Hornsea Three Decommissioning Programme

Ørsted

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Acronyms

Acronym	Definition
AEZ	Archaeological Exclusion Zone
ANS	Artificial Nesting Structures
BATNEEC	Best Available Technique Not Entailing Excessive Cost
BEIS	Department for Business, Energy & Industrial Strategy
BGS	British Geological Survey
BMAPA	British Marine Aggregate Producers Association
BPEO	Best Practicable Environmental Option
CDM	Construction (Design and Management) Regulations
DCO	Development Consent Order
DDV	Drop-down Video
DECC	Department of Energy and Climate Change
DESNZ	Department for Energy Security and Net Zero
dML	deemed Marine License
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ES	Environmental Statement
FFC	Flamborough and Filey Coast
FLO	Fisheries Liaison Officer
HAT	Highest Astronomical Tides
HMR	Helicopter Main Route
HVDC	High Voltage Directional Current
ICES	International Council for the Exploitation of the Seas
IMO	International Maritime Organisation
LAT	Lowest Astronomical Tide
MCZ	Marine Conservation Zone
MHWS	Mean High Water Springs
MMO	Marine Management Organisation
MWS	Marine Warranty Surveyor
OCS	Offshore Convertor Station
OFTO	Owners of These Installations
OSPAR	Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic
OSS	Offshore Substation
OWFs	Offshore Wind Farms
ROV	Remotely Operated Vehicle
SAC	Special Area of Conservation
SPA	Special Protected Area
SSC	Suspended Sediment Concentrations
UK	United Kingdom
UKHO	UK Hydrographic Office
UNCLOS	United Nations Convention on the Law of the Sea
UXO	Unexploded Ordinance
WTG	Wind Turbine Generator

Executive Summary

Hornsea Three Offshore Wind (hereafter "Hornsea Three") is the third project to be developed in the Hornsea Zone. The Hornsea Three Offshore Wind Farm Order 2020 was awarded to Orsted Hornsea Project Three (UK) Limited (hereafter referred to as "Ørsted") on 31st December 2020 and corrected pursuant to the Hornsea Three Offshore Wind Farm (Correction) Order 2021. The Hornsea Three Offshore Wind Farm Order 2020 was further amended pursuant to the Hornsea Three Offshore Wind Farm (Amendment) Order 2023 and the Hornsea Three Offshore Wind Farm (Amendment) Order 2024 (together, "the DCO").

Located approximately 120 km off the Norfolk Coast in the Southern North Sea, the DCO authorises the construction, operation, and maintenance of Hornsea Three and grants consent for up to 231 wind turbine generators (WTGs) fixed to the seabed with monopile or jacket-type foundations. WTGs will be connected by a network of 33kv array cables which will connect into two offshore converter stations (OCS) fixed by jacket foundations within the array area; the OCS will be connected via an interlink cable, before transmitting power through two HVDC export cable circuits (i.e., four cables) to landfall at Weybourne Beach on the North Norfolk coast. From Weybourne offshore export cables will be jointed to the onshore HVDC cables which will connect to an Onshore Converter Station near Swardeston before its terminal connection at the Norwich Main Substation. Marine licensable activities required to construct the offshore infrastructure, including authorisation to deposit substances on the seabed, are granted under two deemed Marine Licenses (dML) within the DCO covering the generation and transmission assets, respectively.

Hornsea Three Offshore Wind Farm is currently in a pre-construction stage. It is owned by Orsted Hornsea Project Three (UK) Limited, who are responding to their decommissioning obligation.

Hornsea Three has engaged with the Department for Energy Security and Net Zero (DESNZ) ahead of offshore construction starting in 2025 who have provided notice in pursuant to Section 105(2) of the Energy Act (2004). The Section 105(2) notice was received on 9 May 2024.

This report, the Hornsea Three Decommissioning Programme represents the decommissioning program in compliance with Section 105(2) of the Energy Act (2004) and includes both generation and transmission assets associated with Hornsea Three.

This Decommissioning Programme has been informed by the following key documents:

- Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004[1]: Guidance notes for Industry, Department for Business, Energy & Industrial Strategy (BEIS[2]), Updated March 2019;
- Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, International Maritime Organisation (IMO), 19th October 1989;
- Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, DESNZ, November 2018;
- Oslo-Paris Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) guidance documents on offshore wind farms (OWFs);
- Guidelines for Environmental Risk Assessment and Management Green Leaves III, Defra, 2011; and United Nations Convention on the Law of the Sea (UNCLOS), 1982.
- It has also considered relevant environmental and health and safety legislation, noting that this will be reviewed and updated in preparation of the final decommissioning programme.

[1] All references to the Energy Act related to the Energy Act of 2004, as legislated.
[2] References are provided to DESNZ through this document given its current role of holding competence on OWF regulation. This will however also include references that were published or developed under previous competencies, particularly under BEIS (Department of Business, Energy and Industrial Strategy). DESNZ was formed from part of BEIS in 2023.

This Decommissioning Programme provides preliminary information on the proposed methods and approaches to decommissioning the offshore installations (as required by the Energy Act 2004, as amended). The scope of the decommissioning applies between the mean low water mark and the seaward limits of the territorial sea and waters in a Renewable Energy Zone (Energy Act, 2004). Methods of decommissioning will be reviewed and updated as appropriate closer to the time of the decommissioning phase.

Cable infrastructure on the landward side of Mean Low Water Springs is therefore considered onshore and out of the scope of this document. In light of changing circumstances, these proposals are subject to updates during operational phases of the wind farm, and to reflect new discoveries particularly in the areas of marine environment, technological change and relevant amendments to legislation.

Ørsted proposes that post-decommissioning, two separate geophysical surveys (swath bathymetry, side scan sonar and magnetometer) are conducted. All results and interpretations will be issued to the DESNZ for review and comment. It is proposed that the geophysical surveys will be carried out one and five years after decommissioning has been completed.

A cost estimate for the programme of work has been derived, based on the equipment and personnel requirements and the duration of works. Financial security provisions have been carefully considered to ensure that this liability will be met. Costs and financial security information are confidential and therefore not included in the Decommissioning Plan. Cost and financial security information details will be submitted within the financial annex submitted to DESNZ separately to the decommissioning programme for confidentiality.

Once Hornsea Three is nearing the end of its operational life (currently anticipated to be approximately 35 years) and subject to potential lifetime extension, such as repowering, Ørsted will initiate a final review of the Decommissioning Plan and the proposed programme of works. Once this review is complete, a 'Decommissioning Programme of Works' will be developed, and the schedule of works will be determined in agreement with the statutory authorities to ensure there is a clear road map with necessary practices.

1 Introduction

1.1 Purpose of this Document

1.1.1.1 This document represents the initial decommissioning plan for the programme of works for Hornsea Three and is being submitted in accordance with the Energy Act 2004 and adhering to the updated requirements issued in March 2019 (DESNZ, 2019).

1.1.1.2 This Decommissioning Plan is informed and supported by the Environmental Impact Assessment (EIA) for Hornsea Three that was submitted to BEIS (as it then was) in May 2018. The Decommissioning Programme is based on the technology available at the time of writing and will be reviewed and updated based on further evidence and technology available nearer to the time of decommissioning.

2 Background Information

2.1 Location

2.1.1.1 Hornsea Three array area (i.e., the area in which the offshore Wind Turbine Generators (WTG) are to be located) is approximately 696 km^2 and is located approximately 121 km northeast off the Norfolk coast and 160 km east of the Yorkshire coast, Figure 1. Hornsea Three has consent for up to 231 WTGs. The electricity generated from Hornsea Three will be transmitted via buried High Voltage Directional Current (HVDC) cables. The export cable corridor will be 163 km in length and will reach landfall west of Weybourne, and the onshore cable route will run from the landfall site to the main National Grid substation at Norwich in Norfolk.

2.2 Project Design

2.2.1 Background

2.2.1.1 An Environmental Statement (ES) for Hornsea Three was submitted in 2018. The ES assessed the likely significant effects of Hornsea Three on the environment and proposed mitigation measures where relevant.

2.2.1.2 Consent to develop Hornsea Three was granted on 31 December 2020 under the Planning Act 2008. Offshore construction is expected to commence in 2025, with the wind farm being fully operational in 2028.

2.2.1.3 The relevant consents for the construction, operation and decommissioning of Hornsea Three are set out in **Table 1: Hornsea Three Offshore Wind Farm consents relevant to construction, operation, and decommissioning.** below:

Table 1: Hornsea Three Offshore Wind Farm consents relevant to construction, operation, and decommissioning.

Regulation	Legislative Context	Granted Consents
Planning Act 2008	Requirement for DCO consent for construction and operation of an offshore generating station with a generating capacity of above 100 MW	DCO granted 31st December 2020 dML: DCO/2016/00001 Transmission Assets dML (DCO Schedule 12) DCO/2021/00001 Generation Assets dML (DCO Schedule 11)
Marine & Coastal Access Act 2009	For licensable marine activities, including depositing objects or substances, or carrying out works, in the sea or on or under the seabed.	Hornsea Three: Marine Licence[3]: - Hornsea Three Transmission Assets UXO inspection (Application reference MLA/2023/00539, Licence reference:

[3] Marine Licence may have expired by the time of decommissioning.

Regulation	Legislative Context	Granted Consents
		L/2024/00150/1, start date: 12/04/2024) - Hornsea Three Transmission Assets UXO clearance (Application reference MLA/2024/00088, Licence reference: tbc, start date: tbc) - Hornsea Three Landfall - Temporary Rock Bag Placement (Application reference MLA/2023/00547, Licence reference: tbc, start date: tbc)
Energy Act 2004, Section 105(2)	Requirement to prepare a Decommissioning Programme for offshore installations.	Notice served on 9th May 2024
Safety Zone Declaration	Guidance for: The Electricity (Offshore Generating Stations) (Safety Zones) (Applications Procedures and Control of Access) Regulations 2007 (SI No 2007/1948).	To be applied for prior to construction and any major maintenance decommissioning works

2.2.1.4 The initial decommissioning plan outlines methods for decommissioning using the format outlined by the DESNZ Guidance Notes, paying particular attention to:

- Comparing the methods of partial and complete removal of foundations;
- Considering integration and cooperation with other companies during decommissioning;
- The expected timeframes and costs of removal;
- Environmental impacts;
- Monitoring; and
- Regular reviews to reflect changing circumstances and knowledge over the project lifetime.

2.2.1.5 A summary of the proposals for decommissioning the offshore components of Hornsea Three are outlined in **Table 2** below:

Table 2: Hornsea Three Offshore Wind Farm decommissioning proposal[4].

Component	Proposed Decommissioning Measure
Wind Turbine/electricity generating equipment	Complete removal from the Hornsea Three array.
Artificial nesting structures (ANS)	Decommissioning requirement of the artificial nesting structures is subject to separate consultation with DESNZ.
Foundations (WTG)	Cut off 1 m below the natural seabed and removed.
Scour protection for foundations	Left *in situ*.
Cable crossings	Left *in situ*.
Cables (array)	Left *in situ*.
Cables (transmission)	Left *in situ* where technically feasible. If cable protection is situated within any European Site or MCZ then Ørsted will carry out

[4] Decommissioning date of the artificial nesting structures is subject to further consultation with DESNZ towards the end of Hornsea Three's operational life, as per DCO Schedule 14, Part 1(7);

Component	Proposed Decommissioning Measure
	appropriate surveys to assess the integrity and condition of that cable protection and determine the appropriate extent of the feasibility of the removal of such cable protection. Ørsted will engage with the MMO prior to the deployment of any cable protection in relation to feasibility studies and monitoring, and subject to the outcome of the feasibility study(ies), endeavour to recover the cable protection in accordance with the requirements of the Order (including the Deemed Marine Licences).
Foundations (offshore convertor station (OCS))	Cut off 1 m below the natural seabed and removed.

2.2.1.6 Once Hornsea Three is nearing the end of its operational life (currently anticipated to be approximately 35 years) and subject to potential lifetime extension, such as repowering, Ørsted will initiate a final review of the Decommissioning Plan and the programme of works.

2.2.1.7 The OFTO Lease and Wind Farm Agreement for Lease and draft Lease with the Crown Estate requires the Tenant to restore the seabed in compliance with a Decommissioning Programme submitted pursuant to the Energy Act 2004 and as approved by the Secretary of State.

2.2.1.8 The schedule of works will be determined once the final review of this document is completed and the 'Decommissioning Programme of Works' has been agreed.

2.2.1.9 A cost estimate for the programme has been derived based on the equipment and personnel requirements and the duration of the works. Financial security provisions have been carefully considered to ensure that this liability will be met.

2.2.1.10 The Decommissioning Plan will be subject to review at a frequency agreed with DESNZ to reflect changing circumstances and regulatory requirements. The process will be able to incorporate: i) improvements in knowledge and understanding of the marine environment, ii) advancements in technology and iii) working practices from similar projects, which will help to add value to this project.

2.2.1.11 Orsted Hornsea Project Three (UK) Ltd is required to apply to the Marine Management Organisation (MMO) for a Marine Licence for decommissioning activities closer to the time that decommissioning is scheduled to take place. This Marine Licence will cover the activities which are not consented under the wind farm's current licences. The exact methods of decommissioning shall be reviewed and updated over the course of the asset lifetime and prior to decommissioning accordingly.

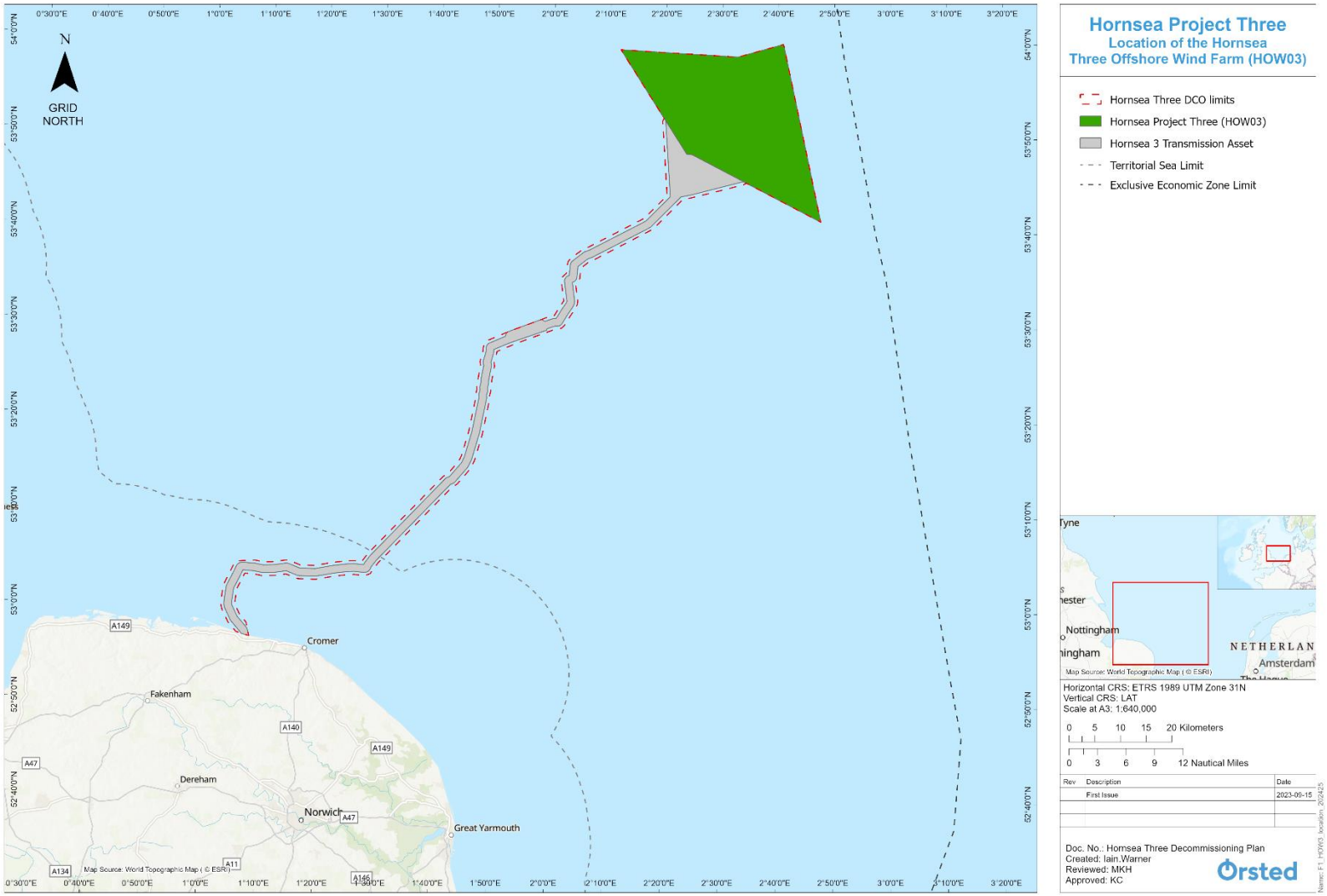

Figure 1: Location of the Hornsea Three Offshore Wind Farm

2.2.2 Project Parameters

2.2.2.1 It should be noted that Hornsea Three has not been constructed at the time of writing. Therefore, this Decommissioning Plan makes reference to maximum Project parameters within the DCO that may be subject to change prior to the Construction phase of Hornsea Three. This Decommissioning Plan will be updated post construction to reflect the as-built project parameters accordingly.

2.2.2.2 The WTGs specifications associated with Hornsea Three are outlined in **Table 3** below:

Table 3: Hornsea Three Offshore Wind Farm turbines.

Turbine Parameter	Hornsea Three
Number of turbines	Up to 231
Capacity (MW)	>100 MW
Turbine type	To be finalised ahead of construction

2.2.2.3 The WTGs will have a maximum rotor diameter of 265 m, be less than 41.8 m from Lowest Astronomical Tide (LAT) to the lowest tip of the rotating blade, and have a maximum blade tip height of 325 m above LAT.

2.2.2.4 The WTG foundation design has yet to be finalised, but will consist of monopiles, with a collective seabed footprint of no more than 435,660 m². With additional scour protection requirements the total seabed footprint of WTG foundations will be no more than 1,623,182 m².

2.2.2.5 The offshore electrical infrastructure platforms associated with Hornsea Three include up to four offshore type two OCSs. Offshore type two OCS will consist of jacket foundation types. The total seabed footprint of electrical infrastructure foundations will be no more than 138,900 m², and 267,900 m² including any additional scour protection required.

2.2.2.6 In total, the volume of scour protection for WTG, offshore accommodation platforms, or offshore electrical infrastructure platforms will not exceed 2,709,673 m³.

2.2.2.7 The total number of cable circuits will not exceed six. Array cables will not exceed 830 km and transmission cables will not exceed 1,371 km.

2.2.2.8 The total number of cable crossings are not expected to exceed 44. Any additional crossings required will be discussed and agreed with the MMO. Hornsea Three are delivering an HVDC systems, and as such Work No. 2 applies.

2.2.2.9 The total maximum volume of cable protection (excluding cable crossings) will not exceed 2,201,000 m³ and total maximum footprint will not exceed 1,540,700m². The total volume associated with cable crossings will not exceed 784,875 m³, and the total footprint will not exceed 747,500 m².

2.2.2.10 The WTG and array layout of Hornsea Three is yet to be finalised, but no development will take place in the Markham's Triangle MCZ, as defined in the DCO.

2.3 Offshore Physical Characteristics

2.3.1 Geology

2.3.1.1 In this section, a brief summary of respective physical characteristics of Hornsea Three is presented. More detailed information about each of the sub-topics is available in the ES (Ørsted, 2018a).

2.3.1.2 The description of the physical environment of the entire offshore project site has been supported by a comprehensive set of contemporary data sets and information collated for the EIA process of Hornsea Three. A full summary of this information is described in the resulting ES.

2.3.1.3 The Hornsea Three array area is characterised by the presence of coarse-grained sediments with both sand and sandy gravel particularly prevalent (Ørsted, 2018a).

2.3.2 Geotechnical

2.3.2.1 **Table 4** describes the geotechnical layers observed at Hornsea Three, as described within the original ES (Ørsted, 2018a).

Table 4: Geotechnical units identified in the Hornsea Three Development Area (Ørsted, 2018a).

BGS Formation	Unit	Description	Thickness (m)
Bolders Bank	III	Stiff diamictons with wide ranging grain sizes	<1 m throughout the majority of the array area
Botney Cut	v	Primarily sands	<1 to 10 m, with a central channel >30 m

2.3.3 Bathymetry

2.3.3.1 Within the Hornsea Three array area, water depths vary from approximately -26.6 mLAT to -72.7 mLAT. The shallowest depths are found in the central eastern parts of the site. Deeper areas are also present within the Hornsea Three array area with depths of up to approximately -60 mLAT along the northern boundary (associated with Outer Silver Pit) and depths of up to approximately -73 mLAT in central areas (associated with Markham's Hole). Sand waves are present in the western extent of the array area, with heights of >0.3 m and oriented along the northwest-southeast tidal axis (Ørsted, 2018a).

2.3.3.2 The Hornsea Three offshore cable corridor consists of primarily coarse-grained sand and gravel, with sands primarily associated with sandbank crests and flanks (Ørsted, 2018a). Fine grained muds are of limited prevalence (Ørsted, 2018a). The offshore cable corridor is relatively shallow at <30 m below LAT, with shallowest depths at sandbank crests (~5 m below LAT), as well as at landfall (Ørsted, 2018a). Sand waves and megaripples are typical of the North Norfolk Sandbank system, with sand wave heights up to 6 m (Ørsted, 2018a).

2.3.4 Metocean

2.3.4.1 Winds most frequently come from the southwest quadrant but also come from all other directions with some regularity (Ørsted, 2018a). Peaks in wave energy are observed from northerly and southerly directions, corresponding to relatively longer fetch lengths (Ørsted, 2018a). The directional distribution and peaks in wave energy are also affected by the relative distribution of shallow water and the position of adjacent coastlines, which may provide sheltering from certain directions (Ørsted, 2018a).

2.3.5 Geophysical Surveys

2.3.5.1 The Hornsea Three array area is situated in an area with a mean spring tidal range of between 2 and 2.5 m (Ørsted, 2018a). The tidal range increases with proximity to the Norfolk and Lincolnshire coast, such that at the Hornsea Three landfall area, the mean spring tidal range is approximately 5.0 m. Tidal currents across the Hornsea Three array area and offshore sections of the Hornsea Three offshore cable corridor generally increase in strength towards the coast. The dominant wave direction within the Hornsea Three array area is from the northwest to north, although there is also a large contribution of waves from southerly sectors (Ørsted, 2018a).

2.3.5.2 The majority of the Hornsea Three array area and offshore cable corridor is characterised by the presence of coarse-grained sediments of variable thickness. In many areas, coarse grained sediments are either present as a thin layer or absent, although where sandwaves are present, may be up to 6 m thick. Finer grained muddy material is present in places although the fines component of the collected

sediment samples very rarely exceeds 50% (Ørsted, 2018a). Active tidal bedforms are present in many areas and include sandwaves, mega ripples and sand ribbons (Ørsted, 2018a).

2.3.5.3 A programme of geophysical monitoring has been developed in the Seabed Monitoring Plan submitted to the MMO for approval (as per Conditions 13 (1)(f), 17-20 (Schedule 11) and 14(1)(f), 18-21 (Schedule 12) of dMLs for Transmission and Generation).

2.3.5.4 A programme of seabed sediment and ecology has been developed in the Benthic Monitoring Plan as approved by MMO (as per Conditions 13 (1)(f), 17-20 (Schedule 11) and 14(1)(f), 18-21 (Schedule 12) of dMLs for Transmission and Generation).

2.3.6 Survey Conclusions

2.3.6.1 Survey conclusions are presented in Chapter 1: Marine Processes of the Hornsea Three ES (Ørsted, 2018a) and Chapter 2: Benthic Ecology (Ørsted, 2018b), and have been used to inform the baseline physical environment within this decommissioning plan. To summarise, the Hornsea Three Array is characterised by peak mean spring tidal current speeds of ~0.5 m/s, increasing along the Hornsea Three ECC. Water depths vary from 26.6-72.7 m below LAT within the array, whilst the ECC has depths of <30 m below LAT. Seabed sediments are primarily coarse-grained throughout the array and ECC, with finer muds present in some locations. Suspended sediment concentrations are relatively low in the array (5 mg/l) compared to the ECC (up to 50 mg/l in summer conditions). Maximum values inshore may be in the region of 100s or 1,000s of mg/l during storm events. High rates of sediment transport are present within the ECC.

2.3.6.2 This section, and the preceding baseline physical environment sections, will be updated post-construction to include the findings of additional post-construction surveys.

2.4 Offshore Biological Environment

2.4.1 Background

2.4.1.1 In this section, a brief summary of the respective biological environment within the Hornsea Three site in its entirety, including the cable route is presented. More detailed information about each of the sub-topics is available in the ES (Ørsted, 2018b-i).

2.4.1.2 The description of the local marine biological environment has been supported by a comprehensive set of contemporary data sets and information collated for the EIA process of Hornsea Three. A full summary of this information is described in the resulting ES (Ørsted, 2018b-i). It should be noted that this ES covers both the array area and offshore cable corridor and represents the best available data to date.

2.4.2 Benthic Ecology

2.4.2.0 The Hornsea Three array area is characterised by sand and muddy sand (SS.SSA: Sublittoral Sands and Muddy Sands), coarse sediments (SS.SCS: Sublittoral Coarse Sediment), and mixed sediments (SS.SMX: Sublittoral Mixed Sediment) (Ørsted, 2018b). Coarse sediments clustered in the northeastern corner of the array area (Ørsted, 2018b). The offshore cable corridor primarily consists of coarse sediment, with patches of sand, muddy sand, and mixed sediments (Ørsted, 2018b).

2.4.2.1 Analysis of benthic surveys in the ES concluded that the Hornsea Three array area and offshore cable corridor contains a diversity of taxonomic groups in several biotopes (Ørsted, 2018b), including:

- SS.SBR.PoR.SspiMx (offshore cable corridor);
- SS.SCS.ICS.SSh (array area);
- SS.SCS.CCS.MedLumVen (offshore cable corridor);
- SS.SCS.ICS.MoeVen (offshore cable corridor);
- SS.SMx.CMx.FluHyd (array area and offshore cable corridor);
- SS.SMX.OMx.PoVen (array area);
- SS.SMu (array area);

- SS.SMu.CSaMu.AfilMysAnit (array area and offshore cable corridor);
- SS.SMx.CMx.MysThyMx (array area and offshore cable corridor);
- SS.SSa.IFiSa.IMoSa (array area);
- SS.SSa.IFiSa.NcirBat (array area and offshore cable corridor);
- SS.SSa.CFiSa.ApriBatPo (offshore cable corridor);
- SS.SSa.CFiSa.EpusOborApri (array area and offshore cable corridor); and
- SS.SSa.IMuSa.FfabMag (array area).

2.4.2.2 This section will be updated post-construction with any additional information/data collected during the lifetime of Hornsea Three.

2.4.2.3 A post-consent Benthic Ecology Monitoring Plan was discharged by the MMO on 8th May 2024. The Benthic Ecology Monitoring Plan presents the proposed approach and methodologies in relation to subtidal benthic ecology monitoring surveys pursuant to the Hornsea Three project area pursuant to the deemed Marine Licences (dMLs), including pre-construction monitoring and post-construction monitoring. Pre-construction monitoring includes Phase 1 Geophysical surveys and Phase 2 Ground Truthing Surveys via drop down video or grab samples. Post construction monitoring will emulate the same surveys to allow a direct comparison of change.

2.4.3 Fisheries and Shellfish

2.4.3.1 The Hornsea Three array area and offshore cable corridor is characterised by a range of fish and shellfish species. Surveys identified the presence of key demersal species, including whiting (*Merlangius merlangus)*, Atlantic cod (*Gadus morhua)*, dab (*Limanda limanda)*, European plaice (*Pleuronectes platessa)*, solenette (*Buglossidium luteum)* and grey gurnard (*Eutrigla gurnardus)* (Ørsted, 2018c). Sandeel are considered present, with much of the Hornsea Three array area representing 'preferred' supporting habitat (e.g. sand dominated sediments with low mud content), whilst the offshore cable corridor represents 'marginal' supporting habitat (sandy gravel with low mud content) (Ørsted, 2018c).

2.4.3.2 Pelagic species present within the Hornsea Three array area and offshore cable corridor include sprat (*Sprattus sprattus)*, Atlantic herring (*Clupea harengus)*, and Atlantic mackerel (*Scomber scombrus)* (Ørsted, 2018c). Atlantic herring are not considered likely to spawn within the Hornsea Three array area or offshore cable corridor (Ørsted, 2018c). Elasmobranchs, such as thornback ray (*Raja clavate)* and spotted ray (*Raja montagui)*, are considered present within the Hornsea Three array area and offshore cable corridor, but in low abundances (Ørsted, 2018c).

2.4.3.3 Shellfish within the Hornsea Three array area and offshore cable corridor are dominated by four commercially important species, including brown crab (*Cancer pagurus)*, European lobster (*Homarus Gammarus)*, Norway lobster (*Nephrops norvegicus)*, and common whelk (*Buccinum undatum)* (Ørsted, 2018c). Brown crab are the most abundant, with commercial fisheries targeting nearshore populations (Ørsted, 2018c).

2.4.3.4 The Hornsea Three array area and offshore cable corridor overlap with spawning grounds for whiting, Atlantic cod, European plaice, lemon sole (*Microstomus kitt)*, Dover sole (*Solea solea)*, sprat, Atlantic mackerel, and Norway lobster (Ørsted, 2018c).

2.4.3.5 Some fish species are thought to make distinct seasonal migrations through the Greater Wash, and therefore may interact with the Hornsea Three offshore cable corridor. These species include sea lamprey *Petromyzon marinus*, river lamprey (*Lampetra fluviatilis)*, twaite shad (*Alosa fallax)*, allis shad (*Alosa alosa)*, Atlantic salmon (*Salmo salar)*, sea trout (*Salmo trutta)*, and European eel (*Anguilla Anguilla)* (Ørsted, 2018c).

2.4.4 Marine Mammals

2.4.4.1 Several marine mammal species are considered present in the vicinity of, and including within the Hornsea Three array, including harbour porpoise (*Phocoena phocoena)*, white-beaked dolphin

(*Lagenorhynchus albirostris)*, Minke whale (*Balaenoptera acutorostrata)*, Harbour seal (*Phoca vitulina)*, and Grey seal (*Halichoerus grypus)* (Ørsted, 2018d).

2.4.4.2 The Norfolk coastline contains a number of important haul-out sites for grey seal, including Donna Nook, The Wash, Blakeney Point, East Horsey, and Scroby Sands. The Hornsea Three offshore cable corridor and associated landfall are expected to be constructed in the vicinity of the Blakeney Point haul-out site (Ørsted, 2018d).

2.4.5 Ornithology

2.4.5.1 The Hornsea Three array area and offshore cable corridor is an important site for a diversity of seabird species (Ørsted, 2018e), including:

- Arctic skua *Stercorarius parasiticus*;
- Arctic tern *Sterna paradisaea*;
- Atlantic puffin *Fratercula arctica*;
- Common guillemot *Uria aalge*;
- Common gull *Larus canus*;
- Common scoter *Melanitta nigra*;
- Common tern *Sterna hirundo*;
- Great black-backed gull *Larus marinus*;
- Great skua *Stercorarius skua*;
- Kittiwake *Rissa tridactyla*;
- Lesser black-backed gull *Larus fuscus*;
- Little gull *Hydrocoloeus minutus*;
- Northern fulmar *Fulmarus glacialis*;
- Northern gannet *Morus bassanus*;
- Razorbill *Alca torda*;
- Red-throated diver *Gavia stellata*; and
- Sandwich tern *Thalasseus sandvicensis*.

2.4.5.2 This section will be updated post-construction with any additional information/data collected during the lifetime of Hornsea Three.

2.4.6 Designated Areas

2.4.6.1 This section contains the relevant designated areas refer to internationally, nationally, regionally and locally designated sites with marine habitats and/or species.

2.4.6.2 The sites that are in closest proximity to Hornsea Three are listed in **Table 5** and all surrounding designated conservation areas are shown in **Figure 2**.

2.4.6.3 To ensure the most up to date evidence is used, the status of nature conservation sites will be reviewed closer to the time of decommissioning to ensure that any newly designated sites are considered within future Decommissioning Plans.

Table 5: Designated sites within 20 km of Hornsea Three

Site name	Designations and Site Codes	Distance to Hornsea Three Array Area (km)	Distance to Hornsea Three Offshore Cable Corridor (km)	Designated features
Cromer Shoal Chalk Beds	MCZ (UKMCZ0031)	111	0 (overlap)	• High energy circalittoral rock; • High energy infralittoral rock; • Moderate energy circalittoral rock; • Moderate energy infralittoral rock; • Peat and clay exposures; • Subtidal chalk; • Subtidal coarse sediment; • Subtidal mixed sediments; • Subtidal sand; and • North Norfolk Coast assemblage of subtidal sediment features and habitats.
Markham's Triangle[5]	MCZ (UKMCZ0084)	0 (adjacent)	13.2	• Subtidal coarse sediment; • Subtidal sand; • Subtidal mud; and • Subtidal mixed sediments.
Inner Dowsing, Race Bank and North Ridge	SAC (UK0030370)	105.8	7.7	• Reefs; and • Sandbanks which are slightly covered by sea water all the time.
The Wash and North Norfolk Coast	SAC (UK0017075)	119.6	0 (overlap)	• Sandbanks which are slightly covered by sea water all the time; • Mudflats and sandflats not covered by seawater at low tide; • Large shallow inlets and bays; • Reefs; • *Salicornia* and other annuals colonising mud and sand; • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*); • Mediterranean and thermos-Atlantic halophilous scrubs (*Sarcocornetea fruiticosi*); • Coastal lagoons; • Harbour seal (*Phoca vitulina*); and • Otter (*Lutra lutra*).
North Norfolk Coast	SAC (UK0019838)	127.1	0 (overlap)	• Coastal lagoons; • Perennial vegetation of stony banks; • Mediterranean and thermo-Atlantic halophilous scrubs; • Embryonic shifting dunes; • "Shifting dunes along the shoreline with *Ammophila arenaria* (""white dunes"")"; • "Fixed coastal dunes with herbaceous vegetation (""grey dunes"")"; and

[5] As per the DCO (Schedule 11, Part 2(9) and Schedule 12, Part 2(11)) no development will take place within the Markham's Triangle MCZ.

Site name	Designations and Site Codes	Distance to Hornsea Three Array Area (km)	Distance to Hornsea Three Offshore Cable Corridor (km)	Designated features
				• Humid dune slacks.
North Norfolk Sandbanks and Saturn Reef	SAC (UK0030358)	9.3	0 (overlap)	• Reefs; and • Sandbanks which are slightly covered by sea water all the time.
Haisborough, Hammond and Winterton	SAC (UK0030369)	89.7	7.8	• Reefs; and • Sandbanks which are slightly covered by sea water all the time.
Southern North Sea	SAC (UK0030395)	1.4	0 (overlap)	• Harbour porpoise (*Phocoena phocoena*).
Greater Wash	SPA (UK9020392)	105.6	0 (overlap)	• Red-throated diver (*Gavia stellata*); • Little gull (*Larus minutus*); • Common scoter (*Melanitta nigra*); • Common tern (*Sterna hirundo*); and • Sandwich tern (*Sterna sandvicensis*).
North Norfolk Coast	SPA (UK9009031)	127.1	0 (overlap)	• Great bittern (*Botaurus stellaris*); • Pink-footed goose (*Anser brachyrhynchus*); • Dark-bellied brent goose (*Branta bernicla*); • Eurasian wigeon (*Anas penelope*); • Eurasian marsh harrier (*Circus aeruginosus*); • Montagu's harrier (*Circus pygargus*); • Pied avocet (*Recurvirostra avosetta*); • Red knot (*Calidris canutus*); • Sandwich tern (*Sterna sandvicensis*); • Common tern (*Sterna hirundo*); • Little tern (*Sterna albifrons*); and • Waterbird assemblage.

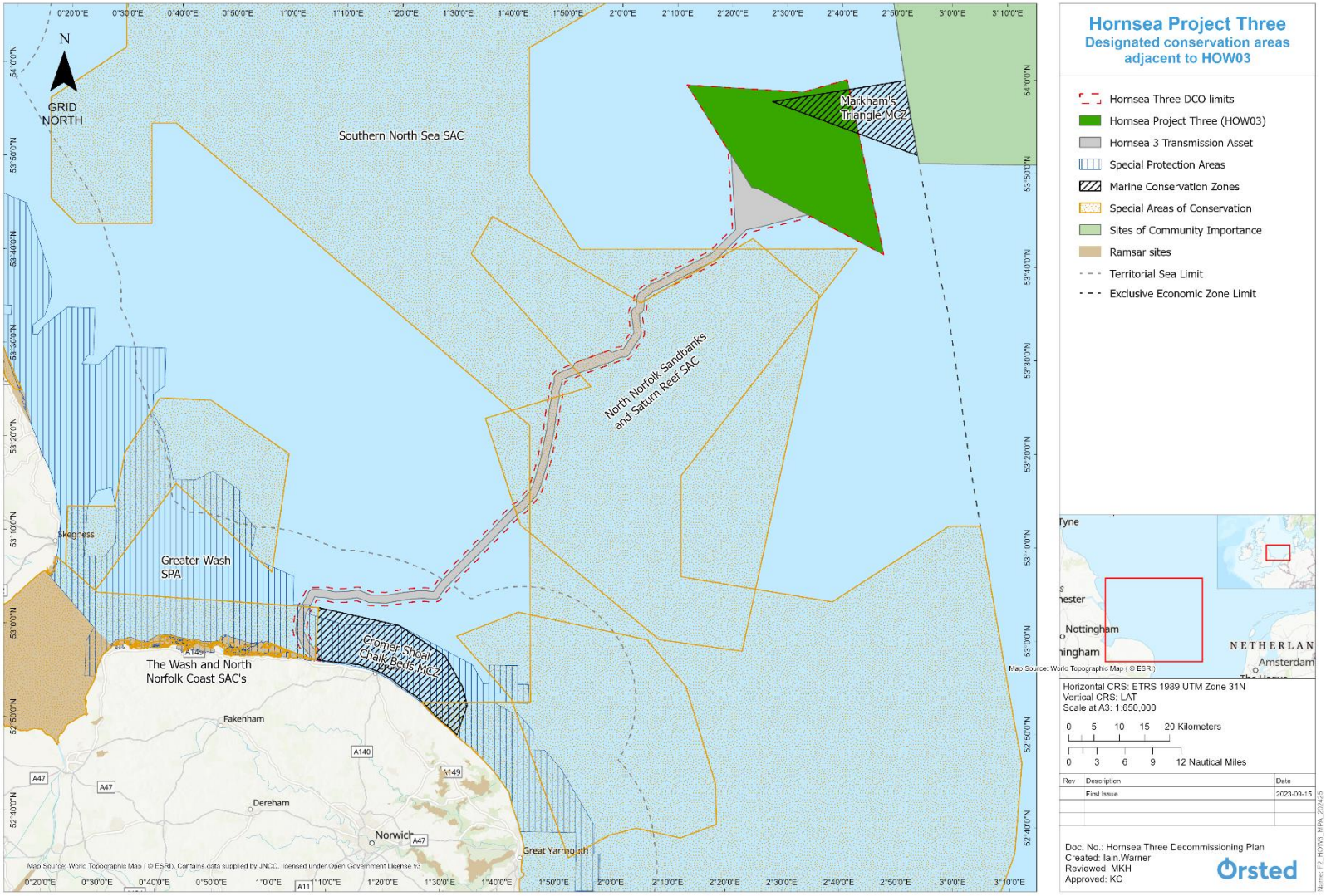

Figure 2: Locations of designated conservation areas adjacent to the Hornsea Three Offshore Wind Farm

2.4.7 Benthic Surveys

2.4.7.1 **Table 6** presents the benthic surveys undertaken for Hornsea Three.

Table 6: Benthic surveys undertaken at the Hornsea Three Offshore Wind Farm (Hornsea Three).

Survey/Study	Date	Undertaken By	Description
Zone characterisation (ZoC) benthic sampling survey	2010	EMU Ltd	122 combined DDV and Hamon grab sampling stations, plus 40 epibenthic beam trawl stations.
Hornsea Project One benthic sampling survey	2010-2011	EMU Ltd	161 combined DDV and Hamon grab sampling stations, of which 40 stations were sampled for sediment chemistry, plus 41 epibenthic beam trawl stations.
Hornsea Project Two benthic infill survey	2012	EMU Ltd	51 combined DDV and Hamon grab sampling stations, of which 8 stations were sampled for sediment chemistry, plus 21 epibenthic beam trawl stations.
Markham's Triangle rMCZ survey	2012	Cefas	21 combined DDV and Hamon grab sampling stations and 29 stations sampled by Hamon grab only.
Hornsea Three array area geophysical and benthic sampling survey	2016	EGS International Ltd	Geophysical survey consisting of dual frequency side scan sonar and multibeam echosounder and 20 ground truthing Hamon grab samples for PSA and infaunal analysis.
Hornsea Three offshore cable corridor geophysical and benthic sampling survey	2016	Bibby HydroMap Limited and Benthic Solutions	Geophysical survey consisting of dual frequency side scan sonar and multibeam echosounder and 19 combined DDV and Hamon grab sampling stations plus one DDV sampling station.
Hornsea Three intertidal survey	2016	RPS Energy	Phase I walkover habitat survey habitat with 0.1 m^2 dig-over sampling.
Hornsea Three benthic sampling survey - beyond 60nm	2017	Gardline	6 stations, 3 of which were also sampled for sediment chemistry, and 10 stations for DDV only.
Hornsea Three benthic sampling survey - within 60 nm	2017	Ocean Ecology	14 combined Hamon grab sampling and DDV stations, 15 stations for DDV only, 5 stations for sediment chemistry only, 5 beam trawls.
Inshore geophysical and DDV survey	2017	Fugro GB Marine	Hornsea Three offshore cable corridor coinciding with the Wash and North Norfolk Coast SAC and Cromer Shoal Chalk Beds MCZ.

2.4.8 Survey Conclusions

2.4.8.1 Survey conclusions are presented in Chapter 2: Benthic Ecology of the Hornsea Three ES (Ørsted, 2018b), and have been used to inform the baseline physical and biological environment within this

decommissioning plan. Benthic surveys identified the presence of *Sabellaria spinulosa* reef at one location within the ECC that was outside of the boundary of North Norfolk Sandbanks and Saturn Reef SAC. No stony reef or chalk reef was identified as present within the array or ECC.

2.4.8.2 This section, and the preceding baseline benthic environment section, will be updated post-construction to include the findings of additional post-construction surveys.

2.5 Offshore Human Environment

2.5.1 Background

2.5.1.1 **Figure 3** shows the location of infrastructure associated with other marine user activities, and **Figure 4** shows the commercial traffic within the vicinity of Hornsea Three, for reference within the following Subsections 2.5.2-2.5.12.

2.5.2 Shipping and Navigation

2.5.2.1 Vessel movement plots are provided for 2022 (MarineTraffic, 2024) in the vicinity of the Hornsea Three array area (**Figure 4**). The plots show that the main transit routes in the region are associated with vessels entering and leaving the Humber Estuary. The data show that the majority of vessel traffic passes around the Hornsea Three Offshore Wind Farm to the east, south, and west. There is a main vessel route that passes through the Hornsea Three array area, but no likely significant effect was determined in the ES for this route (Ørsted, 2018g).

2.5.3 Commercial Fisheries

2.5.3.1 The Hornsea Three array area and offshore cable corridor overlap with International Council for the Exploitation of the Seas (ICES) Rectangles 34F1, 35F1, 36F1 and 36F2 (Ørsted, 2018f). The highest quantity of catch (tonnes) is taken by Danish registered vessels, followed by Dutch registered vessels, and UK registered vessels with smaller amounts by French, German, Swedish and Belgian vessels (negligible amounts are landed by Irish and Isle of Man registered vessels) (Ørsted, 2018f). Key species targeted include European plaice and Dover sole, with Norway lobster representing the most commercially important shellfish species (Ørsted, 2018f).

2.5.3.2 It is noted that a recent exclusion of bottom-towed fisheries has been imposed within the North Norfolk Sandbanks and Saturn Reef SAC.

2.5.4 Recreational Activity

2.5.4.1 The Hornsea Three ES indicates that recreational activity within the array area is low, likely due to its distance from the coastline (~120 km) (Ørsted, 2018k). The Hornsea Three offshore cable corridor is located near several sailing clubs along the Norfolk coastline, and as such, recreational activity occurs at greater levels than within the Hornsea Three array area (Ørsted, 2018k).

2.5.5 Oil and Gas Operations

2.5.5.1 There are currently nine licenced and eight unlicenced blocks coincident with the Hornsea Three array area (Ørsted, 2018k). Three additional blocks (the licenced 49/1a and 49/10a, and the unlicenced 49/10e) are within 1 km of the Hornsea Three array area (Ørsted, 2018k).

2.5.5.2 There are currently ten licenced and 14 unlicenced blocks coincident with the Hornsea Three offshore cable corridor (Ørsted, 2018k). There is one additional licenced block (49/16a) within 1 km of the Hornsea Three offshore cable corridor (Ørsted, 2018k).

2.5.6 Aggregate Extraction

2.5.6.1 There are currently no aggregate extraction sites within the Hornsea Three array area, however Area 484 is located directly adjacent to the Hornsea Three offshore cable corridor (Ørsted, 2018k).

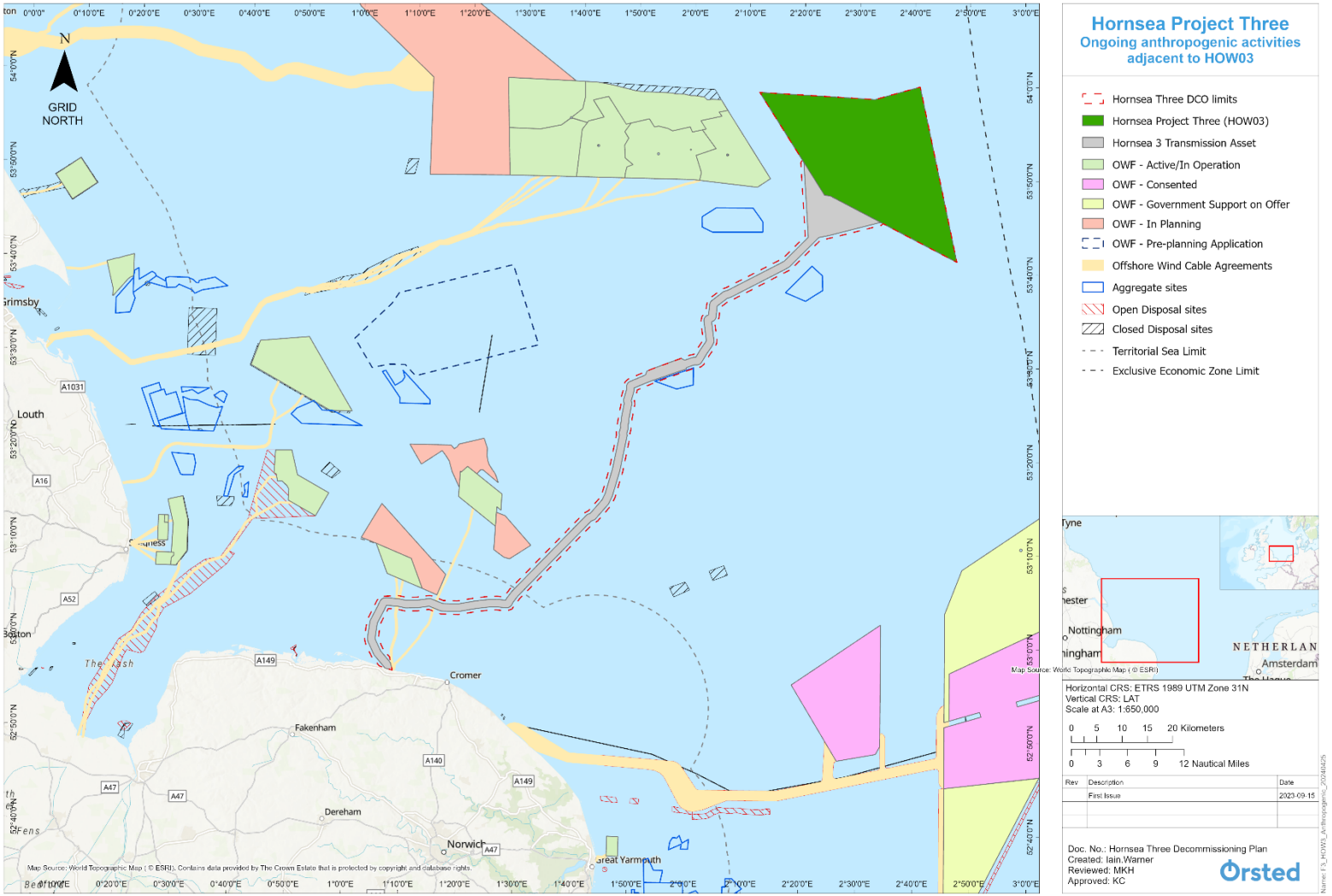

Figure 3: Summary of ongoing anthropogenic activities within the Hornsea Three Offshore Wind Farm generation and transmission assets.

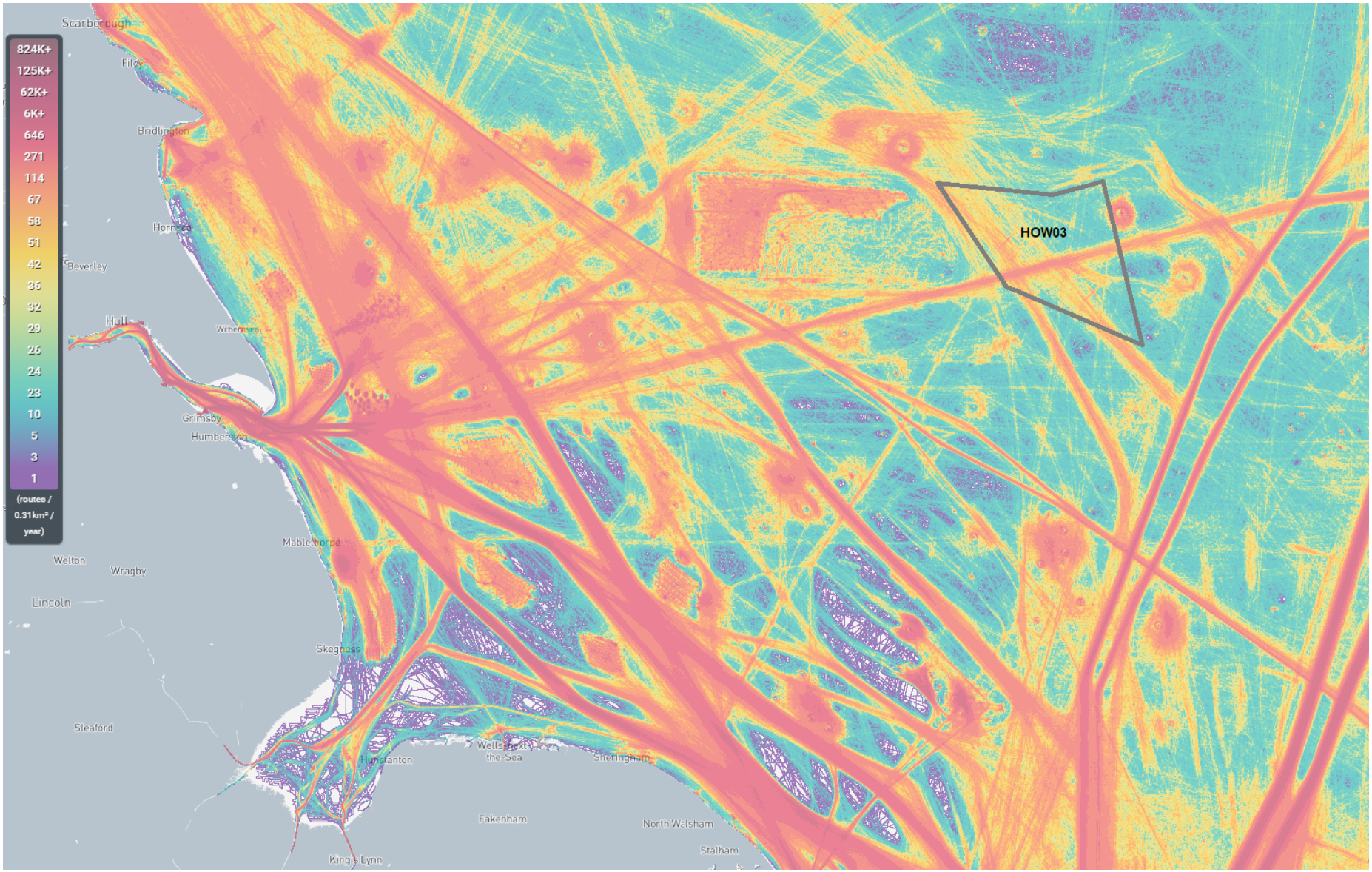

Figure 4: Summary of main routes for commercial traffic in the vicinity of the Hornsea Three Offshore Wind Farm (Source: MarineTraffic, 2024)

2.5.7 Marine Archaeology

2.5.7.1 The location of Archaeological Exclusion Zones (AEZs) will be updated as part of the ES conducted prior to the decommissioning phase. Please see Section 4.4.2 for details on embedded mitigation associated with AEZs.

2.5.8 Marine Disposal Sites

2.5.8.1 There are no dredge disposal sites within the Hornsea Three array area or offshore cable corridor, with the closest being the Hornsea Project One array area disposal site at 7.3 km to the west of the Hornsea Three array area and 6.2 km from the Hornsea Three offshore cable corridor (Ørsted, 2018k).

2.5.9 Cable and Pipelines

2.5.9.1 One active (Norsea com 1 segment 3) and two inactive cables (Stratos 1 and Stratos 2) intersect with the Hornsea Three array area (Ørsted, 2018k). The Norsea com 1 segment 3 cable, Stratos cable, Weybourne to Esbjerg cable, Dudgeon Offshore Wind Farm Export Cable, and Sheringham Shoal Offshore Wind Farm Export Cable intersect with the Hornsea Three offshore cable corridor and associated landfall site (Ørsted, 2018k).

2.5.9.2 There are no pipelines located within the Hornsea Three array area, however 27 active pipelines intersect with the Hornsea Three offshore cable corridor, and two active pipelines are within 1 km of the offshore cable corridor (Ørsted, 2018k).

2.5.10 Military Activity

2.5.10.1 There are two submarine practice areas in the vicinity of the Hornsea Three array area (Ørsted, 2018j). The Outer Silver Pit Submarine Exercise Area is no longer in use, whereas the other submarine practice area is located in Dutch territorial waters 12.5 km to the east of the Hornsea Three array area (Ørsted, 2018j).

2.5.11 Offshore Wind Farms in the Vicinity

2.5.11.1 There are multiple OWFs in operation within the vicinity of Hornsea Three, including Hornsea Project One, Hornsea Project Two, Dudgeon, and Sheringham Shoal (Ørsted, 2018k). The closest OWF projects are Hornsea Project One (7 km from both the Hornsea Three array area and offshore cable corridor) and Hornsea Project Two (7 km from the Hornsea Three array area and 18 km from the Hornsea Three offshore cable corridor) (Ørsted, 2018k).

2.5.11.2 Other OWF projects within the vicinity of Hornsea Three have been proposed and / or consented, including Norfolk Vanguard, Norfolk Boreas, Dudgeon Extension, Sheringham Shoal Extension, and Outer Dowsing. This section will be updated in subsequent iterations of the decommissioning plan to reflect updates to the proposed projects (e.g. if/when the projects enter their respective construction and/or operational phases).

2.5.11.3 **Aviation and Communications**

2.5.11.4 The Hornsea Three array area overlaps with Helicopter Main Route (HMR) 2, which services the oil and gas platforms east of the Hornsea Three array area (Ørsted, 2018h).

2.5.12 Seascape and Visual Character

2.5.12.1 The Hornsea Three ES stated that the array would have a negligible-moderate cumulative impact with other OWF developments, primarily from the Hornsea Project One and Hornsea Project Two; which is not significant in EIA terms (Ørsted, 2018j).

3 Description of Items to be Decommissioned

3.1 Background

3.1.1.1 Hornsea Three will be required to be decommissioned at the end of its operational lifetime, following potential lifetime extension or repowering.

3.1.1.2 The following decommissioning measures are based on today's known techniques and have been proposed with regards to:

- The Best Practicable Environmental Option (BPEO);
- Safety of surface and subsurface navigation;
- Other users of the sea;
- Health and safety considerations; and
- Commercial viability.

3.1.1.3 Components to be left *in situ* following decommissioning will be in accordance with the standards set out by the IMO, BEIS (2019), UNCLOS and OSPAR that specify an installation or structure need not be entirely removed if:

- It is no longer technically feasible (however, the design and construction should be such that entire removal would be feasible);
- It would involve extreme cost;
- It would involve an unacceptable risk to personnel;
- It would involve an unacceptable risk to the environment[6]; and
- It would involve unacceptable risk to Third party assets.

3.1.1.4 It is noted that, at the time of writing this Decommissioning Plan, the exact infrastructure to be decommissioned is not confirmed. The following sections therefore provide a generalised description of current decommissioning measures for offshore wind farms with monopile foundations as a working example.

3.1.1.5 This section will be updated post-construction, when as-built infrastructure is confirmed.

3.2 Generation Assets

3.2.1 WTGs

3.2.1.1 The WTGs will consist of three blades attached to a nacelle housing the hub, generator, gearbox, transformer and other operating equipment.

3.2.1.2 At the time of writing, best industry practice has been to lower the offshore health and safety risk during decommissioning through removing these components as whole sections with dismantling onshore.

3.2.2 Foundations

3.2.2.1 The foundation design to be installed has yet to be determined, however, an example of monopile foundations has been provided below.

3.2.2.2 For a monopile, foundations may consist of two parts, namely a monopile and a transition piece. The monopile may be constructed by welding a series of cylindrical cans, with a larger diameter at the base and smaller diameter at the top, with a conical intersection. Monopile lengths may vary dependent on water depth and seabed conditions. **Figure 5** illustrates a typical monopile foundation.

[6] It is noted that the current DCO contains a condition in which any cable protection installed on the seabed within Marine Protected Areas must be removed during the Decommissioning phase. The Hornsea Three Project is committed to ensuring compliance with this condition where technically feasible and will continue to engage with the appropriate authority by updating this Decommissioning Plan to reflect best available data, industry best practice, and known extents of cable protection, during the Operation and Maintenance Phase of HOW03.

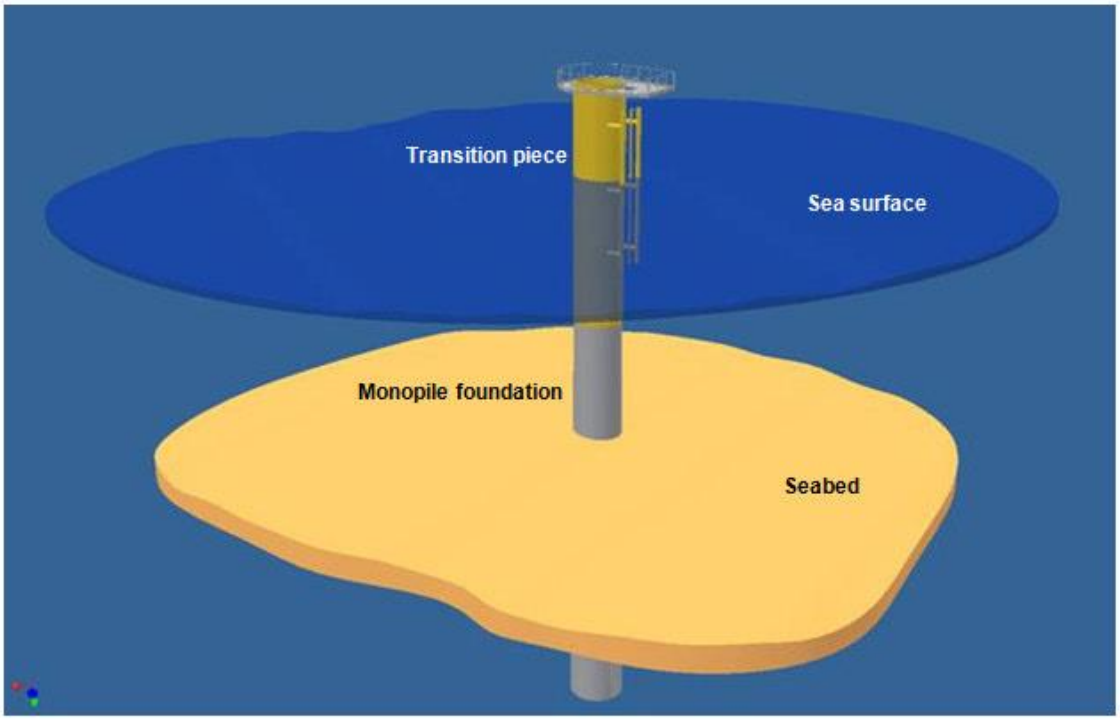

Figure 5: Diagram showing the monopile and foundation of a wind turbine

3.2.2.3 A transition piece may be equipped with boat landing(s), a sidestep platform, intermediate ladders, external and internal platforms, and railings.

3.2.3 Scour Protection

3.2.3.1 Scour protection that may be installed around the base of foundations will be left *in situ*, as it is considered BPEO and more technically feasible. If cable protection is situated within any European Site or MCZ then Ørsted will carry out appropriate surveys to assess the integrity and condition of that cable protection and determine the appropriate extent of the feasibility of the removal of such cable protection. Ørsted will engage with the MMO prior to the deployment of any cable protection in relation to feasibility studies and monitoring, and subject to the outcome of the feasibility study(ies), endeavour to recover the cable protection in accordance with the requirements of the Order (including the Deemed Marine Licences).

3.2.4 Inter-Array Cables

3.2.4.1 The turbines will be connected to OSSs via a network of array cables. The cables will contain inert materials, which are unlikely to impact the environment.

3.2.4.2 Array cables and subsequent cable protection will be left *in situ*. The cable ends will be cut off and buried (likely using a Remotely Operated Vehicle (ROV)) to ensure they do not interfere with vessels etc. At cable or pipeline crossings, cables will remain *in situ* to avoid unnecessary risk to the integrity of the third-party cable or pipeline.

3.3 Transmission Infrastructure

3.3.1.1 The Hornsea Three array area will be connected to the landfall point by four HVDC offshore transmission cables. The transmissions assets consist of two Offshore Convertor Stations (OCS) and two offshore export cables running broadly parallel to each other, making landfall west of Weybourne. The transmission cable(s) will be left *in situ*. Material placed on the seabed to create cable crossings will be left *in situ* to minimise risk to third party assets.

3.3.2 Export cable

3.3.2.1 The export cables will be approximately 320 mm in diameter. They are currently anticipated to be no more than 328 km in length, though Hornsea Three has consent for 1,371 km.

3.3.2.2 If cable protection is situated within any European Site or MCZ then Ørsted will carry out appropriate surveys to assess the integrity and condition of that cable protection and determine the appropriate extent of the feasibility of the removal of such cable protection. Ørsted will engage with the MMO prior to the deployment of any cable protection in relation to feasibility studies and monitoring, and subject to the outcome of the feasibility study(ies), endeavour to recover the cable protection in accordance with the requirements of the Order (including the Deemed Marine Licences).

3.3.3 OCS and Interlink Cable

3.3.3.1 The purpose of an offshore convertor station platform is to transform the voltage of the electricity generated at the wind turbine to a higher voltage suitable for power transmission to shore. A maximum of six offshore cable circuits are consented by the DCO, with a total length of cable to MHWS of up to 1,371 km (as per Schedule 1 Part 3, 5(3) and Schedule 12 Part 2 (3))[7]. This total length of cable include the OCS interlink cable.

3.3.3.2 The OCS interlink cable will consist of two conductor cores bundled together with a fibre optic cable. The fibre optic cable allows for control and communications between the offshore assets and the onshore control centres. Each interlink cable will have a nominal external diameter of 228 mm.

3.3.3.3 A maximum total length of cable to MHWS of up to 1,371 km (as per Schedule 12 Part 2(3)) is consented by the DCO. The final proposed design parameters are compliant with the DCO and the maximum design envelope proposed within the Hornsea Three Environmental Statement (ES).

3.3.4 Artificial Nesting Structures

3.3.4.1 As part of the DCO, Hornsea Three is required to compensate for potential mortality from collision of adult kittiwake associated with the Flamborough and Filey Coast Special Protection Area (FFC SPA) with the operational turbines of Hornsea Three. The compensation that Hornsea Three is required to implement is in the form of coastal artificial nesting structures designed to support sufficient breeding pairs of kittiwake to ensure that the potential impacts from Hornsea Three on this feature are offset.

3.3.4.2 The ANS will include two structures in the Old Hartlepool Yacht Club, Ferry Road, Hartlepool, 1,155 m from the shoreline at its furthest point; two nearshore to South Beach, Lowestoft, 1,250 m and 1,270 m from the shore; and one nearshore to Minsmere, 1,480 m from the shore.

3.3.4.3 The Artificial Nesting Structures are independent marine structures comprising of an octagonal artificial nesting structure topside supported above the water on a single monopile. There is capacity for a total of approximately 504 nesting spaces[8] with 72 on each of the seven nesting elevations, all comprising eight rows of ledges and nine nesting compartments on each row. One elevation of the octagon includes no nesting space or ledges. Specific numbers of nesting spaces are subject to change depending on the final detailed designs for each location. Nesting spaces are incorporated on seven of the eight elevations of the ANS. Typical dimensions of the nesting compartments are 0.4 m width x 0.4 m height x 0.2 m depth, noting specific dimensions are subject to change depending on the final detailed designs for each location. The lowest nesting spaces are located at a safe height of approximately 3.0 m above Highest Astronomical Tides (HAT), 6.0 m above projected HAT when accounting for sea level rise over 40 years,

[7] The maximum length of cable encompasses the offshore export cables and the OCS interlink.
[8] The required minimum provision for each ANS was set at 467 nests. This number was rounded up to 500 to include contingency for the purposes of the design process and to avoid falling below the required minimum. The final design due to its geometry and size resulted in 504 nests as the closest matching quantity of nests.

which is the minimum life requirement for the ANS, and 1.88 m above the highest predicted wave with a probability of 1 in 200 years or 0.5% per year.

4 Description of Proposed Decommissioning Measures

4.1 Background

4.1.1.1 This section gives an overview of legislation and guidance relevant to decommissioning activities and outlines how decommissioning of infrastructure components of the development will be carried out. This section describes the proposed measures for decommissioning the WTGs (the foundations, transition pieces and scour protection), array cables, and transmission infrastructure (the OSSs, interlink and transmission cables).

4.1.1.2 It is not possible to describe the precise technology and methods of decommissioning in this document or when they will be undertaken. These will develop over the operational lifetime of the wind farm and should therefore be reviewed, and a detailed decommissioning works schedule finalised, before the decommissioning phase starts. It is also noted that, at the time of writing, the infrastructure to be decommissioned is not confirmed as it has not yet been installed. This Decommissioning Plan will be updated within such time as agreed with the regulator which shall detail the as-built project infrastructure. As stated in Section 3, the following principles will inform the proposed approach to decommissioning:

- BPEO;
- Safety of surface and subsurface navigation;
- Other users and infrastructure of the sea;
- Health and safety considerations; and
- Adhere to Polluter Pays Principle.

4.1.1.3 Components to be left in situ following decommissioning will be in accordance with the standards set out by the International Maritime Organisation (IMO) that specify an installation or structure need not be entirely removed if:

- It is no longer technically feasible (however, the design and construction should be such that entire removal would be feasible);
- It would involve extreme cost; and
- It would involve an unacceptable risk to personnel.

4.1.1.4 The calculated costs for dismantling are based on selected current vessels and techniques including the limitations of these regarding weather conditions. It is assumed that from now and until the time of decommissioning, there will be an improvement in better access fit to purpose vessels, and more advanced decommissioning technologies.

4.2 Adherence to Relevant Legislation and Guidance

4.2.1.1 The decommissioning measures will comply with the following key UK and international legislation and guidance notes:

- Decommissioning of Offshore Renewable Energy Installations under the Energy Act 2004: Guidance notes for Industry, DESNZ, updated 2019 (DESNZ, 2019);
- Guidelines and Standards for the Removal of Offshore Installations and Structures on the Continental Shelf and in the Exclusive Economic Zone, IMO, 19th October 1989;
- Guidance Notes for Industry: Decommissioning of Offshore Installations and Pipelines under the Petroleum Act 1998, updated 2018, DESNZ;
- OSPAR guidance documents on offshore wind farms;
- Guideline for Submarine Cable Decommissioning (March 2016);
- Guidelines for Environmental Risk Assessment and Management, Defra, September 2002; and

- UNCLOS, 1982.

The decommissioning measures will also comply with all relevant environmental and health and safety legislation in force at the relevant time.

4.2.1.2 Other relevant legislation includes:

- Hazardous Waste (England and Wales) Regulations 2005;
- Marine and Coastal Access Act 2009;
- The Water Resources Act 1991;
- The Conservation of Habitats and Species Regulations 2017;
- Offshore Marine Conservation (Natural Habitats, &c.) Regulations 2007;
- The disposal or recovery of waste on land, principally under Part II of the Environmental Protection Act 1990, other legislation relating to the carriage and transfer of waste and, where appropriate, the Hazardous Waste Regulations 2005; and relevant health and safety legislation;
- London Convention 1972 and the 1996 Protocol, relating to the prevention of marine pollution by dumping of wastes;
- CDM 2015; and
- Appropriate Health and Safety Regulations.

4.3 Phasing and Co-ordination of Decommissioning

4.3.1.1 During the planning stages of decommissioning, Ørsted Hornsea Project Three (UK) Ltd will endeavour to liaise with the owners of these installations (OFTO) to coordinate the decommissioning process and look for potential partnerships where possible and if deemed appropriate.

4.3.1.2 The phasing and detailed programme for decommissioning will be defined and submitted to DESNZ in advance of decommissioning.

4.3.2 Mobilisation

4.3.2.1 Mobilisation of jack-up vessel(s) and any support vessels, is a major task that can take at least six months of planning and preparation, depending on the complexity and extent of the works required. This also includes a similar amount of time at the onshore port and associated facilities to be used for receiving and disassembling the components for processing.

4.3.2.2 The main activity for decommissioning is expected to be the manufacture and installation of the sea fastenings for all components, and quayside/waterside reinforcement if required.

4.3.2.3 The tower sections will be offloaded at the onshore port in vertical position. Therefore appropriate landing and handling facilities need to be in place at an operational stage or before the commencement of offshore decommissioning.

4.3.3 Wind Turbine Generators

4.3.3.1 The dismantling and removal of WTG components (blades, nacelle, tower etc.) will largely be a reversal of the installation process and subject to the same constraints. Using today's technology, dismantling of the turbines will likely require a jack-up vessel to ensure adequate control and to cope with the relatively high lifts and high crane hook loads. Decommissioning will be undertaken in the same controlled manner and in accordance with a risk management plan to ensure the same or higher level of safety.

4.3.3.2 The first phase of decommissioning will be to prepare the site. This is anticipated to include the following actions:

- Inspection of hook-on points and any other safety related equipment that could be required during the decommissioning e.g. fire extinguishers and carbon monoxide meters;
- When de-energisation works are planned due account shall be taken to the fact that it will be required to pitch the blades, spin the hub and yaw the nacelle during decommissioning works;

- Removal of all loose[9] items from the structure;
- In advance of any onsite operations, development of an approved lift plan and safe system of work for the decommissioning of the main components will take place;
- Installation/certification of lifting points; and
- Use of hot bolting key bolts to aid unbolting process.

4.3.3.3 The structure may be disassembled in the following steps (for monopile foundations as an example), some of which may be carried out simultaneously to minimise overall time:

1. Prepare decommissioning teams – ensure all personnel are adequately trained and competent to carry out assigned tasks, ensure personnel are familiar with working procedures, established safety management system, scope of work, carry out toolbox talks etc.
2. Position the jack-up vessel close to the turbine position, pre-load and jack-up to working height. Once the vessel is elevated, attach gangway to the transition piece.
3. Technicians enter the WTG, complete safety checks and prepare for lifting.
4. De-energise the WTG from the export array and isolate the switch gear and earth.
5. Route power supply from the jack-up vessel to the transition piece/WTG/nacelle as required.
6. Prepare the crane.
7. Prepare lifting tools, sea fastenings, bolts, slings, tag lines etc.
8. Handover crane to the lifting team.
9. Install portable turning gear, yaw-box, etc (if required).
10. Check that nacelle systems required for dismantling are operational on temporary power supply.
11. Rotate the hub to bring the first blade in required horizontal position.
12. Remove rotor blades one-by-one and lower to blade storage rack.
13. Remove nacelle and sea fasten.
14. Remove tower either in one piece or in sections (subs to decommissioning vessel setup).
15. Vertical or horizontal stowage of the towers on the vessel shall be planned in advance. The second option will require tailing crane on board.
16. The turbine parts will be placed into engineered sea fastenings approved by the MWS on the vessel and transported to the selected harbour. Alternatively, the components could be placed onto a transport barge.
17. Offload the components/parts by the jack-up main crane, auxiliary cranes/and land cranes to optimise the program.
18. Parts will be processed for reuse, recycle or disposal.

4.3.4 Foundations and Transition Pieces

4.3.4.1 Foundations will be removed after the topside (turbine or accommodation block or OSS) has been removed. This will be carried out according to the best practice at the time of decommissioning. The following section outlines the anticipated removal methods of monopile foundations for the WTGs and jackets for the OCS, if carried out using current technology.

4.3.4.2 For decommissioning of monopile foundations, it is anticipated that the most suitable approach will be to cut below the seabed level to a depth that will ensure the remaining foundation is unlikely to become exposed. Cutting the monopile will require some excavation (expected to be approximately 2 m below the seabed), to be able to remove the monopile. This is likely to be approximately 1 m below the natural seabed although the exact depth will depend upon the seabed conditions, i.e. dynamics and site characteristics at the time of decommissioning. The cutting process is likely to be via mechanical cutting or water jet cutting.

[9] Items that may fall from the structure during decommissioning activity, e.g. snagged rope/nets.

4.3.4.3 Complete removal of foundations has been considered; however, current methods to remove the monopile would require significant excavation of the seabed (approximately 2 m diameter for every metre in depth below the seabed). Current methods to remove the monopile would require a considerable amount of excavation (approximately 2 m diameter for every metre in depth below the seabed).

4.3.4.4 A comparison of the two methods is presented in **Table 7**.

Table 7: Comparison of cutting methods.

Parameter	Complete Removal	Cutting Below Seabed
Potential effect on the safety of surface or subsurface navigation	No effects. However, complete removal would require decommissioning vessels in the area for a longer period, hence possibly impacting navigation for longer.	Limited potential for effects, provided the cutting is made to a sufficient depth. Monitoring post-decommissioning would identify any unlikely exposure.
Potential impact on other users of the sea	Impact during removal works. Longer timeframe therefore more potential impact on other sea users.	Impact during removal works. Remaining pile could impact future foundation works on other offshore projects.
Potential effect on the marine environment, including living resources	A greater detrimental effect to the marine environment. Removal requires complete excavation.	Less intrusive on the seabed and therefore smaller impact on the marine environment. Less time needed for removal.
Risks of injury to personnel associated with removal	Risk to personnel associated with lifting high weights. Risk increased by the length of time needed to undertake works offshore. Diver operations may be required.	Less time needed for removal as excavation required to only 1 m, therefore less possible risk factor for contractors. Likely to be limited requirement for diver operations.

4.3.4.5 The sequence for cutting a monopile foundation and transition pieces below the seabed is anticipated to be:

1. Mobilise suitable vessel (likely to be a jack-up vessel or heavy-lift vessel).
2. Deploy ROVs to inspect the foundation and reinstate lifting attachment if required. The use of divers will be avoided and only deployed if highly necessary.
3. Excavate outside of monopile to approximately 0.5 m below anticipated level of cutting (this will include removing any scour protection or debris around the base of the foundation). Excavated material will be disposed of on the seabed adjacent to the foundation base.
4. Cut the monopile approximately 1 m below seabed level using either a mechanical cutter, a water jet or cutter. Method chosen will be Best Available Technique Not Entailing Excessive Cost (BATNEEC) and according to legislation at the time of decommissioning.
5. Lift monopile onto the decommissioning vessel or transport barge. The foundation parts will be placed into engineered approved by the MWS on the vessel.
6. Transport removed foundation to the selected harbour.
7. Removed foundation will be processed for reuse, recycle or disposal.

4.3.5 Scour/Cable Protection

4.3.5.1 It is proposed, whilst acknowledging the guidance from DESNZ, scour/cable protection within the Hornsea Three array area may need to be left *in situ* (e.g. cable crossings) for logistical/technological reasons. It is also likely that the removal of scour/cable protection from the seabed would have a greater environmental effect than if left *in situ*. However, a review of the removal of scour/cable protection closer to the time of decommissioning will be completed to ensure best practices are used and the latest evidence around scour protection has been assessed.

4.3.6 Array and Transmission Cables

4.3.6.1 Whilst acknowledging the advised decommissioning guidance notes from DESNZ, previously buried cable will be left *in situ*. If left *in situ*, the cable ends will be weighted down and buried to a depth of approximately 1 m (likely using an ROV, subject to local seabed conditions identified in pre-decommissioning surveys) to ensure they do not cause a navigational hazard. At cable or pipeline crossings, the cables will remain in place to avoid unnecessary risk to the integrity of the third-party cable or pipeline.

4.3.6.2 Cable protection laid within Marine Protected Areas will be removed in full.

4.3.6.3 Prior to decommissioning a review of the current evidence for the decommissioning of array and transmission cables will be completed to ensure that the most appropriate approach is used. The assessment of this risk will consider factors such as seabed mobility and previous exposures and will be informed by existing data over time and further relevant surveys prior to decommissioning.

4.4 Summary of Proposed Decommissioning Measures

4.4.1 Background

4.4.1.1 **Table 8** provides a summary of proposed decommissioning measures for Hornsea Three Offshore Wind Farm.

Table 8: Summary of proposed decommissioning measures for Hornsea Three Offshore Wind Farm.

Component	Proposed Decommissioning Measure
Wind turbine/generating equipment	Complete removal from the site
Artificial nesting structures (ANS)	Left *in situ*[10]
Foundations (WTGs and OSSs)	Cut off 1 m below the natural seabed and removed
Scour protection	Left *in situ*
Cables (array)	Left *in situ*
Cables (transmission)	Left *in situ*, with the exception of Marine Protected Areas in which all cable protection will be removed.

4.4.2 Embedded Mitigation

4.4.2.1 The following statements describe measures as part of the embedded mitigation strategy for the decommissioning of Hornsea Three.

[10] Artificial nesting structures are expected to be left *in situ* at this stage, with removal subject to further consultation closer to the time of decommissioning. The Artificial nesting structures will not be decommissioned without SoS approval, as stated in paragraph 7 of Part 1 of Schedule 14 of the draft DCO.

4.4.2.2 During decommissioning, a safety zone is expected to be established to prevent vessels that are not associated with the decommissioning works from entering within 500 m of ongoing works as per the Electricity (Offshore Generating Stations) (Safety Zones) (Application Procedures and Control of Access) Regulations 2007 or such equivalent legislation as is in force at that time.

4.4.2.3 All identified AEZs (Archaeological Exclusion Zones) will be avoided during all decommissioning works.

4.4.2.4 Regarding the local marine industry, Notices to Mariners will be issued before the start of the decommissioning phase. Appropriate effort will be made to ensure that this notice reaches recreational as well as professional mariners in the shipping and fishing industry. The UK Hydrographic Office (UKHO) will be notified as appropriate on the progress and completion of the works. Liaison is on-going with local fishermen and will continue through to decommissioning.

4.5 Proposed Waste Management Solutions

4.5.1.1 Waste management will be carried out in accordance with the relevant legislation at the time of decommissioning and paying regard to the waste hierarchy which suggests that re-use should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal. It is intended that the vast majority of elements from the offshore wind farm will be taken back to land for re-use and recycling. A waste management plan will be drawn up prior to commencement of decommissioning.

4.5.1.2 The scale of offshore wind turbines results in a large amount of material which will need disposal once the structures are decommissioned. Contractor health and safety recommendations, and regulatory requirements of the time will be fully considered and factored during planning of the decommissioning process. Decommissioning industry best practice will be applied, taking into account applicable legislation at the time.

4.5.1.3 An overview of expected types of wastes and their expected re-use, recycling or disposal is given in **Table 9**. In any event, waste management will be carried out in accordance with all relevant legislation at the time of decommissioning and it is intended that any disposal will take place on land.

Table 9: Wind Farm waste types and their assumed treatment.

Waste Type	Re-use	Recycle	Disposal
Steel from wind turbines		X	
WTG	X	X (Mostly)	
Foundations		X	
Used lubricants from wind turbines		X	
Non-recyclable materials and fluids			X
Cable protection			X

4.6 Lighting and Marking

4.6.1.1 During decommissioning, appropriate aviation and nautical marking and illumination will be applied. In regard to aviation safety, the shape, colour and character of the lighting will be compliant with the relevant legislation at the time. In relation to navigational safety, lights and marks will be agreed with relevant UK authorities prior to decommissioning to specify any obstruction marking that may be required during the removal operations. In the event that it is agreed that any obstruction be left on site, which may be considered to present a hazard to navigation, the necessary and specified marking will be provided.

5 Environmental Impact Assessment

5.1.1.1 An EIA was conducted for Hornsea Three in 2018. The resulting ES was submitted as part of the development consent application. This EIA included a an assessment of the likely significant environmental effects of the project during the construction, operation, and decommissioning phases. The ES baseline and identification of impacts remains relevant at this stage.

5.1.1.2 **Table 10** provides a summary of the impacts expected during the decommissioning phase. Due to the length of time between the pre-construction EIA and the decommissioning works, the baseline characteristics of the site, the nature of decommissioning works, and the likely regulatory requirements for the proposed works, will be updated within a pre-decommissioning review of the EIA.

Table 10: Summary of the impacts associated with the decommissioning works.

Activity	Receptor	Description
Dismantling and removal of turbine components (blades, nacelle, tower etc).	Coastal Processes	No impacts as the works will take place above sea level (MHWS). To ensure no debris is left in the marine environment all loose items will be removed before dismantling and removing the turbines.
	Water and sediment quality	During decommissioning, disturbance to the seabed will occur, however, this is anticipated to be on a much smaller scale than during the construction of the wind farm. For a worst case scenario whereby all components are removed (with the exception of the piled foundations), the predicted significance of effects on water quality associated with resuspension of sediments and contaminants will be the same or less than construction, which is minor adverse. Overall, the decommissioning effects are expected to be less than construction because there will be no need for seabed preparation or pile drilling. The risk of any fluids or contaminants within the structures entering into the marine environment is low as operating procedures contained within the decommissioning plan will be developed in order to address this potential risk.
	Benthic Ecology	N/A
	Fish and Shellfish Ecology	N/A
	Marine Mammals	An increased number of vessels during decommissioning has the potential to impact marine mammals. Harbour porpoise do not readily interact with vessels and avoid large structures. The effect is likely to move them away from the location during the works and it is predicted this will be a minor adverse effect. Displacement will be temporary, and the works will be local and for a short period of time so the impact to seals and cetaceans is considered a minor adverse effect.
	Ornithology	Temporary disturbance and displacement are likely to occur during decommissioning. Magnitude and significance of any impacts are likely to be of a similar or identical scale to those presented for the construction phase. Significance of the impact overall is expected to be minor adverse at worst.
	Nature Conservation	The exact location of cable infrastructure relative to the MCZ is currently unknown. MCZs have been included in the seabed impact pathway for 'part removal of monopiles and cable protection.
	Shipping and Navigation	The Hornsea Three array area is located adjacent to a well-used shipping lane (Figure 4) and the ECC is crossed by a number of dense traffic routes. However, the site boundary was designed to minimise impact on navigation and the shipping lane is large and will not be restricted by decommissioning works occurring within the Hornsea Three array area. The impact will be similar or less to that of the construction phase, resulting in a maximum of minor adverse effect on shipping in the ECC. All appropriate aids to navigation and safety will be maintained during decommissioning.

Activity	Receptor	Description
	Commercial fisheries	Commercial fisheries would not have access to fishing grounds within identified safety zones surrounding decommissioning vessels during the decommissioning phase. The impacts for commercial fisheries are considered to be minor adverse impacts during decommissioning, similar to those for construction. A Fisheries Liaison Officer (FLO) will maintain close liaison with the commercial fishing community within the vicinity of the wind farm to minimise the impact to fishers. Hornsea Three will engage with fishers ahead of the commencement of decommissioning activities.
	Other Users	N/A
	Marine Archaeology	All AEZs will be adhered to during decommissioning activities, unless otherwise agreed with Historic England.
	Munitions and Unexploded Ordinance (UXO)	N/A
	Aviation	The Civil Aviation Authority, Ministry of Defence, and other relevant stakeholders will be made aware of the decommissioning
	Seascape	There will be large vessels present during this phase of the works. and the presence of the vessels will be temporary. The removal of the turbines will return the seascape to its original state.
Part removal of monopiles to 1 m below the seabed	Coastal Processes	Part removal of a monopiles may require 2 m excavation around the base of the monopile foundations which will displace sediment. The impacts from this phase of the decommissioning works are considered minor adverse as the impacts will be local and are unlikely to impact the wider tidal regime, and rapid recovery is expected.
	Water and sediment quality	Increased suspended sediment concentrations (SSC) may occur due to the excavation of the seabed and cutting activity. Increased SSC is likely to be of low impact and any suspension of sediment is likely to be temporary. The SSC within the array is generally low compared to the export cable corridor (ECC), and the spatial extent of excavation of the seabed SSC are likely to be temporary and disperse quickly.
	Benthic Ecology	The likely impacts to benthic species are considered low as the works will be local and temporary. An increase in SSC and sediment deposition from excavation and part removal of monopile foundations will occur. This is likely to have a low impact as it will be temporary and localised.
	Fish and Shellfish Ecology	The excavation and removal of the monopiles will cause an increase of SSC but this will be temporary and localised and any plume that is generated will disperse rapidly. The majority of fish species are likely adapted to high background levels of SSC that exist within the Hornsea Three ECC and are able to relocate if the SSC is at uncomfortable levels and therefore considered a minor adverse impact. Smothering of some shellfish may occur, though all commercially important species present show little or no sensitivity to smothering. Noise and vibration from this phase of decommissioning may disrupt spawning activity of key commercial species. To minimise disruption from the decommissioning activity noise and vibration levels will be assessed prior to the works commencing via a comprehensive EIA.

Activity	Receptor	Description
	Marine Mammals	Increases in SSC due to the excavation and removal of structures may cause a temporary minor impact to grey seals (of interest due to haul-out sites near the Hornsea Three landfall) as they use visual cues when foraging. Harbour porpoises use echolocation for foraging and therefore increased SSC will have no impact on harbour porpoises. The decommissioning activities described are unlikely to be equivalent to the levels associated with piling, however, noise levels will be assessed once decommissioning works are further defined.
	Ornithology	The number of vessels required for decommissioning is likely to similar as that for construction, and may cause some displacement to bird species. However, the displacement and disturbance will be localised and temporary and therefore of low impact.
	Nature Conservation	The Hornsea Three offshore cable corridor overlaps with the Cromer Shoal Chalk Beds MCZ, designated for seabed habitats and associated flora/fauna. Increases in SSC are likely to be small-scale and result in minor adverse effects upon MPA features. For assets to be left *in situ*, no additional impacts are expected above those previously assessed within the ES (Ørsted, 2018b). This will result in a long-term loss of designated seabed habitat and associated flora/fauna within the seabed footprint of the cable protection.
	Shipping and Navigation	The Hornsea Three Array boundary was designed to minimise impact on navigation. Throughout the decommissioning phase, mitigation measures outlined in the ES will be followed and Notices to Mariners will be provided.
	Commercial fisheries	Commercial fisheries would not have access to fishing grounds within this area during this phase of decommissioning as the risk of injury would be high. The impacts for commercial fisheries are considered to be minor to moderate adverse impacts. However, communication via the suggested platforms with commercial fisheries will be attempted to reduce the impact to this industry. After the foundations have been removed this area will be open to commercial fisheries . A Fisheries Liaison Officer (FLO) will maintain close liaison with the commercial fishing community within the vicinity of the wind farm to minimise the impact to this industry.
	Other Users	N/A
	Marine Archaeology	No breaches of AEZs are expected as all AEZs will be avoided during phases of decommissioning. Avoidance methods will be similar to those used during construction.
	Munitions and Unexploded Ordinance (UXO)	N/A
	Aviation	N/A
	Seascape	There will be large vessels present during this phase of the works, but over a relatively short period of time. The removal of the foundations will return the seascape to its original state.

Activity	Receptor	Description
Removal of monopiles, removal of scour protection and cables (based on the current available technology).	Coastal Processes	The removal of monopiles will require excavating around the base of the monopile. The footprint of the excavation will be large as the monopiles will have been inserted up to a depth of 50 m below the seabed. This will displace sediment and cause an increase in SSC in the water column. As the decommissioning of monopiles will take place 120 km from shore any impacts to coastal processes are likely to be small.
	Water and sediment quality	Increased suspended sediment concentrations (SSC) may occur due to the excavation of the seabed and cutting activity. Increased SSC is likely to be of low impact as this area is characterised by high ambient concentrations. The SSC within the array is generally low compared to the ECC, and the spatial extent of excavation of the seabed are likely to be temporary and disperse quickly.
	Benthic Ecology	Excavation around the monopile for removal will cause a large amount of sediment to be displaced and an increase in SSC. The excavation and removal of structures are likely to cause a short-term direct impact through habitat loss, which is considered a temporary moderate to major impact. There will be displacement of benthic communities within in this area. This phase of decommissioning is likely to have moderate to major temporary impact on benthic species.
	Fish and Shellfish Ecology	The excavation and removal of the monopiles and some of the scour protection and cables may cause an increase of SSC but this will be temporary and localised and any plume that is generated will disperse rapidly. The majority of fish species are likely adapted to high background levels of SSC that exist within the Hornsea Three ECC, are able to relocate and therefore considered a minor adverse impact. Smothering of some shellfish may occur, although all commercially important species present show little or no sensitivity to smothering. Noise from this phase of decommissioning may disrupt spawning activity of key commercial species. To minimise disruption from the decommissioning activity noise and vibration levels will be assessed prior to the works commencing via an EIA. Demersal species may be directly impacted through habitat loss and disturbance. For some species of fish this impact will be moderate to major.
	Marine Mammals	Increase in SSC due to the excavation and removal of structures may cause a temporary minor impact to seals as they use visual cues when foraging. Porpoises and other cetaceans use echolocation for foraging and therefore increased SSC will have no impact on harbour porpoise. The decommissioning activities described are unlikely to be at the noise levels associated with piling, however when a method has been selected a review of impacts associated with the equipment will be completed.
	Ornithology	The increased presence and active transport of materials by vessels needed for decommissioning may cause some bird displacement. However, the displacement and disturbance will be localised and temporary and therefore it will be considered of low impact.

Activity	Receptor	Description
	Nature Conservation	Impacts in the Hornsea Three array area may indirectly overlap with the Markham's Triangle MCZ, designated for seabed habitats and associated flora/fauna. Whilst the examination process has resulted in refinement of the array layout such that no infrastructure will be constructed within the MCZ, the removal of all assets on the seabed in the vicinity of the MCZ is expected to result in moderate to major increases in SSC. The Hornsea Three offshore cable corridor overlaps with the Cromer Shoal Chalk Beds MCZ, the Wash and North Norfolk Coast SAC, the North Norfolk Sandbanks and Saturn Reef SAC, the Southern North Sea SAC, and the Greater Wash SPA. Full removal of transmission assets is expected to result in moderate to major increases in SSC.
	Shipping and Navigation	The Hornsea Three array area boundary was designed to minimise impact on navigation. Throughout the decommissioning phase, mitigation measures outlined in the ES will be followed and Notices to Mariners will be provided.
	Commercial fisheries	Commercial fisheries would not have access to fishing grounds within this area during this phase of decommissioning as the risk of injury would be high. The impacts for commercial fisheries are considered to be minor to moderate adverse. However, communication via the suggested platforms with commercial fisheries will be attempted to reduce the impact to this industry. After the foundations and cable protection have been removed this area will be open to commercial fisheries.
	Other Users	N/A
	Marine Archaeology	No breaches of AEZs are expected as all AEZs will be avoided during all phases of decommissioning. Avoidance methods will be similar to those used during construction.
	Munitions and Unexploded Ordinance (UXO)	N/A
	Aviation	N/A
	Seascape	There will be large vessels present during this phase of the works, but over a relatively short time period. The removal of the foundations will return the seascape to its original state and therefore a beneficial effect is expected.

5.1.1.3 The ES will be reviewed when the final decommissioning schedule is known. Based on this review, the projected impacts may have to be re-assessed, and newly discovered potential impacts might need to be added.

5.1.1.4 This will lead to a decision as to whether a more detailed assessment is required, based on these key criteria:

- An updated review, identification, and assessment of potential impacts on the physical, biological, and human environment. Planned surveys in and around Hornsea Three which could inform this process could include;
  - Geophysical surveys (side scan sonar);
  - Geotechnical surveys;
  - Benthic grab/trawl surveys;
  - Ornithological surveys;
  - Marine mammal surveys; and
  - Fish surveys.
- An updated review, identification, and assessment of activities of other legitimate users of the sea with the potential to be affected by decommissioning. This is because the nature and/or intensity of human activities taking place on/around Hornsea Three, such as commercial fishing, could have changed over the lifetime of the project;
- An updated review, identification, and assessment of the potential impacts of decommissioning on the local community, i.e. potential socio-economic impacts; and
- An updated review, identification, and assessment of potential impacts on historic environment interests, in particular marine AEZs. The Offshore Renewables Protocol for Archaeological Discoveries will also be adhered to when relevant.

5.1.1.5 Due to the length of time between the original EIA and the decommissioning works, the nature of decommissioning works, and the likely regulatory requirements, it is currently anticipated that an EIA (or future equivalent) will be required for the works.

6 Consultations with Key Stakeholders and General Public

6.1.1.1 Throughout the development of Hornsea Three, close consultation with key stakeholders at a national and local level has been maintained. Consultation will continue during the remaining construction, operational and decommissioning phase.

6.1.1.2 In adherence to the DESNZ guidelines and Section 105 notice received on 9th May 2024 this Decommissioning Programme will be consulted on with the following stakeholders:

- British Marine Aggregate Producers Association (BMAPA);
- Chamber of Shipping;
- Joint Nature Conservation Committee;
- Environment Agency;
- Historic England;
- Marine Management Organisation;
- Maritime and Coastguard Agency;
- National Federation of Fishermen's Organisation;
- Natural England;
- Relevant Harbour Authority/ies;
- Eastern Inshore Fisheries and Conservation Authority;
- Royal Yachting Association;

- The Crown Estate; and
- Trinity House.

6.1.1.3 Furthermore, this draft Decommissioning Programme will be made available publicly on Hornsea Project Three website. Notices advertising the availability of the draft Decommissioning Programme were placed in the Eastern Daily Press and Lloyd's List on 31st May 2024 .

6.1.1.4 The project has been in dialogue with the local fishing industry and this dialogue will be continued during the decommissioning phase.

6.1.1.5 Regarding the local marine industry, Notices to Mariners will be issued before the start of the decommissioning phase. Appropriate effort will be made to ensure that this notice reaches recreational as well as professional mariners in the shipping and fishing industry. The UKHO will be notified as appropriate on the progress and completion of the works.

7 Proposed Decommissioning Schedule

7.1.1.1 Since only a few OWFs have been decommissioned in Europe (Adedipe and Shafiee, 2021), it is difficult to anticipate the operational challenges, costs and precise timing of works. Once other wind farms start to be decommissioned, it will provide valuable insight into the timing, costs and operational challenges to be faced. The Decommissioning Plan will be updated once this knowledge has evolved to the extent that it will allow for a refinement to this document and the associated financial security information.

7.1.1.2 As Hornsea Three has not yet been constructed, the schedule of decommissioning cannot yet be determined.

7.1.1.3 The schedule of works will be determined once the final review of this document is completed and the 'Decommissioning Programme of Works' (see Section 10 below) has been developed.

7.1.1.4 This knowledge, together with the outcome of consultation with relevant authorities, will help develop a final schedule of decommissioning works.

8 Project Management and Verification

8.1.1.1 The final review of this document and the proposed schedule of decommissioning works will be done towards the end of the operational lifetime (depending on whether lifetime extension or repowering may take place or not). This review will produce a Decommissioning Programme of Works, including current knowledge of decommissioning methods, measures, and timing. The Decommissioning Programme will be made available to the public for comment.

8.1.1.2 A Decommissioning Report will be issued for review and approval from the appropriate regulatory authorities after the decommissioning phase is finished, in compliance with the relevant guidance, summarising how the Programme has been carried out.

8.1.1.3 As a minimum, this report would include:

- Confirmation that the approved decommissioning programme has been adhered to during the decommissioning works through photographs or survey footage of the seabed; otherwise, an explanation of any major variances from the programme; this includes information of actual costs of the works and an explanation of any major variances from the forecast costs;
- Information on the outcome of the decommissioning phase, including seabed clearance and any side-scan sonar surveys, which may be required to enable the identification and subsequent recovery of any debris located on the seabed, which may have arisen from the works that may pose a risk to other marine users. These will cover the site and an appropriate buffer zone for comparison;
- Confirmation that in the case where any elements of the development remain protruding from the seabed, the relevant authorities have been notified of the existence of such remains;
- A compliance statement setting out how relevant regulations (environment, health and safety) have been complied with together with any instances of non-compliance;

- A cost breakdown to enable DESNZ to understand the actual cost of decommissioning compared to the predicted cost and to gain a better understanding of the potential accuracy of new decommissioning programmes;
- If infrastructure is left *in situ*, evidence that it has been cut off, buried, or otherwise made safe and treated in accordance with the decommissioning programme; and
- Information of any appropriate aids to navigation have been installed, where required, to overcome risks posed by such remains.

8.1.1.4 Upon completion, and not more than 12 months after the decommissioning works, the report will be provided to DESNZ.

9 Restoration of the Site

9.1.1.1 Following the completion of decommissioning works, the Hornsea Three site will be restored, as far as reasonably practical, to its original pre-construction state. This applies to both the array area and the export cable corridor.

9.1.1.2 The key restoration works will include securing and adequately covering all cut foundations and returning the seabed to pre-construction conditions within appropriate MPAs following removal of cable protection within MPA boundaries. The security and adequacy of this coverage will be agreed in consultation with the appropriate regulatory authorities towards the end of the wind farm's operational lifetime.

10 Post-Decommissioning Site Monitoring, Maintenance, and Management

10.1.1.1 It is proposed that post-decommissioning monitoring surveys of the site will be carried out by an independent contractor at appropriate intervals after completion of the decommissioning works. The scope of such surveys will be agreed in advance with the relevant authorities. It is proposed at this time that geophysical surveys be carried out one and five years after decommissioning has been completed. The decommissioning of offshore renewables energy installations under the Energy Act 2004 guidance for industry (DESNZ, 2019) states that:

10.1.1.2 "*5.9.4 Please note that completion of the Energy Act process does not necessarily mean the developer/owner has no further obligations in relation to the decommissioning. Where infrastructure is permanently left in situ then any residual liability is expected to remain with the developer/owner in perpetuity, and the developer/owner may (depending on the arrangements that have been put in place by the landlord) need to make arrangements to protect itself against any claims for compensation by third parties arising from damage caused by any remaining infrastructure.*"

10.1.1.3 As some structures are proposed to remain *in situ*, the geophysical surveys will provide evidence of the stability of the area and 1-5 years post-decommissioning will determine the nature and scale of effects from the structures remaining *in situ*. Discussions with the relevant bodies about ownership and liability will be made after five years post-decommissioning. In addition, prior to submission of the proposed decommissioning methodology at time of decommissioning works, the tenant of the Lease will enter into discussions with The Crown Estate in relation to residual liabilities should infrastructure remain *in situ*.

10.1.1.4 Should the surveys identify any residual elements of the wind farm protruding above the seabed, appropriate measures will be taken to make the seabed safe, for example, by removal or re-burial in order to avoid posing risk to mariners. The removal or re-burying technique and machinery will be decided depending on the type and size of the identified elements but will be approximately the same as that used for the initial decommissioning works. It is noted that where additional consents are required, the structures will be appropriately safeguarded in the interim period.

10.1.1.5 Should there be any uncertainty regarding the identification of anomalies through the surveys other than those associated with the wind farm, which could be of archaeological interest, these will be referred to the appropriate independent public authority at the time of decommissioning.

10.1.1.6 The UKHO will be informed of these residual elements, so that they can be marked as potential anchoring hazards on relevant maps and charts with the purpose of providing a warning to mariners.

10.1.1.7 It should be noted that Hornsea Project Three (UK) Limited is required to apply to the MMO for a Marine Licence closer to the time of decommissioning activities, which are not anticipated to be sufficiently covered under the wind farm's current consents. It is at this stage that the finer details of the methods and details of any monitoring will be agreed with the relevant authorities and their consultees.

11 References

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