therefore, although they are sensitive to collision risk (Lane *et al*, 2020), there is a very low risk of mortality, particularly with regard to a single turbine with an air gap of at least 22m. In terms of disturbance and displacement impacts e.g. from vessel or infrastructure presence, the foraging range during the breeding season for this species is large, and given the scale of the development, and the very short construction timelines, it is not expected that the Project vessels or infrastructure would impact their foraging behaviours. Given the densities for this species within the Project Area, there is no valid pathway to result in potential LSE for any European site designated for gannet and as such these SPAs have been screened out for further assessment. These conclusions were also agreed with NatureScot during consultation (see Section 4.2).
		Disturbance and Displacement	No	
Forth Islands SPA	294	Collision Risk	No	
		Disturbance and Displacement	No	
Fair Isle SPA	331	Collision Risk	No	
		Disturbance and Displacement	No	
Flamborough and Filey Coast SPA	364	Collision Risk	No	
		Disturbance and Displacement	No	
Noss SPA	368	Collision Risk	No	
		Disturbance and Displacement	No	
Sule Skerry and Sule Stack SPA	425	Collision Risk	No	
		Disturbance and Displacement	No	
Hermaness, Saxa Vord and Valla Field SPA	434	Collision Risk	No	
		Disturbance and Displacement	No	
North Rona and Sula Sgeir SPA	500	Collision Risk	No	
		Disturbance and Displacement	No	
St Kilda SPA	673	Collision Risk	No	
		Disturbance and Displacement	No	

[8] *No Ramsar sites with gannet features identified.*

8.5.9 Summary of European sites taken forward for further assessment

As per the above HRA Screening assessments, the following European sites (SPAs) designated for kittiwake have been taken forward for further assessment (see Section 9 below) of collision risk and disturbance and displacement effects within the breeding season, as potential LSE could not be ruled out during Screening:

- Buchan Ness to Collieston Coast SPA;
- Fowlsheugh SPA;
- Troup, Pennan and Lion's Heads SPA;
- St Abb's Head to Fast Castle SPA;
- Forth Islands SPA;
- Copinsay SPA;
- East Caithness Cliffs SPA;
- Flamborough and Filey Coast SPA; and
- Marwick Head SPA.

9 REPORT TO INFORM APPROPRIATE ASSESSMENT (RIAA)

9.1 Introduction

This Section of the HRA Report provides further assessment to inform Stage 2 of the HRA process, whereby no potential for LSE could be concluded for European sites considered during HRA Screening (Stage 1).

The approach to provide the RIAA assessment along with the HRA Screening has been agreed during consultation with MD-LOT and NatureScot, as detailed in Section 4.2.

9.2 European sites screened out of further assessment

In line with the HRA Screening assessments presented in Sections 5, 6, 7 and 8 of this HRA Report, and in agreement with NatureScot (see Section 4.2), the following receptors and associated European sites have been screened out of further assessment as no potential for LSE was concluded:

- All European sites designated for Annex I Habitats (as detailed in Section 5);
- All European sites designated for Diadromous Fish Features (as detailed in Section 6);
- All European sites designated for Marine Mammal Features (as detailed in Section 7)
- European sites designated for Ornithology Features for the following species (as detailed in Section 8):
  - Common gull;
  - Great black-backed gull;
  - Herring gull;
  - 'Commic' tern;
  - Common guillemot;
  - Razorbill;
  - Puffin;
  - Fulmar;
  - Gannet; and
  - Shearwaters.

9.3 European sites screened in for further assessment

In line with the HRA Screening assessment presented in Section 8 of this HRA Report, and in agreement with NatureScot, the following European sites (as shown in Figure 9-1) have been screened in for further assessment as no potential LSE could not be concluded:

- European sites designated for Kittiwake with theoretical connectivity to the Project Area:
  - Buchan Ness to Collieston Coast SPA;
  - Fowlsheugh SPA;
  - Troup, Pennan and Lion's Heads SPA;
  - St Abb's Head to Fast Castle SPA;
  - Forth Islands SPA;
  - Copinsay SPA;
  - East Caithness Cliffs SPA;
  - Flamborough and Filey Coast SPA; and
  - Marwick Head SPA

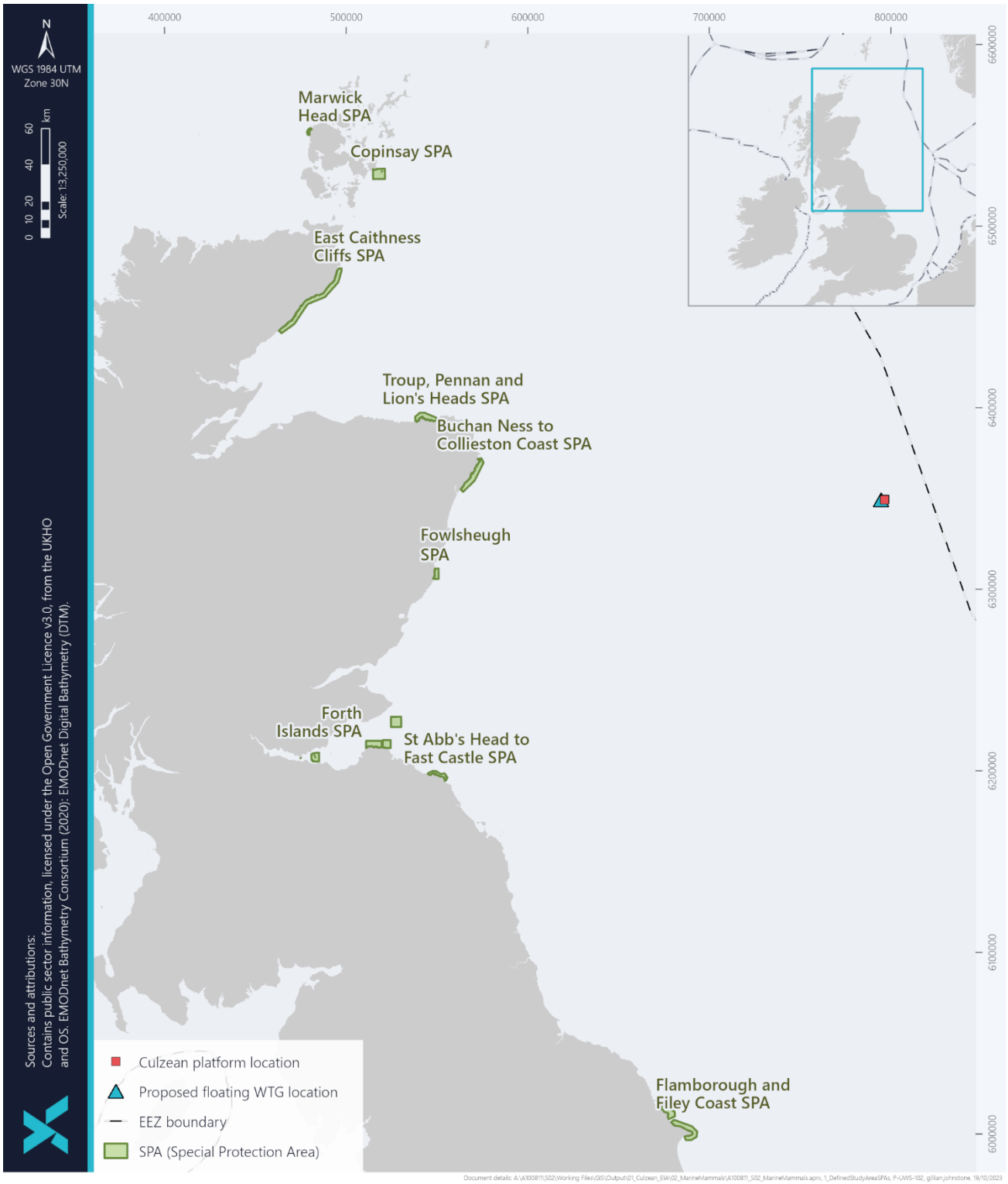

Figure 9-1 SPAs screened into the RIAA

9.4 Assessment overview

In line with the HRA Screening undertaken for ornithology features (as detailed in Section 8), impacts which could not be screened out for the aforementioned SPAs include collision risk during the operational phase of the Project and disturbance and displacement within the construction and operational phases. These impacts have been assessed in detail below for kittiwake within the breeding season, in line with detailed advice sought from NatureScot (see Section 4.2).

9.4.1 Collision Risk

9.4.1.1 Overview

Of all the potential effects that offshore wind developments could have on birds, the potential for mortality caused by flying birds colliding with turbine rotor blades is perhaps the most serious effect. For this reason, the issue of wind turbine avian collision risk and has been, and continues to be, the focus of considerable research effort. There is now a good understanding of the subject, with a well-developed theoretical Collision Risk Modelling (CRM) framework (Band, 2012; Masden, 2015) increasingly validated by results from empirical monitoring studies using sophisticated collision detection methods such as radar and thermal cameras (Skov *et al.*, 2018, Aberdeen Offshore Wind Farm Limited (AOWFL), 2023). On the back of this research, Statutory Nature Conservation Bodies (SNCBs) (e.g., NatureScot) have produce detailed best practice guidance on how avian collision risk from offshore wind developments should be quantified and assessed as per NatureScot Guidance Note 7: *Guidance to support Offshore Wind Applications: Marine Ornithology - Advice for assessing collision risk of marine birds* (NatureScot, 2023b). The aim of this process is to predict how many birds of each species might be killed by the development under examination, and then to examine how the collision mortality would affect the population dynamics of the relevant receptor populations.

9.4.1.2 Kittiwake sensitivity

The sensitivity of Scottish seabird species to collision risk from offshore wind turbines was reviewed by Furness *et al.* (2013). Building on the results of a previous study (Garthe and Hüppop, 2004), together with more recent published scientific and 'grey' literature and expert opinion, Furness *et al.* (2013) developed an index that rates the sensitivity of each seabird species to collision risk (and a separate index for disturbance and displacement sensitivity). The collision risk index values for a species were derived from combining a species' ratings for proportion of flight height activity at rotor height, flight agility, proportion of time spent flying, night-time flight activity and conservation importance. The collision risk index scores develop by Furness *et al.* are considered relevant to the categorisation of receptor sensitivity for the assessment presented below.

Furness *et al.* (2013) gives kittiwake a collision risk index scores of 523, this value is towards the upper end of the range of values for all species, but well below the values for others (such as large gull species). UK breeding kittiwakes currently have a very poor conservation status (Stanbury *et al.*, 2021; Burnell *et al.*, 2023), as such kittiwake are considered to have a high sensitivity to collision risk.

9.4.1.3 CRM approach

In order to ascertain collision risk for kittiwake, CRM was undertaken following best practice guidance recommended by NatureScot (2023b). The Stochastic CRM shiny app v 0.1.1 (Caneco, 2022) was used estimate collision risk. This is

an online Graphical User Interface developed especially for seabird CRM. It is based on the stochastic model developed by Masden (2015), which in turn was developed from the deterministic model developed by Band (2012). The Masden and Band CRM calculate outputs for three model variations termed Option 1, Option 2 and Option 3. The Option 2, the basic model using generic flight height distribution data, (i.e., Johnstone et al., 2014) is considered to be the most appropriate model option for informing the Project's collision risk assessment. Although Option 3 (extended model using generic height distribution data) takes a more sophisticated approach to accounting for flight height distribution, application of this model is limited by uncertainty regarding the appropriate avoidance rate. Predictions were produced from the shiny app CRM run in both deterministic and stochastic modes (as shown in Annex A), as recommended by guidance (NatureScot, 2023b).

The CRM requires input parameters specifying characteristic of the wind farm. The main parameter values describing the characteristics of wind farm used in the models are as follows:

- A development comprising a single turbine;
- A rotor diameter of 112 m;
- A surface clearance of 22 m;
- Maximum rotor blade width of 4 m; and
- A mean rotation rate of 13 rpm.

The CRM also requires input parameters detailing characteristics for each bird species examined. These include monthly estimates of the density of birds in flight (flying bird/km^2), average bird length and wingspan, the type of flight behaviour (gliding or flapping), flight velocity, an adjustment factor for nocturnal activity and flight height frequency distribution (proportion of flying activity for each of a series of 1-metre height bands above sea level). Flight height frequency distribution data for kittiwake were sourced from Johnson *et al.*, 2014. Parameter values for kittiwake species' monthly flying bird density were derived from the results of the APEM DAS (full details provided in EIAR, Appendix F). The parameter values used for species size, flight type, flight velocity and nocturnal activity are the values recommended in NatureScot guidance (NatureScot, 2023b). A full list of wind farm and kittiwake parameters and the values used in the CRMs is presented in Annex A: Kittiwake Collision Risk Modelling.

CRM predicts the number of collisions that would occur each year if birds took no avoidance behaviour. However, studies have shown that seabirds show strong and highly effective avoidance behaviour to wind turbines (Skov *et al.*, 2018; Bowgen and Cook, 2018; AOWFL, 2023). CRM predictions therefore need to be adjusted downwards by an appropriate avoidance rate to give a realistic estimate of the number of birds likely to be killed. Avoidance rates have been derived by a number of studies and these studies have informed the avoidance rates recommended by NatureScot (NatureScot, 2023b). The NatureScot recommended avoidance rate for kittiwake relevant to stochastic CRM Option 2 is 0.993 (SD 0.0003).

9.4.1.4 CRM Results

CRM Option 2 outputs are provided in Annex A: Kittiwake Collision Risk Modelling (Table A 1 to Table A 6). Due to the combination of the development comprising only a single modest-sized wind turbine and low kittiwake densities, the CRM prediction for kittiwake is very low. Indeed, after applying the recommended avoidance rates, the predictions for kittiwakes killed through collision is 0.075 (SD 0.022) mortalities per year based on Stochastic CRM Option 2 outputs (inclusive of the breeding and non-breeding season, as per Annex A; Table A-7).

For this reason, predictions for kittiwake mortality from fatal collisions is also expressed in terms of the number of years the WTG would need to operate for one collision to occur, for this Project a single collision fatality may occur once every 14 years (Table 9-1). Given the marine licence being sought is for a period of 10 years, it is unlikely that a single mortality event would occur during the operation of the Project, with a predicted mortality for collision across a 10 year period calculated as 0.75 mortalities (inclusive of the breeding and non-breeding season). For the breeding season alone, mortalities are modelled at 0.06 (SD 0.019) mortalities per year, or 0.6 mortalities for the 10 year operational period (Table 9-1).

Furthermore, given the large size of kittiwake regional populations during the breeding season under consideration (125,882 birds (Burnell *et al*, 2023)), it is not plausible that additional mortality of less than one bird per annum would lead to more than a negligible change to baseline population mortality rates of kittiwake (examined baseline mortality rates for these species are reviewed in Horswill and Robinson (2015).

Table 9-1 Summary of collision risk modelling predictions for kittiwake

PARAMETER	VALUE
Stochastic CRM Option 2	
Avoidance Rate	0.993
Mean number of fatal collisions per year (breeding and non-breeding season)	0.075 (SD 0.022)
Mean number of fatal collisions per year (breeding season only)	0.060 (SD 0.019)
Number mortality events for 10 year operational period (for breeding and non-breeding season mortalities)	0.75
Number mortality events for 10 year operational period (for breeding season mortalities)	0.6
Average number of operational years for one mortality event (for breeding and non-breeding season mortalities)	13 years
Average number of operational years for one mortality event (for breeding season mortalities)	16 years
Deterministic CRM Option 2	
Avoidance rate	0.992
Mean number of fatal collisions per year (breeding and non-breeding season)	0.076
Mean number of fatal collisions per year (breeding season only)	0.061
Number mortality events for 10 year operational period (for breeding and non-breeding season mortalities)	0.76
Number mortality events for 10 year operational period (for breeding season mortalities)	0.61
Average number of operational years for one mortality event (for breeding and non-breeding season mortalities)	13 years
Average number of operational years for one mortality event (for breeding season mortalities)	16 years

9.4.2 Displacement and Disturbance impacts

9.4.2.1 Overview

Construction phase activity has the potential to affect seabird receptors through disturbance which in turn may lead to displacement of birds from the vicinity of construction activities (Furness *et al.*, 2013). Displacement from areas that birds would otherwise use, for example for foraging, is akin to habitat loss.

Disturbance could arise from the operation of construction vessels and associated on board activities of construction personnel and machinery, noise and lighting. The construction activity is scheduled to take place over a period of one month in Q3 2025, during which vessel movements and other construction activity could occur at all times of day. However, it is noted that a maximum of four vessels will be present at the Project Area at any given time. Disturbance to birds by construction activity would last only for the duration of construction work (one month), after which bird utilisation at the locality is expected to quickly return (within hours) to baseline conditions.

The description of how disturbance and displacement could affect birds presented above for the construction phase also applies to the operation and maintenance phase. The potential for disturbance / displacement in the operation and maintenance phase caused by Project vessel activity is anticipated to be much lower than in the construction phase due to a large reduction in vessel activity; only occasional maintenance visits, by a single vessel, are anticipated. During this phase there will also be the potential for seabirds to show a fixed-structure displacement response, i.e., to the presence of the floating wind turbine. These disturbance / displacement effects will persist through the operation and maintenance phase and are thus considered to be long-term effects, however it is possible that some birds could show a degree of habituation with time

9.4.2.2 Kittiwake sensitivity to disturbance and displacement

Furness *et al.* (2013) highlights a kittiwake a disturbance / displacement sensitivity index score of 6 out of 50. Although this is towards the lower end of the range of values for all species examined, UK breeding kittiwakes currently have a very poor conservation status (Stanbury *et al.*, 2021; Burnell *et al.*, 2023). It is therefore considered appropriate to assign a medium sensitivity for disturbance and displacement for kittiwake.

9.4.2.3 Displacement analysis approach

SNCBs advise the use of a matrix method to quantify potential for displacement of seabirds from offshore wind warm developments (SNCB, 2022). This method is based on theoretical considerations and assumptions about the biological effects of displacement to the individuals affected (Searle *et al.*, 2014; SNCB, 2022). The recommended matrix approach expresses displacement in terms of additional mortality. This has the advantage of making it comparatively easy to quantitatively assesses the impact of displacement on receptor population processes, both in isolation and together with other impacts such as collision mortality. To interpret a displacement matrix, NatureScot advises the use of recommended species-specific values for displacement rate and the proportion of the displaced birds that are assumed to die as per NatureScot Guidance Note 8: *Guidance to support Offshore Wind Applications: Marine Ornithology Advice for assessing the distributional responses, displacement and barrier effects of Marine birds* (see matrices presented in Annex B Kittiwake Displacement Analysis) (NatureScot, 2023d). NatureScot advise that for assessment purposes the ZoI for displacement be assumed to extend to 2 km beyond the development footprint. For a Project of this scale, this ZoI is considered to be extremely cautious. Nonetheless, for conservatism this ZoI has been carried through for the assessment.

NatureScot advise the use of displacement rates of 30% from the ZoI for kittiwake and cautiously advise that mortality rates of both 1% and 3% should be assumed (NatureScot, 2023d). NatureScot guidance also states that the evaluation of impacts of displacement are based on the peak monthly density of a species recorded during baseline surveys in the Project Area and that separate evaluation are undertaken for different seasons.

9.4.2.4 Displacement analysis results

Based on the SNCB displacement matrix method using NatureScot recommended values for % displacement and % mortality, it is estimated that there would be zero displacement mortality of kittiwake during the breeding season and zero displacement mortality of kittiwake in the non-breeding season (see Annex B Kittiwake Displacement Analysis; Table B- 2 and Table B- 3, respectively). Furthermore, the Project will utilise a VMP, which will ensure vessels are travelling at slow speeds to mitigate any potential disturbance and displacement effects for rafting seabirds.

In line with NatureScot advice, displacement impacts during the non-breeding season are not assessed within the HRA. Nonetheless, an assessment of non-breeding season impacts from displacement is provided within Chapter 11: Ornithology, within the EIAR, as requested.

9.4.3 Conservation Objectives

For all SPAs assessed, with the exception of the Flamborough and Filey Coast SPA, the following conservation objectives apply:

- To avoid deterioration of the habitats of the qualifying species or significant disturbance to the qualifying species, thus ensuring that the integrity of the site is maintained; and
- To ensure for the qualifying species that the following are maintained in the long term:
  - Population of the species as a viable component of the site;
  - Distribution of the species within site;
  - Distribution and extent of habitats supporting the species;
  - Structure, function and supporting processes of habitats supporting the species; and
  - No significant disturbance of the species.

For the Flamborough and Filey Coast SPA, the only SPA screened in located outside Scotland, the following conservation objectives are noted:

- To ensure that the integrity of the site is maintained or restored as appropriate; and
- To ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;
  - The extent and distribution of the habitats of the qualifying features;
  - The structure and function of the habitats of the qualifying features;
  - The supporting processes on which the habitats of the qualifying features rely;
  - The population of each of the qualifying features, and,
  - The distribution of the qualifying features within the site.

9.5 Buchan Ness to Collieston Coast SPA

9.5.1 Site details

Buchan Ness to Collieston Coast SPA is located 223 km to the northwest of the Project Area. The SPA is 5,400.76 hectares and was first classified in 1998, with an extension classified in 2009. The SPA comprises south-east facing cliff in Aberdeenshire, Scotland. The 15 km stretch of cliffs runs south of Peterhead, broken only by the sandy beach of Cruden Bay. The varied coastal vegetation on the ledges and the cliff tops includes maritime heath, grassland and brackish flushes (NatureScot, 2009a).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable No change	16 June 2017	Red List

Seabird counts undertaken between 2015- 2021 for the Buchan Ness to Collieston Coast SPA identified 11,295 Apparently Occupied Nests (AON) for kittiwake. This highlights a population decline of 19% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.5.2 Assessment of Adverse Effects On Site Integrity (AEOSI)

Although recent seabird counts of the Buchan Ness to Collieston Coast SPA show a marked decline (19% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Buchan Ness to Collieston Coast SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the Buchan Ness to Collieston Coast SPA for the Project in-combination with other plans or projects.

9.6 Fowlsheugh SPA

9.6.1 Site details

Fowlsheugh SPA is located 249 km to the west of the Project Area. The SPA is 1,303.23 hectares and was first classified in 1992, with an extension classified in 2009. The SPA is located 4 km south of Stonehaven on the east coast of Aberdeenshire in north-east Scotland, and comprises a stretch of sheer cliffs, between 30m and 60m high. The boundary of the SPA overlaps with the boundaries of Fowlsheugh SSSI. The seaward extension extends 2 km into the marine environment and includes the seabed, water column and surface (NatureScot, 2009b).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Favourable Maintained	11 June 1999	Red List

Seabird counts undertaken between 2015- 2021 for the Fowlsheugh SPA identified 14,039 AON for kittiwake. This highlights a population decline of 51% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.6.2 Assessment of AEOSI

Although recent seabird counts of the Fowlsheugh SPA show a marked decline (51% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Fowlsheugh SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the Fowlsheugh SPA for the Project in-combination with other plans or projects.

9.7 Troup, Pennan and Lion's Heads SPA

9.7.1 Site details

Troup, Pennan and Lion's Heads SPA is located 254 km to the northwest of the Project Area. The SPA is 3,365.2 hectares and was first classified in 1997, with an extension classified in 2009. The SPA is s a 9 km stretch of sea cliffs along the Aberdeenshire coast. The cliffs support large colonies of breeding seabirds. The boundary of the Special Protection Area overlaps with the boundary of Gamrie and Pennan coast SSSI and the seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface (NatureScot, 2009c).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable No change	3 July 2007	Red List

Seabird counts undertaken between 2015- 2021 for the Troup, Pennan and Lion's Heads SPA identified 10,616 AON for kittiwake. This highlights a population decline of 44% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.7.2 Assessment of AEOSI

Although recent seabird counts of the Troup, Pennan and Lion's Heads SPA show a marked decline (44% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Troup, Pennan and Lion's Heads SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the Troup, Pennan and Lion's Heads SPA for the Project in-combination with other plans or projects.

9.8 St Abb's Head to Fast Castle SPA

9.8.1 Site details

St Abb's Head to Fast Castle SPA is located 284 km to the southwest of the Project Area. The SPA is 1,736.75 hectares and was first classified in 1997, with an extension classified in 2009. The SPA comprises an area of sea cliffs and coastal strip stretching over 10 km along the Berwickshire Coast north of St Abbs. The boundary of the SPA overlaps with that of St Abb's Head to Fast Castle SSSI, and the seaward extension extends approximately 1 km into the marine environment to include the seabed, water column and surface. (NatureScot, 2009d).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable Declining	14 June 2014	Red List

Seabird counts undertaken between 2015- 2021 for the St Abb's Head to Fast Castle SPA identified 5,150 AON for kittiwake. This highlights a population decline of 68% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.8.2 Assessment of AEOSI

Although recent seabird counts of the St Abb's Head to Fast Castle SPA show a marked decline (68% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the St Abb's Head to Fast Castle SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the St Abb's Head to Fast Castle SPA for the Project in-combination with other plans or projects.

9.9 Forth Islands SPA

9.9.1 Site details

Forth Islands SPA is located 294 km to the southwest of the Project Area. The SPA is 9,797.01 hectares and comprises a series of islands supporting the main seabird colonies in the Firth of Forth. The islands of Inchmickery, Isle of May, Fidra, The Lamb, Craigleith and Bass Rock were classified in 1990. The extension to the site, classified on in 2004 consists of the island of Long Craig. The seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface. The boundary of the SPA overlaps with the boundaries of the following Sites of Special Scientific Interest: Long Craig, Inchmickery, Forth Islands, Bass Rock and the Isle of May. A small overlap also occurs with the Firth of Forth SPA. (NatureScot, 2009e).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable Declining	30 June 2016	Red List

Seabird counts undertaken between 2015- 2021 for the Forth Islands SPA identified 4,542 AON for kittiwake. This highlights a population decline of 22% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.9.2 Assessment of AEOSI

Although recent seabird counts of the Forth Islands SPA show a marked decline (22% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Forth Islands SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the Forth Islands SPA for the Project in-combination with other plans or projects.

9.10 Copinsay SPA

9.10.1 Site details

Copinsay SPA is located 329 km to the northwest of the Project Area. The SPA is 3,607.7 hectares and was first classified in 1994, with a marine extension classified in 2009. The SPA comprises a group of islands 4km off the east coast of Orkney Mainland. The islands have a cliffed rocky coastline and maritime vegetation that support large colonies of breeding seabirds. The boundary of the SPA encompasses Copinsay SSSI, and the seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface (NatureScot, 2023f).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable Declining	11 June 2015	Red List

Seabird counts undertaken between 2015- 2021 for the Copinsay SPA identified 955 AON for kittiwake. This highlights a population decline of 78% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.10.2 Assessment of AEOSI

Although recent seabird counts of the Copinsay SPA show a marked decline (78% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in

negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be **no AEOSI on the Copinsay SPA from the Project alone**.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that **there will be no AEOSI on the Copinsay SPA for the Project in-combination with other plans or projects.**

9.11 East Caithness Cliffs SPA

9.11.1 Site details

East Caithness Cliffs SPA is located 333 km to the northwest of the Project Area. The SPA is 11696.38 hectares and was first classified in 1996, with a marine extension classified in 2009. is of special nature conservation and scientific importance within Britain and the European Community for supporting very large populations of breeding seabirds. It includes most of the sea-cliff areas between Wick and Helmsdale on the north-east coast of the Scottish mainland.

The boundary of the SPA overlaps either partly or wholly with the following SSSIs: Castle of Old Wick to Craig Hammel SSSI, Craig Hammel to Sgaps Geo SSSI, Dunbeath to Sgaps Geo SSSI, Berriedale Cliffs SSSI, Ousdale Burn SSSI and Helmsdale Coast SSSI. The seaward extension extends approximately 2 km into the marine environment to include the seabed, water column and surface. (NatureScot, 2023g).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Favourable Maintained	17 June 2015	Red List

Seabird counts undertaken between 2015- 2021 for the East Caithness Cliffs SPA identified 24,479 AON for kittiwake. This highlights a population decline of 39% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.11.2 Assessment of AEOSI

Although recent seabird counts of the East Caithness Cliffs SPA show a marked decline (39% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to

kittiwake populations As such, it is concluded that there will be no AEOSI on the East Caithness Cliffs SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the East Caithness Cliffs SPA for the Project in-combination with other plans or projects.

9.12 Flamborough and Filey Coast SPA

9.12.1 Site details

Flamborough and Filey Coast SPA is located 364 km to the southwest of the Project Area. The SPA is 7857.99 hectares and was originally designated in 1993 for its internationally important colony of kittiwakes. In 2018, the protected area was extended. This extension provided specific protection to another three species, the overall seabird assemblage, and the terrestrial cliff environment of Filey Brigg. The revised SPA also protects the inshore waters around the seabird breeding cliffs, from mean low water to 2km offshore (Yorkshire Marine Nature Partnership, 2023).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Not assessed[9]	N/A	Red List

Seabird counts undertaken in 2019 for the Flamborough and Filey Coast SPA identified 45,504 AON for kittiwake. This highlights a population increase of 7% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

In 2023, a total of 1041 AON for kittiwake were monitored in 20 plots across the SPA. From those nests, 1072 chicks successfully fledged, giving a mean productivity of 1.02 chicks per pair. This is the highest productivity recorded since 2010, despite apparent localised outbreaks of Highly Pathogenic Avian Influenza (HPAI) causing increased chick and adult mortality in some plots. The long-term trend is still one of decline, but the rapid increase in productivity since 2021 is encouraging (Butcher, J, *et al*, 2023).

9.12.2 Assessment of AEOSI

Recent seabird counts of Flamborough and Filey Coast SPA show a marked incline (7% increase) in breeding kittiwake populations. The collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero

[9] *At present no assessment of the feature conditions for this SPA have been undertaken (Natural England; 2024).*

mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Flamborough and Filey Coast SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that there will be no AEOSI on the Flamborough and Filey Coast SPA for the Project in-combination with other plans or projects.

9.13 Marwick Head SPA

9.13.1 Site details

Marwick Head SPA is located 374 km to the northwest of the Project Area. The SPA is 475.54 hectares and was first classified in 1994, with a marine extension classified in 2009. The SPA comprises a is a 2 km stretch of sea cliffs, and adjacent coastal waters, along the west coast of Orkney Mainland. The cliffs support large colonies of breeding seabirds. The boundary of the Special Protection Area overlaps the boundary of Marwick Head SSSI, and the seaward extension extends approximately 1 km into the marine environment to include the seabed, water column and surface (NatureScot, 2009h).

The only qualifying feature of the SPA which has been taken forward for further assessment is kittiwake, details of this feature and condition are provided below.

QUALIFYING FEATURE	FEATURE CONDITION	ASSESSMENT DATE	BROADER CONSERVATION STATUS
Kittiwake (breeding)	Unfavourable Declining	15 June 2015	Red List

Seabird counts undertaken between 2015- 2021 for the Copinsay SPA identified 906 AON for kittiwake. This highlights a population decline of 84% for kittiwake for the colony since the previous census in 1998-2002 (Burnell, D *et al*, 2023).

9.13.2 Assessment of AEOSI

Although recent seabird counts of the Marwick Head SPA show a marked decline (84% reduction) in breeding kittiwake populations, collision mortalities for the Project have been modelled at less than one bird mortality (0.6) for the 10 year operational period during the breeding season (as detailed in Section 9.4.1), this is considered to result in negligible effects to kittiwake populations. Additionally, displacement and disturbance impacts will result in zero mortalities from the Project (as detailed in Section 9.4.2), this is also considered to result in negligible effects to kittiwake populations. As such, it is concluded that there will be no AEOSI on the Marwick Head SPA from the Project alone.

Furthermore, as the Project alone will result in less than one mortality from collision and displacement together over the operational life of the Project, this is considered to be a negligible effect and it is not plausible that the Project would materially contribute to a wider regional in-combination disturbance or mortality effects for kittiwake features of this SPA. As such, it is concluded that **there will be no AEOSI on the Marwick Head SPA for the Project in-combination with other plans or projects.**

9.14 Summary of conclusions for AEOSI for SPAs assessed

As part of the HRA process, a RIAA has been undertaken to provide information to allow the Competent Authority to ascertain whether the Project will or will not adversely affect the integrity of a European Site. The conclusions of the ornithology assessments presented above show that there are no adverse effects either from the Project alone, or in-combination with other plans or projects, on the site integrity of the SPAs screened into the individual assessments. These conclusions are summarised in Table 9-2 below.

Table 9-2 Conclusions of the RIAA

SPA	IMPACT	CONCLUSION OF ADVERSE EFFECTS
Buchan Ness to Collieston SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
Fowlsheugh SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
Troup, Pennan and Lion's Heads SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
St Abb's Head to Fast Castle SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
Forth Islands SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.

SPA	IMPACT	CONCLUSION OF ADVERSE EFFECTS
Copinsay SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
East Caithness Cliffs SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
Flamborough and Filey Coast SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.
Marwick Head SPA	Collision Risk	No AEOSI from Project alone or in-combination with other plans or projects.
	Displacement & Disturbance	No AEOSI from Project alone or in-combination with other plans or projects.

9.15 Bird monitoring and research initiatives

In addition to there being no potential for AEOSI for the European Sites screened into the assessment, the Project is also consciously aiming to contribute to key environmental research needed to aid understanding for the industry.

As detailed in Section 1.4 of this HRA Report, a number of these initiatives will facilitate crucial understanding of bird behaviour within the vicinity of the floating wind, such as the use of bird and drone detection radar systems to monitor bird activity.

TEPNSUK are also currently investigating participation in ongoing academic projects as part of the R&D programme, with the potential to provide the Project as a test site for several further environmental monitoring projects.

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ANNEX A: KITTIWAKE COLLISION RISK MODELLING

A.1 CRM Input Parameter Values

Table A 1 Simulation options selected for CRM

SIMULATION CHOICE	SELECTION
Number of iterations	1000
Random seed value	10
Large array correction	No

Table A 2 Wind farm parameters used in CRM

NUMBER OF TURBINES	LATITUDE (DEG)	WINDFARM WIDTH (KM)	TIDAL OFFSET (M)	% UPWIND FLIGHTS
1	57	1	0	50

Table A 3 Turbine parameters used in CRM

TURBINE MODEL	NUMBER OF ROTOR BLADES	ROTOR RADIUS (M)	SURFACE CLEARANCE (M)	BLADE WIDTH (M)	SPEED/ PITCH SIMULATION OPTION	ROTATION SPEED (RPM)	ROTATION SPEED SD	ROTOR PITCH (DEG)	ROTOR PITCH SD
3 MW	3	56	22	4	probDist	13	0.5	13	0.1

Table A 4 Wind availability and turbine downtime parameters used in CRM

METRIC	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
Wind availability (%)	96.28	96.53	95.83	92.78	90.86	92.22	89.11	89.92	93.71	96.14	97.14	96.41
Mean downtime (%)	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3	6.3
SD Downtime (%)	2	2	2	2	2	2	2	2	2	2	2	2

Table A 5 Kittiwake size and behaviour parameters used in CRM

PARAMETER	VALUE
Avoidance rate Deterministic CRM Option 2	0.992
Avoidance rate Stochastic CRM Option 2	0.993

PARAMETER	VALUE
Avoidance rate SD	0.0003
Body length (m)	0.390
Body length SD	0.0050
Wingspan (m)	1.08
Wingspan SD	0.0625
Flight speed (m/s)	13.1
Flight speed SD	0.4
Nocturnal activity factor	0.5
Nocturnal activity SD	0.005
Flight type	Flapping
Proportion flight activity at CRH	0.124
Proportion flight activity at CRH SD	0.01

Table A 6 Flying Kittiwake density (birds/km2) parameters used in stochastic CRM

SPECIES	MONTH	JAN	FEB	MAR	APR	MAY	JUN	JULY	AUG	SEP	OCT	NOV	DEC
Kittiwake	Mean	0	0	0	0	0.190	0.060	0.130	0.060	0	0	0.130	0
	SD	0	0	0	0	0.108	0.060	0.091	0.060	0	0	0.091	0

A.2 CRM Outputs for Kittiwake CRM Option 2

Table A 7 . Stochastic CRM Option 2 outputs for kittiwake (number of collisions per year / season after adjustment for avoidance rate)

SEASON	TIME PERIOD	CRM OPTION	MEAN	MEDIAN	SD	CV	2.5%	97.5%
Breeding	April - August	Option 1	0.063	0.063	0.019	30.114	0.030	0.103
		Option 2	0.060	0.059		32.162	0.025	0.101
Non-breeding	September - March	Option 1	0.015	0.015	0.008	54.351	0.002	0.032
		Option 2		0.014		55.846		
Year	January - December	Option 1	0.078	0.078	0.021	26.845	0.042	0.122
		Option 2	0.075	0.073	0.022	29.186	0.037	0.121

Table A 8 . Deterministic CRM Option 2 outputs for kittiwake (number of collisions per year / season after adjustment for avoidance rate)

SEASON	TIME PERIOD	CRM OPTION	NO. COLLISIONS
Breeding	April - August	Option 1	0.064
		Option 2	0.061
Non-breeding	September - March	Option 1	0.016
		Option 2	0.015
Year	January - December	Option 1	0.080
		Option 2	0.076

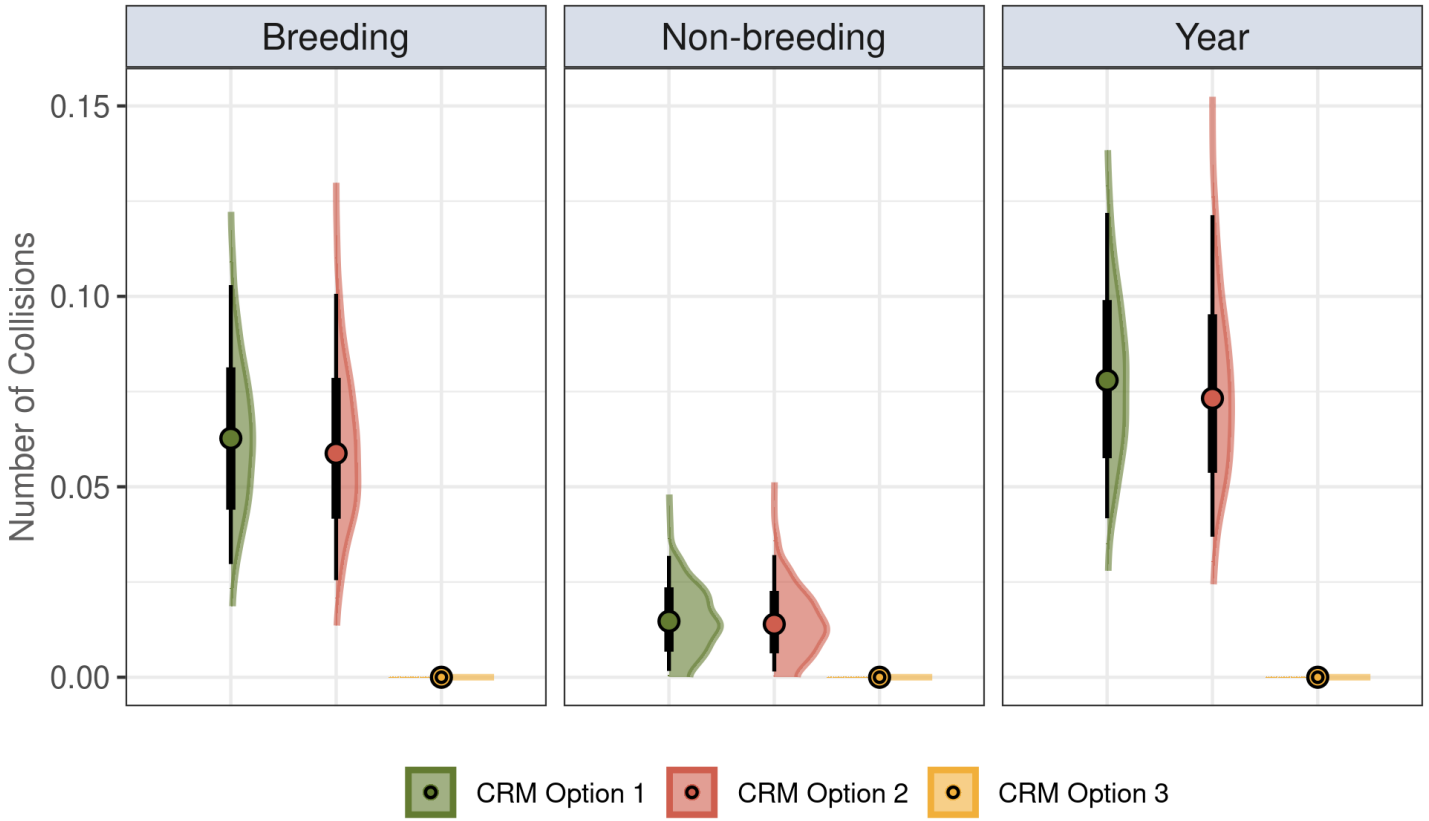

Figure A-1. Collision risk estimates for kittiwake by season and for a whole year. Density distribution, median, 66% and 95% quantile intervals and quantile dotplots (each dot represents ~2% chance outcome) of simulated values. Note CRM Option 3 was disabled.

ANNEX B KITTIWAKE DISPLACEMENT ANALYSIS

B-1 Displacement input parameters

Table B- 1 Input parameters for kittiwake displacement matrix

SPECIES	PEAK DENSITY (BREEDING SEASON)	PEAK DENSITY (NON-BREEDING SEASON)	BUFFER APPLIED	AREA (+2 KM BUFFER)
Kittiwake	0.25 birds/km^2	0.13 birds/km^2	2 km	12.6 km^2

B-2 Kittiwake displacement results

Table B- 2 Displacement matrix for kittiwake during the breeding season. Values are the number of birds rounded to the nearest whole number predicted to be die for a given combination of assumed mortality and rate of displacement. The highlighted cells are the combinations recommended by NatureScot (Guidance Note 8) for the assessment of displacement impacts on kittiwake from offshore wind energy developments.

SCENARIO: KITTIWAKE, PEAK ESTIMATED NUMBER INSIDE 2-KM BUFFER DURING BREEDING SEASON		% MORTALITY OF DISPLACED BIRDS										
		1%	2%	3%	4%	5%	10%	20%	30%	50%	80%	100%
% OF BIRDS DISPLACED	10%	0	0	0	0	0	0	0	0	0	0	0
	20%	0	0	0	0	0	0	0	0	0	1	1
	30%	0	0	0	0	0	0	0	0	0	1	1
	40%	0	0	0	0	0	0	0	0	1	1	1
	50%	0	0	0	0	0	0	0	0	1	1	2
	60%	0	0	0	0	0	0	0	1	1	2	2
	70%	0	0	0	0	0	0	0	1	1	2	2
	80%	0	0	0	0	0	0	1	1	1	2	3
	90%	0	0	0	0	0	0	1	1	1	2	3
	100%	0	0	0	0	0	0	0	0	0	0	3

Table B- 3 Displacement matrix for kittiwake during the non-breeding season. Values are the number of birds rounded to the nearest whole number predicted to be die for a given combination of assumed mortality and rate of displacement. The highlighted cells are the combinations recommended by NatureScot (Guidance Note 8) for the assessment of displacement impacts on kittiwake from offshore wind energy developments.

SCENARIO: KITTIWAKE, PEAK ESTIMATED NUMBER INSIDE 2-KM BUFFER DURING NON-BREEDING SEASON		% MORTALITY OF DISPLACED BIRDS										
		1%	2%	3%	4%	5%	10%	20%	30%	50%	80%	100%
% OF BIRDS DISPLACED	10%	0	0	0	0	0	0	0	0	0	0	0
	20%	0	0	0	0	0	0	0	0	0	0	0
	30%	0	0	0	0	0	0	0	0	0	0	0
	40%	0	0	0	0	0	0	0	0	0	1	1
	50%	0	0	0	0	0	0	0	0	0	1	1
	60%	0	0	0	0	0	0	0	0	0	1	1
	70%	0	0	0	0	0	0	0	0	1	1	1
	80%	0	0	0	0	0	0	0	0	1	1	1
	90%	0	0	0	0	0	0	0	0	1	1	1
	100%	0	0	0	0	0	0	0	0	1	1	2