MachairWind Offshore Windfarm

Report to Inform Marine Protected Area Assessment

ScottishPower Renewables | MachairWind Offshore Windfarm

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GLOSSARY OF ACRONYMS

Term	Definition
ADD	Acoustic Deterrent Device
CBRA	Cable Burial Risk Assessment
CEA	Cumulative Effects Assessment
DAS	Digital Aerial Surveys
dB	Decibel
DVM	Diel Vertical Migration
ECC	Export Cable Corridor
EDR	Effected Deterrence Range
EIA	Environmental Impact Assessment
EIAR	Environmental Impact Assessment Report
EMP	Environmental Management Plan
EPS	European protected Species
ETG	Expert Topic Group
HRA	Habitats Regulations Appraisal
HWDT	Hebridean Whale and Dolphin Trust
IAC	Inter-Array Cables
IMMA	Important Marine Mammal Area
IAMMWG	Inter-Agency Marine Mammal Working Group
ICUN	International Union for Conservation of Nature
IMMA	Important Marine Mammal Area
INSPIRE	Impulsive Noise Propagation and Impact Estimator
INTOG	Innovation and Targeted Oil & Gas
iPCoD	Interim Population Consequences of Disturbance
IUCN	International Union for Conservation of Nature
JNCC	Joint Nature Conservation Committee
IWC	International Whaling Commission
kJ	Kilo Joules
km	Kilometre
MBES	Multi-Beam Echosounder
MD-LOT	Marine Directorate – Licensing Operations Team
MMMP	Marine Mammal Mitigation protocol
MPA	Marine Protected Area

Term	Definition
MPA	Marine Protected Area
MPCP	Marine Pollution Contingency Plan
MU	Management Unit
N/A	Not Applicable
NAS	Noise Abatement System
NEQ	Net Explosive Quantity
NCMPA	Nature Conservation Marine Protected Area
NMFS	National Marine Fisheries Service
NRW	Natural Resource Wales
nm	nautical miles
O&M	Operation and Maintenance
OnTDA	Onshore Transmission Development Area
OSP	Offshore Substation Platforms
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
PDE	Project Design Envelope
POA	Plan Option Area
PTS	Permanent Threshold Shift
SBP	Sub Bottom Profiler
SCANS	Small Cetaceans in European Atlantic waters and the North Sea
SEL / $L_{E,p}$	Sound Exposure Level
SEL_{cum} / $L_{E,p,t}$	Cumulative Sound Exposure Level
SMP	Sectoral Marine Plan
SMWWC	Scottish Marine Wildlife Watching Code
SNCB	Statutory Nature Conservation Bodies
SNH	Scottish Natural heritage
SPL / L_p	Sound Pressure Level
SEL_{cum} / $L_{E,p,t}$	Cumulative Sound Pressure Level
SPL_{peak} / $L_{p,pk}$	Peak Sound Pressure Level
SEL_{ss} / $L_{E,p,ss}$	Single Strike Sound Exposure Level
SSC	Suspended Sediment Concentrations
SSS	Side Scan Sonar
TTS	Temporary Threshold Shift
UHR	Ultra-High Resolution
UK	United Kingdom

Term	Definition
USBL	Ultra-Short Baseline
UXO	Un-exploded Ordnance
UWN	Underwater Noise
WDA	Windfarm Development Area
WS	West Scotland
ZoI	Zone of Influence

GLOSSARY OF TERMS

Term	Definition
Cable protection	Protective measure to minimise the effects of scour and hazards along the offshore cables (e.g. to prevent cable exposure or snagging of vessel anchors or fishing gear), as well as for protecting these cables at infrastructure crossing points.
Collision	The act or process of two moving objects colliding.
Combined Assessment	A whole-Project assessment considering interactions between the Windfarm Development Area, Offshore Export Cable Corridor and Onshore Transmission Development Area (i.e. considering impact interactions and additive effects to determine if any effects would be materially elevated from those assessed for the Windfarm Development Area-alone assessment). Due to long delays in securing confirmation of the Project's grid connection location, the level of detail available for the Offshore Export Cable Corridor and Onshore Transmission Development Area is limited and therefore the assessment is commensurate with the level of detail available at the time of carrying out the assessment. Within the upcoming Offshore Export Cable Corridor and Onshore Transmission Development Area consent applications, their respective scoping and Environmental Impact Assessment Report / Environmental Report will take account of all likely effects predicted within the WDA EIA and present updated combined assessments using the latest available information covering all aspects of the Project.
Development Area	Application boundary for consenting purposes which, for the Project, consists of a Windfarm Development Area, Offshore Export Cable Corridor, and Onshore Transmission Development Area. Separate consent and marine licence applications will be submitted for each Development Area where applicable.
Embedded mitigation measure	Mitigation measures, including industry good practice measures, that are directly incorporated into the design for the MachairWind Windfarm Development Area to avoid or reduce environmental effects.
Environmental Impact Assessment (EIA)	The process of evaluating the likely significant environmental effects of a proposed development over and above the existing circumstances (or 'baseline').
International Council for the Exploration of the Seas (ICES) statistical rectangles	The International Council for the Exploration of the Seas (ICES) standardise the division of sea areas to enable statistical analysis of data. Each ICES statistical rectangle is '30 min latitude by 1 degree longitude' in size (approximately 30 x 30 nautical miles). A number of rectangles are amalgamated to create ICES statistical areas.
Inter-array cables (IACs)	Armoured cable containing electrical and fibre optic cores which link the wind turbine generators to each other and to the offshore substation platform(s).
Landfall	The area from Mean Low Water Springs to a transition bay(s), where the offshore export cable(s) come ashore.
MachairWind Offshore Windfarm	An offshore windfarm capable of exporting around 2 GW of renewable energy to the National Electricity Transmission System. MachairWind Offshore Windfarm comprises three Development Areas: • The WDA – located on the west coast of Scotland to the northwest of Islay and west of Colonsay; • The Offshore Export Cable Corridor – a preliminary boundary extending from the WDA to mean high water springs at a landfall location near Girvan, South Ayrshire; and • The Onshore Transmission Development Area – a preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the

Term	Definition
	proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. Separate consent and licence applications will be submitted for each Development Area.
Management Units (MUs)	The MUs provide an indication of the spatial scales at which impacts of plans and projects alone, cumulatively and in-combination, need to be assessed for the marine mammal species in UK waters, with consistency across the UK.
National Electricity Transmission System	The high-voltage electricity power transmission network serving Great Britain which receives electricity from generators (such as offshore windfarms) and transmits that electricity to anywhere on the National Electricity Transmission System to satisfy demand.
Offshore cables	The collective term for all offshore cables i.e. IACs, offshore substation platform link cables, offshore export cables and associated fibre optic cables.
Offshore ECC infrastructure	The offshore transmission infrastructure located within the boundary of the Offshore Export Cable Corridor, namely the offshore export cable(s).
Offshore export cable	Armoured cable containing electrical cores between the offshore substation platform(s) and landfall. Offshore export cables will include bundled fibre optic cables. The offshore export cables are subject to Marine Licence applications under the Marine (Scotland) Act 2010. The portion of the offshore export cable(s) located within the WDA is assessed as part of this MachairWind WDA EIA and a marine licence application to construct, alter or improve this portion has been submitted alongside the WDA application. A separate marine licence application will be submitted for the portion of the offshore export cable(s) from the WDA boundary to mean high water Mean High Water Springs.
Offshore Export Cable Corridor (ECC)	The preliminary boundary extending from the WDA to mean high water springs near Girvan, South Ayrshire and within which the offshore export cable(s) will be located. A separate marine licence application will be submitted for the offshore export cable(s) located within the Offshore ECC.
Offshore Substation Platform (OSP)	An offshore platform with a fixed foundation located within the WDA which houses electrical equipment such as transformers, switchgear, protection and control systems, and enables the windfarm's renewable electricity to be collected via inter-array cables and exported to the National Electricity Transmission System via offshore export cables.
Offshore Substation Platform (OSP) link cables	Electrical cables which link OSPs (if more than one OSP is required). These cables will include fibre optic cores or bundled fibre optic cables. OSP link cables will be wholly located within the WDA.
Onshore Transmission Development Area (OnTDA)	The preliminary boundary which extends landward from mean low water springs and includes the land required for the landfall of the offshore export cables and their route up to but not including the proposed high voltage direct current switching station which will be developed and constructed by Transmission Owner, ScottishPower Transmission. This Transmission Owner is responsible for consenting the high voltage direct current switching station. Onward connections to the National Electricity Transmission System will be consented by National Grid Electricity Transmission and ScottishPower Transmission. Where relevant, these are considered as part of cumulative effects assessment in the EIA.
OnTDA infrastructure	The onshore transmission infrastructure, for which the Applicant is responsible, that is located primarily within the OnTDA, up to mean low water springs, and includes but is not limited to: landfall(s), onshore export cables, transition joint bays, telecom/SCADA infrastructure including vehicular access, joint bays, link boxes and temporary construction compounds. The OnTDA infrastructure will be subject to a planning application under the Town and Country Planning (Scotland) Act 1997.
Operational life	The operational life is the expected length of time from final commissioning of the WDA until the cessation of commercial operations. This is anticipated to be 35 years.

Term	Definition
Option Agreement Area (OAA)	The seabed area awarded to ScottishPower Renewables in January 2022 through the Scotwind leasing round.
OSPAR	OSPAR started in 1972 with the Oslo Convention against dumping and was broadened to cover land-based sources of marine pollution and the offshore industry by the Paris Convention of 1974. These two conventions were unified, updated and extended by the 1992 OSPAR Convention. OSPAR is so named because of the original Oslo and Paris Conventions ("OS" for Oslo and "PAR" for Paris).
Pelagic	Of or relating to the open sea.
Permanent Threshold Shift (PTS)	A permanent total or partial loss of hearing sensitivity caused by acoustic trauma. PTS results in irreversible damage to the sensory hair cells of the ear, and thus a permanent reduction of hearing acuity.
ScotWind	A Crown Estate Scotland seabed leasing round which enabled developers to propose offshore wind projects and apply for seabed rights to plan and build windfarms in Scottish waters.
Scour protection	Protective measures to avoid sediment being eroded away from the base of the wind turbine generator foundations as a result of the flow of water.
The Applicant	The legal entity submitting consent applications for the MachairWind Offshore Windfarm, namely MachairWind Limited.
The Project	MachairWind Offshore Windfarm including all its Development Areas and associated infrastructure.
Transition bay	Connects offshore and onshore export cables at the landfall. The transition bay will be located above mean high water.
West Scotland (WS)	WS has been defined as a smaller MU to assess for the likely number of minke whales using the Sea of Hebrides NCMPA, rather than the full UK MU. This provides an indication of the spatial scales at which impacts of plans and projects alone, cumulatively and in-combination, need to be assessed for minke whale in UK waters, with consistency across the UK.
Windfarm Development Area (WDA)	The application boundary within the OAA where consent will be sought for the proposed WDA infrastructure. The WDA infrastructure is subject to Section 36 consent and marine licence applications (generation and transmission) which are being applied for separately from the Offshore ECC infrastructure and OnTDA infrastructure.
WDA infrastructure	The offshore generation and transmission infrastructure located within the WDA including but not limited to: WTGs, WTG fixed foundations (and associated scour protection), OSP(s), OSP fixed foundations (and associated scour protection), IACs, OSP link and offshore export cable(s) and their associated external cable protection (insofar as these are located within the WDA) and fibre optic cables.
Wind Turbine Generator (WTG)	A wind turbine generator which converts wind energy into electrical energy. Each wind turbine generator is a complex system composed of a high number of components. Typically, the main components include the rotor assembly (composed of three blades and a hub); the nacelle (containing a generator, shaft and gearbox, power electronic converter and transformer); and the tower (containing lifting equipment and the switchgear).

1 REPORT TO INFORM MARINE PROTECTED AREA ASSESSMENT

1.1 INTRODUCTION

1. The MachairWind Offshore Windfarm ('the Project') is being developed by MachairWind Limited ('the Applicant') with separate applications being submitted for each of its three Development Areas i.e. the Windfarm Development Area (WDA), the Offshore Export Cable Corridor (ECC) and Onshore Transmission Development Area (OnTDA). The WDA is 448 km^2 and is located off the west coast of Scotland, to the northwest of Islay and west of Colonsay. The WDA infrastructure includes but is not limited to:

- Wind Turbine Generators (WTG) and associated fixed foundations and scour protection;
- Offshore Substation Platforms (OSP) and associated fixed foundations and scour protection;
- Inter-array cables (IACs) and associated cable protection;
- OSP link cables and associated cable protection; and
- The portion of the offshore export cable(s) located within the WDA, and associated cable protection.

2. When operational, the WDA is anticipated to have a capacity of around 2 Gigawatts (GW) generated by up to 144 WTGs. This will have the potential to generate renewable electricity for up to two million UK homes, contributing to Scotland and the UK's transition to Net Zero and the UK's energy security in line with Government policy.

3. The earliest that WDA construction could commence is anticipated to be 2030.

4. This report provides the Nature Conservation Marine Protected Area (NCMPA) assessment for the WDA. The Applicant will submit a separate NCMPA assessment for the Offshore ECC infrastructure following further refinement and Environmental Impact Assessment (EIA) scoping of the Offshore ECC (see **Chapter 1 Introduction** of the Environmental Impact Assessment Report (EIAR) for further details on the consenting approach for the Project).

1.2 PURPOSE OF THIS REPORT

5. Sites designated as NCMPAs within Scottish waters are established for the protection of nationally important marine habitats, species, and geodiversity features under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009 (see **Section 1.3** for further information).

6. The purpose of this report is to assess the potential for the WDA infrastructure to significantly hinder the achievement of the conservation objectives of the relevant NCMPAs, which are as follows (see **Section 1.5** for further information regarding the NCMPA screening process):

- Sea of the Hebrides NCMPA; and
- Loch Sunart to the Sound of Jura NCMPA.

1.3 LEGISLATION, POLICY AND GUIDANCE

7. NCMPAs in Scotland are designated under the Marine (Scotland) Act 2010 within 12 nautical miles (nm) from shore, and under the Marine and Coastal Access Act 2009 in offshore waters between 12 nm and 200 nm. NCMPAs are designated to protect biodiversity and heritage, with specific focus on protected features (species, habitats, large scale features or geomorphological features).

8. Under the Marine (Scotland) Act 2010 and the Marine and Coastal Access Act 2009, provisions are made for the relevant public authority. In this instance, the Scottish Ministers, whose decision is administered through the Marine Directorate – Licensing Operations Team (MD-LOT), consider whether a licensable activity can affect (other than insignificantly) a protected feature in an NCMPA or any ecological or geomorphological process on which the conservation of any protected feature in an NCMPA is dependent. Subject to the exceptions described below, the Scottish Ministers must not grant authorisation for the licensable activity where there is a significant risk of hindering the achievement of the conservation objectives of the NCMPA. The exceptions are as follows:

- There are no other means of proceeding that would create a substantially lower risk;
- The benefit to the public clearly outweighs the risk of damage to the environment; and
- Measures will be undertaken of equivalent environmental benefit to the damage which will or is likely to occur.

9. To assess whether there is any significant risk of the Project hindering the achievement of the conservation objectives of a given NCMPA, an NCMPA assessment should be completed.

1.4 CONSULTATION

10. This NCMPA assessment has been informed by engagement with stakeholders, including those listed below:

- Marine Directorate Licensing and Operations Team (MD-LOT);
- NatureScot; and
- Argyll and Bute Council.

11. The consultation outcomes in relation to the NCMPA assessment are outlined in **Table 1.1**, which summarises stakeholder feedback, outlines how the Applicant has responded to the feedback received, and details how it has been considered within this assessment.

12. In addition to the engagement outlined in **Table 1.1**, the points of agreement between the Applicant, MD-LOT and NatureScot are listed below:

- MD-LOT and NatureScot agreed that black guillemot of the Clyde Sea Sill (Marine Protected Area) MPA could be screened out of the assessment;
- NatureScot confirmed that geodiversity and benthic features of all the NCMPAs considered could be screened out of the assessment;
- NatureScot agreed that Sea of Hebrides NCMPA and the Loch Sunart to the Sound of Jura NCMPA should be screened in for further assessment;
- NatureScot agreed with the proposed approach for assessment of marine mammals (see ID 9 in **Table 1.1**); and
- Argyll and Bute Council agreed that the South Arran NCMPA could be screened out of further assessment.

Table 1.1 Summary of consultation relevant to the NCMPA assessment

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
Scoping Opinion				
1.	MD-LOT	09 January 2025	In regard to the Marine Protected Area ("MPA") Screening Report, the Scottish Ministers refer to the representation from NatureScot and agree that minke whale of the Sea of Hebrides MPA should be screened in for assessment and advise that underwater noise from geophysical survey works should also be scoped in for assessment.	The Applicant confirms that minke whale of the Sea of Hebrides MPA and underwater noise from geophysical survey works have been screened in for assessment, see **Section 6.1.2.1** for further details.
2.	MD-LOT	09 January 2025	In regard to the MPA Screening Report, the Scottish Ministers refer to the representation from NatureScot and agree there is no connectivity to black guillemot of the Clyde Sea Sill MPA for the Proposed Development and can be screened out of the assessment.	The Applicant welcomes the agreement on this matter.
3.	NatureScot	09 January 2025	We welcome submission of the (Habitats Regulations Appraisal) HRA Stage 1 and NCMPA Screening Reports alongside the EIA Scoping Report as this enables us to consider and provide advice under each assessment process at the same time. We provide advice to help inform HRA and NCMPA requirements for marine ornithology, marine mammals, benthic ecology, diadromous fish and geodiversity features in each of the relevant appendices.	Noted.
4.	NatureScot	09 January 2025	We recommend early consideration of potential inclusion of positive effects for biodiversity as well as nature inclusive design. Whilst it is not currently a policy requirement, as part of the need to address both the climate and biodiversity crises, we encourage Applicants to consider this as part of their submission.	The Project has considered nature inclusive design solutions and potential positive effects for biodiversity in the **Nature Positive Plan**, submitted alongside this NCMPA assessment.
5.	NatureScot	09 January 2025	An NCMPA Screening Report (Appendix H) has been provided alongside the Scoping Report. Having reviewed the information contained within the screening report – we agree that geodiversity features of all the NCMPAs considered can be screened out from further assessment	The Applicant welcomes the agreement on this matter.
6.	NatureScot	09 January 2025	An NCMPA Screening Report (Appendix H) has been provided alongside the Scoping Report. Having reviewed the information	The Applicant welcomes the agreement on this matter.

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			contained within the Screening Report, we agree that benthic features of the NCMPAs considered can be screened out from further assessment	
7.	NatureScot	09 January 2025	It is noted in Section 9.7.3 that the WDA does not overlap with any designated site for fish or shellfish species. However, the Sea of Hebrides NCMPA and the Loch Sunart to the Sound of Jura NCMPA could potentially be impacted by the proposal. Therefore, we agree that these designated sites should be scoped in for further assessment.	The Applicant welcomes the agreement on this matter. Potential impacts on the Sea of Hebrides NCMPA and the Loch Sunart to the Sound of Jura NCMPA have been assessed in **Section 6** and **Section 8** of this document respectively.
8.	NatureScot	09 January 2025	An NCMPA Screening Report (Appendix H) has been provided alongside the Scoping Report. Section 3.2 of the Screening Report considers sites designated for fish species and concludes that basking shark of the Sea of Hebrides NCMPA and flapper skate of the Loch Sunart to the Sound of Jura NCMPA should be screened in for further assessment – we agree with these conclusions.	The Applicant welcomes the agreement on this matter. Potential impacts on the Sea of Hebrides NCMPA and the Loch Sunart to the Sound of Jura NCMPA have been assessed in **Section 6** and **Section 8** of this document respectively.
9.	NatureScot	09 January 2025	An NCMPA Screening Report (Appendix H) has been provided alongside the Scoping Report and we agree that minke whale of the Sea of Hebrides NCMPA should be screened in for assessment. It is noted in Paragraph 35 that “where MUs for a given species extend over a very large area (e.g. minke whale and Risso’s dolphin over the Celtic and Greater North Sea Management Unit (MU)), it is proposed that the assessment will focus on the appropriate SCANS IV (Small Cetaceans in European Atlantic Waters and the North Sea) Block CS-H which provides a more accurate estimate of the population.” We are content with this approach - that a more precautionary SCANS estimate is used for the adjacent block due to the fact that the NCMPA sits within both CS-F and CS-H as well as considering the densities presented in Paxton et al. (2014).	The Applicant welcomes the agreement on this matter. Potential impacts on the minke whale feature of the Sea of Hebrides NCMPA have been assessed in **Section 6** of this document.
10.	NatureScot	09 January 2025	Table 4.3 details the impacts screened in for minke whale as a designated species of the Sea of Hebrides NCMPA and we are generally content with these. However, we advise that underwater	The Applicant confirms that minke whale of the Sea of Hebrides MPA and underwater noise from geophysical survey works have

I.D.	Consultee	Date/Engagement Activity	Stakeholder Comment	Applicant Response
			noise from geophysical survey works should also be scoped in for assessment.	been screened in for assessment, see **Section 6.1.2.1** for further details.
11.	NatureScot	09 January 2025	An NCMPA Screening Report (Appendix H) has been provided alongside the Scoping Report. We have reviewed the information provided in Section 3.4 and agree that there is no connectivity to black guillemot of the Clyde Sea Sill NCMPA for the WDA, but this will need to be considered for the OfTDA when this is scoped.	The Applicant welcomes the agreement on this matter. The Clyde Sea Sill NCMPA will be screened in and assessed as part of the Offshore ECC consent application
12.	North Ayrshire Council	23 October 2024	Thank you for contacting North Ayrshire Council regarding the above. I can confirm that from a Planning Service perspective, the Council has no comments to make. It is noted that the South Arran Nature Conservation Marine Protection Area was considered to be part of the assessment but has been “screened out”. This is considered to be a reasonable approach given the distance to the proposal and the nature of the protected features of the designation.	The Applicant welcomes North Ayrshire Council’s agreement that the South Arran NCMPA can be screened out of further assessment.

1.5 EMBEDDED MITIGATION MEASURES

13. Mitigation measures relevant to the features of the Sea of the Hebrides and Loch Sunart to the Sound of Jura NCMPA's have been defined, assessed, and embedded within the design and assessment of the WDA infrastructure through **Chapter 9 Fish (including Basking Shark) and Shellfish** and **Chapter 10 Marine Mammals and Leatherback Turtle** of the EIAR. These measures are relied upon in the screening (**Section 2**) and the main assessment (**Section 6** and **8**) presented in this report.

14. Embedded mitigation relevant to the NCMPA assessment includes:

- The development of, and adherence to, a Marine Mammal Mitigation Protocol (MMMP) / Piling Noise Mitigation Plan in accordance with **Appendix 9 Draft MMMP**;
- Development of, and adherence to, a Marine Pollution Contingency Plan (MPCP);
- Development of, and adherence to, a Cable Plan (incorporating a Cable Burial Risk Assessment (CBRA));
- Development of, and adherence to, an Invasive Non-Native Species Mitigation Plan;
- The development of, and adherence to, an Environmental Management Plan (EMP) in accordance with **Appendix 6 Outline EMP**, which includes provision that vessels will adhere to the guidelines laid out in the Scottish Marine Wildlife Watching Code (SMWWC) where safe and appropriate to do so, to reduce the potential for vessel collision, by reducing vessel transit speeds and by maintaining speed and course when in the presence of marine mammal species. In the unlikely event that a collision event occurs, this will be reported on, and full information of the incident, including the marine mammal species, will be recorded. In addition, vessel movements to and from any port will be incorporated within existing vessel routes where practicable;
- Micro-siting of infrastructure, where practicable, around any identified sensitive habitats; and
- Joint Nature Conservation Committee (JNCC) (2017) guidelines for minimising the risk of injury to marine mammals from geophysical surveys will be followed.

2 SCREENING SUMMARY

2.1 OVERVIEW OF SITE-LEVEL SCREENING CONCLUSIONS

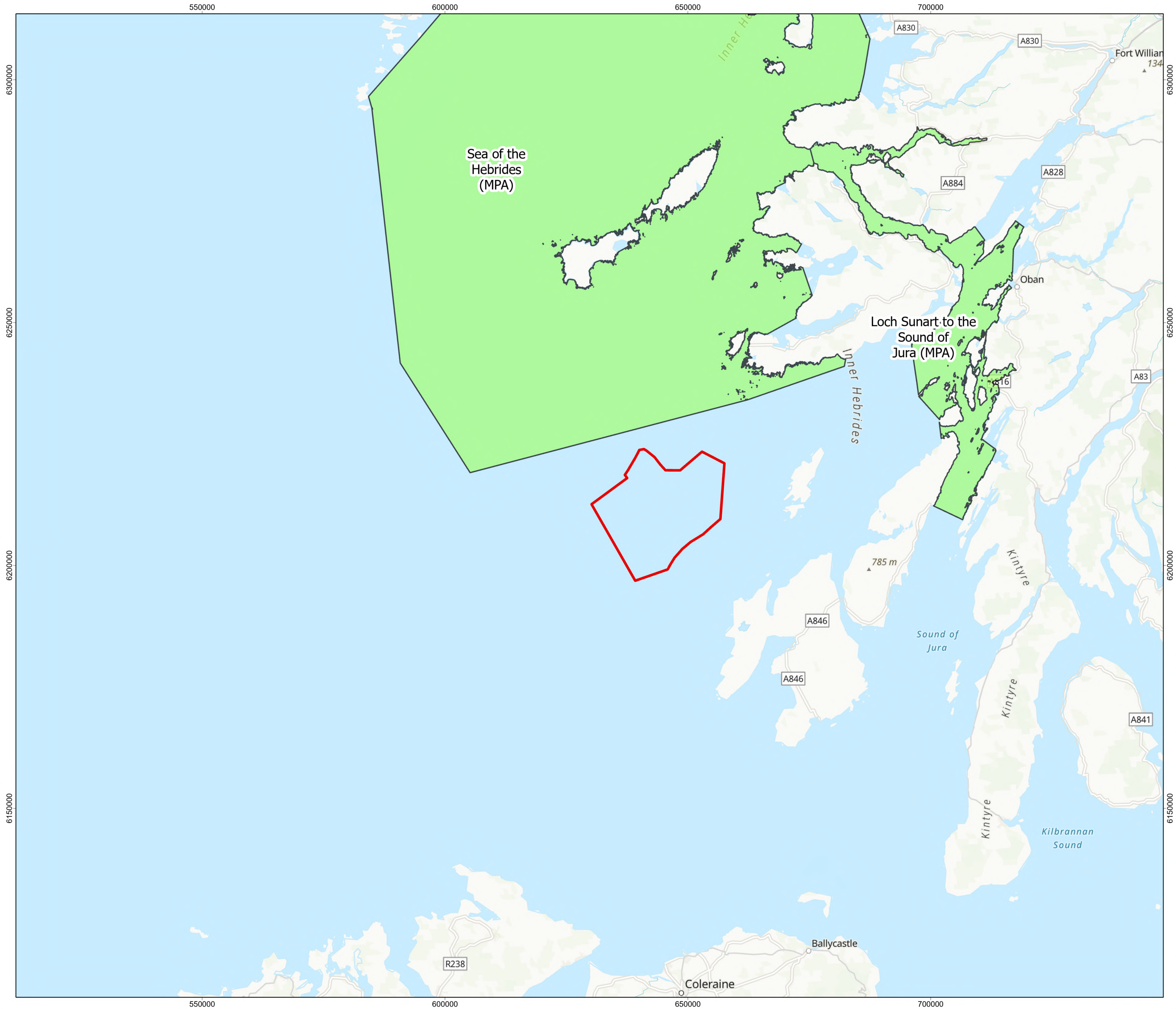
15. The Project's NCMPA screening report was submitted alongside the WDA Scoping Report as Appendix H Nature Conservation Marine Protected Area Screening. That screening exercise undertook a site-level assessment to identify NCMPAs with the potential to be affected by the WDA infrastructure.

16. The minke whale and basking shark features of the Sea of the Hebrides NCMPA, and the flapper skate feature of the Loch Sunart to the Sound of Jura NCMPA were screened in for further assessment. This is because the Zone of Influence (ZoI) identified for minke whale and basking shark overlaps with the Sea of the Hebrides NCMPA and for flapper skate with the Loch Sunart to Sound of Jura NCMPA.

17. No benthic habitats/species and geodiversity features, or offshore ornithology features associated with any of the NCMPAs included in this NCMPA Screening were screened in. This is because there is no overlap of the identified ZoI for these features with any of the relevant NCMPAs.

18. As noted in **Section 1.4**, these conclusions were supported by the comments received from stakeholders in the Scoping Opinion, with agreement being noted regarding the sites and features screened in / out of further assessment.

19. **Figure 2.1** shows the NCMPAs screened into this Report to Inform MPA Assessment.



Windfarm Development Area

Marine Protected Area (MPA)

N

0 10 20 Kilometres

1	09/04/2026	AB	GC	PM	GC
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000195		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:750,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 2.1: WDA and NCMPA overview

NOT TO BE USED FOR NAVIGATION

Haskoning Enhancing Society Together

ScottishPower Renewables

Project: C:\Users\304634\OneDrive - Royal HaskoningDHV\WIP\03 GIS\A02_Figures\03_EIA\01_WDA\Other_Reports\NCMPA\MCW_EIA_WDA_NCMPA.aprx
Name: Fig_2-1_MCW-DWF-ENV-MAP-RHS-000195_WDA_NCMPA_Overview

2.2 SUMMARY OF IMPACT PATHWAY SCREENING

2.2.1 Sea of the Hebrides NCMPA

2.2.1.1 Basking Shark

20. **Table 2.1** sets out the impacts screened in for the assessment of the basking shark feature of the Sea of the Hebrides NCMPA for the construction, operation and maintenance (O&M) and decommissioning phases of the Project.

Table 2.1 Summary of impact pathway screening for the basking shark feature of the Sea of the Hebrides NCMPA

Potential Impact	Project Phase* Scoped in (✓) / out (x)			Justification
	C	O&M	D	
Remobilisation of contaminated sediments	✗	✗	✗	Contaminants survey data shows that the seabed sediments within the WDA do not contain contaminants in concentrations that would pose a risk to water quality should the seabed sediments be suspended during construction, O&M and decommissioning activities. Therefore, this potential impact is **screened out**, for all phases.
Accidental release of pollutants	✗	✗	✗	Through implementation of the embedded mitigation practices detailed in Chapter 6 Marine Physical Environment of the Scoping Report, it is considered that the risk of a spill occurring is low and with the appropriate management measures in place, should a spill occur, the risk to the marine environment is effectively mitigated. Therefore, this potential impact is **screened out**, for all phases.
Increased Suspended Sediment Concentrations (SSC) resulting in potential reduction of prey species	✓	✓	✓	The northern extent of the tidal excursion distance overlaps very slightly with the Nature Conservation Marine Protected Area (NCMPA). An increase in SSCs could potentially affect zooplankton abundance which is an important prey resource for basking sharks. Therefore, this potential impact is **screened in**, for all phases.
Vessel collision and disturbance	✓	✓	✓	Potential impact could occur within the boundary of the NCMPA. Therefore, this potential impact is **screened in**, for all phases.
Underwater noise	✓	✓	✓	Potential impact could occur within the boundary of the NCMPA. Therefore, this potential impact is **screened in**, for the construction and O&M phases.
*C, O&M, D = Construction, Operation and Maintenance and Decommissioning, respectively.				

2.2.1.2 Minke Whale

21. **Table 2.2** sets out the impacts screened in for assessment for minke whale for the construction, O&M and decommissioning phases of the Project. In line with NatureScot advice at the WDA Scoping

Workshop on 01 May 2024, only potential impacts which could occur within the boundary of the NCMPA have been considered.

22. The impacts presented in **Table 2.2** align with the impacts identified for minke whale in **Chapter 10 Marine Mammals and Leatherback Turtle**, with the exception of changes to prey availability which, in agreement with MD-LOT and NatureScot has been scoped out due to the distance of the NCMPA from the WDA. As with the chapter, underwater noise sources have been separated because different noise sources such as impulsive and non-impulsive can cause different impacts to minke whale. See **Chapter 10 Marine Mammals and Leatherback Turtle** for further information on each impact.

Table 2.2 Summary of impact pathway screening for the minke whale feature of the Sea of the Hebrides NCMPA

Potential Impact	Project Phase* Scoped in (✓) / out (x)			Justification
	C	O&M	D	
Changes to prey availability	✘	✘	✘	**Screened out** as detailed in Appendix H Nature Conservation Marine Protected Area (NCMPA) Screening previously submitted with the Scoping Report.
Changes in water quality	✘	✘	✘	**Screened out** as detailed in Appendix H Nature Conservation Marine Protected Area (NCMPA) Screening previously submitted with the Scoping Report.
Underwater noise from operational wind turbines	n/a	✘	n/a	**Screened out** as detailed in Appendix H Nature Conservation Marine Protected Area (NCMPA) Screening previously submitted with the Scoping Report.
Underwater noise from non-piling activities (for example rock placement and cable laying)	✓	✓	✓	Underwater noise associated with other construction and maintenance activities can cause disturbance to marine mammals.
Underwater noise and presence of vessels	✓	✓	✓	Underwater noise and the presence of vessels can cause disturbance to marine mammals.
Barrier effects due to underwater noise	✓	✓	✓	Underwater noise can create a barrier effect preventing movement or migration of minke whale between important feeding and/or breeding areas.
Collision risk with vessels	✓	✓	✓	Potential impact could occur within the boundary of the NCMPA.
Underwater noise during unexploded ordnance clearance	✓	n/a	n/a	Underwater noise from unexploded ordnance clearance can cause physical injury to marine mammals.
Underwater noise during piling	✓	✘	✘	Underwater noise from piling can result in physical injury to marine mammals.
Underwater noise from geophysical survey works	✓	✓	✓	Underwater noise associated with survey activities can cause disturbance to marine mammals.
Cumulative impacts from underwater noise	✓	✓	✓	Underwater noise can cause disturbance to marine mammals.
Cumulative impacts from collision risk and presence of vessels	✓	✓	✓	Underwater noise and the presence of vessels can cause disturbance and increase collision risk.

Potential Impact	Project Phase* Scoped in (✓) / out (x)			Justification
	C	O&M	D	
Cumulative impacts from barrier effects	✓	✓	✓	Underwater noise can cause disturbance to marine mammals.
*C, O&M, D = Construction, Operation and Maintenance and Decommissioning, respectively.				

2.2.2 Loch Sunart to the Sound of Jura NCMPA

23. The screening of potential impact pathways for the Loch Sunart to the Sound of Jura NCMPA has considered a range of potential impact pathways associated with the WDA infrastructure. The outcomes of the impact pathway screening, across the construction, O&M, and decommissioning phases, are summarised in **Table 2.2.3**.

Table 2.2.3 Summary of Initial Impact Pathway Screening for the Loch Sunart to the Sound of Jura NCMPA

Potential Impact	Project Phase* Scoped in (✓) / out (x)			Justification
	C	O&M	D	
Increased SSC and sediment re-deposition	✘	✘	✘	Based on tidal excursion which extends from the WDA in a southerly direction by approximately 7-11 km (i.e. the average distance travelled by tidal flow between low-water slack tide and high-water slack tide before the current direction reverses). The tidal excursion traverses only a short distance in all other directions (including approximately 4-7 km in the North and centre of the WDA). This encompasses the area over which suspended sediment could be transported following disturbance from the seabed. There would be no overlap with the Loch Sunart to the Sound of Jura NCMPA and therefore, these potential impacts are **screened out**, for all phases.
Remobilisation of contaminated sediments	✘	✘	✘	Contaminants survey data shows that the seabed sediments within the WDA do not contain contaminants in concentrations that would pose a risk to water quality should the seabed sediments be suspended during construction, O&M and decommissioning activities. Therefore, this potential impact is **screened out**, for all phases.
Accidental release of pollutants	✘	✘	✘	Screened out based on implementation of the embedded mitigation practices detailed in **Chapter 6 Marine Physical Environment** of this Scoping Report. Therefore, this potential impact is **screened out**, for all phases.
Underwater noise	✓	✘	✓	Worst-case underwater noise modelling impact ranges for the sequential installation of six pin-piles at the east modelling location indicate a potential overlap with the NCMPA. Decommissioning may also require noisy activities to be undertaken which could impact upon the features of the NCMPA. Therefore, underwater noise from piling during construction and underwater noise during decommissioning has been screened in.
*C, O&M, D = Construction, Operation and Maintenance and Decommissioning, respectively.				

3 MAIN ASSESSMENT – METHODOLOGY

24. The NCMPA Main Assessment stage focuses on determining whether the WDA or associated activities pose a significant risk of hindering the achievement of the conservation objectives of an NCMPA. This assessment is undertaken on a case-by-case basis, following completion of the initial screening stage where such a risk cannot be ruled out. In Scotland, an NCMPA Assessment is a statutory requirement when applying for a marine licence if the proposed activity is capable of affecting an NCMPA, even if the impact is assessed as not significant. While the NCMPA Main Assessment draws on evidence produced through the Environmental Impact Assessment (EIA) process, it is a separate statutory assessment with a different purpose and methodology.

25. Under Section 83 of the Marine (Scotland) Act 2010 and Section 126 of the Marine and Coastal Access Act 2009, Scottish Ministers must assess whether the activity could hinder the conservation objectives of designated NCMPAs. As the competent authority, Scottish Ministers will not grant a marine licence unless the applicant can demonstrate that there is no significant risk to the NCMPA, or that the public benefit clearly outweighs the environmental risk, with appropriate mitigation or compensatory measures in place.

26. The Main Assessment has built on Stage 1, the initial screening, considering in greater detail aspects such as scale, timing and duration of WDA activities in the context of the NCMPAs screened into the Main Assessment. The Main Assessment also includes consideration of cumulative effects with other activities in line with EIA requirements (see **Chapter 5 EIA Methodology** of the EIAR).

27. Conservation objectives for NCMPA features describe the desired conditions of the NCMPA feature. Therefore, the objective for each given feature considers whether it is:

- Already in favourable condition, and is to remain in this condition; and
- Not already in favourable condition, and is to be brought into this condition, and subsequently remain in this condition.

28. In line with relevant guidance (such as Nature Conservation Marine Protected Areas: Draft Management Handbook (Marine Scotland, 2013) and Development management and Nature Conservation Marine Protected Areas (NatureScot, 2025a)), temporary and reversible effects that do not affect the ability of the feature to recover naturally and do not compromise the long-term achievement of the conservation objectives will not, in isolation, be considered to hinder the achievement of the conservation objectives, provided the feature and supporting processes are sufficiently resilient.

3.1 COMBINED ASSESSMENT

29. Potential interactions between the WDA and the Offshore ECC impacts have been considered in the Stage 2 Main Assessment for the WDA, in line with the approach described for the EIAR in **Chapter 5 EIA Methodology**. A WDA alone assessment is undertaken first, followed by a WDA and Offshore ECC combined assessment which considers any potential interactions between impacts and/or potential for additive effects. This approach enables potential interactions between each Development Area to be identified and assessed, ensuring a whole Project assessment is undertaken in a manner that is meaningful and proportionate. The level of detail of assessment of the Offshore ECC is commensurate with the level of detail that is available at the time of writing. To inform the combined assessment, a set of assumptions were developed which includes a preliminary boundary for the Offshore ECC, anticipated project components and associated construction methods and timelines. These are set out in **Chapter 3 Project Description** of the EIAR, Sections 3.7 and 3.8. Within the upcoming Offshore ECC consenting application, the respective NCMPA screening will include the NCMPA screening / Stage 2 assessment outcomes for the WDA and

present an updated combined assessment using the latest available information covering all aspects of the Project.

4 OVERVIEW OF THE PROJECT INFRASTRUCTURE

4.1 WDA INFRASTRUCTURE

30. The WDA infrastructure for the Project includes:

- Up to 144 WTGs on fixed foundations;
- Up to two OSPs;
- IACs;
- OSP link cables;
- Portion of Offshore export cable(s) located within the WDA;
- If required, scour protection for foundation structures supporting the WTGs and OSPs; and
- If required, external cable protection for IAC, OSP link and offshore export cable(s) (insofar as the latter are located in the WDA application boundary).

31. The WDA will have a seabed lease for up to 60 years, and the infrastructure will have an indicative operational life of 35 years, with first power expected in the early to mid-2030s.

32. Further details of the WDA infrastructure are provided in **Chapter 3 Project Description** of the EIAR.

4.2 DEVELOPMENT AREAS

33. The Project has been split into the following three Development Areas for which separate consents and/or licences will be sought by the Applicant for the respective infrastructure:

- The WDA for the installation and operation of the WDA infrastructure (noting this includes the portion of the offshore export cable(s) located therein);
- The Offshore ECC, for the installation and operation of the Offshore ECC infrastructure; and
- The Onshore Transmission Development Area (OnTDA), for the installation and operation of the OnTDA infrastructure.

4.3 WORST-CASE SCENARIO

34. The final design of the WDA will be confirmed by detailed engineering studies post-consent. To undertake a robust and precautionary impact assessment, the realistic worst-case design scenarios (i.e., those that would cause the greatest impact) are defined from the Project Design Envelope (PDE); ensuring that all other design scenarios would have equal or less impact. The realistic worst-case scenarios for the NCMPA assessment are summarised in **Table 4.1**.

Table 4.1 Realistic worst-case scenario for the basking shark feature of the Sea of the Hebrides NCMPA

Impact	Realistic Worst-Case Scenario	Rationale
Construction		
Impact 1: Increased suspended sediment concentrations and sediment redeposition	**Worst-case scenario for total temporary increases in SSCs = 20,251,431 m^3**	The worst-case scenario aligns with the equivalent assessment presented in **Chapter 9 Fish (Including Basking Shark) and Shellfish** of the EIAR which should be referred to for details of how the total volume has been calculated.
Impact 2: Vessel collision and disturbance	Pre-construction vessel trips (round trips to and from port) (total): 140 Vessel trips across entire construction period (round trips to and from port) (total): 5,699 Max. no. of all types of vessels operating on site simultaneously during construction: 117	Maximum number of construction vessels and construction vessel round trips include those required for export cable installation within the Offshore ECC in addition the WDA, so the assumptions are conservative.
Impact 3: Underwater Noise	Piling period 2030 Q2 to 2034 Q4 Monopiles • Maximum number of monopiles: 144 • Maximum pile diameter: 15 m • Maximum hammer energy: 6,600 kilo Joules (kJ) • Maximum number of monopiles installed per day: one • Maximum piling duration per monopile = 320 minutes • Maximum piling duration for maximum monopiles = 768 hours which = 32 days Pin-piles • Maximum number of pin-piles for WTGs: 576 • Maximum number of pin-piles for OSPs: 32 (16 per OSP) • Total number of pin-piles: 608 • Maximum pile diameter: 4.5 m • Maximum hammer energy: 4,400 kJ • Maximum number of pin-piles installed per day: six • Maximum piling duration per pin-pile = 195 minutes	The spatial worst-case scenario is based on the impact range for the maximum hammer energy required for the installation of monopiles. Maximum hammer energy is unlikely to be required on all piles but is assessed for all piles as a worst-case scenario.

Impact	Realistic Worst-Case Scenario	Rationale
	• Maximum piling duration for maximum pin-piles = 1976 hours which = 82.3 days	
Operation and Maintenance		
Impact 1: Increased suspended sediment concentrations and sediment redeposition	Cable repair and reburial total volume of sediment disturbed per year within the WDA – I63,600 m^3	The worst-case scenario aligns with the equivalent assessment presented in **Chapter 9 Fish (Including Basking Shark) and Shellfish** of the EIAR.
Impact 2: Vessel collision and disturbance	Annual no. of vessel round trips required for routine operational and planned maintenance activities: 423	Maximum number of O&M vessels include those required for export cable installation within the Offshore ECC in addition to the WDA, so the assumptions are conservative.
Impact 3: Underwater Noise	O&M activities may include cable laying, suction dredging, backhoe dredging, drilling, rock placement and trenching. O&M activities will continue during the lifetime of the Project, up to 35 years.	Results from the underwater noise modelling report (see **Appendix 10.1 Underwater Noise Technical Report**) have predicted auditory impact ranges for fish and shellfish.
Decommissioning		
Impact 1: Increased suspended sediment concentrations and sediment redeposition	The worst-case scenario of decommissioning would be similar to those of the above outlined construction impacts of this table although piling would not be required during decommissioning and so underwater noise impacts would be less.	The impacts of decommissioning are primarily linked to the removal of infrastructure from the seabed, such as offshore cables and scour and cable protection. These activities may cause temporary disturbance to the seabed and surrounding marine environment. However, it is anticipated that the overall environmental impacts associated with decommissioning will be equal to, or potentially less than, those experienced during the construction phase. This is due to the fact that much of the infrastructure will have already settled into place, and the removal process will likely be more controlled and less intrusive. Additionally, any disturbance will be short-term and localised, with efforts made to minimise harm to marine habitats and ecosystems.
Impact 2: Vessel collision and disturbance		
Impact 3: Underwater Noise		

Table 4.2 Realistic worst-case scenarios for the minke whale feature of the Sea of the Hebrides NCMPA

<table>
<tr><th>Impact</th><th>Realistic Worst-Case Scenario</th><th>Rationale</th></tr>
<tr><td colspan="3">Construction</td></tr>
<tr><td>Impact 1: Underwater noise during geophysical surveys</td><td>A worst-case scenario of up to three geophysical survey vessels operating on site at any one time has been assumed for the assessment. These are expected to utilise the following equipment:
• Sub Bottom Profiler (SBP);
• Multi-beam echosounder (MBES);
• Ultra-high resolution (UHR) Sparker
• Ultra-Short Baseline (USBL); and
• Side Scan Sonar (SSS).</td><td>Equipment and source levels (Section 6.1.2.1) are indicative. Prior to any geophysical survey, an EPS Risk Assessment (RA) and EPS licence application (which will include definition of the full survey scope) will be submitted to MD-LOT for approval.</td></tr>
<tr><td>Impact 2: Underwater noise during Un-exploded Ordnance (UXO) clearance</td><td>A potential worst-case is UXO with a Net Explosive Quantity (NEQ) of 750 kg (based on Natural England guidance (Parker et al., 2025)).
Types and sizes of UXO: Various possible types and sizes of UXO, ranging from 0.25 kg to 750 kg.
Underwater noise modelling and assessments include low-order deflagration with shaped charge of 0.25 kg NEQ.
Underwater noise modelling and assessments are based on a worst-case high-order detonation of UXO with NEQ of 750 kg (including donor charge).</td><td>Low-order clearance would be the default method for UXO that require clearance.
As a worst-case, assessments are based on high-order detonation in case there is an accidental detonation during a low order procedure. Additionally, if three attempts of low order clearance failed, high order clearance would be the next alternative.
A detailed UXO survey will be completed prior to construction when a separate Marine Licence for UXO clearance will be submitted to MD-LOT for approval. The type, size and number of possible detonations and duration of UXO clearance operations is therefore not known at this stage. However, underwater noise during UXO clearance has been assessed in Section 6.1.2.2 for information purposes.</td></tr>
<tr><td>Impacts 3 & 4: Underwater noise during piling</td><td colspan="2" rowspan="2">As per construction Impact 3 in Table 4.1.</td></tr>
<tr><td>Impact 6: Barrier effects due to underwater noise</td></tr>
</table>

Impact	Realistic Worst-Case Scenario	Rationale
Impact 5: Underwater noise from non-piling activities (for example rock placement and cable laying)	Non-piling construction activities associated with seabed preparation and cable installation include: cable laying, suction dredging, drilling, rock placement and trenching. Offshore construction period: five years.	Results from underwater noise modelling undertaken for the Project (see **Appendix 10.1 Underwater Nosie Modelling** of the EIAR) have estimated auditory impact ranges for marine mammals from non-piling activities.
Impact 5: Underwater noise and presence of vessels Impact 7: Collision risk with vessels	Maximum number of construction vessels operating at the WDA at any one time is 117. Total number of construction vessel round trips: 5,699. There will be an average of 3 vessel transits between the selected construction port(s) and the WDA per day over the five year offshore construction period.	Maximum number of construction vessels and construction vessel round trips include those required for export cable installation within the Offshore ECC in addition to the WDA, so the assumptions are conservative.
Operation and Maintenance		
Impact 1: Underwater noise from geophysical survey works	<u>Expected to utilise the following equipment</u> • SBP; • MBES; • UHR; • USBL; and • SSS.	Equipment and source levels (**Section 6.1.2.1**) are indicative. Prior to any geophysical survey, an EPS Risk Assessment (RA) and EPS licence application (which will include definition of the full survey scope) will be submitted to MD-LOT for approval.
Impact 5: Underwater noise from non-piling activities (for example rock placement and cable laying)	A programme of monitoring and scheduled maintenance would be undertaken throughout the lifetime of the Project to ensure that all WDA infrastructure is maintained in safe working order and to maximise operational efficiency. Underwater noise generating O&M activities include planned and unplanned maintenance and could include cable reburial/repair/replacement, suction dredging, drilling, rock placement and trenching.	Results from underwater noise modelling undertaken for the Project (see **Appendix 10.1 Underwater Noise Modelling** of the EIAR) have estimated auditory impact ranges for marine mammals from non-piling activities. O&M activities will occur throughout the anticipated operational lifetime of the Project of 35 years. O&M activities would likely be concentrated in the summer months and would be sporadic and intermittent through the operational life of the Project.
Impact 5: Underwater noise and presence of vessels	Indicative peak numbers of vessels on site at any one time during O&M: 13	Results from underwater noise modelling undertaken for the Project (see **Appendix 10.1 Underwater Nosie Modelling** of

Impact	Realistic Worst-Case Scenario	Rationale
Impact 7: Collision risk with vessels	Indicative annual vessel round trips during O&M: 423. An average of 1-2 vessels could be transiting to the WDA per day.	the EIAR) have estimated auditory impact ranges for marine mammals.
Impact 6: Barrier effects due to underwater noise	During the O&M phase of the Project, marine mammals could be subject to barrier effects from the operational noise of WTGs. Maximum number of WTGs: 144.	The maximum spatial area and duration of potential impact would result in the worst-case barrier effect.
Decommissioning		
Impact 1: Underwater noise from geophysical survey works	The worst-case scenarios for decommissioning would be similar to those defined in the construction phase.	The impacts of decommissioning are primarily linked to the removal of infrastructure from the seabed, such as foundations, offshore cables and scour and cable protection. These activities may cause temporary disturbance to the seabed and increases SSCs within the surrounding marine environment. However, it is anticipated that the overall environmental impacts associated with decommissioning will be equal to, or potentially less than, those experienced during the construction phase. This is because there will be no requirement for piling and much of the WDA infrastructure will have already settled into place, and the removal process will likely be more controlled and less intrusive with respect to impacts on marine mammals. Additionally, any disturbance will be short-term and localised, with efforts made to minimise harm to marine mammals.
Impact 5: Underwater noise from non-piling activities (for example rock placement and cable laying)		
Impact 5: Underwater noise and presence of vessels		
Impact 6: Barrier effects due to underwater noise		
Impact 7: Collision risk with vessels		

Table 4.3 Realistic worst-case scenario for the flapper skate feature of the Loch Sunart to Sound of Jura NCMPA

Impact	Realistic Worst-Case Scenario	Rationale
Construction		
Impact 1: Underwater Noise	As per construction Impact 3 in **Table 4.1**.	
Decommissioning		
Impact 1: Underwater Noise	As per construction Impact 2 in **Table 4.1**.	The impacts of decommissioning are primarily linked to the removal of infrastructure from the seabed, such as offshore cables and scour and cable protection. These activities may cause temporary disturbance to the seabed and surrounding marine environment. However, it is anticipated that the overall environmental impacts associated with decommissioning will be equal to, or potentially less than, those experienced during the construction phase. This is due to the fact that much of the infrastructure will have already settled into place, and the removal process will likely be more controlled and less intrusive. Additionally, any disturbance will be short-term and localised, with efforts made to minimise harm to marine habitats and ecosystems.

5 BACKGROUND INFORMATION ON THE SEA OF THE HEBRIDES NATURE CONSERVATION MARINE PROTECTED AREA

5.1 OVERVIEW

35. The Sea of the Hebrides NCMPA is screened in for assessment based on the WDA being capable of affecting the basking shark and minke whale features of the NCMPA.

36. The Sea of the Hebrides NCMPA is situated between the Isle of Mull, Isle of Harris and the northwest coast of Scotland and is approximately 4.3 km from the WDA at its closest point. It was first designated in 2020 and comprises an area of 10,039 km^2.

37. The NCMPA is host to a wide range of marine life and features a front. The front feature appears during spring and summer to the southwest of Tiree and provides an important functional link to both basking sharks and minke whales by facilitating favourable feeding conditions. Minke whales are considered to be declining in Scottish waters and basking shark is listed as 'Endangered' on the International Union for Conservation of Nature (IUCN) Red List and is a Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) threatened or declining species.

38. The protected marine geomorphology of the Scottish Shelf Seabed is represented by the Inner Hebrides Carbonate Production Area (NatureScot, 2020a).

39. All of the biodiversity and geodiversity features are in favourable condition at the Sea of the Hebrides NCMPA and therefore the Conservation Objectives seek to 'conserve' this condition. A number of activities are considered capable of affecting the protected features and there is therefore a need to consider whether additional management is required (NatureScot, 2020b).

40. As noted in **Section 2.2.1** all features of the NCMPA have been screened out with the exception of minke whale and basking shark. Based on the ZoIs identified, it is considered that the WDA and associated works are capable of affecting these features of the NCMPA.

5.2 CONSERVATION OBJECTIVES

41. **Table 5.1** sets out the Conservation Objectives for the basking shark and minke whale features of the NCMPA (NatureScot, 2025b).

Table 5.1 Conservation objectives for minke whale and basking shark features of the Sea of the Hebrides Nature Conservation Marine Protected Area

Protected Feature(s)	Type	Conservation Objective	Condition
Minke whale and basking shark	Mobile species	• Maintain in favourable condition. • Minke whale and basking shark in the Sea of the Hebrides NCMPA are not at significant risk from injury or killing. • Conserve the access to resources (e.g. for feeding and courtship) provided by the NCMPA for various stages of the minke whale and basking shark life cycle. • Conserve the distribution of minke whale and basking shark within the site by avoiding significant disturbance. • Conserve the extent and distribution of any supporting feature upon which minke whale and basking shark is dependent. • Conserve the structure and function of supporting features, including processes to ensure minke whale and basking shark are healthy and not deteriorating.	Favourable (NatureScot, 2020b)

42. “Favourable condition,” with respect to a mobile species of marine fauna, means that:

- The species is conserved or, where relevant, recovered to include the continued access by the species to resources provided by the NCMPA for, but not restricted to, feeding, courtship, spawning or use as nursery grounds;
- The extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered; and
- The structure and function of any supporting feature, including any associated processes supporting the species within the NCMPA, is such as to ensure that the protected feature is in a condition which is healthy and not deteriorating.

43. For the purpose of determining whether a protected feature is in favourable condition, any alteration to that feature brought about entirely by natural processes is to be disregarded.

5.2.1 Relevance of Conservation Objectives to this Assessment

5.2.1.1 Basking Shark

44. **Table 5.2** sets out the proposed impacts being assessed for the basking shark feature of the NCMPA against the Conservation Objectives which they may have the potential to hinder.

Table 5.2 Potential impacts that have the potential to hinder the Conservation Objectives for the basking shark feature of the Sea of the Hebrides NCMPA

Conservation Objective	Potential Impacts that may hinder the Conservation Objective and have been scoped in
Maintain in favorable condition.	All potential impacts assessed in **Section 6.1.1**.
Minke whale and basking shark in the Sea of the Hebrides NCMPA are not at significant risk from injury or killing.	• Collision risk with vessels • Underwater noise
Conserve the access to resources (e.g. for feeding and courtship) provided by the NCMPA for various stages of the minke whale and basking shark life cycle.	• Increased SSC resulting in potential reduction of prey species
Conserve the distribution of minke whale and basking shark within the site by avoiding significant disturbance.	• Underwater noise • Vessel collision and disturbance
Conserve the extent and distribution of any supporting feature upon which minke whale and basking shark is dependent.	• Increased SSC resulting in potential reduction of prey species
Conserve the structure and function of supporting features, including processes to ensure minke whale and basking shark are healthy and not deteriorating.	• Increased SSC resulting in potential reduction of prey species

5.2.1.2 Minke Whale

45. **Table 5.3** sets out the proposed impacts being assessed for the minke whale feature of the NCMPA against the Conservation Objectives which they may have the potential to hinder.

Table 5.3 Potential Impacts that have the potential to hinder the Conservation Objectives for the minke whale feature of the Sea of the Hebrides NCMPA

Conservation Objective	Potential Impacts that may hinder the Conservation Objective and have been scoped in
Maintain in favorable condition.	All potential impacts assessed in **Section 6.2.2**.
Minke whale and basking shark in the Sea of the Hebrides NCMPA are not at significant risk from injury or killing.	• Underwater noise during geophysical surveys • Underwater noise during unexploded ordnance clearance

Conservation Objective	Potential Impacts that may hinder the Conservation Objective and have been scoped in
	• Underwater noise during piling • Collision risk with vessels • Cumulative impacts from collision risk and presence of vessels
Conserve the access to resources (e.g. for feeding and courtship) provided by the NCMPA for various stages of the minke whale and basking shark life cycle.	No potential impacts scoped in that may affect this Conservation Objective.
Conserve the distribution of minke whale and basking shark within the site by avoiding significant disturbance.	• Underwater noise during geophysical surveys • Underwater noise during unexploded ordnance clearance • Underwater noise during piling • Underwater noise from non-piling activities (for example rock placement and cable laying) • Barrier effects due to underwater noise • Vessel interaction (collision risk) • Cumulative impacts from underwater noise • Cumulative impacts from barrier effects
Conserve the extent and distribution of any supporting feature upon which minke whale is dependent.	No potential impacts scoped in that may affect this Conservation Objective.
Conserve the structure and function of supporting features, including processes to ensure minke whale and basking shark are healthy and not deteriorating.	No potential impacts scoped in that may affect this Conservation Objective.

5.3 BASELINE CONDITION

5.3.1 Basking Shark

46. Basking sharks show strong seasonality in Scottish waters, with numbers increasing markedly between May and September. The Sea of the Hebrides NCMPA supports some of the most consistent and dense seasonal aggregations of this species, particularly between July and the end of September (NatureScot, 2020a; Pikesley et al., 2024). **Plate 5.1** (Pikesley et al., 2024) shows basking shark density estimates for the UK based on public sightings data from 2014-2020. Within the west coast of Scotland, areas west of Coll, north of Tiree, and around Hyskeir are well-established summer hotspots, where sharks aggregate at the sea surface to exploit dense concentrations of zooplankton (Speedie et al., 2009; Witt et al., 2016). The prevalence of basking sharks within these areas reflects the influence of large-scale hydrodynamic drivers, such as seasonal stratification, tidal mixing and frontal formation, which enhance zooplankton productivity and retention within the NCMPA (Basking Shark Scotland, 2023).

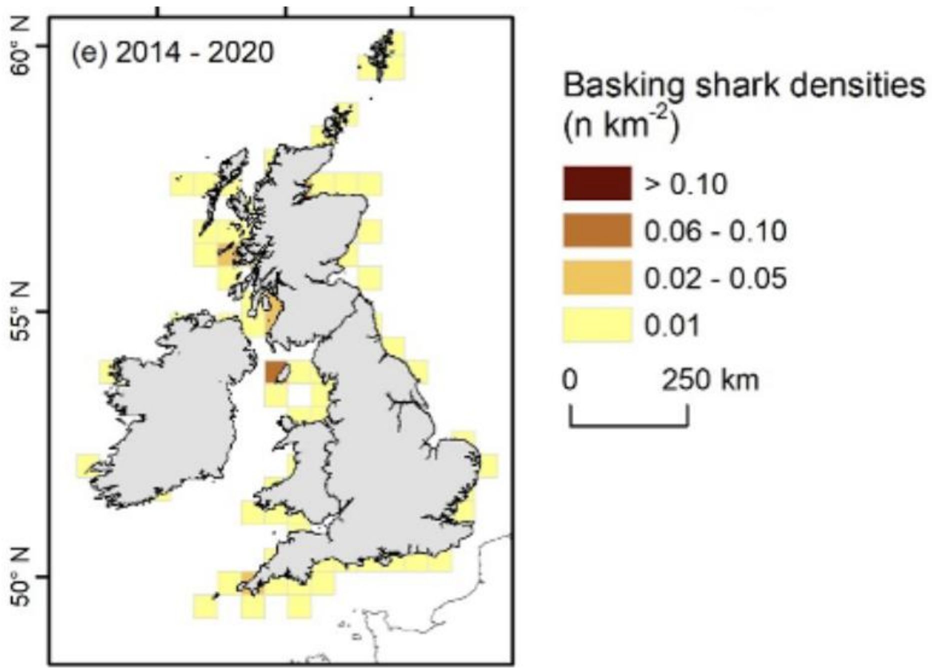


Plate 5.1 Basking shark density estimates based on public sightings data from the Marine Conservation Society and the Shark Trust for 2014-2020

47. Despite these predictable seasonal aggregations, population estimates remain highly uncertain. No agreed estimates exist for Scotland or the wider Northeast Atlantic, owing largely to the logistical difficulty of surveying a migratory species that does not rely on surface breathing. Tentative estimates of 1,000-2,000 sharks for local sectors of the Sea of the Hebrides NCMPA have been generated from dedicated boat-based surveys and photo-identification studies, but these are considered conservative due to methodological limitations, including short survey periods, low resighting rates, and lack of availability correction for animals below the surface (Booth et al., 2013; Gore et al., 2016; NatureScot, 2020a). Long-term visual surveys conducted by the Hebridean Whale & Dolphin Trust show a consistently strong seasonal presence throughout the Inner Hebrides, reinforcing the significance of this region for the species (Hebridean Whale & Dolphin Trust, 2023). Surveys undertaken as part of ScottishPower Renewables' investigation into the previously proposed Argyll Array Offshore Wind Farm recorded a total of 918 individual shark observations in a single day to the southwest of Tiree, which is the maximum number ever recorded in a single day (Booth et al., 2013). More recent site-specific survey data collected for the Project provides further context on basking shark use of the WDA. Thirty months of Digital Aerial Surveys (DAS), supplemented by third-party aerial survey data and geophysical surveys undertaken in 2023 and 2025, recorded only small numbers of basking sharks within the WDA. During the DAS, two individuals were recorded in April 2021, followed by a single record in November 2021, one individual in April 2022, and four individuals in April 2023. In addition, third-party aerial survey data recorded seven basking sharks in May 2021 within the wider survey area. No basking sharks were sighted during the Project's geophysical surveys in 2023 (August – November) and 2025 (April – June). Observations were infrequent and dominated by isolated individuals, with no evidence of sustained aggregation or repeated use of the area. This data indicates that the WDA is not a core area for basking sharks and is more likely to be used occasionally by transiting individuals moving between preferred feeding and aggregation areas further to the north within the Sea of the Hebrides NCMPA.

48. The basking shark is listed as Endangered on the IUCN Red List and is an OSPAR threatened or declining species, having suffered historic exploitation in the Northeast Atlantic (Witt et al., 2012; OSPAR Commission, 2021). Its ecology is characterised by long-distance migrations and seasonal

movements across temperate continental shelf waters, where sharks congregate for feeding and, potentially, courtship (Witt et al., 2016). Their reliance on filter-feeding profoundly shapes their habitat use: in summer, sharks occupy productive coastal areas with dense patches of zooplankton, often recorded in shallow waters and moderate tidal regimes characteristic of the Sea of the Hebrides (Witt et al., 2016). During autumn and winter, basking sharks typically disperse into deeper waters of the Northeast Atlantic, Bay of Biscay, and Celtic Sea, although some individuals remain relatively close to Scotland year-round (Witt et al., 2016).

49. Recent high resolution tracking studies have revealed complex vertical movement behaviour in basking sharks, including “yo yo” diving patterns, prolonged deep occupancy (>1,000 m), and Diel Vertical Migration (DVM) and reverse DVM. These behaviours appear linked primarily to foraging dynamics but may also contribute to thermoregulation or energy conservation (Witt et al., 2016; Doherty et al., 2019; Shepard et al., 2006). Sharks generally occupy the epipelagic zone (0-100 m) during summer feeding but can conduct rapid vertical movements depending on water column structure and prey distribution (Witt et al., 2016). Such behaviours support the conclusion that basking sharks transiting through the WDA would likely be near the surface during summer when prey is abundant.

50. In considering potential risks and pressures, NatureScot identifies the key threats to basking sharks as vessel collision, incidental capture, and disturbance, particularly during their summer surface-feeding behaviour (NatureScot, 2020b; OSPAR Commission, 2021). Indirect effects on prey availability are regarded as low risk due to the resilience of the region’s large-scale oceanographic processes. Basking sharks are not considered vulnerable to noise-related physical injury because, like other elasmobranchs, they detect particle motion rather than sound pressure and therefore have fundamentally different auditory sensitivity to teleost fish (Popper et al., 2014). Since basking shark are not considered to be at risk of injury from underwater noise, they are only sensitive to the particle motion component of underwater noise rather than sound pressure, therefore all activities generating underwater noise have been assessed (Popper et al., 2014).

5.3.2 Minke Whale

51. The Sea of the Hebrides NCMPA is recognised as an important area for minke whales, which are a designated protected feature of the site. The NCMPA lies within the Minches and Sea of the Hebrides Important Marine Mammal Area (IMMA), identified for supporting persistent and seasonally important aggregations of minke whales associated with productive shelf waters and oceanographic fronts (IUCN Marine Mammal Protected Areas Task Force, 2021). Statistical modelling undertaken to support Scottish MPA identification indicates that the Sea of the Hebrides NCMPA supports seasonally elevated relative densities of minke whales, particularly during summer months, compared with other west coast waters, although absolute density values are not published (**Plate 5.2**) (Paxton et al., 2014; NatureScot, 2025). The summer is a vital season for minke whale, whilst at their feeding grounds, it is essential minke whales build up sufficient energy from prey intake to make the migrations to their breeding grounds in lower latitudes (Scottish National Heritage (SNH), 2012).

52. Site-specific evidence is available from a pilot digital aerial survey undertaken within the Sea of the Hebrides MPA proposal area in late summer 2016. This survey recorded minke whales throughout the site, with spatial variation in encounter rates and higher relative densities associated with productive frontal areas. The study confirmed regular seasonal use of the area by minke whales but concluded that survey effort was insufficient to derive a statistically robust absolute density estimate for the MPA (Webb et al., 2018).

53. Minke whale exhibit a strong seasonal pattern of occurrence within the Sea of the Hebrides, using the area primarily as a summer feeding ground. Site documentation and long-term monitoring

indicate that minke whales are most frequently recorded between late spring and autumn, with peak occurrence during summer, when individuals are observed feeding on small schooling fish such as sandeels and other pelagic species (NatureScot, 2025; Hebridean Whale and Dolphin Trust (HWDT), 2024). Long-term vessel-based monitoring demonstrates high inter-annual variability in sightings, reflecting the dynamic nature of prey availability and environmental conditions in the region (Hartny-Mills et al., 2024).

54. At a wider regional scale, the most recent absolute abundance and density estimate for minke whales are provided by the Small Cetaceans in European Atlantic waters and the North Sea (SCANS)-III survey, which estimated approximately 15,000 individuals across surveyed Northeast Atlantic waters, including waters west of Scotland to 12,417 individuals recorded in the SCANS-IV survey. These data provide important population-level context but are not spatially resolved at the NCMPA scale and are therefore used as contextual information rather than site-specific baseline density estimates (Hammond et al., 2021; Inter Agency Marine Mammal Working Group (IAMMWG), 2023).

55. The WDA is located within the SCANS-IV survey block CS-F, while the Sea of the Hebrides NCMPA is located within SCANS-IV survey blocks CS-F, CS-G and CS-H (note that no minke whale were recorded in block CS-G) (**Figure 5.1**). The SCANS-IV survey recorded an abundance of just under 500 (493) individuals with a density estimate of 0.0353 minke whale per km^2 (Gilles et al., 2023) in the survey block CS-H, and 209 individuals with a density estimate of 0.0137 minke whale per km^2 in survey block CS-F.

56. The CS-H density estimate of 0.0353 km² has been used within the assessments as the most precautionary estimate.

57. An abundance of 209 is assessed as CS-F is the survey block within which the WDA is located. However, the NCMPA is located within multiple survey blocks (as noted above), and therefore an assessment against an abundance of 702, encompassing all survey blocks is also provided.

58. However, the total abundance recorded for the SCANS-IV survey blocks in west Scotland (WS) waters[1] is 2,458 individuals, and is considered to provide a more realistic representation of population size. **Figure 5.1** presents the area of the WS population for minke whale.

59. All three population estimates are presented within each assessment. However it should be noted that the total WS population is used as the population reference to conclude whether there is any potential to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA, as minke whale are wide-ranging species and it is assumed that any minke whale within WS would be present within and use the Sea of the Hebrides NCMPA (see **Table 5.4** and **Figure 5.1**).

*Table 5.4 Minke whale density and reference populations used for the assessment. **Bolded** items are those on which the conclusion on the potential to hinder the conservation objectives is based*

Density Estimate per km^2	Source	Reference population (ref population name)	Source
0.0353	SCANS-IV survey block CS-H	209 (CS-H MU)	SCANS-IV survey block CS-H
		702 (CS-F & CS-H MU)	SCANS-IV survey blocks CS-F and CS-H
		2,458 (WS)	**SCANS-IV survey blocks CS-F, CS-H, CS-I and CS-J**

[1] Taking numbers from all SCANS-IV survey blocks CS-F; CS-G; CS-H; CS-I and CS-J

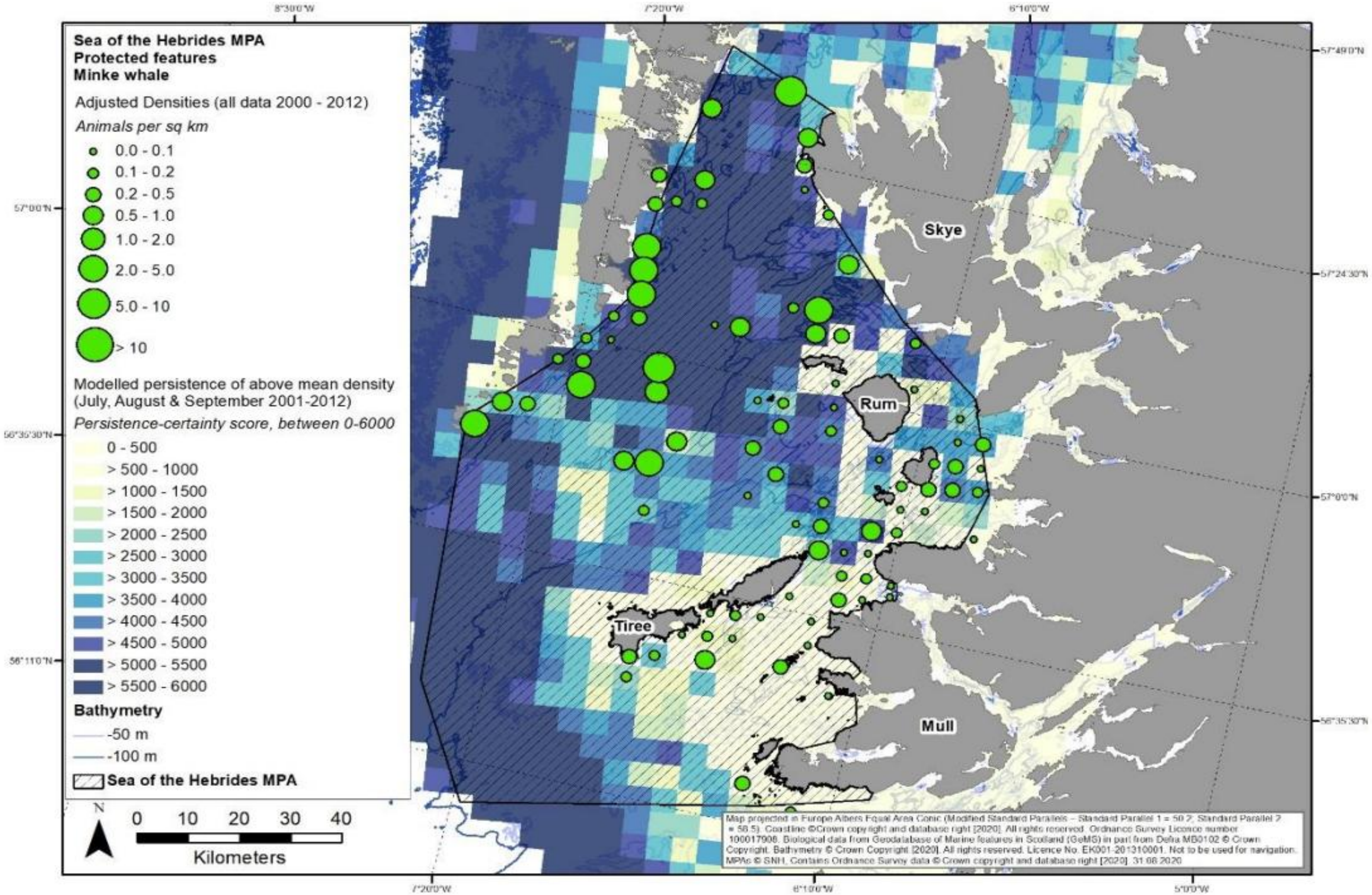
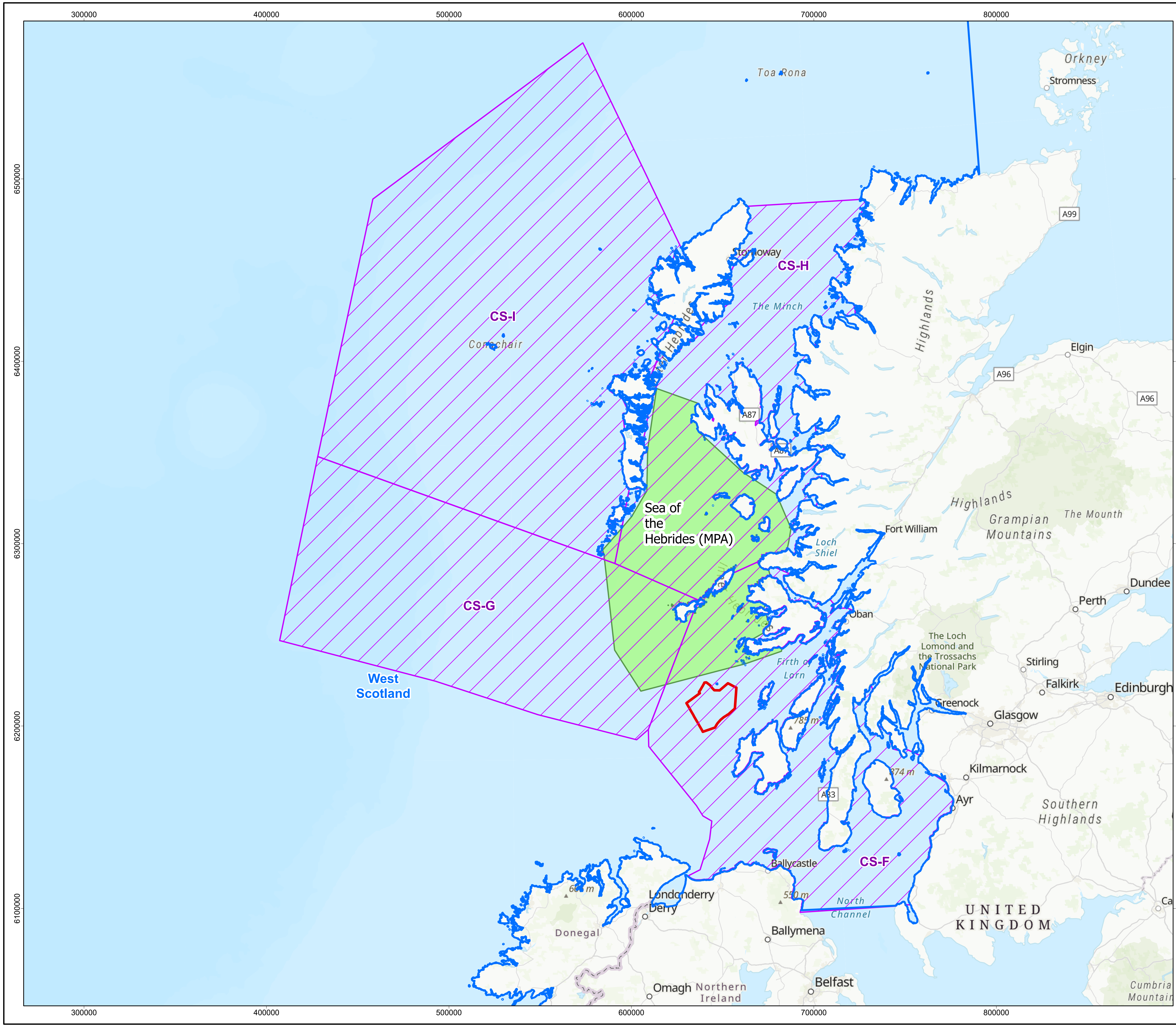


Plate 5.2 Map of the Sea of the Hebrides MPA showing the modelled/recorded distribution of minke whale



- Windfarm Development Area
- Marine Protected Area (MPA)
- Minke West Scotland Management Units (WS MU)
- Harbour Porpoise West Scotland Management Units (WS MU)

0 10 20 40 60 80 Kilometres

1	11/02/2026	FC	AB	SB	PM
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000185
DATUM	ETRS89
PROJECTION	UTM Zone 29N
SCALE	1:2,000,000
PAGE SIZE	A3
PROJECT TITLE	MachairWind

Figure 5.1: Minke West Scotland Reference Population (WS MU) in relation to the Sea of Hebrides NCMPA

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Name: MCW-DWF-ENV-MAP-RHS-000185_Minke_SeaOfHebridesNCMPA

6 MAIN ASSESSMENT - SEA OF THE HEBRIDES NCMPA

6.1 WINDFARM DEVELOPMENT AREA ALONE ASSESSMENT

60. This section presents the main assessment of the effects arising from the construction, O&M and decommissioning of the WDA infrastructure on the protected features of the Sea of the Hebrides NCMPA and the Loch Sunart to the Sound of Jura NCMPA. The designated features relevant to this assessment are basking shark and minke whale for the Sea of the Hebrides NCMPA and flapper skate for the Loch Sunart to the Sound of Jura NCMPA. Each of the potential impacts identified during the screening stage (see **Section 2.2.1**) are discussed individually in the following sections. For each impact, the assessment considers the effects on the relevant attributes and targets associated with the designated features and subsequently, the implications for the NCMPA conservation objectives. The assessment draws on the best available scientific evidence to support the conclusions presented.

6.1.1 Basking Shark

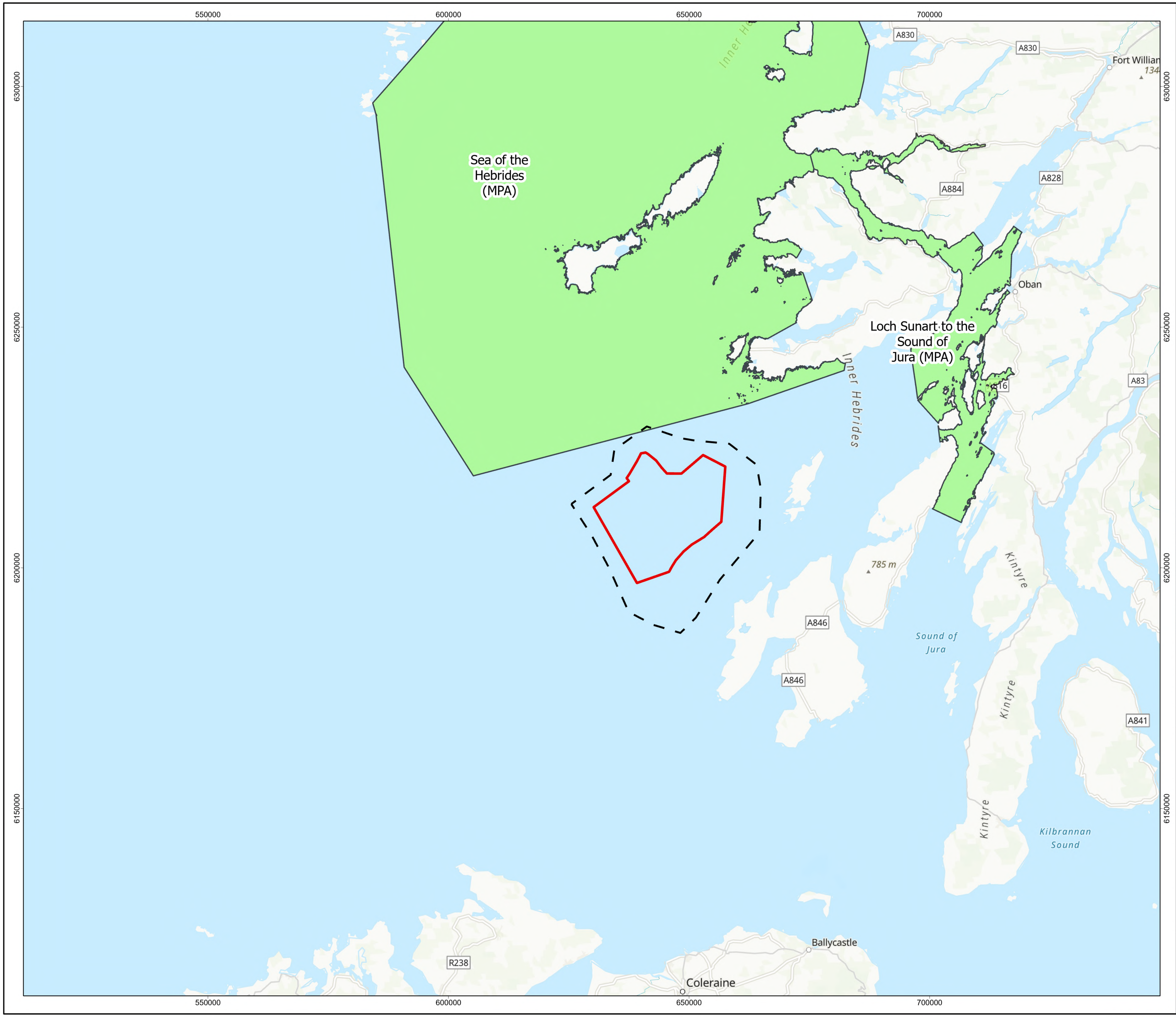
6.1.1.1 Impact 1: Increased Suspended Sediment Concentrations (SSC) Resulting in Potential Reduction of Prey Species

6.1.1.1.1 Construction

61. Based on the realistic worst-case construction scenarios (**Table 4.1**), up to 20,251,431 m³ (see Section 9.7 in **Chapter 9 Fish (Including Basking Shark) and Shellfish** for rationale) of sediment may be temporarily suspended within the WDA during seabed preparation, foundation installation (including drilling), sandwave clearance and cable installation. For the purposes of this assessment, it is conservatively assumed that all suspended sediment occurring within the WDA could overlap with areas seasonally used by basking sharks for feeding and transit. However, as there is only a 766 m overlap of the tidal ellipse (**Figure 6.1**) with the NCMPA, in reality, the volume of suspended sediment likely to interact with the NCMPA would be an extremely small proportion of this worst-case volume.

62. Basking sharks occur in large numbers in the Sea of the Hebrides during summer months, reflecting the ecological importance of this area for the species (NatureScot, 2020).

63. Basking sharks aggregate predictably between July and September, particularly west of Coll, north of Tiree and around Hyskeir, where zooplankton accumulate in tidal-mixing fronts and stratified summer waters (Basking Shark Scotland, 2023; Scotland's Marine Assessment, 2020). These large-scale hydrographic processes drive prey availability and will not be altered by short-lived sediment plumes. Basking sharks are a highly mobile species and can readily avoid areas with increased SSCs, minimising the risk of smothering or burial. However, because they feed primarily on plankton, increased SSCs may reduce their ability to detect zooplankton. While SSC increases may temporarily reduce water clarity, strong regional tidal flows disperse suspended particles quickly, returning conditions to baseline. Evidence indicates that temporary SSC elevation does not meaningfully affect zooplankton biomass or distribution (NatureScot, 2020) and effects are expected to be minor and short-lived.



Windfarm Development Area
SSC ZoI
Marine Protected Area (MPA)

N

0 10 20 Kilometres

1	20/04/2026	AB	GC	PM	GC
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000202		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:750,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 6.1: WDA and NCMPA overview with suspended sediment concentration zone of influence (based on tidal excursion distance)

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64. In the context of NCMPA conservation objectives, these temporary SSC increases will not hinder the population from being maintained in favourable condition. Basking sharks routinely adjust their position in response to short-term disturbances, relocating temporarily before returning once conditions normalise (Hebridean Whale & Dolphin Trust, 2023). SSC changes pose no pathway for injury and do not interfere with access to feeding areas, as the hydrodynamic drivers of zooplankton productivity remain intact. Key ecosystem functions such as seasonal productivity, nutrient cycling and hydrodynamic mixing continue unchanged under these conditions (Basking Shark Scotland, 2023).

65. Overall, temporary and reversible SSC increases are not expected to alter prey availability or ecological processes supporting basking shark feeding. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the basking shark feature within the Sea of the Hebrides NCMPA**.

6.1.1.1.2 Operation and Maintenance

66. Based on the realistic worst-case O&M scenario (**Table 4.1**), the primary source of increased SSC within the Sea of the Hebrides NCMPA will be activities that involve localised seabed disturbance, most notably during offshore cable repair works. In such instances, cables may be temporarily retrieved to a surface vessel for jointing before being re-laid on the seabed. These operations are predicted to generate sediment plumes comparable in character to those observed during construction, with an average worst-case annual sediment disturbance of 63,600 m^3. Strong tidal flows characteristic of the region disperse suspended material rapidly, meaning any reduction in water clarity will be brief and restricted to the immediate vicinity of works.

67. As described in **Section 6.1.1.1.1**, temporary SSC increases do not affect the large-scale physical and ecological processes that support basking shark foraging, including stratification, tidal mixing and zooplankton concentration. O&M activities are smaller in scale, less frequent and more spatially confined than construction, and therefore pose even less potential for interaction with basking sharks. Given their mobility and capacity to adjust behaviour in response to temporary disturbance, basking sharks are unlikely to experience any lasting changes in distribution or access to feeding areas. There are no mechanisms by which these short-term SSC increases could lead to injury or mortality, and feeding resources will remain fully available because the hydrodynamic and biological processes underpinning zooplankton productivity remain unaffected. Therefore, SSC increases during O&M **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA**.

6.1.1.1.3 Decommissioning

68. The detailed approach to decommissioning will be confirmed closer to the end of the Project's operational life, in line with evolving regulatory requirements and industry best practice. A separate consent process will be required at that time, and the final methodology will be developed to reflect the most current environmental standards. However, a Decommissioning Programme setting out the anticipated approach to decommissioning will be submitted to MD-LOT in the pre-construction period.

69. Vessel activity during decommissioning is expected to be similar to, or lower than, the levels seen during construction, as the works will focus on lifting and removing above-seabed structures and cables rather than extensive seabed preparation. As a result, sediment disturbance will be similar in nature but generally lower than during construction and limited to the immediate areas where equipment is recovered.

70. Temporary increases in SSC may occur when cables or structures are lifted, but any plumes are expected to disperse quickly under the prevailing tidal conditions that characterise the NCMPA. These short-lived changes will not alter the broader hydrodynamic processes, such as stratification, tidal mixing and frontal systems, that sustain zooplankton productivity and support seasonal basking shark aggregations.

71. As set out in **Section 6.1.1.1.1**, short-term increases in SSC do not affect the hydrodynamic or ecological processes that sustain zooplankton productivity and support basking shark aggregations within the NCMPA. Consequently, the effects of increased SSCs will therefore **not hinder the maintenance of any conservation objectives for the Sea of the Hebrides NCMPA** for basking sharks.

6.1.1.2 Impact 2: Vessel Collision and Disturbance

6.1.1.2.1 Construction

72. Construction of the WDA infrastructure will require up to 140 pre-construction vessel trips, approximately 5,699 vessel trips across maximum offshore construction period of five years, and a maximum of 117 vessels operating simultaneously during peak activity (see **Table 4.1**). The indicative port locations which are illustrative only and do not reflect any formal decisions about site or port selection but which have been selected to ensure that reasonable worst-case scenarios can be assessed are as follows:

- Marshalling & Assembly (Construction):
  - Kishorn;
  - Arnish/Stornoway; and
  - Hunterston.
- Marine Operations (Construction):
  - Oban;
  - Port Ellen; and
  - Bendoran (Mull).
- O&M:
  - Campbeltown;
  - King George V (Glasgow); and
  - Hunterston.

73. Of these, Kishorn, Arnish/Stornoway and Bendoran (Mull) could result in vessel transits through the Sea of the Hebrides NCMPA (**Figure 6.3**). Because these activities extend across several years, vessel presence within the Sea of the Hebrides NCMPA will be intermittent and distributed across both space and time. The area is known to support some of the highest seasonal densities of basking sharks in UK waters, with aggregations concentrated west of Coll, north of Tiree and around Hyskeir (NatureScot, 2020; Hebridean Whale & Dolphin Trust, 2023). During July-September, basking sharks often feed slowly at or near the surface, which increases their exposure to vessel presence and elevates the likelihood of collision or other interactions (OSPAR Commission, 2021; Speedie et al., 2009). While surface-feeding, they spend prolonged periods filtering plankton with limited ability to detect or evade approaching boats, making them particularly susceptible to vessel strike (Chapple et al., 2024; McInturf et al., 2024).

74. Although surface-feeding behaviour theoretically increases vulnerability, basking sharks have well-documented avoidance responses to approaching vessels. Tagging and boat-based surveys

indicate that individuals commonly alter course or temporarily relocate when vessels approach, resuming typical behaviour once activity has passed (Scotland's Marine Assessment, 2020). Given that construction vessel traffic will be concentrated in defined operational corridors and not uniformly across the NCMPA, and because work fronts move spatially over time, the likelihood of repeated disturbance in the same area is low. Embedded mitigation, including speed restrictions, trained observers (MMOs/PSOs), and adherence to defined transit routes, further reduces the potential for close interactions or collision risk, as described in **Appendix 6 Outline EMP** and **Section 1.5**.

75. In relation to the NCMPA conservation objectives, temporary avoidance of vessels is not expected to compromise the ability to maintain the basking shark feature in favourable condition. Sharks routinely return to feeding areas once disturbance subsides, consistent with observations from long-term sighting datasets within the Inner Hebrides and broader Sea of the Hebrides region (Hebridean Whale & Dolphin Trust, 2023). Vessel presence does not alter the large-scale hydrodynamic processes, such as stratification, tidal mixing and frontal development, that generate high zooplankton productivity and underpin the feeding ecology of the species (Basking Shark Scotland, 2023).

76. The objective to ensure that basking sharks are not at significant risk of injury or killing is also met. Mitigation described in **Appendix 6 Outline EMP** and **Section 1.5**, including adherence to the guidelines laid out in the SMWWC and that vessel movements to and from any port will be incorporated within existing vessel routes where practicable reduces collision risk. These measures operate alongside the sharks' natural avoidance behaviour, evidenced in multiple long-term datasets, to keep overall injury risk extremely low (Scotland's Marine Assessment, 2020).

77. Access to feeding opportunities within the NCMPA is maintained, as vessel movements do not disrupt the tidal fronts, stratified layers or plankton dynamics that define preferred foraging habitat (NatureScot, 2020; Basking Shark Scotland, 2023). The natural distribution of basking sharks within the NCMPA will therefore be conserved, as temporary avoidance does not amount to sustained displacement, and the species demonstrates high mobility and rapid return to disturbed areas (Chapple et al., 2024; McInturf et al., 2024). The extent and distribution of supporting features, such as the water-column structure, zooplankton dynamics and frontal systems that influence basking shark foraging zones, will not be affected by vessel movements.

78. Overall, while temporary behavioural responses may occur, vessel presence associated with construction, O&M and decommissioning will not lead to long-term changes in basking shark behaviour, distribution or access to resources. As such, vessel collision and disturbance during construction **will not hinder the maintenance of any of the conservation objectives for the basking shark feature within the Sea of the Hebrides NCMPA.**

6.1.1.2.2 Operation and Maintenance

79. During O&M, vessel activity will be far lower than during construction. As outlined in **Table 4.1**, the maximum anticipated annual number of round trips required for routine and planned maintenance is 423, and only a proportion of these have potential to transit through the Sea of the Hebrides NCMPA on the basis of the indicative ports described in **Section 6.1.1.2.1**.

80. Basking sharks can be sensitive to vessel presence when surface-feeding, but the reduced level of activity during O&M, combined with ongoing measures such as adherence to SMWWC keeps collision risk very low. Studies show basking sharks typically avoid vessels and return once activity has passed. Given the intermittent and low-intensity vessel use during O&M, any avoidance will be brief and will not affect access to key feeding areas.

81. Hydrodynamic processes that support zooplankton availability are unaffected by vessel movements, and feeding hotspots remain fully accessible. The conservation objectives for basking shark, including maintaining favourable condition and natural distribution, continue to be supported.

82. In summary, vessel presence during O&M is limited, temporary and substantially lower than during construction. Consequently, these activities will not result in lasting behavioural change, displacement, or increased risk to basking sharks within the Sea of the Hebrides NCMPA and **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA**.

6.1.1.2.3 Decommissioning

83. The detailed approach to decommissioning will be confirmed closer to the end of the Project's operational life, in line with evolving regulatory requirements and industry best practice. A separate consent process will be required at that time, and the final methodology will be developed to reflect the most current environmental standards.

84. Vessel activity during decommissioning is expected to be similar to, or lower than, the levels seen during construction, as the works will focus on lifting and removing above-seabed structures and cables rather than extensive seabed preparation. This results in a shorter period of vessel presence within the Sea of the Hebrides NCMPA and a much more localised pattern of activity.

85. Ongoing embedded measures, such as adherence to the SMWWC (**Section 1.5**) will reduce collision risk. Given the species' typical avoidance behaviour and the short-term nature of decommissioning activity, any disturbance is expected to be temporary, with sharks able to move away and return once activity decreases.

86. These conditions mean that all NCMPA conservation objectives remain supported during decommissioning. The basking shark population will continue to use the site without long-term disruption, fulfilling the objective to maintain the feature in favourable condition. The low likelihood of vessel collisions ensures that the objective to avoid risk of injury or killing is upheld. Sharks will retain access to key seasonal feeding areas, supporting their natural distribution, and the physical and ecological processes that underpin prey availability, such as tidal mixing, stratification and zooplankton dynamics, will remain entirely unaffected. Accordingly, these conditions **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA**.

6.1.1.3 Impact 3: Underwater Noise

6.1.1.3.1 Construction

87. Construction of the WDA will generate underwater noise from a range of activities, including pile installation for up to 144 WTG monopiles or 608 pin-piles, vessel operations, cable installation, UXO clearance, and seabed preparation works. Underwater noise modelling predicts that, under a worst-case scenario, recoverable injury thresholds for stationary fish receptors may extend up to 88 km from piling locations. However, basking sharks, as highly mobile elasmobranchs, are far less sensitive to sound pressure and respond primarily to particle motion, with a considerably reduced risk of physiological injury (Popper et al., 2014).

88. Basking sharks do not possess a swim bladder and therefore fall within Popper et al.'s (2014) Group 1 hearing category, meaning they detect only the particle motion component of underwater sound and have a comparatively low sensitivity to anthropogenic noise. Embedded mitigation includes soft-start piling and ramp-up procedures, which enable basking sharks to detect early increases in

particle motion and move away before peak noise levels are reached, thereby reducing the potential for any significant behavioural or physiological effects. Additionally, piling schedules will likely avoid simultaneous noisy activities across the WDA, further reducing cumulative noise fields. Evidence from tagging and long-term monitoring studies indicates that basking sharks show predictable avoidance behaviour to acute disturbance and are able to relocate temporarily from areas of high activity, (Hebridean Whale & Dolphin Trust, 2023). Although short-term behavioural changes such as brief avoidance or altered swimming patterns may occur, these responses are expected to be temporary and reversible. Given the intermittent nature of construction activity within the WDA, sustained disruption to feeding, migratory movement, or residency within the NCMPA is not anticipated.

89. Underwater noise generated during construction will not compromise the ability of the Sea of the Hebrides NCMPA to maintain the basking shark feature in favourable condition. Any behavioural responses are expected to be brief and reversible, with sharks resuming normal area use once noise sources cease. Given the species' broad-scale mobility, sustained displacement is unlikely. Embedded mitigation greatly reduces the potential for exposure to harmful sound levels. Together with the species' low sensitivity to sound pressure and strong natural avoidance behaviour, these measures ensure that the risk of injury or killing remains very low. Access to important feeding areas, including the plankton-rich tidal fronts west of Coll, north of Tiree and around Hyskeir, will not be affected. The physical and ecological processes that create these high-productivity zones, tidal mixing, stratification and frontal development, are not altered by underwater noise. Temporary disturbances do not interfere with movement through the NCMPA, nor do they disrupt the distribution of supporting features such as water-column structure or zooplankton dynamics.

90. Overall, while brief behavioural responses may occur, underwater noise arising from construction is not expected to lead to long-term changes in basking shark behaviour, distribution, health or access to resources. Consequently, underwater noise during construction **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA.**

6.1.1.3.2 Operation and Maintenance

91. During O&M, underwater noise will be limited to the low-frequency sounds produced by the WTGs and the occasional, short-term noise from maintenance vessels transiting to and from the site. These sources are far quieter and more intermittent than construction activities, and the sound they generate dissipates quickly with distance. As a result, routine operational noise forms only a small and stable part of the broader acoustic environment within the Sea of the Hebrides NCMPA.

92. The mobile nature of basking sharks allows them to respond easily to any localised disturbance, and any brief changes in behaviour, such as slight course adjustments are expected to be temporary. Given that vessel movements occur infrequently throughout the operational period, the likelihood of meaningful disturbance remains low.

93. The NCMPA conservation objectives continue to be fully supported under these conditions. Operational noise does not reach levels that could injure basking sharks, nor is it expected to disrupt their seasonal use of important feeding grounds. Individuals can continue to move freely within the site, return quickly to areas after brief disturbance, and maintain their natural feeding and transit patterns.

94. As set out for construction (**Section 6.1.1.3.1**), underwater noise does not affect the physical or ecological processes that support basking shark foraging within the Sea of the Hebrides NCMPA.

Given the much lower and more localised nature of O&M noise, these supporting processes and the quality of feeding habitat within the NCMPA is maintained.

95. Overall, underwater noise during O&M will be low in intensity, intermittent and highly localised, creating no barriers to basking shark movement, feeding or overall condition. These characteristics ensure that the ability to maintain the conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA in a favourable condition and **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA.**

6.1.1.3.3 Decommissioning

96. The detailed approach to decommissioning will be confirmed closer to the end of the Project's operational life, in line with evolving regulatory requirements and industry best practice. A separate consent process will be required at that time, and the final methodology will be developed to reflect the most current environmental standards. However, a Decommissioning Programme setting out the anticipated approach to decommissioning will be submitted to MD-LOT in the pre-construction period.

97. These sounds will be temporary, localised and dispersed across a relatively small number of active work areas. Given the strong tidal conditions within the Sea of the Hebrides NCMPA, noise will attenuate rapidly with distance, and the acoustic environment will return to baseline conditions once individual tasks are completed.

98. As described for construction (**Section 6.1.1.3.1**), basking sharks have low sensitivity to underwater noise and can readily avoid localised disturbance. Decommissioning noise will be temporary and comparable to or less than construction, with any behavioural responses expected to be brief and reversible.

99. All NCMPA conservation objectives will remain supported during decommissioning. Noise levels are not expected to pose a risk of injury to basking sharks, nor will they impede the animals' ability to move freely throughout the site or maintain their natural seasonal patterns of use. Sharks will continue to access important productivity-driven feeding areas throughout the NCMPA as usual.

100. In summary, underwater noise during decommissioning will be short-term, limited in extent and substantially lower than during construction. These conditions will not alter basking shark behaviour, access to resources, or overall use of the NCMPA, and **will not hinder the maintenance of any conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA**.

6.1.2 Minke Whale

6.1.2.1 Impact 1: Underwater Noise During Geophysical Surveys

6.1.2.1.1 Construction

101. As described in Section 10.12.1.3 of **Chapter 10 Marine Mammals and Leatherback Turtle**, geophysical surveys will likely be required to inform detailed design work post-consent.

102. The equipment that could be used for any geophysical survey is described in Table 10.16 in Section 10.12.1.3 in **Chapter 10 Marine Mammals and Leatherback Turtle**, where the sound generated can fall in the functional hearing range of minke whale. As a result, such sources have the potential to cause auditory and physiological injury to individuals in close proximity and may be detectable over distances of several hundred metres (Deng et al., 2014).

103. To assess for impacts to minke whale from geophysical surveys, the same approach has been applied as what is presented in Section 10.12.1.3 in **Chapter 10 Marine Mammals and Leatherback Turtle**.

104. The maximum permanent auditory injury (PTS) impact range for low frequency cetaceans such as minke whale is 178 m (0.10 km^2) from SBP recorded at 219 dB peak, 183 Decibels (dB) cumulative Sound Exposure Level (SEL_{cum} / $L_{E,p,t}$) (Southall et al., 2019) (**Table 6.1**).

105. To assess for disturbance to minke whale, it was requested by NatureScot following the second Expert Topic Group (ETG) meeting to use a 5 km Effective Deterrent Range (EDR) for each survey vessel, in line with JNCC (2020) guidance (See Table 10.2 in **Chapter 10 Marine Mammals and Leatherback Turtle**).

106. Potential spatial disturbance from geophysical surveys has been assessed using a worst-case scenario, assuming activity occurs within the WDA at the closest point to the Sea of Hebrides NCMPA (4.3 km). A distance of 4 km is discounted and the resulting area of disturbance overlap calculated across the NCMPA. This approach is highly precautionary, as actual spatial overlap is expected to be substantially lower (**Table 6.1**). For up to three simultaneous surveys, less than 1% of the NCMPA area may be disturbed (**Table 6.1**).

107. **Table 6.1** presents the number of minke whale that could be at risk of exposure to PTS and/or disturbance from geophysical surveys. The following mitigation measures, as outlined within the JNCC (2017) 'Guidelines for Minimising the Risk of Injury to Marine Mammals from Geophysical Surveys' would apply for geophysical surveys using noisy equipment (see **Appendix 9 MMMP** and Section 10.12.1.3.3 in **Chapter 10 Marine Mammals and Leatherback Turtle**).

108. Therefore, accounting for embedded mitigation measures and that less than 1% of the WS minke whale population could be exposed to auditory injury or disturbed during geophysical surveys in the construction phase of the WDA, geophysical surveys **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

Table 6.1 PTS and disturbance assessment for minke whale from geophysical surveys using SBP

Survey Type and area of effect	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
PTS		
One geophysical survey 178 m (0.1 km²)	<1 (0.0007% CS-H MU; 0.0005% CS-F & CS-H MU; **0.0001% WS**)	No Less than 1% of the population affected
Two geophysical surveys 178 m (0.2 km²)	<1 (0.001% CS-H MU; 0.001% CS-F & CS-H MU; **0.0003% WS**)	No Less than 1% of the population affected
Three geophysical surveys 178 m (0.3 km²)	<1 (0.002% CS-H MU; 0.002% CS-F & CS-H MU; **0.0004% WS**)	No Less than 1% of the population affected
Disturbance		
One geophysical survey 5 km (78.54 km²)	3 (0.56% CS-H MU; 0.39% CS-F & CS-H MU; **0.11% WS**) (0.03% of the NCMPA area)	No Less than 1% of the population affected
Two geophysical surveys (157.08 km²)	6 (1.12% CS-H MU; 0.79% CS-F & CS-H MU; **0.23% WS**) (0.06% of the NCMPA area)	No Less than 1% of the population affected
Three geophysical surveys 5 km (235.62 km²)	9 (1.68% CS-H MU; 1.18% CS-F & CS-H MU; **0.34% WS**) (0.09% of the NCMPA area)	No Less than 1% of the population affected

6.1.2.1.2 Operation and Maintenance

109. Any geophysical surveys occurring in the WDA in the O&M phase will be temporary, not long-term and therefore the effects will be the same or less than as assessed in the construction phase (**Section 6.1.2.1.1**).

110. Therefore, any geophysical surveys in the O&M phase of the WDA, **would not have the potential to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA**.

6.1.2.1.3 Decommissioning

111. Any geophysical surveys occurring in WDA in the decommissioning phase will be temporary, therefore the effects will be the same as assessed in the construction phase of the WDA (see **Section 6.1.2.1.1**).

112. Therefore, any geophysical surveys in the O&M phase of the WDA, **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.1.2.2 Impact 2: Underwater Noise During UXO Clearance

6.1.2.2.1 Construction

113. UXO clearance may be required prior to construction. Any UXO identified would be avoided where possible or safely removed and disposed of at an approved location; where removal is not feasible, clearance would be undertaken. UXO clearance activities would require a Marine Licence from MD-LOT and a EPS Licence under the Conservation of Habitats and Species Regulations 2017. A separate Marine Licence application would be submitted following completion of a detailed UXO survey and updated assessment. At this stage, the number of UXO items and duration of clearance activities are unknown; therefore, the current assessment is provided for information only.

114. UXO clearance involving explosive detonation can generate very high-intensity impulsive underwater noise, which has the potential to cause auditory injury, physiological harm, and behavioural disturbance to minke whales particularly at close range (JNCC, 2025).

115. Mitigation measures following the JNCC (2025a) guidelines to minimise risk of injury from UXO clearance and explosives presented in **Appendix 9 Draft MMMP** of the EIAR will reduce the risk of auditory injury to minke whale.

116. The Joint Statement on UXO clearance (Defra, 2025) state that low noise methods must be the first option. Therefore, for any UXO clearance required in the WDA, low order clearance method would be used first which is likely to have no impact on the conservation objectives for minke whale in the Sea of Hebrides in the NCMPA. However, as a precautionary approach, high order UXO clearance has been assessed to present the worst-case of an accidental detonation.

6.1.2.2.1.1 Auditory Injury

117. The assessment of potential auditory injury to marine mammals within the WDA is based on the impact criteria outlined by National Marine Fisheries Service (NMFS) (2018) / Southall et al. (2019). These criteria incorporate species-specific hearing sensitivity thresholds and weightings presented in Table 10.15 in **Chapter 10 Marine Mammals and Leatherback Turtle**, identifying the onset of PTS and temporary threshold shift (TTS) for minke whale that may be present in or around the UXO clearance zones.

118. Minke whale are sensitive to low frequency sounds, with a PTS threshold of 219 dB and TTS threshold of 213 dB using unweighted Peak Sound Pressure Level (SPL_{peak} / $L_{p,pk}$) (dB re 1 µPa). For cumulative exposure to impulsive sounds, the PTS threshold is 183 dB and TTS threshold 168 from Weighted Single Strike Sound Exposure Level (SEL_{ss} / $L_{E,p,ss}$) and Cumulative Sound Pressure Level (SEL_{cum} / $L_{E,p,t}$) (dB re 1 $\mu Pa^2 s$).

119. The predicted impact ranges for auditory injury from UXO clearance is presented in **Table 6.2**. Underwater noise modelling was undertaken by Subacoustech Environmental Ltd to predict the noise levels expected to arise from UXO clearance with various charge weights (**Appendix 10.1 Underwater Noise Modelling Report**). The modelled impact ranges for low order clearance to represent most likely case, and the highest charge weight for high order clearance (without embedded or additional mitigation) to represent a worst-case is then used to assess the potential effects on minke whale.

120. **Table 6.2** presents the predicted impact ranges for PTS and the number of minke whale that could be impacted. The worst-case predicts that up to 14 individuals (0.55% of the WS reference population) could be impacted from a high-order detonation, within an impact range of 11 km.

121. Therefore, with less than 1% of the WS minke whale population being exposed to permanent auditory injury (prior to any mitigation) during UXO clearance in the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

122. **Table 6.2** presents the predicted impacts ranges for TTS and the number of minke whale that could be impacted from a temporary auditory injury. Less than 5% of the MUs could be exposed to risk of TTS during low-order UXO clearance in the construction phase of the WDA and therefore it does not have the potential to hinder the relevant minke whale specific conservation objective of the Sea of Hebrides NCMPA.

123. The predicted impact range for TTS at 110 km (for high-order UXO clearance) is extremely over precautionary. Southall (2021) notes that applying impulsive noise exposure criteria to high-intensity sources (e.g. pile driving or detonations) can predict TTS onset at distances of tens of kilometres. In practice, acoustic propagation over such ranges substantially alters the signal, including reduced signal onset rate, lower peak levels, reduced high-frequency content, and elongated signal duration (Hastie et al., 2019; Amaral et al., 2020; Martin et al., 2020). As a result, the use of impulsive exposure criteria at large distances is widely regarded as overly precautionary and predicted TTS or PTS ranges extending to tens of kilometres are unlikely to be realistic (Southall, 2021).

124. This is supported by empirical evidence. Robinson et al. (2022) measured sound levels from high-order detonations at distances of up to 58 km, with peak SPL / $L_{p,pk}$ below 180 dB re 1 µPa and substantially lower SEL/ $L_{E,p,wtd}$. Accordingly, the underwater noise modelling prediction of a 110 km TTS impact range for minke whale is considered a significant overestimate, as received levels at such distances would be non-damaging and well below those associated with TTS onset levels.

125. Consequently, an additional assessment has been carried out for TTS from high order clearance, using a 10 km impact which is assumed to be more realistic based on the propagation of impulsive noise at distance. Up to 11 minke whale could be affected with less than 5% the MU affected.

126. Therefore, as less than 5% of the WS minke whale population could be exposed to TTS during UXO clearance in the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA** (**Table 6.2**).

Table 6.2 Assessment for auditory injury to minke whale from UXO clearance in the WDA (green shaded row represent a 10 km TTS range for minke whale)

UXO clearance method and area of effect	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
PTS		
Low Order UXO clearance Unweighted SPL_{peak} / $L_{p,pk}$ 170 m (0.9 km^2)	<1 (0.0006% CS-H MU; 0.0005% CS-F & CS-H MU; 0.0001% WS)	No Less than 1% of the population affected
Low Order UXO clearance Weighted SEL / $L_{E,p,wtd}$ (single pulse)	<1	No

UXO clearance method and area of effect	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
230 m (0.17 km^2)	(0.001% CS-H MU; 0.0009% CS-F & CS-H MU; 0.0002% WS)	Less than 1% of the population affected
High order UXO clearance Unweighted SPL_{peak} / $L_{p,pk}$ 2.5 km (19.63 km^2)	1 (0.1% CS-H MU; 0.10% CS-F & CS-H MU; 0.03% WS)	No Less than 1% of the population affected
High order UXO clearance Weighted SEL / $L_{E,p,wtd}$ (single pulse) 11 km (380.13 km^2)	14 (2.7% CS-H MU; 1.91% CS-F & CS-H MU; 0.55% WS)	No Less than 1% of the population affected
TTS		
Low Order UXO clearance Unweighted SPL_{peak} / $L_{p,pk}$ 320 m (0.32 km^2)	<1 (0.002% CS-H MU; 0.002% CS-F & CS-H MU; 0.0005% WS)	No Less than 5% of the population affected
Low Order UXO clearance Weighted SEL / $L_{E,p,wtd}$ (single pulse) 3.2 km (31.17 km^2)	2 (0.2% CS-H MU; 0.28% CS-F & CS-H MU; 0.08% WS)	No Less than 5% of the population affected
High order UXO clearance Unweighted SPL_{peak} / $L_{p,pk}$ 4.6 km (66.48 km^2)	3 (0.001% CS-H MU; 0.43% CS-F & CS-H MU; 0.12% WS)	No Less than 5% of the population affected
High order UXO clearance Weighted SEL / $L_{E,p,wtd}$ (single pulse) 110 km (38,013.3 km^2)	1,342 (100.0% CS-H MU; 100.0% CS-F & CS-H MU; 54.59% WS)	Yes More than 5% of the population affected
High order UXO clearance Weighted SEL / $L_{E,p,wtd}$ (single pulse) 10 km (314.16 km^2)	11 (2.2% CS-H MU; 1.57% CS-F & CS-H MU; 0.45% WS)	No Less than 5% of the population affected

6.1.2.2.1.2 Disturbance

127. There is currently no universally accepted threshold for behavioural disturbance from underwater noise. However, it is commonly assumed that a fleeing response may occur at sound levels similar to those causing TTS. Southall et al. (2007) proposed that behavioural disturbance begins at the lowest level of noise exposure that causes a measurable, transient impact on hearing (i.e. TTS onset) (Southall et al., 2007).

128. Although TTS is not a behavioural effect in itself, any temporary compromise in hearing ability could influence behaviour, particularly in species that rely heavily on acoustic cues for survival (Tougaard et al., 2023). The assessment of potential disturbance ranges has used TTS / fleeing response thresholds because the noise is so short-term that displacement or other behavioural responses is unlikely. To further evaluate potential disturbance, the JNCC (2025b) recommended EDRs derived

from harbour porpoise (*Phocoena Phocoena*) studies have been applied due to a lack of behavioural response data for minke whale.

129. The number of minke whale that could be disturbed from UXO clearance using TTS thresholds is presented in **Table 6.2**. The number of minke whale that could be disturbed using the EDRs is presented in **Table 6.3**.

130. Based on the EDRs presented below, the maximum number of minke whale that could be disturbed would be from a high-order clearance, with up to 45 individuals, or 1.83% of the WS, at risk of disturbance. However, low-order clearance is the most likely case with less than 1% of the population that could be exposed to disturbance (**Table 6.3**).

131. Potential spatial disturbance from UXO clearance has been assessed using a worst-case scenario, assuming activity occurs within the WDA at the closest point to the Sea of Hebrides NCMPA (4.3 km). A distance of 4 km is discounted and the resulting area of overlap calculated across the NCMPA. This approach is highly precautionary, as actual spatial overlap is expected to be substantially lower. For a low-order clearance, up to 0.03% of the NCMPA area may be disturbed, for a high-order with noise abatement systems (NAS), up to 1.2% may be disturbed, and for a high-order clearance, up to 8% of the NCMPA area may be disturbed.

132. As less than 5% of the WS minke whale population could be disturbed during UXO clearance in the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

Table 6.3 Assessment for disturbance to minke whale from UXO clearance in the WDA

UXO clearance method and area of effect	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Low Order UXO clearance 5 km (78.54 km^2)	3 (0.6% CS-H MU; 0.43% CS-F & CS-H MU; **0.12% WS**) (0.03% of the NCMPA area)	No Less than 5% of the population affected
High order UXO clearance with noise abatement systems (NAS) 10 km (314.16 km^2)	12 (2.2% CS-H MU; 1.71% CS-F & CS-H MU; **0.49% WS**) (1.13% of the NCMPA area)	No Less than 5% of the population affected
High order UXO clearance without NAS 20 km (1,256.64 km^2)	45 (8.9% CS-H MU; 6.41% CS-F & CS-H MU; **1.83% WS**) (8.01% of the NCMPA area)	No Less than 5% of the population affected

6.1.2.3 Impact 3: Auditory Injury from Underwater Noise During Piling

6.1.2.3.1 Construction

133. Underwater noise modelling was undertaken by Subacoustech Environmental Ltd to predict noise levels associated with piling and non-piling activities (**Appendix 10.1 Underwater Noise Modelling Report**). The resulting impact ranges were used to assess potential effects on marine mammals (see Section 10.12.1.5 in **Chapter 10 Marine Mammals and Leatherback Turtle**.

134. Auditory injury (PTS and TTS) was modelled using the Southall et al. (2019) criteria, applying the Impulsive Noise Propagation and Impact Estimator (INSPIRE) v6, a semi-empirical model developed for shallow, mixed UK coastal waters. Further details, including confidence in the modelling approach, are provided in **Appendix 10.1 Underwater Noise Modelling Report**.

6.1.2.3.1.1 Auditory Injury

135. Minke whale are sensitive to low frequency sounds (see **Section 6.1.2.2.1.1**).

136. PTS can occur instantaneously from acute exposure to high noise levels, such as single strike (SPL_{peak} / $L_{p,pk}$) of the maximum hammer energy applied during piling. PTS can also occur as a result of prolonged exposure to increased noise levels, such as for the duration of pile installation (SEL_{cum} / $L_{E,p,t}$).

137. The modelling results for the potential for instantaneous PTS due to the first hammer strike and single strike at maximum hammer energy for the installation of monopiles and pin-piles are provided in **Appendix 10.1 Underwater Noise Modelling Report**.

138. **Table 6.4** presents the predicted PTS and TTS impact ranges for minke whale from piling in the WDA. PTS and TTS from cumulative exposure to the piling of monopiles is up to 27 km and 120 km respectively, which is likely to be very unrealistic as explained in **Section 6.1.2.2.1.1**. If a more realistic 10 km predicted impact range was applied, the number of minke whales that could be exposed to auditory injury from piling is 11 (2.2% CS-H MU; 1.6% CS-F & CS-H MU; 0.5% WS) (**Table 6.2**). However, as the modelling software used is not able to explicitly represent changes in signal impulsiveness during propagation, an assessment has been carried out using the predicted impact ranges in **Table 6.4**.

139. **Table 6.5** presents the estimated number of minke whales that could be exposed to permanent auditory injury. For a monopile installation, up to 39 individuals could be exposed to cumulative PTS, representing approximately 1.6% of the WS population, which is considered a significant proportion. However, as noted above, the predicted impact range of 27 km is over precautionary. For PTS from a single strike, less than 1% of the minke whale WS population could be exposed. In all pin-pile assessments, less than 1% of the minke whale WS population could be at risk of PTS.

140. **Table 6.6** presents the estimated number of minke whales that could be exposed to temporary auditory injury. For a single monopile installation, up to 21.6% of the WS population could be exposed to cumulative TTS. For a single pin-pile installation, up to 14.1% of the WS population could be exposed to cumulative TTS, increasing to 18.7% of the WS population for the sequential installation of up to six pin-piles. For TTS from a single strike, less than 5% of the minke whale population could be exposed for either monopiles or pin-piles.

141. More than 1% of the WS minke whale population could be exposed to permanent auditory injury from monopiles, or more than 5% exposed to TTS from either monopiles or pin-piles during piling in the WDA. The mitigation measures described in **Appendix 9 Draft MMMP** following JNCC (2010) guidelines on minimising the risk of injury from piling would reduce the risk of minke whales being exposed to permanent auditory injury (PTS) from a single strike during piling activities within the WDA.

142. As noted above (**Section 6.1.2.2.1.1**), the impulsive characteristics of piling noise decrease substantially as sound propagates, resulting in a much lower likelihood of auditory injury at long distances, with a range of 10 km for injury from impulsive sources being precautionary and realistic. Mysticetes hear best at low frequencies and can therefore detect piling noise over large distances; however, detectability does not equate to injury, displacement or habitat loss, and beyond a few

kilometres observed responses are typically behavioural, short-term and highly variable between contexts (Fernandez-Betelu et al., 2021; Erbe et al., 2025). Large-scale studies show continued habitat use by baleen whales despite far-field exposure to impulsive noise, with only intermittent or subtle behavioural changes even tens of kilometres from source, meaning that assuming potential effects out to 10 km represents a conservative, precautionary bounding distance rather than a predictive impact radius (Fernandez-Betelu et al., 2021; Erbe et al., 2025). With a potential injury range of 10 km, up to 11 minke whale, or less than 0.5% of the population, may be at risk of either PTS or TTS onset, which is not significant (**Table 6.2** in **Section 6.1.2.2**).

143. Based on a more realistic injury range of 10 km, there would be no significant risk of either PTS or TTS onset as a result of piling, and therefore piling **will not have the potential to hinder the relevant minke whale conservation objectives of the Sea of Hebrides NCMPA**.

Table 6.4 Predicted PTS and TTS impact ranges (and areas) from first strike and single strike SPL_{peak} / Lp -pk and SEL_{cum} / $L_{E,p,t}$ at maximum hammer energy for monopile and pin-pile

Impact	Maximum impact range and area for monopiles	Maximum impact range and area for pin-piles
PTS from first strike at 550 kJ (*at 550 kJ for monopolies and 450 kJ for pin-piles*)	<0.05 km (<0.01 km^2)	<0.05 km (<0.01 km^2)
PTS from single strike at full energy *(6,600 kJ for monopolies and 4,440 kJ for pin-piles)*	0.08 km (0.02 km^2)	0.06 km (0.01 km^2)
PTS from cumulative exposure *(6,600 kJ for monopolies and 4,440 kJ for pin-piles)*	27 km (1,100 km^2)	16 km (490 km^2)
PTS from cumulative exposure for sequential piling *(4,440 kJ for six pin-piles)*	Not Applicable (N/A)[2]	21 km (610 km^2)
TTS from first strike at 550 kJ (*at 550 kJ for monopolies and 450 kJ for pin-piles*)	0.1 km (0.03 km^2)	0.07 km (0.02 km^2)
TTS from single strike at full energy *(6,600 kJ for monopolies and 4,440 kJ for pin-piles)*	0.19 km (0.11 km^2)	0.15 km (0.07 km^2)
TTS from cumulative exposure *(6,600 kJ for monopolies and 4,440 kJ for pin-piles)*	120 km (15,000 km^2)	95 km (9,800 km^2)
TTS from cumulative exposure for sequential piling *(4,440 kJ for six pin-piles)*	N/A[2]	120 km (13,000 km^2)

[2] Sequential monopiling has not been considered, with only one monopile per day expected to be required

Table 6.5 Assessment of PTS in minke whale from piling in the WDA

Impact	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Monopiles		
PTS from first strike at 550 kJ	<1 (0.00007% CS-H MU; 0.00005% CS-F & CS-H MU; **0.00001% WS**)	No **Less than 1% of the population affected**
PTS from single strike at full energy 6,600 kJ	<1 (0.0001% CS-H MU; 0.0001% CS-F & CS-H MU; **0.00003% WS**)	
PTS from cumulative exposure 6,600 kJ	39 (18.58% CS-H MU; 5.53% CS-F & CS-H MU; **1.58% WS**)	**Yes** **More than 1% of the population affected (see Paragraphs 141-143)**
Pin-piles		
PTS from first strike at 450 kJ	<1 (0.0002% CS-H MU; 0.00005% CS-F & CS-H MU; **0.00001% WS**)	No **Less than 1% of the population affected**
PTS from single strike at full energy 4,440 kJ		
PTS from cumulative exposure 4,440 kJ	18 (8.28% CS-H MU; 2.46% CS-F & CS-H MU; **0.70% WS**)	
PTS from cumulative exposure for sequential piling 4,440 kJ for six pin-piles	22 (10.53% CS-H MU; 3.13% CS-F & CS-H MU; **0.88% WS**)	

Table 6.6 Assessment of TTS in minke whale from piling in the WDA

Impact	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Monopiles		
TTS from first strike at 550 kJ	<1 (0.0005% CS-H MU; 0.0002% CS-F & CS-H MU; **0.00004% WS**)	No **Less than 5% of the population affected**
TTS from single strike at full energy 6,600 kJ	<1 (0.002% CS-H MU; 0.0006% CS-F & CS-H MU; **0.0002% WS**)	
TTS from cumulative exposure 6,600 kJ	530 (100.0% CS-H MU; 75.43% CS-F & CS-H MU; **21.54% WS**)	**Yes** **More than 5% of the population affected (see Paragraphs 141-143)**
Pin-piles		
TTS from first strike at 450 kJ	<1 (0.0001% CS-H MU; 0.0001% CS-F & CS-H MU; **0.00003% WS**)	No **Less than 5% of the population affected**
TTS from single strike at full energy 4,440 kJ		
TTS from cumulative exposure 4,440 kJ	346 (70.18% CS-H MU; 49.28% CS-F & CS-H MU; **14.07% WS**)	**Yes** **More than 5% of the population affected (see Paragraphs 141-143)**
TTS from cumulative exposure for sequential piling 4,440 kJ for six pin-piles	459 (100% CS-H MU; 65.38% CS-F & CS-H MU; **18.67% WS**)	

6.1.2.4 Impact 4: Disturbance and Behavioural Impacts from Underwater Noise During Piling

6.1.2.4.1 Construction

144. Direct, specific studies of minke whale behavioural responses to impact piling are limited. Consequently, assessments commonly draw on case studies from other baleen whale species and other impulsive, high-energy anthropogenic noise sources (e.g. seismic airguns and naval sonar), where the acoustic characteristics and response mechanisms are considered broadly comparable.

145. Mid-frequency naval sonar differs acoustically from piling, however it represents a high-intensity impulsive sound similar to piling and is therefore capable of eliciting clear behavioural responses in baleen whales. A detailed study of minke whale responses to naval training activities demonstrated horizontal avoidance behaviour, increased movement speed, and cessation of vocalisations during sonar exposure, followed by a return to baseline behaviour after exposure ceased (Durbach et al., 2021). This study provides direct evidence that minke whales respond behaviourally to intense anthropogenic noise, supporting the assumption that piling noise may also trigger short-term avoidance or behavioural modification.

146. Durbach et al., (2021) reported the observed responses were temporary, and there was no evidence of prolonged displacement beyond the period of noise exposure. This supports the conclusion that, while disturbance may occur, effects are reversible and limited in duration.

147. To assess for disturbance to minke whale, in the absence of robust, species-specific behavioural response data for this species, the recommended EDRs for harbour porpoise (JNCC et al., 2025b) have been applied, as a precautionary proxy, as harbour porpoise is more acoustically sensitive than minke whale (**Table 6.7**) (see Section 10.12.1.6.2.1 in **Chapter 10 Marine Mammals and Leatherback Turtle**).

148. Assessment of behavioural disturbance to minke whale from impact piling has also been undertaken using a received SPL threshold of 160 dB re 1 µPa root mean square (rms) (**Table 6.7**). This threshold originates from guidance developed by the NMFS to identify the onset of Level B behavioural harassment in marine mammals exposed to impulsive sound sources, such as impact pile driving. Although initially developed within a U.S. regulatory context, the 160 dB threshold has been widely adopted internationally, including in Scottish offshore windfarm EIAs, as a precautionary and pragmatic proxy for the onset of disturbance where species-specific empirical data are limited. For this reason, the 160 dB re 1 µPa (rms) threshold is considered an appropriate conservative indicator of potential disturbance, recognising that not all animals exposed above this level will necessarily exhibit a measurable behavioural response (Tougaard, 2021). The impact area was derived using the underwater noise model output contours corresponding to a received sound level of 160 dB re 1 µPa. Noise contour files were reviewed for all modelled piling locations, and the worst-case scenario was identified as the ‘west’ piling location (see **Appendix 10.1, Underwater Noise Modelling Report**). For this location, the spatial extent of the 160 dB contour was extracted and used to define the impact area radiating from the sound source. Using this approach, the calculated impact area was 977.02 km² for monopile installation and 480.95 km² for pin-pile installation (**Table 6.7**).

149. Consequently, to assess for disturbance to minke whale, the dose response curve developed for harbour porpoise (Graham et al., 2017) (see Section 10.12.1.6.2.1 in **Chapter 10 Marine Mammals and Leatherback Turtle**) has been applied. Because the dose response curve applied was developed primarily for harbour porpoise, a species with very high-frequency hearing sensitivity, their application to other cetaceans, including minke whale, may therefore introduce bias due to differences in auditory sensitivity and behavioural ecology (Southall et al., 2021). In addition, the

assessment considers piling noise only and does not account for potential mitigation from Acoustic Deterrent Devices (ADDs). The results should therefore be interpreted as highly precautionary (**Table 6.7**).

150. **Table 6.7** presents the number of minke whale that could be exposed to disturbance from piling activities in the WDA**.** Results from the dose response curve assessment indicate that 43% of the minke whale WS could be disturbed by a single piling event. This estimate is considered overly precautionary and unrealistic. Thompson et al. (2025) demonstrated that current approaches for estimating disturbance to harbour porpoise from impact piling using dose response curves in UK waters are likely to be unrealistically conservative, and that distance-based response functions may provide a more appropriate alternative. In line with this evidence, the assessment of piling-related disturbance for the WDA applies the number of potentially disturbed minke whales derived for the EDR assessment, thereby providing a more realistic worst-case scenario.

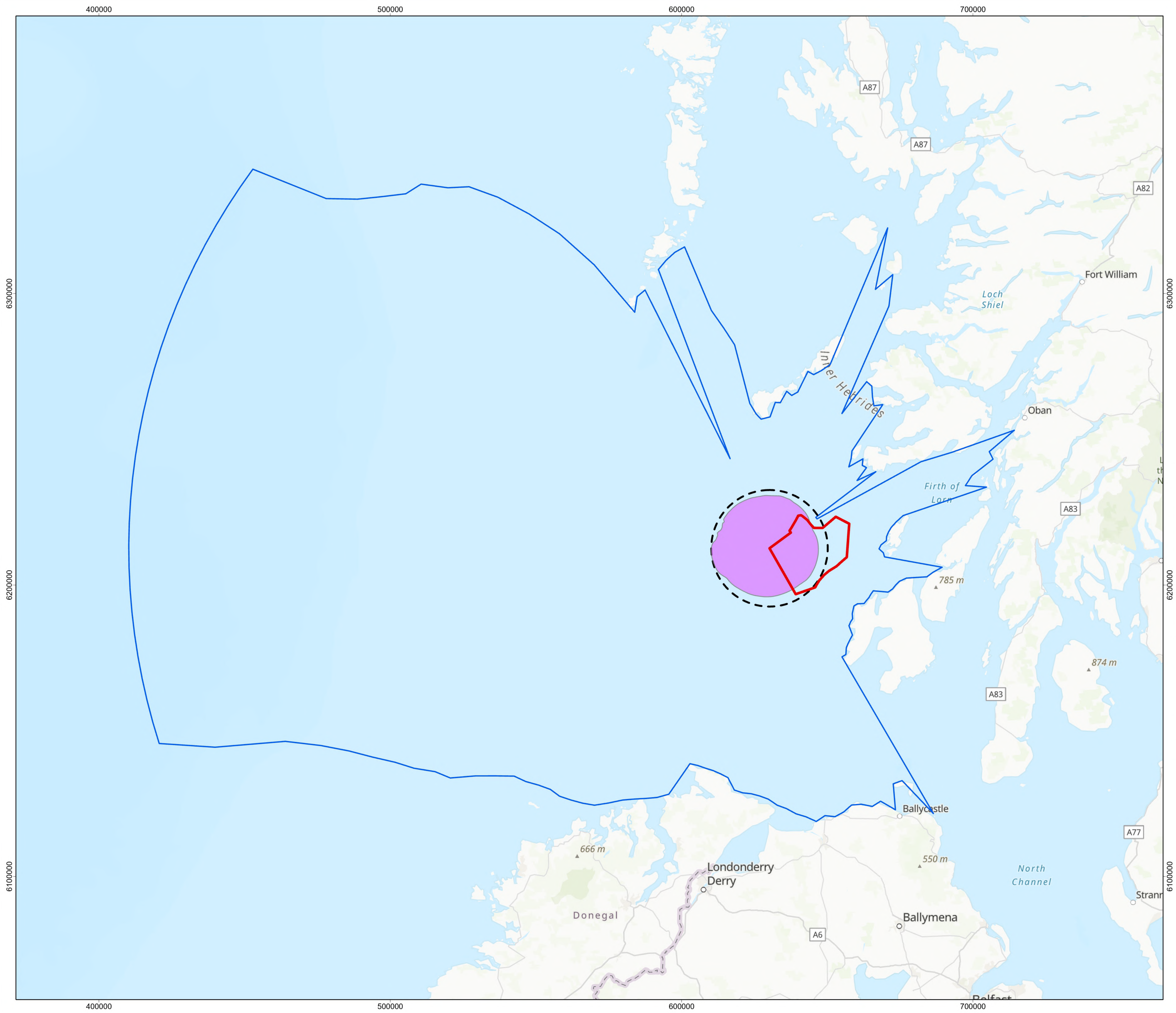
151. Potential spatial disturbance from piling has been assessed using a worst-case scenario, assuming activity occurs within the WDA at the closest point to the Sea of Hebrides NCMPA (4.3 km). This distance is discounted and the resulting area of overlap calculated across the NCMPA. This approach is highly precautionary, as actual spatial overlap is expected to be substantially lower. Under the EDR approach, for a monopile or pin-pile, the total area of disturbance would be up to 8.01% of the NCMPA. Under the Level B harassment approach, up to 6.2% of the NCMPA area could be disturbed. This is based on the 160 dB contour provided within the underwater noise modelling, and shown on **Figure 6.2.** Given this is the absolute worst-case, and it is likely that any disturbance overlap would be considerably less on most occasions, this is not expected to cause significant disturbance within the NCMPA.

152. Assessing the impact with EDRs shows that less than 5% of the WS population could be exposed to disturbance from piling. Therefore, disturbance from piling activities in the construction phase **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

Table 6.7 Assessment of disturbance to minke whale from piling in the WDA

Disturbance assessment method	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Monopiles and/or pin-piles 20 km EDR (1,256.64 km^2)	45 (8.9% CS-H MU; 6.41% CS-F & CS-H MU; **1.83% WS**) (8.01% of the NCMPA area)	**No** **Less than 5% of the population affected**
Level B harassment - Monopile 160 dB (977.02 km^2)	35 (7.1% CS-H MU; 4.99% CS-F & CS-H MU; **1.42% WS**) (6.13% of the NCMPA area)	**No** **Less than 5% of the population affected**
Level B harassment - Pin piles 160 dB (480.95 km^2)	17 (3.4% CS-H MU; 2.4% CS-F & CS-H MU; **0.7% WS**) (6.2% of the NCMPA area)	**No** **Less than 5% of the population affected**
Dose response curve assessment	1,059 (100.0% CS-H MU; 100.0% CS-F & CS-H MU; **43.08% WS**)	**Yes**

Disturbance assessment method	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
		More than 5% of the population affected (see Paragraph 150)



Legend:
- Windfarm Development Area
- DRC assessment
- Effective Deterrent Range (20km)
- 160 db contour

N

0 20 40 60 Kilometres

REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER
1	20/04/2026	AB	GC	PM	CG

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000204		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:1,250,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 6.2: Disturbance assessment methods for minke whale

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Name: Fig_6-2_MCW-DWF-ENV-MAP-RHS-000204_MinkeWhaleDisturbance

6.1.2.4.1.1 Population Modelling

153. Population modelling has been undertaken to assess the potential population-level consequences of disturbance using the interim Population Consequences of Disturbance (iPCoD) framework. The iPCoD approach provides a structured means of translating predicted individual-level responses to disturbance, such as behavioural disruption, into potential medium- and long-term effects on population dynamics. The application of population modelling therefore allows disturbance effects to be evaluated at an appropriate ecological scale, supporting robust interpretation of significance in the context of the EIA (see **Appendix 10.4 IPCoD Modelling Technical Report** for further information).

154. The population modelling for minke whale is based on disturbance numbers only and includes a worst-case of up to 45 minke whale being disturbed, based on the results of the EDR assessment (**Table 6.7**), representing the most realistic worst-case.

155. One year after the start of piling the median ratio of impacted versus the unimpacted population size is 99.96%. One year after piling finishes, the median ratio of impacted versus the unimpacted population size is 99.07%. Five years after piling the median ratio of impacted versus the unimpacted population size is 99.76%. This remains stable up until the end of the 25 years, with a 99.76% median ratio of the impacted versus the unimpacted population (**Table 6.9**).

156. There is less than 1% difference between the unimpacted and impacted population, in both the median and the mean since the piling started, which is not significant under Natural Resource Wales (NRW) (2023) guidance in EIA terms (**Table 6.9**; **Plate 6.1**). Therefore, disturbance from piling activities in the construction phase **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

Table 6.8 Results of the iPCoD modelling using the number of minke whale that could be exposed to disturbance from piling at the WDA, giving the mean population size of minke whale WS population for years up to 2055 for both impacted and unimpacted populations as well as the mean and median ratio

Time period	Mean			Median			Lower 2.5% and upper 97% Confidence Intervals	
	Un-impacted pop	Impacted pop	Impacted as % of unimpacted	Un-impacted pop	Impacted pop	Impacted as % of unimpacted	Un-impacted pop	Impacted pop
Start	2,458	2,458	100.00%	2,458	2,458	100.00%	2,458 – 2,458	2,458 – 2,458
2031	2,457	2,456	99.96%	2,469	2,468	99.96%	2,178 – 2,678	2,178 – 2,678
2032	2,451	2,440	99.55%	2,450	2,441	99.63%	2,132 – 2,756	2,106 – 2,756
2033	2,460	2,438	99.11%	2,452	2,434	99.27%	2,112 – 2,826	2,076 – 2,808
2035	2,462	2,439	99.07%	2,456	2,438	99.27%	2,082 – 2,890	2,014 – 2,880
2040	2,458	2,452	99.76%	2,444	2,438	99.75%	1,960 – 3,022	1,948 – 3,020
2050	2,455	2,448	99.71%	2,430	2,422	99.67%	1,844 – 3,270	1,818 – 3,264
2054	2,453	2,447	99.76%	2413	2,410	99.88%	1,792 – 3,338	1,770 – 3,338
2055	2,456	2,450	99.76%	2,424	2,417	99.71%	1,778 – 3,354	1,762 – 3,350

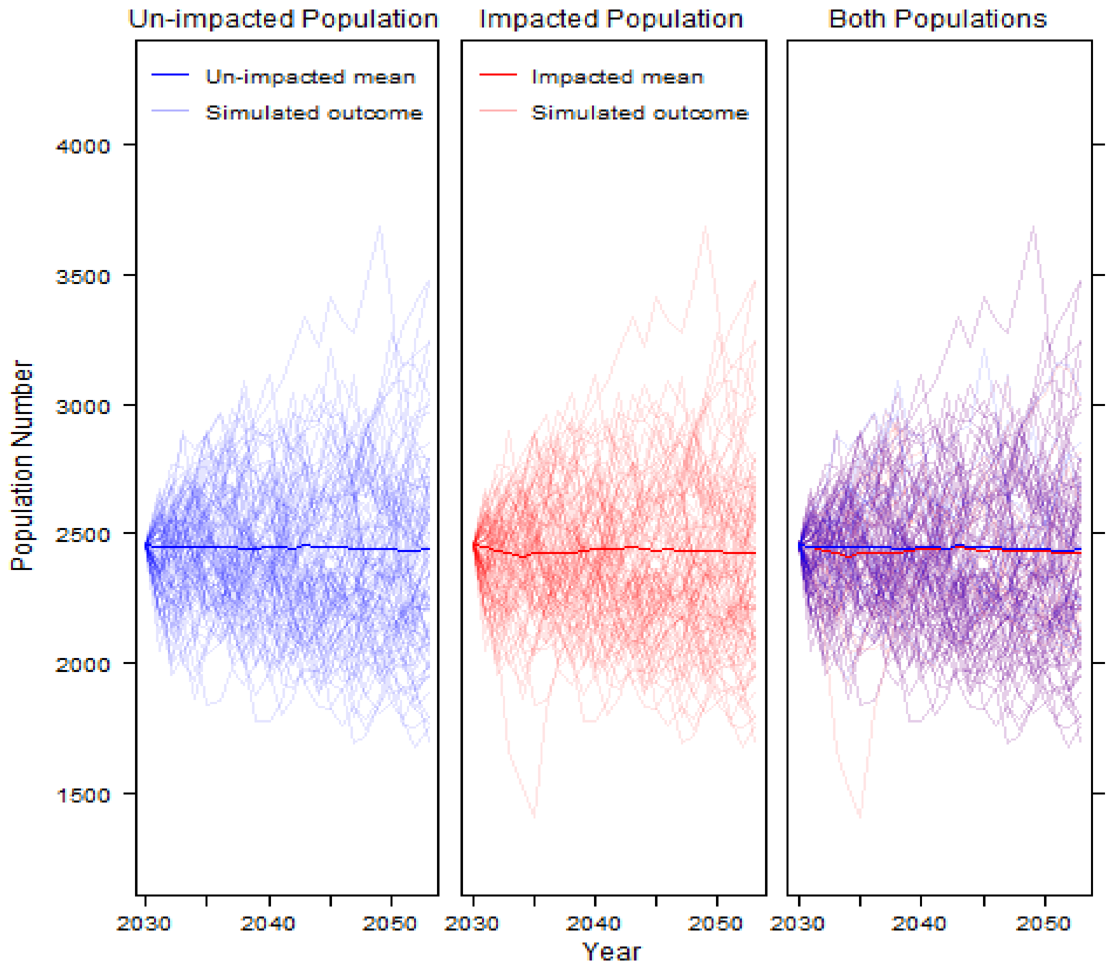


Plate 6.1 Simulated worst-case minke whale WS population sizes for both the unimpacted and the impacted populations using disturbance only

6.1.2.4.1.2 Disturbance During Acoustic Deterrent Device Activation

157. To minimise the possibility of PTS in all marine mammals during piling operations, one recommended mitigation measure is the activation of an ADD prior to the commencement of soft start procedures. At this stage, any assessment of potential disturbance caused by ADD activation is indicative only, as final mitigation requirements will be defined in the Final MMMP / Piling Noise Mitigation Plan prior to construction. These will be based on the best available evidence and developed in consultation with the relevant Statutory Nature Conservation Bodies (SNCBs) (JNCC, 2025).

158. Worst-case cumulative sound exposure level (SEL_{cum} / $L_{E,p,t}$) modelling during the installation of up to 144 monopiles, including soft-start and ramp-up phases, indicates a maximum potential impact range of approximately 27 km for minke whale. As described in **Section 6.1.2.1.2**, predicted impacts ranges exceeding 10 km is likely to be over precautionary due to the level of impulsiveness reducing as the sound propagates into the marine environment.

159. However, to mitigate up to 27 km for minke whale, ADD activation alone cannot provide effective mitigation. Evidence from McGarry et al. (2017) and Boisseau et al. (2021) indicates that the Lofitech seal scarer influences minke whale behaviour within relatively limited ranges, with behavioural responses observed up to 1 to 1.5 km from the source. Minke whales were shown to move at least

1.7 km away within 15 minutes of activation, with a maximum deterrence distance of 4.5 km reported. Beyond these distances, ADD effectiveness for minke whales is likely to be limited.

160. Consultation with NatureScot (see **Chapter 10 Marine Mammals and Leatherback Turtle**) has agreed to use SPL_{peak} / Lp_{-pk} for ADD activation times, with further consultation post consent when finalising the final MMMP / Piling Noise Mitigation Plan.

161. In **Chapter 10 Marine Mammals and Leatherback Turtle,** a 15-minute ADD activation time has been applied to account for the time it would take harbour porpoise to swim out a 1 km area as that was the worst PTS (SPL_{peak} / Lp_{-pk}) impact range across all receptors. Using a 15-minute ADD activation time, minke whale, would be deterred to a distance of approximately 1.9 km, assuming a precautionary swimming speed of approximately 2.1 m/s (SNH, 2016; Biology Insights, 2025). Potential spatial disturbance from ADD activation has been assessed using a worst-case scenario, assuming activity occurs within the WDA at the closest point to the Sea of Hebrides NCMPA (4.3 km). A 4 km distance is discounted and the resulting area of overlap calculated across the NCMPA. This approach is highly precautionary, as actual spatial overlap is expected to be substantially lower.

162. **Table 6.9** presents the number of minke whale that could be disturbed due to ADD activation. As less than 5% of the WS could be exposed to disturbance from ADD activation prior to piling during the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

Table 6.9 Assessment of disturbance to minke whale from ADD activation prior to piling based on the JNCC (2025) EDRs

Disturbance assessment method	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
ADD activation (11 km EDR (380.13 km^2))	14 (2.6% CS-H MU; 1.99% CS-F & CS-H MU; **0.57% WS**) (1.53% of the NCMPA area)	No **Less than 5% of the population affected**

6.1.2.5 Impact 5: Auditory Injury and Behavioural Impacts from Non-Piling Activities and Vessel Activities

6.1.2.5.1 Construction

163. Potential sources of underwater noise during non-piling construction activities include drilling, rock placement, trenching, dredging and cable laying. According to OSPAR (2009), there is no strong evidence suggesting that noise generated during subsea cable installation poses a significant threat to marine mammals (see Section 10.12.1.7 in **Chapter 10 Marine Mammals and Leatherback Turtle**).

6.1.2.5.1.1 Auditory Injury

164. Underwater noise modelling specific to the WDA was carried out to assess the likelihood of auditory injury in marine mammals from non-piling construction activities and vessel activity. Full details are available in **Appendix 10.1 Underwater Noise Modelling Report** with **Table 6.10** presenting the activities and their associated source levels. The modelled impact ranges for PTS and TTS fall below the threshold for fleeing minke whale. This indicates that auditory injury (PTS or TTS) is not expected to occur, as the hearing threshold is not exceeded.

165. The largest TTS ranges for minke whale (stationary) is from rock placement activities. For TTS to occur, a minke whale would have to be within the predicted impact area for approximately 24 hours for prolonged exposure to the underwater noise, which is unlikely, as animals are likely to be passing or will flee from the area (Todd et al 2015).

166. Therefore, the 2 km predicted TTS range from rock placement for a stationary receptor has been assessed as a highly precautionary approach, along with a 440 m impact range from the presence of vessels (**Table 6.11**).

167. To account for multiple sound sources, TTS has been assessed for a maximum of 117 vessels operating simultaneously in the WDA during peak activity, and with up to four non-piling activities occurring at the same time, using the impact ranges for one rock placement, cable laying, suction dredging and trenching following the approach in Section 10.12.1.7 and 10.11.1.8 in **Chapter 10 Marine Mammals and Leatherback Turtle**.

*Table 6.10 Predicted impact ranges (and areas) for PTS and TTS from 24-hour cumulative exposure to construction vessels/non-piling noise for both a fleeing and a stationary minke whale (**impact ranges and areas used for the assessment are in bold)***

Non piling noisy activity	PTS impact range (m)	TTS impact range (m)
	SEL_{cum} / $L_{E,p,t}$ Weighted (199 dB re 1 µPa2s) Non-impulsive	SEL_{cum} / $L_{E,p,t}$ Weighted (179 dB re 1 µPa2s) Non-impulsive
Fleeing receptor at 2.1 m/s swim speed (SNH, 2016; Biology Insights, 2025)		
Cable laying	< 50	< 50
Dredging (backhoe)	< 50	< 50
Dredging (suction)	< 50	< 50
Drilling	< 50	< 50
Rock placement	< 50	< 50
Trenching	< 50	< 50
Vessel noise (large)	< 50	< 50
Vessel noise (medium)	< 50	< 50
Stationary receptor		
Cable laying	< 50	970
Dredging (backhoe)	< 50	< 50
Dredging (suction)	60	630
Drilling	< 50	160
Rock placement	< 50	**2,000 (12.57 km^2)**
Trenching	< 50	820
Vessel noise (large)	< 50	**440 m (0.6 km^2)**
Vessel noise (medium)	< 50	280

168. **Table 6.11** shows that less than 5% of the minke population (WS and smaller population references) could be exposed to permanent and temporary auditory injury from non-piling activities during the construction phase in the WDA.

169. Therefore, as less than 5% of the WS could be exposed to disturbance from the presence of vessels and non-piling activities during the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

Table 6.11 Assessment of auditory injury to minke whale from non-piling activities and the presence of vessels in the WDA

Impact	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Dredging (suction) (PTS) based on a stationary receptor	<1 (0.0002% CS-H MU; 0.00006% CS-F & CS-H MU; **0.00002% WS**)	No **Less than 5% of the population affected**
Rock placement (TTS) based on a stationary receptor	<1 (0.9% CS-H MU; 0.06% CS-F & CS-H MU; **0.02% WS**)	No **Less than 5% of the population affected**
Multiple non-piling activities (TTS) based on stationary receptor	<1 (0.1% CS-H MU; 0.09% CS-F & CS-H MU; **0.003% WS**)	No **Less than 5% of the population affected**
Auditory injury from one vessel	<1 (0.004% CS-H MU; 0.003% CS-F & CS-H MU; **0.0009% WS**)	No **Less than 5% of the population affected**
Auditory injury (TTS) from multiple vessels during construction (117 vessels)	3 (0.6% CS-H MU; 0.43% CS-F & CS-H MU; **0.09% WS**)	No **Less than 5% of the population affected**

6.1.2.5.1.2 Disturbance

170. There could be a maximum of 117 vessels operating at the WDA at any one time during the construction phase. As described in **Chapter 10 Marine Mammals and Leatherback Turtle,** there is currently no disturbance range proposed for minke whales. Therefore, a 4 km disturbance range was applied, which stemmed from evidence derived from harbour porpoise studies (Brandt et al., 2018; Rose et al., 2019; Benhemma-Le Gall et al., 2021; Benhemma-Le Gall et al., 2023).

171. As a precautionary approach, the potential for disturbance to minke whale has been assessed using an impact range of 4 km for all vessels. However, with the high number of vessels potentially working at the WDA simultaneously, a 4 km buffer has been added to the WDA. This accounts for the maximum number of vessels operating inside the WDA, (see Figure 10.1 in **Chapter 10 Marine Mammals and Leatherback Turtle**). The worst-case disturbance area is therefore 851.8 km^2. This disturbance range has also been applied to assess for disturbance from multiple non-piling construction activities occurring at the same time.

172. During the construction phase of the WDA, vessels will need to transit to and from port. While the port location(s) have not yet been decided an indicative list of construction ports includes:

- Marshalling & Assembly (Construction):
  - Kishorn;
  - Arnish/Stornoway; and
  - Hunterston.
- Marine Operations (Construction):
  - Oban;
  - Port Ellen; and
  - Bendoran (Mull).

173. If Bendoran (Mull), Kishorn or Arnish/Stornoway ports were used, then vessels would be transiting through the Sea of Hebrides NCMPA (**Figure 6.3**). As a worst-case scenario, a disturbance area of a vessel transit from the WDA to Stornoway will be assessed. Following the approach in **Chapter 10 Marine Mammals and Leatherback Turtle**, applying a 4 km buffer around the total vessel transit route, allowed calculation of the spatial disturbance area of 2,212.3 km^2. This approach is considered precautionary as it treats vessel activity as a static area of influence and does not explicitly account for the movement of vessels over time, thereby likely overestimating the area subject to potential disturbance.

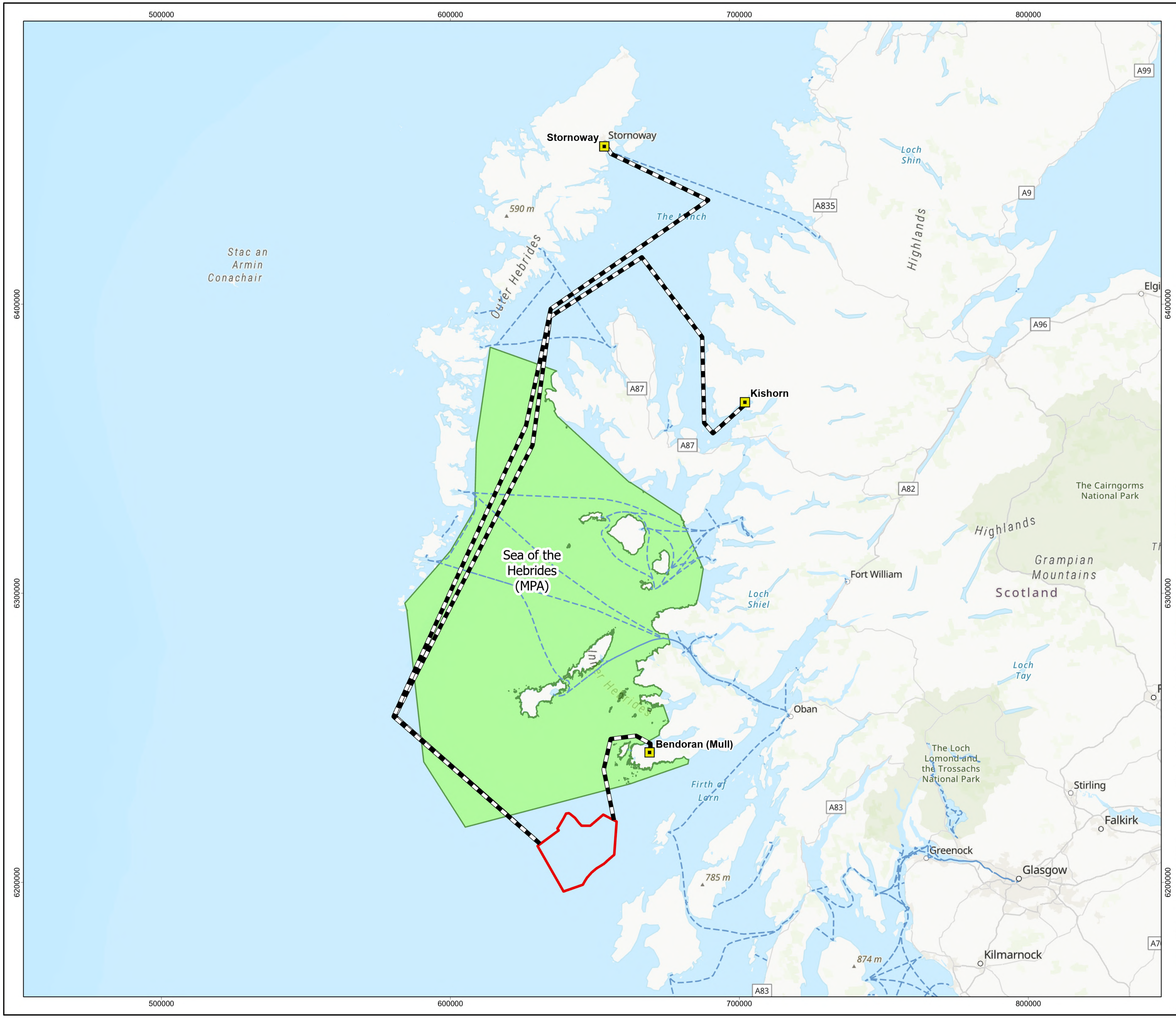
174. **Table 6.12** presents the estimated number of minke whales that could be disturbed due to vessel presence and non-piling activities. The worst-case disturbance scenario relates to transiting vessels, with up to 3.2% of the WS MU potentially exposed. However, vessel-related disturbance is predicted to occur over a relatively limited spatial extent of 2,212.3 km^2, as the assessment does not account for the fact that vessel noise represents a moving source rather than a static impact area. Any disturbance associated with vessel movements would be temporary and transient in nature, and is therefore unlikely to result in significant effects on minke whales. Mitigation measures set out in **Appendix 6 Outline EMP** (**Section 1.5**) include adherence by Project vessels to the SMWWC which will minimise the risk of disturbance to minke whales and other marine mammals.

175. As less than 5% of the WS population could be exposed to disturbance from the presence of vessels and non-piling activities during the construction phase of the WDA, the activity **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

Table 6.12 Assessment of disturbance to minke whale from non-piling activities and the presence of vessels in the WDA

Impact	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
One non-piling activity or single vessel 4 km (50.27 km^2)	2 (0.4% CS-H MU; 0.28% CS-F & CS-H MU; **0.08% WS**) (0% of the NCMPA area)	**No** **Less than 5% of the population affected**
Multiple non-piling activities and up to 117 vessels (851.75 km^2)	30 (6.1% CS-H MU; 4.28% CS-F & CS-H MU; **1.22% WS**)	**No** **Less than 5% of the population affected**

Impact	Maximum number of individuals (% of ref pop)	Risk of hindering the minke whale conservation objectives of the Sea of Hebrides NCMPA
Transiting vessels (2,212.3 km^2)	78 (15.8% CS-H MU; 11.12% CS-F & CS-H MU **3.18% WS**) (13.4% of the NCMPA area)	**No** **Less than 5% of the population affected**



Windfarm Development Area

Marine Protected Area (MPA)

Ferry Route

Transiting Vessels from Windfarm Development Area to Ports for Construction

Port for Construction

N

0 10 20 40 60 Kilometres

1	20/04/2026	FC	AB	SB	PM
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000186		
DATUM	ETRS89	PROJECTION	UTM Zone 29N
SCALE	1:1,250,000	PAGE SIZE	A3
PROJECT TITLE	MachairWind		

Figure 6.3: Indicative Vessel Tracks Transiting from the WDA to Ports through the Sea of Hebrides NCMPA during Construction Phase

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Haskoning Enhancing Society Together

ScottishPower Renewables

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6.1.2.5.2 Operation and Maintenance

176. During the O&M phase of the WDA, there will be less vessel activity and therefore less O&M activities compared to the number of vessels and non-piling activities in the construction phase of the WDA.

177. The assessment for auditory injury and disturbance from O&M activities and vessels during the O&M phase is the same or less than that for non-piling activities and vessels in the construction phase (**Section 6.1.2.5.1.1** and **6.1.2.5.1.2**).

178. During the O&M phase of the WDA, vessels will need to transit to and from port. While the O&M port location(s) have not yet been decided, an indicative list of ports includes:

- Campbeltown;
- King George V (Glasgow); and
- Hunterson.

179. No matter which port is selected, no vessels will be transiting through the Sea of Hebrides NCMPA in between the WDA and port.

180. Therefore, any vessel operations and O&M activities in the O&M phase of the WDA **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

6.1.2.5.3 Decommissioning

181. Any auditory injury or disturbance due to underwater noise in the WDA from non-piling activities and the presence of vessels, will be similar or less in the decommissioning phase compared to the construction phase (see **Section 6.1.2.5.1**).

182. Therefore, any auditory injury and behavioural impacts from decommissioning activities and vessel activities **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

6.1.2.6 Impact 6: Barrier Effects due to Underwater Noise

6.1.2.6.1 Construction

183. Underwater noise generated during construction and non-piling activities within the WDA may create temporary acoustic barriers for minke whale. In semi-enclosed coastal environments, avoidance behaviour can increase energy expenditure, elevate stress levels, and interfere with communication and navigation. Elevated noise may also reduce effective communication ranges and disrupt echolocation, potentially leading to short-term displacement and increased travel distances.

184. Given the coastal setting of the WDA, there is a potential risk of barrier or entrapment effects from loud and impulsive noise sources (e.g. piling and high-order UXO clearance).

185. Figure 10.4 in **Chapter 10 Marine Mammals and Leatherback Turtle** presents the underwater noise modelling contour outputs for all modelled piling locations, shown up to a received noise level of 145 dB re 1 µPa. The 145 dB noise contour has been used to assess the potential for barrier effects, as Graham et al. (2017) identified a 50 % probability of behavioural response in cetaceans at this received level. This threshold is therefore considered the most appropriate for evaluating potential barrier effects to minke whale. Noise levels below this threshold are not considered likely to result in a barrier to movement; while lower-level noise may cause behavioural disturbance or avoidance, it is not expected to impede movement or result in habitat fragmentation.

186. Figure 10.4 in **Chapter 10 Marine Mammals and Leatherback Turtle** demonstrates that there are numerous potential transit routes and exit points between islands, consistent with established vessel tracks. This indicates that sufficient space remains for all receptors to move freely around noisy areas and avoid entrapment. Therefore, barrier effects due to underwater noise **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.1.2.6.2 NCMPA Operation and Maintenance

187. Any barrier effects due to underwater noise in the WDA, will be less in the O&M phase compared to the construction phase (see **Section 6.1.2.6.1**).

188. Therefore, barrier effects due to underwater noise **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

6.1.2.6.3 Decommissioning

189. Any barrier effects due to underwater noise in the WDA, will be similar or less in the decommissioning phase compared to the construction phase (see **Section 6.1.2.6.1**).

190. Therefore, barrier effects due to underwater noise **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA**.

6.1.2.7 Impact 7: Vessel Interaction (Collision Risk)

6.1.2.7.1 Construction

191. Minke whales regularly use the Sea of Hebrides NCMPA as a seasonal feeding area, particularly between spring and autumn, when prey availability is enhanced by productive frontal systems (NatureScot, 2020; Hebridean Whale and Dolphin Trust, 2023). As a coastal-feeding baleen whale that frequently forages at or near the surface, minke whales may be vulnerable to vessel collision where spatial overlap occurs with transiting vessels (Laist et al., 2001). Vessel strike risk is influenced primarily by vessel speed, size, and the ability of whales to detect and avoid approaching vessels, with baleen whales not always exhibiting effective avoidance responses (International Whaling Commission (IWC), 2022).

192. Within the Sea of Hebrides NCMPA, prior to construction at the WDA, vessel activity comprises a mix of commercial shipping, ferries, fishing vessels, and recreational craft. However, the site does not coincide with major international shipping lanes, and vessel movements are generally transient rather than continuous (NatureScot, 2020). While minke whales are capable of relatively agile movement compared to larger baleen whales, their unpredictable surfacing behaviour and feeding focus may reduce situational awareness, particularly where vessels are travelling at higher speeds (Laist et al., 2001; Robbins, 2022). In addition, the forward-directed “acoustic shadow” created by vessel noise may limit a whale’s ability to detect an oncoming vessel in sufficient time to evade collision (Vanderlaan & Taggart, 2007).

193. During the construction phase there will be up to 5,699 vessel round trips across the anticipated maximum five year offshore construction phase, transiting from the WDA to one of the ports listed in **Section 6.1.2.5.1.2**,), which provides an average of three vessel transits per day. **Figure 6.3** provides an indicative vessel track from the WDA to the possible construction ports. If Bendoran (Mull), Kishorn or Arnish/Stornoway ports are to be used, then vessels would be transiting through the Sea of Hebrides NCMPA.

194. Despite these sensitivities, evidence indicates that reported ship-strike incidence for minke whales is lower than for some larger baleen whale species, and population-level impacts are not currently considered a primary pressure for the species in Scottish waters (NatureScot, 2020; IWC, 2022). The wide spatial extent of the NCMPA, combined with the mobile and wide-ranging nature of minke whales, further reduces the likelihood that vessel collisions would occur at a frequency sufficient to undermine the conservation objective for the feature. Vessel activity associated with the WDA will be spatially limited, temporary and intermittent, with vessels operating at low speeds within the WDA and following defined transit routes

195. Overall, vessel collision risk within the Sea of the Hebrides NCMPA is assessed as low and is not considered likely to hinder the achievement of the conservation objective to conserve minke whales as a protected feature of the site, provided that vessel activity remains intermittent and consistent with existing patterns of use (NatureScot, 2020). Accordingly, vessel collision risk **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.1.2.7.2 Operation and Maintenance

196. The number of vessels will be less in the O&M phase compared to the construction phase of the WDA and there will be no vessel transits within the Sea of Hebrides NCMPA on the basis of the indicative ports considered for the assessment (see **Section 6.1.1.2.1**).

197. Therefore, vessel collision risk **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.1.2.7.3 Decommissioning

198. The number of vessels and potential ports will be similar or less in the decommissioning phase compared to the construction phase of the WDA (see **Section 6.1.2.7.1**).

199. Therefore, vessel collision risk **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.2 COMBINED ASSESSMENT: WINDFARM DEVELOPMENT AREA, OFFSHORE EXPORT CABLE CORRIDOR AND ONSHORE TRANSMISSION DEVELOPMENT AREA

6.2.1 Basking Shark

200. The impacts for the WDA presented in **Section 6.1.1** could potentially have interactions and additive effects with activities occurring in the Offshore ECC, which is likely to be approximately 25 km from the NCMPA at the closest point. However, there will be no interactions and additive effects between the WDA and the OnTDA for basking shark in the Sea of the Hebrides NCMPA, therefore this section will focus solely on the combined effects of the WDA and the Offshore ECC.

6.2.1.1 Impact 1: Increased Suspended Sediment Concentrations Resulting in Potential Reduction of Prey Species

201. Seabed preparation and cable-installation activities within the Offshore ECC, such as ploughing, jetting or trenching, will add to the areas where sediments are temporarily disturbed. However, as the tidal ellipse only has a very small overlap (766 m) with the NCMPA (**Figure 2.1**) and export cable installation activities would not take place at the very northern tip of the WDA, there is no potential for SSCs from export cable installation to interact with the NCMPA. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA.**

6.2.1.2 Impact 2: Vessel Collision and Disturbance

202. The vessel numbers assumed for the WDA already include those required for offshore export cable installation, meaning the Offshore ECC does not add to the overall level of vessel traffic when considered alongside the WDA. Cable-laying vessels typically operate at slow speeds during installation, and works are expected to occur at different times for each cable type, which limits the potential for overlapping disturbance. As a result, any additional contribution to collision or disturbance risk from the Offshore ECC is expected to remain small and highly localised. Similarly, embedded measures for vessel operations (**Section 1.5**) will apply consistently across all Development Areas, helping to reduce the likelihood of close encounters and supporting the ability of basking sharks to avoid vessels when necessary.

203. In the context of the Sea of the Hebrides NCMPA conservation objectives, these conditions ensure that basking sharks remain able to use the site without interruption. Access to important seasonal feeding areas is unaffected, and the brief, localised nature of disturbance does not lead to sustained displacement or changes in the species' natural distribution within the NCMPA. The conservation objectives for the basking shark feature, maintaining favourable condition, ensuring low risk of injury or killing, conserving natural distribution, and protecting supporting physical and ecological processes, will **not hinder the maintenance of any of the conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA**.

6.2.1.3 Impact 3: Underwater Noise

204. Based on the current technical assumptions, no piling will occur within the Offshore ECC, meaning it will not add to the higher-intensity underwater noise associated with foundation installation in the WDA. UXO clearance within the Offshore ECC would temporarily increase the overall footprint of noise sources, but low-order clearance techniques and the short, impulsive nature of these events mean that any additional contribution remains brief and localised and unlikely to interact with the NCMPA. Noise generated during cable installation, such as rock placement, trenching or jetting, is much lower than piling noise and dissipates rapidly under local hydrodynamic conditions, limiting any additive effect when considered alongside the WDA.

205. Although the Offshore ECC will contribute some short-term vessel noise during installation, these additions are comparatively small next to the activity within the WDA. The distribution of works over different times and locations further limits the potential for overlap, ensuring that the combined underwater noise field remains dominated by the WDA's construction activities.

206. In the context of the NCMPA conservation objectives for basking sharks, these contributions do not lead to any change in the overall assessment. The low sensitivity of basking sharks to underwater noise, combined with their ability to avoid localised disturbances, means that temporary additions from the Offshore ECC are not expected to interfere with natural behaviour, distribution or access to seasonal feeding areas. The short duration of noise sources ensures no risk of injury, and the broader hydrodynamic processes that maintain plankton availability remain unaffected.

207. Overall, while the Offshore ECC introduces additional, short-lived underwater noise sources, these are minor in comparison with the primary activities of the WDA and are unlikely to interact with the NCMPA. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the basking shark feature of the Sea of the Hebrides NCMPA** and does not alter the conclusions for the WDA-alone.

6.2.2 Minke Whale

208. The impacts for the WDA presented in **Section 6.1.2** are likely to have interactions and additive effects with activities occurring in the Offshore ECC. However, there will be no interactions and additive effects between the WDA and the OnTDA for minke whale in the Sea of the Hebrides NCMPA, therefore this section will just focus on the combined effects of the WDA and the Offshore ECC.

6.2.2.1 Impact 1: Underwater Noise During Geophysical Surveys

209. Geophysical surveys may be undertaken within the Offshore ECC at the same or similar time as the WDA. There is therefore potential for underwater noise throughout the WDA and Offshore ECC during geophysical surveys.

210. Potential effects in the WDA have been assessed in **Section 6.1.2.1** for auditory injury (PTS) and disturbance for a maximum of up to three vessels as a worst-case. It is not anticipated that more than three geophysical survey vessels would be operating throughout the WDA and Offshore ECC, therefore the assessment presented in **Section 6.1.2.1** is a good representation of the level of impact that would occur within Offshore ECC.

211. The assessment concludes that these effects **will not hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA**.

6.2.2.2 Impact 2: Underwater Noise During UXO Clearance

212. Underwater noise during UXO clearance for the WDA-alone is assessed in **Section 6.1.2.1.2**.

213. The WDA-alone assessment concluded that there would be no potential to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA if low order clearance methods was used. There was a significant effect with numbers that could be exposed to TTS from a high order clearance, but that is unrealistic and unlikely due to low order clearance methods being the preferred option.

214. A marine licence for UXO clearance for the WDA and Offshore ECC will be submitted post-consent when accurate information on the number and location of UXO devices is available.

215. Based on the indicative assessment for the WDA-alone, it is not anticipated that there would be any significant additive effects from UXO clearance however this will be assessed as part of the separate marine licence application post-consent.

216. Potential interactions and additive effects between the WDA and the Offshore ECC from UXO clearance will be assessed for auditory injury (PTS/TTS) and disturbance for minke whale in the Sea of Hebrides NCMPA from a single low-order UXO clearance and a high order UXO clearance for the Offshore ECC. It is anticipated that this will be very similar to that presented for the WDA-alone however, minke whale densities will be recalculated based on the final Offshore ECC.

6.2.2.3 Impact 3: Auditory Injury from Underwater Noise During Piling

217. There will be no piling in the Offshore EEC, therefore there will be no interactions and additive effects between the WDA and the Offshore ECC.

6.2.2.4 Impact 4: Disturbance and Behavioural Impacts from Underwater Noise During Piling

218. There will be no piling in the Offshore EEC, therefore there will be no interactions and additive effects between the WDA and the Offshore ECC.

6.2.2.5 Impact 5: Auditory Injury and Behavioural Impacts from Vessels and Non-Piling Activities

219. Auditory injury and behavioural response from non-piling activities is assessed for the WDA alone in **Section 6.1.2.5.**

220. For auditory injury, the worst-case impact range is 2 km for minke whale for any rock placement activity, and 440 m for vessel activity which is highly precautionary as for auditory injury to occur in a single minke whale, the animal would need to be within the predicted impact range for at least 24-hours which is highly unlikely. The WDA-alone assessment concluded that there would be no significant effect on minke whale, from a single activity or multiple activities occurring at the same time within the WDA for both auditory injury and disturbance.

221. Potential interactions and additive effects between the WDA and the Offshore ECC from the presence of vessels and non-piling activities will be assessed for auditory injury and disturbance for minke whale in the Sea of Hebrides NCMPA. However, it is considered that there is very low potential for additive auditory injury effects from non-piling activities occurring in the WDA and Offshore ECC except, potentially, if activities were to occur within the Offshore ECC within 6 km of the WDA assuming activities are undertaken at the same time, which is unlikely. There is no risk of the WDA-alone activities hindering the conservation objectives of the NCMPA and the conclusions for the Offshore ECC would be the same or very similar to those for the WDA-alone. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the minke whale feature of the Sea of the Hebrides NCMPA**. Further details will be included within the Offshore ECC EIA.

6.2.2.6 Impact 6: Barrier Effects due to Underwater Noise

222. Barrier effects due to underwater noise is assessed for the WDA-alone in **Section 6.1.2.5.2**. The WDA-alone assessment concluded that there would be no potential to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA.

223. Potential interactions and additive effects between the WDA and the Offshore ECC from barrier effects due to underwater noise are unlikely due to the anticipated limited temporal and spatial overlap of activities within each Development Area and the lower levels of noise emissions associated with Offshore ECC infrastructure installation compared to WDA infrastructure. There is no risk of the WDA-alone activities hindering the conservation objectives of the NCMPA and the conclusions for the Offshore ECC would be the same or very similar to those for the WDA-alone. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the minke whale feature of the Sea of the Hebrides NCMPA**.

6.2.2.7 Impact 7: Vessel Interaction (Collision Risk)

224. Vessel collision risk is assessed for the WDA-alone in **Section 6.1.2.6.2**.

225. For vessel interaction and collision risk, the WDA-alone assessment concluded that no potential to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA.

226. The vessel numbers assumed for the WDA already include those required for offshore export cable installation, meaning the Offshore ECC does not add to the overall level of vessel traffic when considered alongside the WDA. Cable-laying vessels typically operate at slow speeds during installation, and works are expected to occur at different times for each cable type, which limits the potential for overlapping disturbance. As a result, any additional contribution to collision or disturbance risk from the Offshore ECC is expected to remain small and highly localised. Similarly, embedded measures for vessel operations (**Section 1.5**) will apply consistently across all Development Areas, helping to reduce collision risk and supporting the ability of marine mammals to

avoid vessels when necessary. There is no risk of the WDA-alone activities hindering the conservation objectives of the NCMPA and the conclusions for the Offshore ECC would be the same or very similar to those for the WDA-alone. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the minke whale feature of the Sea of the Hebrides NCMPA**.

6.3 CUMULATIVE EFFECTS

6.3.1 Basking Shark

6.3.1.1 Screening of Potential Cumulative Impacts

227. The first step in the Cumulative Effects Assessment (CEA) is the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 6.13**, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale.

Table 6.13 Potential cumulative impacts (impact screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction and Decommissioning			
Impact 1: Increased Suspended Sediment Concentrations resulting in potential reduction of prey species	No	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of which forms the assessment has a high level of confidence attributed to it.	The increase in SSCs and subsequent sediment re-deposition will be highly localised and short-lived. There is no expected interaction with other plans or projects.
Impact 2: Vessel Collision and Disturbance	No	Medium Qualitative assessments based on projects screened in for assessment. As the assessments are qualitative only, there is limited project specific data used within the assessments (although project specific information is used wherever possible). Therefore, there is a medium confidence in the data used to inform this assessment.	With robust mitigation measures in place, the risk of vessel collision involving basking sharks is considered low, and the likelihood of WDA vessels contributing to cumulative effects is minimised. The potential for vessel collision and disturbance with basking shark has been excluded from the CEA.
Impact 3: Underwater Noise	Yes	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of	Disturbance from Underwater Noise (UWN) refers to a short-term behavioural change caused by noise exposure and typically resolves within hours to days after the source ceases. These effects generally extend over wider

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
		which forms the assessment has a high level of confidence attributed to it.	ranges and areas than those predicted for recoverable injury. The Zone of Influence (ZoI) may overlap with other projects if sequential pile driving occurs. Disturbance from UWN during construction has been included in the CEA to account for possible cumulative impacts.
O&M			
Impact 1: Increased Suspended Sediment Concentrations resulting in potential reduction of prey species	No	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of which forms the assessment has a high level of confidence attributed to it.	The increase in SSCs and subsequent sediment re-deposition will be highly localised and short-lived. There is no expected interaction with other plans or projects.
Impact 2: Vessel Collision and Disturbance	No	Medium Qualitative assessments based on projects screened in for assessment. As the assessments are qualitative only, there is limited project specific data used within the assessments (although project specific information is used wherever possible). Therefore, there is a medium confidence in the data used to inform this assessment.	With robust mitigation measures in place, the risk of vessel collision involving basking sharks is considered low, and the likelihood of WDA infrastructure contributing to cumulative effects is minimised. The potential for vessel collision and disturbance with basking shark has been excluded from the CEA.
Impact 3: Underwater Noise	Yes	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of which forms the assessment has a high level of confidence attributed to it.	Disturbance from UWN refers to a short-term behavioural change caused by noise exposure and typically resolves within hours to days after the source ceases. These effects generally extend over wider ranges and areas than those predicted for PTS. The ZoI during O&M is expected to be less so overlap with projects is not expected. However, disturbance from UWN during O&M has been

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
			included in the CEA on a precautionary basis.

6.3.1.2 Screening of Other Plans, Projects and Activities

228. A CEA has been undertaken for the impact pathways screened in and assessed within this NCMPA Assessment. For the purposes of this assessment, it is assumed that the projects included in the CEA presented in **Chapter 9 Fish (including basking shark) and Shellfish** of the WDA EIAR may have activities that overlap with the Sea of the Hebrides NCMPA.

229. This precautionary approach ensures that all projects with a potential impact pathway are considered within the CEA, while maintaining consistency with the NCMPA Assessment, which focuses specifically on pathways that could affect the ability of the Sea of the Hebrides NCMPA to achieve its conservation objectives.

6.3.1.3 Cumulative Effects Assessment

6.3.1.3.1 Cumulative Impact 1: Underwater Noise

230. The Sea of the Hebrides NCMPA is situated in an area of the west coast of Scotland that already experiences routine levels of underwater noise associated with commercial fishing, aquaculture operations, ferry routes, and recreational boating. As such, basking sharks within the NCMPA are already exposed to regular low to mid-frequency vessel noise under baseline conditions.

231. In the context of the screened-in impact pathways, the projects of greatest relevance are west-coast marine renewable developments, particularly ScotWind and Innovation and Targeted Oil & Gas (INTOG) projects, which may require vessel activity during construction and O&M. While some projects involve installation activities capable of generating underwater noise, the available licencing information indicates that many do not involve high-energy impulsive noise sources such as piling. Consequently, the potential for cumulative exposure to concurrent impulsive noise is very low.

232. During construction, UWN from the Project is expected to be short-lived and intermittent. Other projects that could overlap either produce only low-level vessel noise or are located too far away to contribute to cumulative effects within the Sea of the Hebrides NCMPA. Although future projects may increase activity across the wider region, construction is expected to take place at different times rather than all at once. Section 9.12.2 of **Chapter 9 Fish (including Basking Shark) and Shellfish** provides a list of other plans, projects and activities that may result in cumulative impacts and which have been included within the CEA. Basking sharks are highly mobile and would be able to move away from any local increase in noise if needed.

233. Once the Project becomes operational, the only underwater noise will come from maintenance vessels. This type of noise is generally low-level and similar to routine vessel noise already present in the region. When considered alongside other developments and existing vessel traffic, these combined sounds remain part of the normal background conditions along the west coast and are not expected to disturb basking sharks.

234. During decommissioning, activities will create even less noise than construction because no piling is required. Other projects in the region are also likely to remove infrastructure at different times,

meaning there is little chance of noise from multiple decommissioning activities overlapping. Overall, underwater noise during this phase is expected to be very limited.

235. Because the combined noise from the Project and other relevant activities remains within the range of existing background conditions, the acoustic environment of the Sea of the Hebrides will not be meaningfully altered. As a result, none of the conservation objectives for basking shark, relating to maintaining their natural range, abundance, behaviour, or supporting environmental conditions, would be hindered. In summary, cumulative underwater noise **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.3.2 Minke Whale

6.3.2.1 Screening of Potential Cumulative Impacts

236. The first step in the CEA is the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as 'impact screening'). This information is set out in **Table 6.14**, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale.

Table 6.14 Potential cumulative impacts (impact screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction			
Impact 1: Cumulative impacts from underwater noise	*Yes*	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of which forms the assessment has a high level of confidence attributed to it.	Disturbance due to underwater noise refers to a temporary behavioural change caused by noise exposure and typically resolves within hours to days after the source ceases. These effects generally extend over wider ranges and areas than those predicted for PTS. The impact ranges for noisy activities during the WDA construction phase represents worst-case. Therefore, disturbance from underwater noise during the construction phase of the WDA has been included in the CEA as a representation for all phases.
Impact 2: Cumulative impacts from collision risk and presence of vessels	Yes	Medium Qualitative assessments based on projects screened in for assessment. As the assessments are qualitative only, there is limited project specific data used within the assessments (although project specific information is used wherever possible). Therefore, there is a medium confidence in	With robust mitigation measures in place, the risk of vessel collision involving minke whale is considered low, and the likelihood of WDA vessels contributing to cumulative effects is minimised. However, following the approach in **Chapter 10 Marine Mammals and Leatherback Turtle**, the potential for vessel collision and disturbance with minke whale has been included in the CEA.

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
		the data used to inform this assessment.	
Impact 3: Cumulative impacts from barrier effects due to underwater noise	Yes	Medium Qualitative assessments based on projects screened in for assessment. As the assessments are qualitative only, there is limited project specific data used within the assessments (although project specific information is used wherever possible). Therefore, there is a medium confidence in the data used to inform this assessment.	Underwater noise associated with impact piling has the greatest potential to contribute to barrier effects. Therefore, barrier effects due to underwater noise is screened into the CEA.

6.3.2.2 Screening of Other Plans, Projects and Activities

237. The CEA screening undertaken for **Chapter 10 Marine Mammals and Leatherback Turtle (Appendix 10.5)** was used to inform the following assessment on minke whale.

6.3.2.3 Cumulative Effects Assessment

6.3.2.3.1 Cumulative Impact 1: Disturbance from Underwater Noise

238. The potential sources of in-combination underwater noise which could disturb minke whale, and which are screened into the assessment are:

- Piling at other offshore windfarms;
- Non-piling activities at operational offshore windfarms (such as vessels, cable installation works, dredging, seabed preparation and rock placement);
- Other construction activities at other marine renewable schemes (e.g. wave and tidal) (such as vessels, cable installation works, dredging, seabed preparation and rock placement);
- Aggregate extraction and dredging;
- Oil and gas installation / decommissioning schemes;
- Seismic surveys;
- Subsea cables and pipelines;
- Other marine industries, such as gas storage, offshore mines, and carbon capture;
- High resolution geophysical surveys (such as for offshore windfarms); and
- UXO clearance.

6.3.2.3.1.1 Cumulative Impact 1a: Disturbance from Underwater Noise from Piling at other Offshore Windfarms

239. A review of other offshore wind plans and projects has been undertaken to identify potential in-combination effects on the Sea of Hebrides NCMPA.

240. No other offshore windfarm projects have undertaken a project-level assessment of the Sea of Hebrides NCMPA. This reflects the fact that existing, consented and proposed offshore wind

developments are either geographically distant from the NCMPA and/or do not present credible pathways for effects on the protected features of the site.

241. As a result, no other offshore windfarm projects have been identified that could act in-combination with the WDA to result in cumulative effects on the Sea of Hebrides NCMPA. The assessment therefore concludes that cumulative effects from piling **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.3.2.3.1.2 Cumulative Impact 1b: Assessment of Underwater Noise from Non-Piling Activities at other Offshore Windfarms

242. No existing or proposed offshore windfarms assessed the Sea of Hebrides NCMPA (see **Section 6.3.2.3.1.1**).

243. The assessment therefore concludes that cumulative effects from non-piling activities and/or O&M activities from any offshore windfarm **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.3.2.3.1.3 Cumulative Impact 1c: Assessment of Disturbance from other Industries and Activities

244. There are no other noisy activities that have been screened in with exception of the Western link 2 subsea cable, which has not assessed the Sea of Hebrides NCMPA (see **Appendix 10.5 Cumulative Effects Screening** of the EIAR).

245. As described in **Appendix 10.5 Cumulative Effects Screening**, it is currently not possible to accurately estimate the location or number of potential seismic or geophysical surveys that could be undertaken at the same time as construction and potential piling activity within the WDA. Therefore, as a precautionary approach an indicative assessment has been carried out which assumes at least one geophysical, one seismic survey and one UXO clearance. All of these can be related to port projects and other industrial activities.

246. To assess for cumulative disturbance from geophysical surveys to minke whale in the Sea of Hebrides NCMPA, a 5 km EDR; (equating to an area of 78.54 km²) has been applied (see **Section 6.1.2.1**). To assess for disturbance from a seismic survey, a 10 km EDR (314.16 km²) (JNCC, 2025) has been applied and a 20 km EDR (1,256.64 km²) for a high order UXO detonation. As stated in **Section 6.1.2.4**; the assessment of piling-related disturbance for the WDA applies the number of potentially disturbed minke whales derived for the EDR assessment, as that provides a more realistic worst-case scenario.

247. **Table 6.15** presents the number of minke whale that could be disturbed due to cumulative noise from piling at the WDA and potential other noise sources. If there were a high-order UXO clearance, a seismic survey and a geophysical survey occurring at the same time as piling at the WDA, less than 5% of the WS would be disturbed. The assessment therefore concludes that cumulative effects from piling **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

Table 6.15 Assessment of disturbance to minke whale from piling in the WDA

Project	Impact Area	Maximum number of individuals (% of reference population)
Piling at MachairWind	1,256.64 km²	45 (1.83% WS)
UXO clearance |(high order as worst-case)	1,256.64 km²	45 (1.83% WS)

Project	Impact Area	Maximum number of individuals (% of reference population)
One Geophysical survey	78.54 km^2	3 (0.12% WS)
One seismic survey	314.16 km^2	12 (0.49% WS)
Total number of minke whale		**105**
(without the MachairWind WDA)		*60*
Percentage of WS		**4.27%**
(without the MachairWind WDA)		*2.44%*

6.3.2.3.2 Cumulative Impact 2: Underwater Noise and Collision Risk from the Presence of Vessels

248. Vessel activity within (and adjacent to) the Sea of Hebrides NCMPA area typically includes a mix of ferries, commercial shipping, fishing vessels and recreational craft, leading to repeated opportunities for exposure to both vessel noise and collision risk. However, these activities have been occurring for years and would be considered as part of the baseline (see **Appendix 10.5 Cumulative Effects Screening).**

6.3.2.3.2.1 Disturbance

249. Assessing the potential increase in disturbance to minke whale from combined vessel activity is challenging due to the considerable spatial and temporal variability in vessel movements across different projects and activities, as well as natural fluctuations in minke whale distribution throughout the Sea of Hebrides NCMPA.

250. In practice, vessels travelling to and from the WDA and other offshore developments are expected to use established shipping routes already frequented by existing marine traffic, to which minke whale are likely accustomed. This familiarity, along with some degree of habituation to routine vessel movements, such as ferries, means that any additional disturbance risk is expected to be largely confined to the immediate vicinity of the relevant projects and schemes.

251. Behavioural studies in Faxaflói Bay demonstrated that minke whales altered movement and foraging behaviour during interactions with multiple vessels (whale-watching boats), including shorter dives, increased horizontal movement and reduced feeding activity when multiple vessels were present. Subsequent spatially explicit capture–recapture analyses showed that, although some individuals encountered multiple vessels repeatedly, the cumulative time spent exposed to vessels across a season was low, limiting the likelihood of long-term effects on vital rates (Christiansen et al, 2013; 2015). These studies indicate that short-term disturbance can occur during periods of multiple-vessel presence, but that population-level consequences are unlikely where exposure remains intermittent and animals are able to resume baseline behaviour once vessels depart.

252. Based on this evidence, there will be no long-term restriction of movement as a result of vessel disturbance from the WDA in combination with other vessel activity in the area and it **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.3.2.3.2.2 Collison Risk

253. Assessments of baleen whale strandings and mortalities demonstrate that vessel speed, vessel density and whale distribution shifts are key predictors of collision risk. While focused primarily on larger species, these findings are applicable to minke whales occupying similar habitats, particularly where multiple vessels operate concurrently (Thorne and Wiley, 2024). The available evidence shows that higher levels of vessel traffic are associated with an increased risk of collision, reinforcing the need for effective management of vessel activity where minke whales are present.

254. Although there will be an increase in vessel activity associated with the WDA, during the construction phase, there will be an average of up to three vessel transits per day. The transits will be spatially limited, temporary and intermittent, with vessels operating at low speeds. Lasit et al. (2001) reported that vessel strike risk increases due to increasing vessel speeds. In addition, all vessels will be following defined transit routes. In combination with other relevant plans and projects, there is no mechanism for a sustained or widespread increase in vessel density within the NCMPA, nor for prolonged periods of high-speed vessel movements that would materially elevate collision risk. Taking account of the limited duration and scale of vessel activity, the absence of major shipping lanes within the NCMPA, and the lack of any plausible pathway for cumulative collision risk to affect a significant proportion of the minke whale feature, there is not expected to be any significant risk of collision to the minke whale population.

255. Christiansen et al. (2015) suggests that multiple vessels do not inherently result in high collision risk where vessel speeds are low and vessels operate under established codes of conduct. All vessels transiting through the Sea of Hebrides NCMPA as part of the WDA will follow mitigation measures such as adherence to the SMWWC (**Section 1.5**). It is anticipated that vessels from other projects and activities would also adhere to the SMWWC, to reduce collision risk.

256. Therefore, it is concluded that cumulative vessel collision risk **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

6.3.2.3.3 Cumulative Impact 3: Barrier Effects due to Underwater Noise

257. Assessments of potential barrier effects due to underwater noise for the WDA alone during construction (**Section 6.1.2.6.1**) and O&M (**Section 6.1.2.6.2**) phases concluded that impacts would be short-term, intermittent, and spatially limited, with no potential for cumulative effects from piling to hinder the relevant minke whale conservation objective of the Sea of Hebrides NCMPA.

258. Underwater noise associated with impact piling represents the noise source with the greatest potential to contribute to barrier effects, particularly if piling is occurring concurrently with MachairWind. If other noise sources were to occur at the same time as piling at the WDA, the elevated sound levels could result in temporary displacement or avoidance by minke whale, potentially increasing travel distances to foraging areas and increasing energetic expenditure.

259. However, the potential for cumulative barrier effects is limited by several factors. Construction activities such as piling are temporary and intermittent, and piling will not occur across the wider region, or continuously across the WDA. In addition, the marine environment in the MachairWind WDA and surrounding waters is characterised by open-water conditions with multiple alternative transit routes, channels and exits between islands, reducing the likelihood that minke whale would become confined between noise sources and coastline features.

260. Taking into account the temporary and intermittent nature of construction noise, no other noise sources confirmed in proximity to the Sea of Hebrides NCMPA, the availability of alternative

movement routes, and the embedded mitigation measures (**Section 1.5**), the potential for significant cumulative barrier effects due to underwater noise is considered low. Therefore, there will be no long-term restriction of movement as a result of the WDA cumulatively with other noisy projects in the area and it **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Sea of the Hebrides NCMPA.**

7 BACKGROUND INFORMATION ON THE LOCH SUNART TO THE SOUND OF JURA NCMPA

7.1 OVERVIEW

261. Loch Sunart to the Sound of Jura NCMPA is located approximately 45 km east of the WDA and was identified for one MPA search feature (flapper skate) and one geodiversity feature (Quaternary of Scotland). The NCMPA was established in 2014, with restrictions on fisheries implemented in 2016 (NatureScot, 2024).

262. Tagging surveys were conducted by the Marine Directorate, Scottish Association for Marine Science and NatureScot to aim to understand how the NCMPA supports flapper skates (Thorburn, et al., 2018). It was this study that informed the restriction of specific fishing activities to conserve marine resources and ecosystems, supporting climate change adaption and maintaining biodiversity.

7.2 CONSERVATION OBJECTIVES

263. The conservation objective for the flapper skate feature of the Loch Sunart to the Sound of Jura NCMPA is to conserve the feature in favourable condition. For mobile species such as flapper skate, favourable condition requires that the species is conserved or, where necessary, recovered; that access to resources within the MPA is maintained; that supporting habitats remain intact; and that the structure and function of those supporting habitats are sufficient to ensure the species remains healthy and not deteriorating.

264. Due to fishing activity, the estimated rate of mortality of flapper skate is considered to be higher than the level required to sustain the population (Neat et al., 2014). Therefore, statutory mechanisms exist such as Fisheries Orders or Marine Conservation Orders to conserve the features in the NCMPA (SNH, 2014a). These mechanisms support the overall conservation objective by reducing harmful interactions, safeguarding essential habitats, and enabling the long-term recovery and resilience of this Critically Endangered species.

Table 7.1 Conservation objectives for Loch Sunart to the Sound of Jura Nature Conservation Marine Protected Area

Protected Feature(s)	Type	Conservation Objective	Condition
Flapper skate	Mobile species	• Conserve the feature in favourable condition; • Ensure flapper skate within the NCMPA are not at significant risk from injury or killing; • Conserve access to resources provided by the NCMPA (e.g., feeding, courtship, spawning, nursery grounds); • Conserve the distribution of flapper skate within the site by avoiding significant disturbance; • Conserve the extent and distribution of any supporting features upon which flapper skate depend (e.g., glaciated channels/troughs, cobble/boulder egg-laying substrates); and • Conserve the structure and function of supporting features to ensure the feature remains healthy and not deteriorating.	Favourable

7.2.1 Relevance of Conservation Objectives to this Assessment

265. **Table 5.2** sets out the proposed impacts being assessed for the flapper skate feature of the NCMPA against the Conservation Objectives which they may have the potential to hinder.

Table 7.2 Potential impacts that have the potential to hinder the Conservation Objectives for the flapper skate feature of the Loch Sunart to the Sound of Jura NCMPA

Conservation Objective	Potential Impacts that may hinder the Conservation Objective and have been screened in
Maintain in favourable condition	Underwater noise (construction and, decommissioning)
Conserve the access to resources (e.g., feeding, courtship, spawning, nursery grounds) provided by the NCMPA for various life-cycle stages of flapper skate.	Underwater noise (construction and decommissioning)
Conserve the extent and distribution of any supporting features upon which the species is dependent is conserved or, where relevant, recovered.	Underwater noise resulting in temporary behavioural avoidance
Conserve the structure and function of any supporting feature, including any associated processes supporting the species within the MPA, is such as to ensure the protected feature is in a condition which is healthy and not deteriorating.	No potential impacts scoped in that may affect this Conservation Objective.

7.3 BASELINE CONDITION

7.3.1 Flapper Skate

266. The common skate was the original qualifying feature of the NCMPA. However, it was later determined that the common skate is actually two species (common skate complex), the flapper skate and the blue skate (Dipturus floassada) (Iglesias et al., 2009). Within the NCMPA, the protected feature is the flapper skate, which is listed as Critically Endangered in the North-East Atlantic on the IUCN Red List and recognised by OSPAR as a threatened and/or declining species. The feature is currently assessed as being in favourable condition at the site level. Flapper skate is widely distributed across the NCMPA (**Plate 7.1**, (SNH, 2014b)), occupying a range of habitats including deep glaciated channels and troughs (typically 100-150 m depth), which act as important supporting features. These geomorphological structures may provide seasonal thermal refuges and areas important for adult occupancy.

267. The species is known to exhibit high site fidelity, with tagging studies elsewhere showing that individuals may remain resident within key areas or return repeatedly to preferred habitats (Orrell et al., 2025). This behaviour heightens the importance of site-based protection, as significant injury or displacement within the NCMPA could have wider implications for population stability. Life-history traits also contribute to the species' vulnerability. Flapper skate have low fecundity, long incubation periods for egg cases (approximately 18 months), and a late age at sexual maturity (7-16 years for males and 9-26 years for females), meaning population recovery from historical overfishing is slow (Thorburn et al., 2023; Benjamins et al., 2021).

268. Overall, the Loch Sunart to the Sound of Jura NCMPA supports a resident, demographically important flapper skate population that relies on the site's combination of deep glaciated channels, sheltered conditions, and suitable benthic habitats. The conservation of this feature within the NCMPA remains critical given its global conservation status and limited distribution.

269. A study conducted by the Marine Directorate, Scottish Association for Marine Science and NatureScot showed that there was an increase, as follows, in flapper skates within two areas of the NCMPA after a restriction on fisheries (Thorburn, et al., 2018):

- The resident population size increased from 403 to 848 individuals in the Firth of Lorn between 2016 and 2019; and
- The resident population size increased from 355 to 524 in the Sound of Jura between 2018 and 2019.

270. Evidence also showed that individuals were very limited in their movement between the Firth of Lorn and the Sound of Jura and that there was little overspill between the NCMPA and wider area, both observations serving to highlight the importance of the NCMPA (Thorburn, et al., 2018).

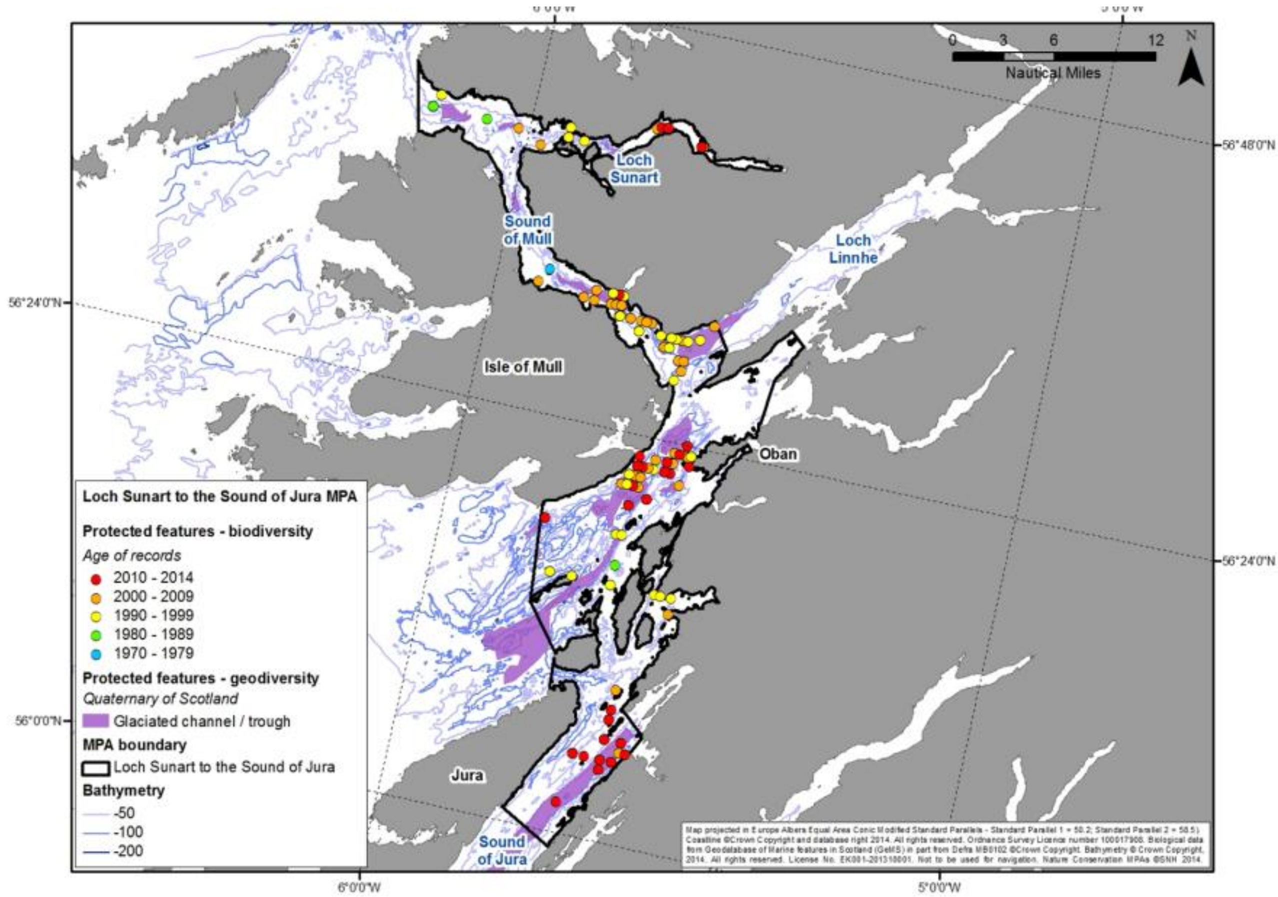


Plate 7.1 The known distribution of protected features within Loch Sunart to the Sound of Jura NCMPA (SNH, 2014a)

8 MAIN ASSESSMENT – LOCH SUNART TO THE SOUND OF JURA NCMPA

8.1 WINDFARM DEVELOPMENT AREA ALONE ASSESSMENT

8.1.1 Impact 1: Underwater Noise

8.1.1.1 Construction

271. Construction of the WDA will generate underwater noise from vessel activity, cable installation, limited seabed preparation and other short-term sources. Worst-case underwater noise modelling indicates that underwater noise from the WDA will have a slight overlap with the Loch Sunart to the Sound of Jura NCMPA (**Figure 8.1**).

272. Flapper skate, as large benthic elasmobranchs, are substantially less sensitive to sound pressure than teleost fish, falling into Popper et al.'s (2014) Group 1 hearing classification. They do not possess a swim bladder, relying instead on detection of particle motion. As a result, even under a worst-case scenario, the risk of physiological injury to flapper skate is considered low.

273. The ecological importance of the Loch Sunart to the Sound of Jura NCMPA for flapper skate relates primarily to life-history functions such as site affinity, movement behaviour, and potential nursery use (Neat et al., 2014; Lavender, 2022). These behaviours are not associated with any heightened seasonal sensitivity to noise. Construction noise from the WDA will be intermittent and occur at a considerable distance from the NCMPA, limiting the likelihood of exposure.

274. Embedded mitigation for underwater noise includes soft-start procedures and gradual ramp-up of any relevant activities (see **Appendix 9 Draft MMMP** of the EIAR). Although high-energy piling would not occur near the NCMPA, these measures further reduce the minimal residual noise-related risk. Together, these measures further limit the potential for disturbance.

275. Evidence from tagging studies demonstrates that flapper skate show strong site fidelity within the NCMPA but are also capable of relocating temporarily in response to disturbance (Neat et al., 2014; Thorburn et al., 2022). Avoidance responses to increased particle motion are well documented in elasmobranchs, and flapper skate possess the mobility to move away from any localised disturbance should they encounter it. Given the spatial separation between the WDA and the NCMPA (approximately 45 km east), any behavioural changes would be short-lived and reversible, with no sustained disruption to habitat use.

276. In relation to the NCMPA conservation objective to "maintain the feature in a favourable condition, underwater noise from the WDA will not prevent flapper skate from being maintained in its current condition. Responses to noise are expected to be minor and temporary, with normal behaviour resuming soon after noise levels diminish. The distance from the noise source and low sensitivity of flapper skate to pressure sound, further ensure that the feature remains protected. Supporting habitats within the NCMPA, including preferred benthic substrates, refuge areas, and potential nursery habitat, will not be affected by underwater noise. Sound does not alter seabed structure, oceanographic conditions, or ecological processes that maintain these habitats. None of the environmental conditions underpinning the suitability of the area for flapper skate will be changed. The natural distribution of flapper skate within the NCMPA will be conserved. Temporary local avoidance of elevated noise levels in distant offshore areas does not constitute displacement from the NCMPA and is not expected to occur given the predicted sound field. Physical, biological, and oceanographic supporting features, such as depth range, benthic habitat structure, and environmental stability, remain unaffected by underwater noise.

277. Overall, although short-term behavioural responses to underwater noise may occur in the wider region, these effects will be minor, temporary, and fully reversible. Construction of the WDA will not result in any long-term change to flapper skate behaviour, distribution, health, survival, or access to habitats within the Loch Sunart to the Sound of Jura NCMPA. Underwater noise will therefore **not hinder achievement of the conservation objective for the flapper skate feature of the Loch Sunart to the Sound of Jura NCMPA.**

8.1.1.2 Decommissioning

278. The detailed approach to decommissioning will be confirmed closer to the end of the Project's operational life, in line with evolving regulatory requirements and industry best practice. A separate consent process will be required at that time, and the final methodology will be developed to reflect the most current environmental standards. However, a Decommissioning Programme setting out the anticipated approach to decommissioning will be submitted to MD-LOT in the pre-construction period.

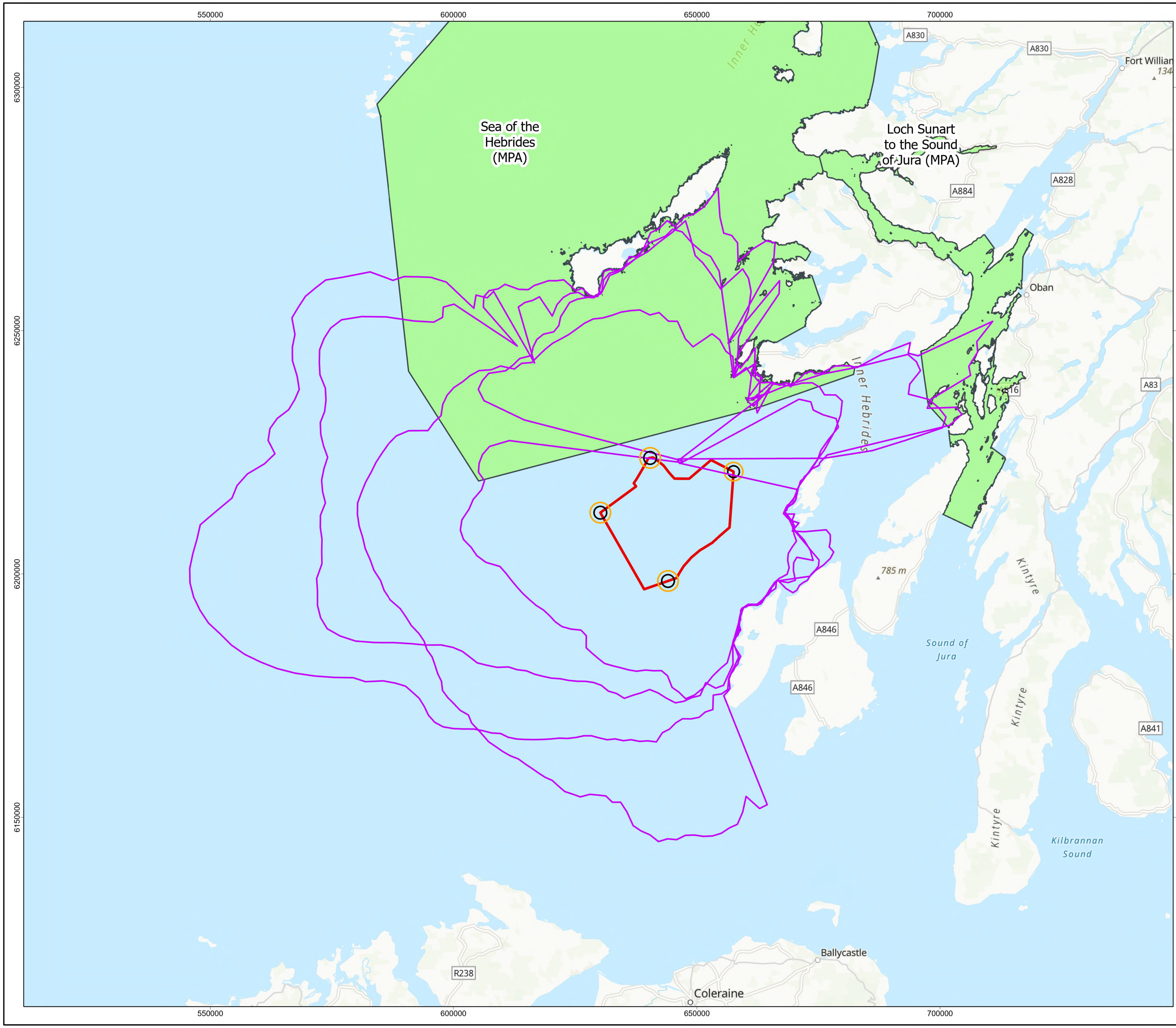
279. Decommissioning activities, primarily involving the recovery of cables and the removal of above-seabed infrastructure, are expected to generate underwater noise at levels comparable to, or lower than, those associated with construction. These activities will not involve high-energy impulsive sources such as piling.

280. Noise generated during decommissioning will be temporary and confined to small, discrete work areas at comparable or lower levels than in construction. Given the strong tidal and advective conditions within Scottish west-coast sea lochs and channels, underwater sound is expected to

attenuate rapidly with distance before reaching the Loch Sunart to the Sound of Jura NCMPA. Once each component removal task is completed, the acoustic environment will quickly return to baseline conditions, consistent with patterns documented for the species' core habitat (Thorburn et al., 2022). Decommissioning-related noise is therefore not expected to interfere with key behaviours, including refuge use, resting, or movements associated with this NCMPA.

281. All conservation objectives for the flapper skate feature will continue to be supported during decommissioning. Noise levels are not expected to pose any risk of injury, nor will they impede the ability of skate to move freely within or access the NCMPA. Observed site fidelity patterns for the species within the Loch Sunart to the Sound of Jura MPA (Neat et al., 2014; Thorburn et al., 2022) indicate that temporary avoidance of small offshore noise sources does not result in sustained displacement or long-term disruption of habitat use. The physical and ecological processes that support flapper skate, such as benthic habitat integrity, substrate stability, and the sheltered hydrographic conditions characteristic of the NCMPA, are unaffected by underwater noise. These sound sources do not alter sediment structure, depth regimes, or biological productivity, meaning the structure and function of supporting features will remain intact.

282. In summary, underwater noise during decommissioning will be short-term, spatially limited, and substantially lower in intensity than construction-phase activity. These conditions will not affect flapper skate behaviour, site fidelity, access to key nursery or refuge areas, or use of the NCMPA as a whole. Therefore, decommissioning noise **will not hinder the achievement of the conservation objective to conserve the flapper skate feature of the Loch Sunart to the Sound of Jura NCMPA.**



Windfarm Development Area
Marine Protected Area (MPA)

Multiple Pulse Unmitigated SELcum dB Contour

186 dB
216 dB
219 dB

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1	09/02/2026	AB	GC	MI	PM
REV	REV DATE	GIS CREATOR	GIS REVIEWER	TECHNICAL CHECKER	TECHNICAL APPROVER

DRAWING NUMBER	MCW-DWF-ENV-MAP-RHS-000184
DATUM	ETRS89
PROJECTION	UTM Zone 29N
SCALE	1:750,000
PAGE SIZE	A3
PROJECT TITLE	MachairWind

Figure 8.1: Fish and Shellfish Worst-Case Underwater Noise Modelling (unmitigated) in relation to the Loch Sunart to the Sound of Jura NCMPA

NOT TO BE USED FOR NAVIGATION

Haskoning Enhancing Society Together
ScottishPower Renewables

Project: C:\Users\304634\OneDrive - Royal HaskoningDHV\WIP\03 GIS\A02_Figures\03_EIA\01_WDA\Other_Reports\NCMPA\MCW_EIA_WDA_NCMPA.aprx
Name: MCW-DWF-ENV-MAP-RHS-000184_UWNModellingMPA

8.2 COMBINED ASSESSMENT: WINDFARM DEVELOPMENT AREA, OFFSHORE EXPORT CABLE CORRIDOR AND ONSHORE TRANSMISSION DEVELOPMENT AREA

283. The impacts for the WDA presented in **Section 8.1** could potentially have interactions and additive effects with activities occurring in the Offshore ECC, which is likely to be approximately 63 km from the NCMPA at its closest point. However, there will be no interactions and additive effects between the WDA and the OnTDA for flapper skate in the Loch Sunart to the Sound of Jura NCMPA, therefore this section will focus solely on the combined effects of the WDA and the Offshore ECC.

8.2.1 Impact 1: Underwater Noise

284. Based on the current technical assumptions, no piling will occur within the Offshore ECC, meaning it will not add to the higher intensity underwater noise associated with foundation installation in the WDA. UXO clearance within the Offshore ECC would temporarily increase the overall footprint of noise sources, but low order clearance techniques and the short, impulsive nature of these events mean that any additional contribution remains brief and localised and unlikely to interact with the NCMPA. Noise generated during cable installation, such as rock placement, trenching or jetting, is much lower than piling noise and dissipates rapidly under local hydrodynamic conditions, limiting any additive effect when considered alongside the WDA.

285. Although the Offshore ECC will contribute some short-term vessel noise during installation, these additions are comparatively small compared to noisy activities within the WDA. The distribution of works over different times and locations further limits the potential for overlap, ensuring that the combined underwater noise field remains dominated by the WDA’s construction activities.

286. In the context of the NCMPA conservation objectives for flapper skate, these contributions do not lead to any change in the overall assessment. The low sensitivity of flapper skate to underwater noise, combined with their ability to avoid localised disturbances, means that temporary additions from the Offshore ECC are not expected to interfere with natural behaviour, distribution or access to seasonal feeding areas. The short duration of noise sources ensures no risk of injury, and the broader hydrodynamic processes that maintain plankton availability remain unaffected.

287. Overall, while the Offshore ECC introduces additional, short lived underwater noise sources, these are minor in comparison with the primary activities of the WDA and are unlikely to interact with the NCMPA. Consequently, these effects **will not hinder the maintenance of any of the conservation objectives for the basking shark feature within the Loch Sunart to the sound of Jura NCMPA** and does not alter the conclusions for the WDA-alone

8.3 CUMULATIVE EFFECTS

8.3.1 Screening of Potential Cumulative Impacts

288. The first step in the CEA is the screening / identification of which whole-Project impacts could have a cumulative effect with other plans, projects and activities (described as ‘impact screening’). This information is set out in **Table 8.1**, together with a consideration of the confidence in the data that is available to inform a detailed assessment and the associated rationale.

Table 8.1 Potential cumulative impacts (impact screening)

Impact	Potential for Cumulative Impact	Data Confidence	Rationale
Construction and Decommissioning			
Impact 1: Underwater Noise	Yes	High Quantitative assessments are based on actual project data wherever available. Data for offshore windfarms are provided by relevant project specific EIAs and therefore the included data of which forms the assessment has a high level of confidence attributed to it.	Disturbance from UWN refers to a short-term behavioural change caused by noise exposure and typically resolves within hours to days after the source ceases. These effects generally extend over wider ranges and areas than those predicted for recoverable injury. The Zone of Influence (ZoI) may overlap with other projects if sequential pile driving occurs. Disturbance from UWN during construction has been included in the CEA to account for possible cumulative impacts.

8.3.2 Screening of Other Plans, Projects and Activities

289. A CEA has been undertaken for the impact pathways screened in and assessed within this NCMPA Assessment. For the purposes of this assessment, it is assumed that the projects included in the CEA presented in Chapter 9 Fish (including basking shark) and Shellfish of the WDA EIAR may have activities that overlap with the Loch Sunart to the sound of Jura NCMPA.

290. This precautionary approach ensures that all projects with a potential impact pathway are considered within the CEA, while maintaining consistency with the NCMPA Assessment, which focuses specifically on pathways that could affect the ability of the Sea of the Hebrides NCMPA to achieve its conservation objectives.

8.3.3 Cumulative Effects Assessment

8.3.3.1 Cumulative Impact 1: Underwater Noise

291. The Loch Sunart to the sound of Jura NCMPA is situated in an area of the west coast of Scotland that already experiences routine levels of underwater noise associated with commercial fishing, aquaculture operations, ferry routes, and recreational boating. Under baseline conditions, flapper skate within the NCMPA are therefore already exposed to regular low- to mid-frequency vessel noise.

292. The projects most relevant to cumulative underwater noise are other west coast marine renewable developments, including ScotWind and INTOG projects, which may require vessel activity during construction and O&M. Review of available licensing information indicates that these projects

screened in for the assessment do not involve high energy impulsive noise sources such as piling. As a result, the potential for cumulative exposure to concurrent impulsive noise is considered low.

293. During construction, UWN from the Project is expected to be short lived and intermittent. Other projects that could overlap either produce only low level vessel noise or are located at distances where meaningful overlap within the NCMPA is unlikely. Although future projects may increase activity across the wider region, construction is expected to take place at different times rather than simultaneously. Section 9.12.2 of **Chapter 9 Fish (including Basking Shark) and Shellfish** provides a list of other plans, projects and activities that may result in cumulative impacts and have been included within the CEA.

294. During decommissioning, activities will create less noise than construction because no piling is required. Other projects in the region are also likely to remove infrastructure at different times, meaning there is little chance of noise from multiple decommissioning activities overlapping. Overall, underwater noise during this phase is expected to be very limited.

295. In combination with other activities, underwater noise from the Project will not result in a meaningful change to the acoustic environment of the Loch Sunart to the Sound of Jura NCMPA. As a result, none of the conservation objectives for basking shark, relating to maintaining their natural range, abundance, behaviour, or supporting environmental conditions, would be hindered. In summary, cumulative underwater noise **will not hinder the maintenance of any of the conservation objectives for the minke whale feature within the Loch Sunart to the sound of Jura NCMPA**.

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