


PROGRAMME

DECOMMISSIONING PROGRAMME

Project	East Anglia TWO Offshore Windfarm		
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REVISION SUMMARY

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DESCRIPTION OF REVISIONS

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ABBREVIATIONS

AA	Appropriate Assessment
AEZs	Archaeological Exclusion Zones
AtoN	Aids to Navigation
BEIS	Department for Business, Energy, and Industrial Strategy
BMAPA	British Marine Aggregate Producers Association
BPEO	Best Practicable Environmental Option
CPS	Cable Protection System
DCO	Development Consent Order
DESNZ	Department for Energy Security and Net Zero
DOL	Depth of Lowering
dML	Deemed Marine Licences
DP	Decommissioning Programme
EA	East Anglia
EATL	East Anglia TWO Limited
ECC	Export Cable Corridor
EIA	Environmental Impact Assessment
ERCoP	Emergency Response and Co-operation Plan
ES	Environmental Statement
HSE	Health, Safety and Environment
IAC	Inter Array Cables
IMO	International Maritime Organisation
km	Kilometres
kV	Kilovolt
LAT	Lowest Astronomical Tide
L x W x H	Length x Width x Height
MCA	Maritime and Coastguard Agency
MFE	Mass Flow Excavator
MMO	Marine Management Organisation
MW	Megawatts
NtM	Notice to Mariners
OFSS	Offshore Substation
OFTO	Offshore Transmission Owner
ORIEs	Offshore Renewable Energy Installations
OSPAR	Convention for the Protection of the Marine Environment of the North-East Atlantic
ROV	Remotely Operated Vehicles
SAC	Special Area of Conservation
SCADA	Supervisory Control and Data Acquisition

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SNS	Southern North Sea
SPA	Special Protection Areas
SPR	ScottishPower Renewables
UK	United Kingdom
UNCLOS	United Nations Convention on the Law of the Sea
WMP	Waste Management Plan
WTG	Wind Turbine Generators

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1 INTRODUCTION

1.1 PROJECT OVERVIEW

East Anglia (EA) TWO is an offshore windfarm being developed by EA TWO Limited (EATL) and owned by ScottishPower Renewables (SPR). The original application for development consent for EA TWO was submitted to the Planning Inspectorate by EATL in November 2019, with a Development Consent Order (DCO) and associated deemed Marine Licences (dMLs) granted in April 2022 by the Secretary of State (SoS) for the Department for Business, Energy and Industrial Strategy (BEIS)¹.

Since consent was awarded, the DCO has been subject to a Correction Order in December 2022.

1.2 PURPOSE OF THE DECOMMISSIONING PROGRAMME

The expected operational lifetime of the Project is at least 25 years, depending on conditions during the Project's lifecycle. Towards the end of the expected operational lifetime a decision will be undertaken as to whether ongoing operations are feasible. This decision could extend the Project's lifecycle and subsequently postpone the decommissioning phase. At the end of its lifetime, the EA TWO windfarm will be decommissioned.

This document forms the Decommissioning Programme (DP) and has been developed in order to discharge Schedule, Part 3, Condition 10 of the EA TWO DCO, which states:

'No offshore works may commence until a written decommissioning programme in compliance with any notice served upon the undertaker by the Secretary of State pursuant to section 105(2) of the 2004 Act(a) has been submitted to the Secretary of State for approval'.

It is noted that as part of the offshore transmission licensing regime, elements of the windfarm relating to transmission assets are expected to be divested to a third-party Offshore Transmission Operator (OFTO) in the future. Following this, the DP will be modified to reflect this change in the EATL's assets.

EATL received notice under Section 105(2) of the Energy Act 2004 on the 20th Jan 2024. This notice requires that EATL prepare and submit EA TWO's DP to the SoS of the DESNZ no later than 31st Dec 2026.


1.3 DOCUMENT STRUCTURE

The structure of this DP is outlined in Table 1-1.

Table 1-1 Document structure

Section	Overview
Section 1 – Introduction	Introduction to the document and consent requirements.
Section 2 – Background Information	Relevant background information including the layout of the windfarm, and a summary of environmental conditions across the site.
Section 3 – Description of Items to be Decommissioned	A full description of all items associated with the marine infrastructure to be decommissioned.
Section 4 – Description of Proposed Decommissioning Measures	An overview of the proposed approach to decommissioning the windfarm, including an overview of the process, details of items to be left <i>in situ</i> , proposed waste management solutions, and lighting and marking considerations.
Section 5 – Environmental Impact Assessment (EIA)	Details of the EIA that was prepared for EA TWO and its consideration of decommissioning activities.
Section 6 – Consultation	The consultation process to be undertaken to support development and finalisation of the DP.

¹ BEIS existed until 2023 when it was split into several separate departments, including the Department for Energy Security and Net Zero (DESNZ) which is now the relevant department.

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Section	Overview
Section 7 – Costs and Financial Securities	Proposed strategy for providing details of the costs of decommissioning and the financial security which the companies that are party to the programme propose to provide.
Section 8 – Proposed Decommissioning Schedule	Details of the proposed decommissioning timescales.
Section 9 – Project Management and Verifications	Information on how EATL will manage the implementation of the DP.
Section 10 – Seabed Left and Intended	Information relating to steps that will be taken in order to confirm that the seabed has been left as intended following decommissioning, including information on site surveys and schedules.
Section 11 – Restoration of the Site	Description of how EATL intends to restore the site as far as reasonably practicable, to the condition that it was in prior to construction of the installation.
Section 12 – Post-decommissioning Monitoring, Maintenance and Management	Details of the post-decommissioning monitoring/activities that will be required, given that EATL is not proposing to fully remove all infrastructure.

2 BACKGROUND INFORMATION

2.1 THE DEVELOPMENT

The EA TWO site is located in the southern North Sea, within the East Anglia Zone, approximately 32.6 km from the nearest point to the coast (located at Southwold) and 37 km from the Port of Lowestoft. Two export cables will make landfall North of Thorpeness in Suffolk. The windfarm site covers an area of approximately 218.4 km² and its location can be seen in Figure 2-1.

It is one of nine offshore zones belonging to the Crown Estate which formed part of the third licence round for United Kingdom (UK) offshore windfarms.

EA TWO is comprised of 64 wind turbine generators (WTGs) and is anticipated to have a maximum operational capacity of up to 960 megawatts (MW). The EA TWO WTGs each have a maximum hub height of 175 m above Lowest Astronomical Tide (LAT) and a maximum total tip height of 282 m above LAT. The turbines are mounted on transition pieces situated on monopile foundations.

A network of up to 200 km 66 kV inter-array buried, subsea cables connect strings of wind turbines together and connect the wind turbines to the offshore substation. There is a network of approximately 160 km of offshore export cables (80 km per cable).

The project also includes one offshore substation (OFSS) which collects the generated electricity from the windfarm and subsea export cables which take the electricity to landfall.

Further details of the project infrastructure that will be decommissioned are provided in Section 3 of this document.

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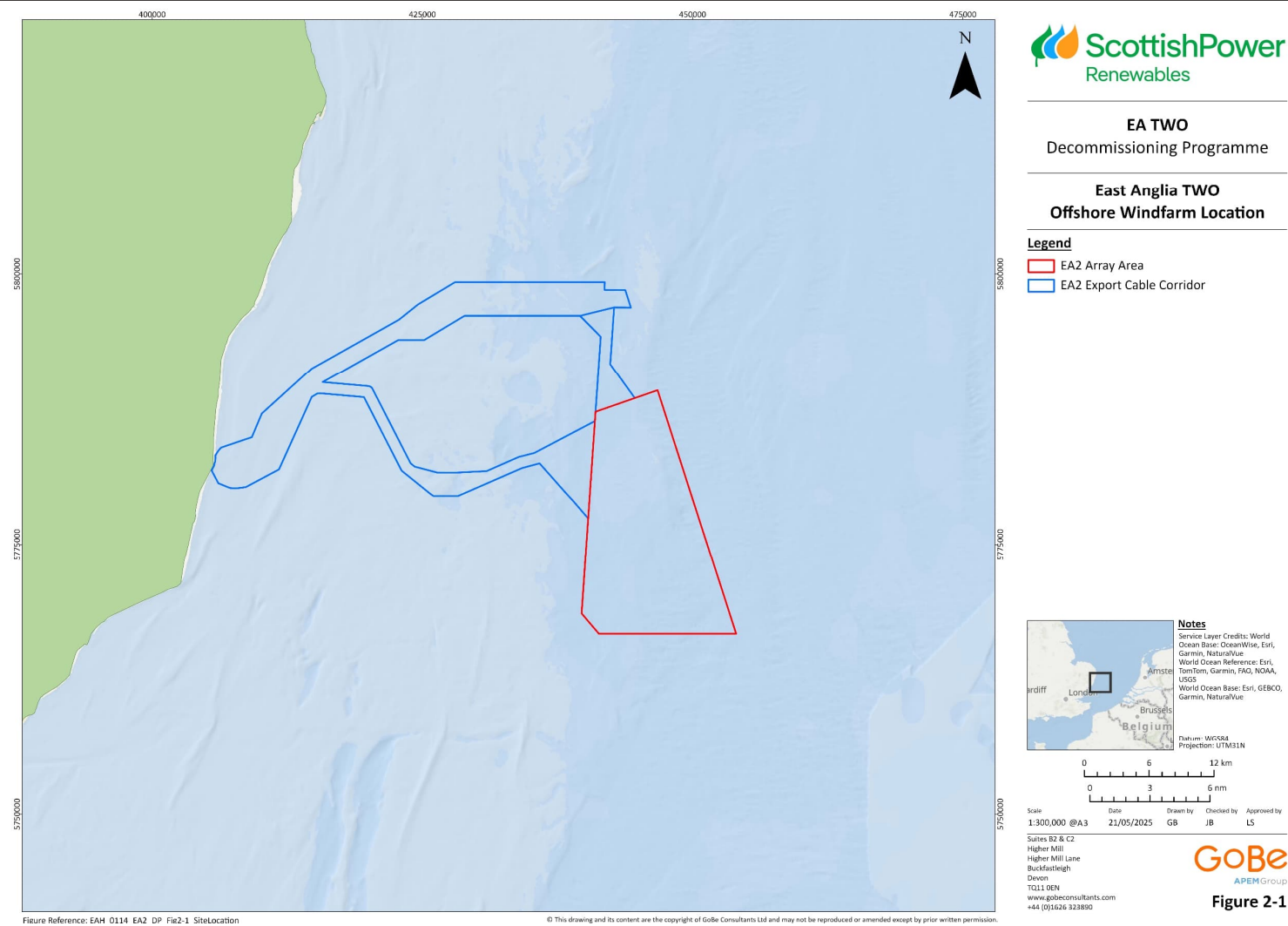



Figure 2-1 East Anglia TWO offshore windfarm location

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2.2 SITE CHARACTERISTICS

This section provides a summary of the key characteristics of the offshore environment at the Project. The site characteristics are described by a comprehensive data set which was used to inform the Project EIA for the DCO application. A full summary of this information is described in the Environmental Statement (ES).

2.2.1 Offshore Physical Environment

2.2.1.1 Geology

As presented in Volume 1, Chapter 7: Marine Geology, Oceanography and Physical Processes of the ES, no site specific geological surveys of the EA TWO windfarm site have been conducted however (Fugro EMU, 2013) describes how the geology of the East Anglia Zone generally consists of Pleistocene sands and clays overlain by Holocene sand deposits. The thickness of the Holocene sediments of the East Anglia Zone varies from less than 1 m across most of the area to greater than 20 m in the sand wave fields and on the sand ridges, especially in the north of the Zone. The sand is marine and predominantly fine to medium grained with local laminae of mud.

The geology of the export cable corridor (ECC) close to the coast comprises mainly Pleistocene sediments with Red Crag Formation in the southern parts of the corridor, and London Clay in the northern parts. There is an area of outcropping Coralline Crag Formation close to the coast, characterised by cemented shelly sandstone. This extends offshore for a maximum of about 3 km. Further offshore, Westkapelle Ground Formation overlies the Red Crag Formation. There is a buried channel up to 20 m deep infilled with Brown Bank Formation near the offshore end of the cable corridor.

2.2.1.2 Bathymetry and Topography


Water depths within the EA TWO windfarm site vary from a minimum depth of 33 m below LAT to a maximum depth of 67 m below LAT, with the exception of an area of 29 m below LAT on a sand wave near the centre of the site, and 76 m below LAT in a depression to the east of the site. This depression is approximately 400 m across and 20 m deep.

The bathymetry of the EA TWO windfarm site is dominated by areas of megaripples, and sand waves are widespread. Sand waves are dominant in the east and southeast of the site, separated by flat seabed from a smaller area of sand waves in the west. The largest sand waves are generally 5-10 m high (with one reaching 14 m) with a wavelength of up to 500 m. The smaller sand waves are approximately 2-3 m high with a wavelength of between 20 m and 40 m (Gardline, 2017).

Crests are predominantly oriented east-southeast to west-northwest and few differing from this. Most sand waves are asymmetrical, with the steeper flank facing south-southwest (indicating a dominant south-southwest component in the bottom current vector).

Megaripples and ripples are common throughout the windfarm site. However, there are several large areas where there are no bedforms. In the absence of bedforms, the seabed is flat with a few local irregularities dependent on the underlying geology, such as where London Clay sub-crops. Such an area is present across the north of the site where it is shallower (35-40 m below LAT) and devoid of morphological features except for a few megaripples.

Water depths across the offshore ECC vary from a minimum depth of 2 m below LAT inshore (across an area of outcropping rock), to a maximum depth of 53 m below LAT at the seaward end. Closest to the coast, the bathymetry of the ECC is dominated by rock outcrop (Coralline Crag) with an irregular surface formed of southwest-northeast oriented ridges between 0.5 m and 2 m high. To the north of this outcrop, areas of megaripples are present, oriented west-southwest to east-northeast, up to 0.5 m high with wavelengths ranging from 3 m to 15 m. Across the northern part of the inshore section, there is a sand-shoal at around 3.5 m below LAT. Both north and south of the rock outcrop, closest to the coast, there are also areas of featureless sand.

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2.2.1.3 Metocean Characteristics

2.2.1.3.1 Wind and Wave Regimes

The EA TWO windfarm site, and the former East Anglia Zone in general, is within a micro-tidal regime. The average spring tidal range varies between 0.1 m and 2.0 m (East Anglia Offshore Wind, 2012) and typically weakens towards deeper areas.

This relatively low tidal range is due to general proximity to an amphidromic point in the southern North Sea that is positioned just outside the central, eastern boundary of the former East Anglia Zone. Due to this, the tidal range across the windfarm site is modest (0.5 m-1.2 m) and not extreme. At the amphidromic point, the tidal range is near zero. The tidal range then increases with radial distance from this point.

At the coast, the tidal range reaches 2.55 m on mean spring tides at Sizewell (just to the north of the ECC landfall).

The North Sea is particularly susceptible to storm surges and water levels can become elevated around 2.05 m above astronomical tidal levels during a one year return period surge event, and around 3.09 m during a 100-year return period surge event, as measured at Sizewell.

A study conducted by MetOceanWorks (2020) determined that wind speeds at the EA TWO location at 10 m height originate mainly from the southwest, with a mean annual wind speed of approximately 8.0 m/s.

2.2.1.3.2 Tidal Processes

Within the EA TWO windfarm site, tidal currents are strongest across the west of the site, reaching up to 1.4 m/s on spring tides and 0.9 m/s on neap tides at an Admiralty Diamond close to the ECC. Tidal streams are directed towards the south-southwest on a flooding tide and towards the north-northeast on the ebbing tide. Speeds reduce to around 0.7 m/s on spring tides and 0.4 m/s on neap tides in shallow water just off the Suffolk coast.

The southern North Sea is prone to storm surges, with a predicted maximum surge current of 0.4 m/s (Health, Safety and Environment (HSE), 2002 as cited in Volume 1, Chapter 7 Marine Geology, Oceanography and Physical Processes of the ES). Whilst this is less than the typical daily current speeds recorded within the EA TWO windfarm site and ECC, surge currents can combine with tidal currents to create faster overall currents.


2.2.2 Offshore Biological Environment

2.2.2.1 Benthic Environment

As presented in Volume 1, Chapter 9: Benthic Ecology of the ES, the predominant habitats are sands and gravels in both the EA TWO site and ECC, and these determine infaunal and epifaunal communities which are present. Such communities are dominated by polychaetes such as, *Spiophanes bombyx* and *Nephtys cirrosa*, crustaceans such as *Urothoe brevicornis* and *Bathyporeia elegans* and echinoderms such as *Ophiuroidea sp.* and *Echinocyamus pusillus*. The homogeneity of the benthic ecology across the EA TWO site is evident by the fact that only four different infaunal communities were identified as present, all of which were extremely similar.

The only sensitive species associated within the EA TWO site and ECC is *Sabellaria spinulosa*, which is a tube-building polychaete worm that is found in the subtidal and lower intertidal/sublittoral fringe. *S spinulosa* may form reefs, however, this is not an obligate growth form. It is these reef structures that are protected (pursuant to section 41 of the Natural Environment and Rural Communities Act (2006) and not the species itself; importantly crusts and veneers do not qualify as reefs.

Grab data obtained in 2012 for the ES indicated the species presence however noted it was only present in reef form in only a couple of locations.

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2.2.2.2 Fish and Shellfish

As presented in Volume 1, Chapter 10: Fish and Shellfish Ecology, site specific surveys and desktop studies were undertaken to inform the EA TWO ES. The ES describes the fish and shellfish species identified as being present within the EA TWO Site and ECC as relatively common and widespread across the Southern North Sea (SNS). Species of note include several commercial species, such as sandeel *Hyperoplus lanceolatus*, Atlantic herring *Clupea harengus*, mackerel *Scomber scombrus*, haddock *Melanogrammus aeglefinus*, whiting *Merlangius merlangus*, cod *Gadus morhua*, plaice *Pleuronectes platessa*, lobster *Homarus gammarus*, scallops *Pecten maximus*, common whelks *Buccinum undatum*, brown shrimp *Crangon crangon*, pink shrimp *Pandalus montagui* and edible crab *Cancer pagurus*. This broadly aligns with the species represented in recent MMO landings data (2025).

Spawning and nursery grounds have been defined for several species, including cod, plaice, sole, whiting, lemon sole, herring, mackerel, sprat, sandeel, thornback ray, top and spurdog. within and in the vicinity of the EA TWO site and ECC. Elasmobranch and diadromous fish species potentially use areas within or in the vicinity of The EA TWO site and ECC. These spawning and nursery grounds are summarised in Figure 2-2.

Species	Spawning season and intensity in the offshore development area												Nursery Grounds	
	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	East AngliaTWO Windfarm site	Offshore cable corridor
Plaice	•	•											n/a	
Dover sole				•	•								n/a	
Cod		•	•											
Lemon sole														
Whiting													n/a	n/a
Mackerel*					•	•	•							
Sandeel sp.														
Sprat					•	•								
Herring*													n/a	
Thornback ray				•	•	•	•	•					n/a	
Top	Gravid females present year round													

Spawning times and Intensity colour key: orange= high intensity spawning / nursery ground, yellow= low intensity spawning / nursery grounds, grey= unknown spawning / nursery grounds, • = peak spawning, n/a= no overlap with spawning / nursery grounds


*For these species there is no overlap with spawning grounds however they are within close proximity to the offshore development area.

Figure 2-2 Summary of EA TWO spawning and nursery grounds that overlap with the array and ECC

2.2.2.3 Ornithology

As presented in Volume 1, Chapter 12: Offshore Ornithology, the following species were reported to be present within the EA TWO site: red-throated diver, Great northern diver, fulmar, gannet, arctic skua, great skua, lesser black-backed gull, herring gull, great black-backed gull, kittiwake, common tern, guillemot, razorbill and puffin. All these species are listed as EC Birds Directive Migratory Species. For the ECC, no site-specific surveys were completed and only one species has been assessed, red-throated diver, with data provided from a Special Protection Area (SPA) study commissioned by Natural England.

During the breeding season only kittiwake and lesser black-backed gull exceeded the threshold for regionally important numbers, and no species were present in nationally or internationally important numbers. During winter red-throated diver (EC Birds Directive Annex I Species), fulmar, kittiwake, lesser black-backed gull, guillemot and razorbill (all EC Birds Directive Migratory Species) exceeded the threshold for regionally important numbers, and no species were present in nationally or internationally important numbers.

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Nature conservation designated sites as relevant to EA TWO, including SPA's are described in Section 2.2.3 of this document.

2.2.2.4 Marine Mammals

As presented in the ES, the diversity and abundance of marine mammal species found within the SNS is relatively low. There are seven marine mammal species that occur regularly over large parts of the SNS; these species include grey seal (*Halichoerus grypus*), harbour seal (*Phoca vitulina*), harbour porpoise (*Phocoena phocoena*), bottlenose dolphin (*Tursiops truncatus*), white-beaked dolphin (*Lagenorhynchus albirostris*), killer whale (*Orcinus orca*) and minke whale (*Balaenoptera acutorostrata*).

Harbour porpoise is the most commonly sighted cetacean in the North Sea, and is the cetacean most frequently observed in the EA TWO site and ECC, based on boat and aerial survey data. Grey seal and harbour seal are also commonly seen within the North Sea, however the use of EA TWO by these species is low, based on boat surveys.

2.2.3 Nature Conservation Designations

Table 2-1 provides information of designated sites considered in the Appropriate Assessment (AA) in the ES.

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Table 2-1 Nature conservation designations

Site name	Area	Site description	Conservations objectives	Distance to EA TWO
Southern North Sea Special Area of Conservation (SAC)	36,951 km ²	<p>The Southern North Sea SAC has been identified as an area of importance for harbour porpoise (<i>Phocoena phocoena</i>). This site stretches from the central North Sea (north of Dogger Bank) to the Straits of Dover in the south. The majority of the site lies offshore, though it does extend into coastal areas of Norfolk and Suffolk crossing the 12 nm boundary. The SAC ranges in depth from Mean Low Water down to 75 m, with most of it shallower than 40 m, and is characterised by its sandy, coarse sediments which cover much of the site.</p> <p>The SAC is divided into seasonal components which correlate to area in which persistently high densities of harbour porpoise are recorded. These areas are defined as summer (April to September inclusive), and winter (October to March inclusive).</p> <p>The assumption is that sites are used differently during summer and winter presumably driven by shifts in prey/prey preferences.</p>	<p>To avoid deterioration of the habitats of the harbour porpoise or significant disturbance to the harbour porpoise, thus ensuring that the integrity of the site is maintained, and the site makes an appropriate contribution to maintaining the Favourable Conservation Status (FCS) for the harbour porpoise.</p> <p>To ensure for harbour porpoise that, subject to natural change, the following attributes are maintained or restored in the long term:</p> <ul style="list-style-type: none"> • The species is a viable component of the site; • There is no significant disturbance of the species; and • The supporting habitats. 	0 km
Outer Thames Estuary SPA	3,924 km ²	<p>The Outer Thames Estuary SPA is classified for the protection of the largest aggregation of wintering red-throated diver (<i>Gavia stellata</i>) in the UK, an estimated population of 6,466 individuals, which is 38% of the wintering population in the UK. It also protects foraging areas for common tern (<i>Sterna hirundo</i>) (2.66% of UK population (2011 - 2015)) and little tern (<i>Sternula albifrons</i>) (19.64% of UK population (2011 - 2015)) during the breeding season.</p>	<p>The conservation objectives for the protected features of the SPA are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and 	0 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
			<ul style="list-style-type: none"> The distribution of qualifying features within the site. 	
The Sandlings SPA	33.91 km ²	<p>The Sandlings SPA lies near the Suffolk Coast between the Deben Estuary and Leiston. It lies within the Suffolk Coast and Heaths National Character Area (NCA) a mainly flat or gently rolling landscape that forms a long, narrow band extending between 10 and 20 km inland. It is often open land but with few commanding viewpoints. In many places, and especially near the coast, wildlife habitats and landscape features lie in an intimate mosaic, providing great diversity in a small area. Much of the NCA forms part of the Suffolk Coast and Heaths Area of Outstanding Natural Beauty (AONB).</p>	<p>The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified.</p> <p>The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> The extent and distribution of the habitats of the qualifying features; The structure and function of the habitats of the qualifying features; The supporting processes on which the habitats of the qualifying features rely; The populations of each of the qualifying features; and The distribution of qualifying features within the site. 	0 km
Orfordness - Shingle Street SAC	8.88 km ²	<p>The Orfordness - Shingle Street SAC comprises of the following habitats:</p> <ul style="list-style-type: none"> Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins) (25%); Salt marshes, Salt pastures, Salt steppes (15%); Shingle, Sea cliffs, Islets (40%); Improved grassland (18%); and Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites) (2%). <p>The primary reason for designation is the following Annex 1 habitats.</p> <ul style="list-style-type: none"> Coastal lagoons; 	<p>Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring:</p> <ul style="list-style-type: none"> The extent and distribution of qualifying natural habitats; The structure and function (including typical species) of qualifying natural habitats, and The supporting processes on which qualifying natural habitats rely. 	37 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
		<ul style="list-style-type: none"> Annual vegetation of drift lines; and Perennial vegetation of stony banks. 		
Alde-Ore Estuary SPA and Ramsar	24.04 km ²	<p>The Alde-Ore Estuary SPA sustains nationally important numbers of:</p> <ul style="list-style-type: none"> Marsh Harrier (<i>Circus aeruginosus</i>) at least 1.9% of the GB breeding population 5 year mean, 1993-1997 Avocet (<i>Recurvirostra avosetta</i>) (Western Europe/Western Mediterranean – non- breeding) 23.1% of the GB breeding population 5 year mean, 1990-1994 Little tern (<i>Sterna albifrons</i>) (Eastern Atlantic – breeding) 2% of the GB breeding population 5 count mean, 1993-4, 1996-8 Sandwich tern (<i>Sterna sandvicensis</i>) (Western Europe/Western Africa) 1.2% of the GB breeding population 5-year mean, 1992-1996. Over winter the area regularly supports: Ruff (<i>Philomachus pugnax</i>) (Western Africa -wintering) 0.4% of the GB population 5 year peak mean 1991/92-1995/96 Avocet (<i>Recurvirostra avosetta</i>) (Western Europe/Western Mediterranean - breeding) 60.3% of the GB population 5 year peak mean 1991/92-1995/96 <p>Additional species that breed on the site include:</p> <ul style="list-style-type: none"> During the breeding season the area regularly supports: Lesser black back gull (<i>Larus fuscus</i>) (Western Europe/Mediterranean/Western Africa) 11.3% of the breeding population 5 year mean 1994-1998 Over winter the area regularly supports: Redshank (<i>Tringa tetanus</i>) (Eastern Atlantic - wintering) 1.1% of the population 5 year peak mean 1991/92-1995/96 	<p>Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the FCS of its Qualifying Features, by maintaining or restoring;</p> <ul style="list-style-type: none"> The extent and distribution of qualifying natural habitats; The structure and function (including typical species) of qualifying natural habitats; and The supporting processes on which qualifying natural habitats rely. 	37 km
Greater Wash SPA	3, 536 km ²	The Greater Wash SPA is located in the mid-southern North Sea between Bridlington Bay in the north and the	The Conservation Objectives for the site are: “With regard to the SPA and the individual	37 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
		Outer Thames Estuary SPA in the south. The SPA boundary encompasses offshore areas identified as containing high densities or encompassing breeding season foraging ranges of the qualifying bird species. To the north, off the Holderness coast in Yorkshire, seabed habitats primarily comprise coarse sediments, with occasional areas of sand, mud and mixed sediments. Subtidal sandbanks occur at the mouth of the Humber Estuary, primarily comprising sand and coarse sediments. Offshore, soft sediments dominate, with extensive areas of subtidal sandbanks off The Wash as well as north and east Norfolk coasts. Closer inshore at The Wash and north Norfolk coast, sediments comprise a mosaic of sand, muddy sand, mixed sediments and coarse sediments, as well as occasional Annex I reefs. The area off the Suffolk coast continues the mosaic habitats mostly dominated by soft sediment.	<i>species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change; Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring; The extent and distribution of the habitats of the qualifying features The structure and function of the habitats of the qualifying features The supporting processes on which the habitats of the qualifying features rely The population of each of the qualifying features, and, The distribution of the qualifying features within the site".</i>	
Broadland SPA	55 km ²	Broadland is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk in eastern England. The Broads are a series of flooded medieval peat cuttings. They lie within the floodplains of five principal river systems, known as Broadland. The area includes the river valley systems of the Bure, Yare and Waveney and their major tributaries. The distinctive open landscape comprises a complex and interlinked mosaic of wetland habitats including open water, reedbeds, carr woodland, grazing marsh, tall herb fen, transition mire and fen meadow, forming one of the finest marshland complexes in the UK. The differing types of management of the vegetation for reed, sedge and marsh hay, coupled with variations in hydrology and substrate, support an extremely diverse range of plant communities. The area is of international importance for a variety of wintering and breeding raptors and waterbirds associated with extensive lowland marshes.	<p>The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above).</p> <p>The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and 	39.76 km

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			<ul style="list-style-type: none"> The distribution of qualifying features within the site. 	
Deben Estuary SPA	9.76 km ²	<p>The Deben Estuary SPA regularly supports, in winter, internationally important numbers of avocet (<i>R. avosetta</i>) (7.5 % of the GB population 5-year peak mean 1991/92-1995/96), a species listed on Annex 1. Key sub-features of the site are intertidal mudflat communities and saltmarsh communities. The SPA also regularly supports, in winter, internationally important numbers of dark-bellied brent geese (<i>Branta bernicla</i>) (0.8% of the population 5-year peak mean 1991/92-1995/96).</p> <p>The site also supports a notable assemblage of breeding and wintering wetland birds. The habitat supporting bird feeding and roosting habitat: eelgrass beds, intertidal sandflat and mudflat communities and saltmarsh, all occur within the SPA.</p>	<p>The conservation objective for the internationally important populations of the regularly occurring Annex 1 bird species and regularly occurring migratory bird species. Subject to natural change, maintain in favourable condition the habitats for the internationally important populations of the regularly occurring Annex 1 bird species, under the Birds Directive, in particular:</p> <ul style="list-style-type: none"> Intertidal mudflat communities; and Saltmarsh communities. 	50 km
Breydon Water SPA	12 km ²	<p>Breydon Water SPA was classified in 1996; however, a boundary extension was added in 2000 to incorporate Halvergate marshes. Breydon Water SSSI and Halvergate Marshes SSSI are the constituent sites of the Breydon Water SPA and together include the landward extension of the Breydon Water SPA. With the extension, the SPA now covers 1202.94 ha and its hinterland lie within the Broads, one of the family of National Parks. The estuary forms the lower reaches of the Yare and Waveney rivers, which drain most of central East Anglia. At high tide Breydon Water forms a large water body and as the tide recedes, remaining water forms a narrow channel. The SPA incorporates a number of important supporting habitats such as, intertidal mudflats, saltmarsh and freshwater grazing marsh. The grazing marshes that lie on the landward side of the seawall on Breydon Water SSSI and Halvergate Marshes SSSI are not covered by the highest astronomical tide and therefore lie outside the boundary of Breydon Water European Marine Site.</p>	<p>The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above).</p> <p>The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> The extent and distribution of the habitats of the qualifying features; The structure and function of the habitats of the qualifying features; The supporting processes on which the habitats of the qualifying features rely; The populations of each of the qualifying features; and 	50.97 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
			<ul style="list-style-type: none"> The distribution of qualifying features within the site. 	
Vlaamse Banken SAC	1099 km ²	The Vlaamse Banken SCI is located in Belgian waters and extends for some 109,940 ha. The site is designated for the following Annex I habitats: Sandbanks which are slightly covered by sea water all the time; and Reefs. Additional information for the Vlaamse Banken SCI can be found in the Natura 2000 data form.	No information on conservation status or conservation targets for the site features have been sourced.	59 km
Bancs des Flandres SAC	1129 km ²	This site is in France, located in the Atlantic biogeographical region, designated since January 2010 and it protects 3 species of the Nature Directives and 1 habitat type of the Habitats Directive; sandbanks which are slightly covered in sea water all the time.	No information on conservation status or conservation targets for the site features have been sourced.	82 km
Vlakte van de Raan SAC	175 km ²	This site is in the Netherlands, located in the Atlantic and Marine Atlantic biogeographical regions, designated since December 2008. It protects 6 species of the Nature Directives and one habitat of the Habitats Directive.	No information on conservation status or conservation targets for the site features have been sourced.	82 km
SBZ 2 / ZPS 2 SPA	81 km ²	This site is in Belgium, located in the Marine Atlantic biogeographical region. It protects 15 species under the Nature Directives and 2 habitat types of the Habitats Directive.	No information on conservation status or conservation targets for the site features have been sourced.	84 km
Voordelta SAC and SPA	835 km ²	The site is located in the Netherlands and has been a designation since July 1998. It protects 37 species under the Nature Directives and 7 habitats under the Habitats Directive.	No information on conservation status or conservation targets for the site features have been sourced.	84 km
Vlakte van de Raan SCI	175 km ²	The site is located in Belgian waters and extends for some 17,500 ha. Additional information for the Vlakte van der Raan SCI can be found in the Natura 2000 data form.	No information on conservation status or conservation targets for the site features have been sourced.	89 km
SBZ 3 / ZPS 3 SPA	57 km ²	This site is in Belgium, located in the Marine Atlantic biogeographical region. It protects 15 species of the Nature Directives and 2 habitat types of the Habitats Directive.	No information on conservation status or conservation targets for the site features have been sourced.	92 km
North Norfolk Coast SPA	78.86 km ²	This SPA is located east of The Wash on the northern coastline of Norfolk, eastern England. The SPA covers	The site's conservation objectives apply to the site and the individual species and/or assemblage of	94 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
		<p>7886.79 ha and extends 40km from Holme to Weybourne and includes a great variety of coastal habitats; intertidal mudflats and sandflats, coastal waters, saltmarshes, shingle, sand dunes, freshwater grazing marshes and reedbeds.</p> <p>The site is important within Europe as one of the largest areas of undeveloped coastal habitat of its type. It is the fourth most important wetland site for waterfowl in Britain. The site is particularly important for saltmarsh containing some of the best examples of this habitat type in Europe.</p>	<p>species for which the site has been classified (the 'Qualifying features' listed above).</p> <p>The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of the habitats of the qualifying features; • The structure and function of the habitats of the qualifying features; • The supporting processes on which the habitats of the qualifying features rely; • The populations of each of the qualifying features; and • The distribution of qualifying features within the site. 	
The Wash and North Norfolk Coast SAC	32 km ²	<p>The North Norfolk Coast SAC has an area of 3,207.37 ha and is located to the east of The Wash embayment on the East coast of England. The Annex I habitats that are marine features of the site include coastal lagoons and Mediterranean and thermo-Atlantic halophilous scrub, both of which are listed as primary reasons for selection of the site. Otter is the only Annex II species listed as a qualifying feature of the site.</p> <p>Coastal lagoons are a priority habitat and are relatively uncommon in the UK. They can increase biodiversity and provide important habitats for breeding and overwintering birds; for this reason, much of the coastal lagoon resource within the UK has been included in the SAC series.</p> <p>The North Norfolk Coast SAC was designated for percolation lagoons and together with the Orfordness-Shingle Street SAC and the Benacre-Eastern Bavents SAC, forms a significant part of the percolation lagoon resource in this part of the UK. Percolation lagoons are</p>	<p>The site's conservation objectives apply to the site and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying features' listed above).</p> <p>The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring:</p> <ul style="list-style-type: none"> • The extent and distribution of qualifying natural habitats and habitats of the qualifying species; • The structure and function (including typical species) of qualifying natural habitats; • The structure and function of the habitats of the qualifying species; 	94 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
		separated from the sea by shingle banks but allow sea water to enter by percolating through the shingle or by over-topping the bank (e.g. in storms). Salinity in the lagoons is maintained by this percolation of seawater through the beach or dune barrier with the substrate located at the bottom of the lagoons being generally made up of shingle covered by mud.	<ul style="list-style-type: none"> The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; The populations of each of the qualifying species; and The distribution of qualifying species within the site. 	
SBZ 1 / ZPS 1 SPA	63 km ²	This site is in Belgium, located in the Marine Atlantic biogeographical region. It has been under birds directive since 1900. It protects 15 species of the Nature Directives and 2 habitat types of the Habitats Directive.	No information on conservation status or conservation targets for the site features have been sourced.	94 km
Humber Estuary SAC	376 km ²	The Humber Estuary SAC extends about 70 km from the mouth of the Humber, past the ports of Grimsby, Immingham, Hull and Goole and up to the limit of saline intrusion on the rivers Ouse and Trent and covers an area of around 366.57 km ² .	<p>The conservation objectives for the site are as follows:</p> <p><i>“The objectives are to ensure that, subject to natural change, the integrity of the site is maintained or restored as appropriate, and that the site contributes to achieving the Favourable Conservation Status of its qualifying features, by maintaining or restoring: the extent and distribution of qualifying natural habitats and habitats of the qualifying species; the structure and function (including typical species) of qualifying natural habitats; the structure and function of the habitats of the qualifying species; the supporting processes on which qualifying natural habitats and the habitats of qualifying species rely; the populations of each of the qualifying species; and the distribution of qualifying species within the site”.</i></p>	164 km
Flamborough and Filey Coast SPA	78.5 km ²	Flamborough and Filey Coast SPA is located on the Yorkshire coast between Bridlington and Scarborough. The site has been designated due to its importance by supporting over 1% of the biogeographical populations of four regularly occurring migratory species and a breeding	<p>Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring;</p> <ul style="list-style-type: none"> The extent and distribution of the habitats of the qualifying features 	248 km

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Site name	Area	Site description	Conservations objectives	Distance to EA TWO
		<p>seabird assemblage of European importance. This includes:</p> <ul style="list-style-type: none"> Black-legged kittiwake <i>Rissa tridactyla</i>, represents 2% of the North Atlantic subspecies Northern gannet <i>Morus bassanus</i> represents 2.6% North Atlantic Common guillemot <i>Uria aalge</i> represents 15.6% of the subspecies population (<i>Uria aalge albionis</i>); Razorbill <i>Alca torda</i> represents 2.3% of the subspecies population (<i>Alca torda islandica</i>) 	<ul style="list-style-type: none"> The structure and function of the habitats of the qualifying features The supporting processes on which the habitats of the qualifying features rely; The population of each of the qualifying features, and, The distribution of the qualifying features within the site. 	

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2.2.4 Offshore Human Environment

A summary of the key receptors concerning the human environment for EA TWO are provided within this section.

2.2.4.1 Existing and Planned Installations in the Vicinity

2.2.4.1.1 Offshore Wind


As presented in the Volume 1, Chapter 17: Infrastructure and Other Users of the ES, the UK waters of the SNS is an area of significant offshore wind development activity, having been subject to several phases of offshore wind development. EA TWO is neighboured by SPR offshore windfarm developments EA ONE, EA ONE North and EA THREE. The array areas are approximately the following distances from EA TWO:

- 10.01 km for EA ONE (operational);
- 10.44 km for EA ONE North (to be constructed); and
- 47.73 km for EA THREE (under construction).

A summary of other offshore windfarm developments within close proximity to EA TWO (within 50 km) are presented below.

Table 2-2 Summary of offshore windfarm developments within 50 km of EA TWO

Name	Status	EA TWO ECC (km)	EA TWO Array (km)
Five Estuaries	In Planning	16.13	5.32
Galloper	Operational	17.1	7.2
Greater Gabbard	Operational	20.3	12.6
Gunfleet Sands Demo	Operational	58.6	74.5
Gunfleet Sands I	Operational	53.4	69.7
Gunfleet Sands II	Operational	52.28	67.18
London Array	Operational	52.4	58.5
Belwind phase 1	Operational	67.64	50.51
Belwind phase 2	Operational	66.65	49.53
Borssele	Operational	62.81	45.64
Borssele Kavel IV	Operational	62.81	45.64
Norfolk Boreas	Consented	71.7	78.1
Norfolk Vanguard East	Consented	61.21	66.78
Norfolk Vanguard West	Consented	55.05	63.03
Scroby Sands	Operational	33.4	49.3
North Falls	In Planning	40.55	31.50
Ijmuiden Zone	In Planning	76.15	77.92
Hollandse Kust D	In Planning	91.54	85.02
HKW Noord - HKW-N	In Planning	70.50	59.62

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2.2.4.1.2 Oil and Gas

Historically, there have been three oil and gas platforms situated in the northern part of the East Anglia Zone, one of which has recently been decommissioned and removed. Any significant additional infrastructure including operational platforms, wells and pipelines are located just outside the northern boundary of the East Anglia Zone.

There is no surface or subsurface infrastructure in the EA TWO windfarm site. Within 50 km of the EA TWO offshore development area there are ten wells, with the closest being 1 km away. However, these wells are of 'plugged' or 'abandoned' status and will 'never be used or re-entered again' (Oil and Gas Authority 2018).

There are no pipelines located within the EA TWO offshore development area. Two gas pipelines cross the former East Anglia Zone, the Bacton-Zeebrugge interconnector running northwest to southeast, 9 km northeast of the EA TWO offshore development area and the Balgzand-Bacton Line gas pipeline running east – west, 48 km north of the EA TWO windfarm site.

No licensed blocks for oil and gas overlap the offshore development area.

2.2.4.1.3 Subsea Telecommunications and Power Cables

The SNS has a high density of sub-sea cabling that provides links between the UK, continental Europe and beyond. There are two active telecommunications cables that run through the EA TWO ECC. Several out of service subsea cables are known to run through EA TWO. Nine cables that are in planning or are operational intersect with the offshore development area.

The routes of the three Greater Gabbard Offshore Wind Farm offshore export cables and the three proposed Galloper offshore windfarm export cables would cross the EA TWO ECC from north to south. This would require up to 30 cable crossings assuming a worst case of four EA TWO offshore export cables installed within the ECC.

The worst case for total number of cable crossings includes contingency for potential discoveries and are as follows:

- Export cable: 30 crossings;
- Platform link cables: 30 crossings; and
- Inter-array cables: 25 crossings


In addition, there are likely to be disused cables that date from over 100 years ago, many of which are now lost or not shown on charts and represent a risk to seabed activity. Modern charts only display cables decommissioned since 1987.

2.2.4.2 Navigation

As presented in Volume 1, Chapter 14 Shipping and Navigation, shipping in the vicinity of EA TWO includes commercial shipping, fishing and recreational vessels; based upon marine traffic survey data presented in the EA TWO ES a variety of vessels pass through the Project each day; 39% of these were cargo vessels, 15% tankers, 14% fishing vessels, and 15% recreational vessels.

A number of shipping routes pass in proximity to the site, with a large number of vessels recorded using two Deep Water Routes passing to the north and east of the array. In terms of commercial vessel routes passing through EA TWO, a number of vessels transit NW (north-west) or SE (south-east) through the site, generally between ports in the NE (north-east) of the UK and ports in the Netherlands and Belgium. Passenger ferry routes to Rotterdam comprise part of this commercial traffic. The EA TWO ECC intersects dredging transit routes with relatively high vessel densities.

Levels of recreational activity within and in the vicinity of EA TWO are relatively low according to Royal Yachting Association data; the vast majority of recreational vessels recorded are sailing yachts. The Royal Yachting Association data also shows there are two eastbound cruising routes for recreational vessels passing through

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EA TWO array. However, recreational craft should be able to transit between the wind turbines in suitable conditions as well as route around the EA TWO windfarm site.

2.2.4.3 Commercial Fishing

As presented in Volume 1, Chapter 13 Commercial Fisheries, the EA TWO ES confirms that sightings of commercial fishing vessels are comprised principally of UK, Dutch and Belgian vessels, with considerably lower numbers of French and German vessels observed. The ES primarily uses data from 2011 to 2017; however, where relevant, more recent fishing data has been cross referenced. The ES refers to fisheries data from the following International Council for the Exploration of the Sea. (ICES) rectangles, this information has been utilised for informing this baseline:

- ICES rectangle 33F1, where the inshore section of the ECC is located; and
- ICES rectangle 33F2, where the offshore section of the ECC and the East Anglia TWO windfarm site are located.

An overview of the principal fishing fleets and methods operating in the offshore development area is given based on analysis of MMO surveillance sightings from 2011 and 2017 by method and nationality. In rectangle 33F1, where the inshore section of the ECC is located, most surveillance sightings are of UK vessels, principally potters / whelkers, followed by trawlers, long liners and netters. French trawlers and Belgian beam trawlers have also been observed in this inshore rectangle in some numbers with vessels from other nationalities showing negligible records. In this context it is important to note that both French and Belgian vessels hold historic fishing rights within this rectangle, being allowed to fish within the UK's 6 and 12 nm limit in this area.

In rectangle 33F2, where the offshore section of the ECC and the East Anglia TWO windfarm site are located, the majority of surveillance sightings are of Dutch and Belgian vessels, primarily beam trawlers and trawlers (unspecified).

The majority of local UK vessels active in the vicinity of the offshore development area are of under 10 m in length. Many of these are multipurpose having the ability to deploy multiple gears. The principal methods used by these vessels include potting, netting, long lining and trawling and target shellfish species (lobster *Homarus gammarus*, edible crab *Cancer pagurus* and whelk *Buccinum undatum*) as well as fish species such as sole, plaice, rays, cod *Gadus morhua* and bass. By virtue of their small size and associated limited operational range, these vessels primarily operate within the 12nm limit (and mostly within the 6nm limit) and therefore in areas relevant to of the inshore section of the ECC (within rectangle 33F1). Various vessels are however known to target areas further offshore, including areas as far out as the East Anglia TWO windfarm site. However, in offshore areas within the study area (rectangle 33F2), the majority of landings are from larger vessels (over 15 m), mainly beam trawlers targeting flatfish species such as sole and plaice.

2.2.4.4 Offshore Archaeological and Cultural Heritage


As presented in Volume 1, Chapter 16 Marine Archaeology and Cultural Heritage, comprehensive archaeological assessments are included and have been summarised in the offshore Written Scheme of Archaeological Investigation (WSI) (EA2-GEN-CNS-PLN-IBR-000109), which has been approved by the MMO (in consultation with Historic England under the EA TWO dMLs).

A geophysical survey campaign has been undertaken, and shallow geological (palaeolandscape) features of archaeological interest were differentiated in accordance with the definitions set out below.

Criteria discriminating relevance of shallow geological features:

- P1 Feature of probable archaeological interest, either because of its palaeography or likelihood for producing paleoenvironmental material; and
- P2 Feature of possible archaeological interest.

Seabed features of archaeological interest were differentiated in accordance with the definitions set out below:

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- A1/High: Anthropogenic origin of archaeological interest;
- A2/Medium/Low: Uncertain origin of possible archaeological interest; and
- A3: Historic record of possible archaeological interest – United Kingdom Hydrographic Office reference to feature that shows no trace on seabed.

In the case of archaeological discovery during the Decommissioning, contractors are to implement the Protocol for Archaeological Discoveries (PAD) (EA2-GEN-ENV-PRO-IBR-000001) (or its equivalent at the time of decommissioning). The PAD will confirm the roles and responsibilities, reporting process and actions that must be taken by the Contractor or Project Personnel in the event of an unexpected or incidental find relating to the historic environment. The aim of the PAD is to monitor and manage unexpected or incidental archaeological finds to mitigate any adverse effects of the development of offshore wind projects upon the historic environment and to ensure that the cultural heritage is understood and protected accordingly. In addition, the Project will consider, in consultation with Historic England, the need for a Decommissioning Archaeological Method Statement to outline how such above measures will be met in good time ahead of work commencing, together with Programmes for post-decommissioning monitoring requirements.

2.2.4.5 Dredging, Dumping and Disposal

No aggregate dredging areas exist within the proposed EA TWO project boundaries. The closest dredging area is licence area 430 (Southwold Aggregates Area) which lies 3 km west of the EA TWO array and 3.6 km to the north of the ECC.

EA TWO has a designated disposal site, which overlaps partially with the Project array and ECC; this is licenced under the dMLs. EA TWO is permitted to dispose of drill arisings and material extracted during seabed preparation activities. Should disposal sites require reopening for decommissioning works, appropriate licencing requirements will be met, including consideration of potential impacts and any need for contaminant sampling.

2.2.4.6 Civil Aviation and Ministry of Defence


The airspace above the northern portion of the EA TWO windfarm site from sea level to FL195 is uncontrolled and classified as Class G airspace. The airspace above the central portion of the EA TWO windfarm site is Class G to FL135, and above the southern portion is Class G to FL85. The uncontrolled airspace immediately above the EA TWO windfarm site is transited by most types of civilian aircraft operating, quite legitimately, 'off-route' and is also used by military aircraft for general training and exercise purposes. Additionally, the broad area is crossed by a number of HMRs that serve the offshore oil and gas industry platforms in the southern North Sea.

The most easterly point of the East Anglia TWO windfarm site boundary is 7 km west of the London / Amsterdam Flight Information Region airspace boundary. The north of the East Anglia TWO windfarm site marginally overlaps with the Lakenheath South Aerial Tactics Area.

3 DESCRIPTION OF ITEMS TO BE DECOMMISSIONED

At the end of EA TWO's operational lifetime, it is anticipated that all structures above the seabed will be completely removed, with monopiles cut approximately 1 to 2 m below the seabed. The decommissioning sequence is expected to generally be the reverse of the construction sequence. Decommissioning industry best practice will be applied, considering the legislation applying at that time. Items to be decommissioned, as well as the methodology, will be agreed in due time with the relevant authorities and through revisions to this DP.

At the time of writing, some design details such as exact locations of infrastructure (e.g., due to micro-siting to avoid environmental and engineering constraints) are not finalised. These details will be updated in future revisions of this DP.

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Further details of the decommissioning process, including the decommissioning method for each of the major components, are set out in Section 4.

3.1 OFFSHORE TOPSIDE INFRASTRUCTURE AND FOUNDATION

The main components to be decommissioned are summarised in Table 3-1.

Table 3-1 Summary of topside infrastructure and foundations components to be decommissioned

Components	Number	Key dimensions
WTGs		
WTG	Up to 64	Ref: EA2-WTG-ENG-SPE-SGR-000105 <ul style="list-style-type: none"> Siemens: SG DD-236 Tower weight: 1100 tonnes Tower: 8 m bottom diameter x 123 m height Nacelle: 815 tonnes Nacelle: 9 m x 2 0 m x 11 m height Blades: 60 tonnes Blade: 4.5 m diameter x 115 m height Maximum tip height from LAT of 263 m Maximum hub height from LAT of 145 m Minimum clearance above sea level (MHWS) of 22 m
WTG foundations	Up to 64 monopiles	<u>Monopile</u> <ul style="list-style-type: none"> Approximately 8 m top diameter, 10 m bottom diameter. Length will vary dependant on seabed conditions and water depth. Transition pieces will be mounted on the monopile during fabrication and will form the point of connection between the WTG to the support structure. Maximum length: 80 – 95 m Weights: 1650 – 2265 tonnes Embedment depth range Approximately 34 m <u>Transition Piece</u> <ul style="list-style-type: none"> Transition piece weight: 760 tonnes Transition piece maximum length: 21 m Approximately 8m top diameter, 10m bottom diameter
OFSS		
Topside	One	<ul style="list-style-type: none"> The preliminary dimensions of the topside are; 59 m x 37 m x 23 m (Length x Width x Height (L x W x H)) Number of decks: 5 Topside weight: 5652 tonnes
OFSS foundations	One jacket	<ul style="list-style-type: none"> Type: Four legs, two pin piles per leg Weight: 3485 tonnes Footprint: 42 m x 40 m Height: 58 m Pile weight: 2624 tonnes

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3.2 CABLES

It is EATL's preferred option methodology to bury the inter-array and export cables during installation, however there are instances in which additional cable protection may be required in order to achieve the intended depth of lowering requirement and/or protection of the asset. Cable crossings will also require cable protection to be placed on the seabed. At the time of writing, it is assumed that the cable protection will be left *in situ* following decommissioning, with the exception of cable protection systems at foundations to enable the removal of the IACs from the WTGs and the OFSS. The main cable components to be decommissioned are summarised in Table 3-2.

Table 3-2 Summary of cables to be decommissioned

Components	Number	Key dimensions
IAC's	<ul style="list-style-type: none"> 3-core 66 kilovolt (kV) armoured submarine cables Copper or aluminium conductors Insulation / conductor screening and steel wire armour with a further outer protective layer. All cables will incorporate optical fibres for communication purposes. Further fibres may be required for condition monitoring and/or temperature measurement purposes. 	Approximate 200 km in length
Export Cable	<ul style="list-style-type: none"> Two single core 320 kV armoured submarine cables bundled together with a fibre optic cable. 	Approximately 160 km in length (80 km per cable)

4 DESCRIPTION OF PROPOSED DECOMMISSIONING MEASURES

4.1 INTRODUCTION

This section provides an overview of the decommissioning options available and sets out the proposed approach to the decommissioning of the various components of the Project as described in Section 3.


4.2 ADHERENCE TO RELEVANT LEGISLATION AND GUIDANCE

The proposed decommissioning measures set out in the following section aim to adhere to the following key UK and International legislation and guidance notes:

- Decommissioning of Offshore Renewable Energy Installations (OREIs) under the Energy Act 2004: Guidance notes for Industry (BEIS, 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, DECC;
- Convention for the Protection of the Marine Environment of the North-East Atlantic (OSPAR) guidance documents on offshore windfarms;
- Environmental Liability Directive;
- Guidelines for Environmental Risk Assessment and Management, Defra, September 2002; and
- United Nations Convention on the Law of the Sea (UNCLOS), 1982.

Other legislation of relevance includes the following:

- Hazardous Waste Regulations 2005;
- Coastal Protection Act 1949;
- Marine and Coastal Access Act 2009;

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- The Water Resources Act 1991;
- Directive 2008/98/EC on waste (Waste Framework Directive); the Conservation of Habitats and Species Regulations 2010;
- 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;
- Construction (Design and Management) Regulations (CDM) 2007;
- The Conservation of Habitats and Species Regulations 2010 (as amended) which implements the EC Directive 92/43/EEC in the United Kingdom (if there is potential to disturb European Protected Species);
- Appropriate Health and Safety Regulations;
- MGN 654 and its annexes for OREIs - Guidance on UK Navigational Practice, Safety and Emergency Response; in particular Annex 4 which addresses risk mitigation for all phases of the project including decommissioning, and Annex 5 which addresses the SAR considerations;
- UK Marine Policy Statement;
- East Inshore/Offshore Marine Plans; and
- The Emergency Response and Co-operation Plan (ERCoP) (which will be developed before construction works start). A separate ERCoP will also be developed specifically for decommissioning prior to any decommissioning activities commencing.

In alignment with DESNZ guidance (BEIS, 2019), this DP will undergo comprehensive review 12-18 months before the first security provision to identify any changes in assumptions on cost and risk. From payment of the first security onward, EATL will review the DP annually thereafter with any changes submitted to DESNZ for approval. Even if no changes are necessary, written confirmation stating a high-level review has been undertaken will still be submitted to DESNZ. A final review alongside any necessary updates will be conducted and submitted to DESNZ two years prior to the commencement of decommissioning, or sooner if deemed necessary by EATL or DESNZ. The timing of the review ensures that the project is sufficiently close to the commencement of decommissioning for legislation and relevant guidance to be up to date at the point of decommissioning. It also allows sufficient time for any necessary assessments to be undertaken or consents to be obtained. This DP will be updated following OFTO divestment.


The East Offshore Marine Plan (which reflects the requirements of the UK Marine Policy Statement) includes policies that apply to spatially discrete areas. One of these spatially discrete areas (E-AGG-3) overlaps with the EA TWO ECC. The E-AGG-3 policy is intended to enable public authorities to consider how proposals for marine development and activities within areas of high potential aggregate resource, as defined by British Geological Survey, may impact the ability to access commercially viable marine sand and gravel resources in the future. At the time of decommissioning, consultation with relevant stakeholders will be undertaken in relation to Policy E-AGG-3 and this will be fully considered within the updated DP that will be produced two years prior to the end of the operational period of EA TWO.

4.3 DECOMMISSIONING OPTIONS

EATL have considered alternative options for the decommissioning of EA TWO; with a brief summary of the options set out below. When making a final decision on the approach to decommissioning towards the end of the lifetime of EA TWO, EATL will take into consideration the Best Practicable Environmental Option (BPEO), commercial viability, the prevailing regulatory requirements and Health, Safety and Environment (HSE) risks.

4.3.1 Planned Phasing/Integration

EATL will liaise with other offshore windfarm developers and / or OFTOs in the vicinity of the EA TWO to identify and evaluate any potential opportunities for synergies or economies of scale through decommissioning facilities at the same time. If any opportunities are identified these will be discussed and agreed with the relevant authorities at the time of decommissioning and this document will be updated accordingly.

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4.3.2 Decommissioning and Construction of a New Windfarm

For this scenario, the assumption has been made that wind energy is still economically attractive at the end of the operational lifetime of EA TWO, and the technical integrity of EA TWO is declining. If this were the case, installing new and better technology may be more profitable than increasing the Operation and Maintenance (O&M) effort on the existing windfarm. Under this scenario, and subject to all necessary consents being granted, the existing windfarm would be decommissioned (either partially or in its' entirety) and a new windfarm erected.

4.3.3 Re-powering

In this scenario, it is assumed that wind energy is still economically attractive at the end of the operational lifetime of EA TWO, the technical integrity of the wind turbines is declining, but the electrical infrastructure and possibly the foundations have sufficient remaining design life. If electrical infrastructure is installed properly, its lifetime could be up to 50 years. Experience from the oil and gas industry indicates that the lifetime of foundations can also be extended outside the original design specifications.

By closely monitoring the structural integrity of the asset, it could be possible, subject to any necessary consents being granted, to re-use these parts of the system in a repowering or life extension of the windfarm – that is fitting new wind turbines to the existing foundation and electrical systems.

4.3.4 Step-down

This scenario assumes it is not profitable to invest in new technology but that most wind turbines will continue to perform sufficiently beyond the original design lifetime of 25 years. Under this scenario, the windfarm would be decommissioned through a controlled step-down. In this case, wind turbines would gradually shut down as their technical integrity declined. A decommissioning campaign would most likely be undertaken when the complete windfarm was shut down but could also be done stepwise if this was found to be more cost effective or if the prevailing regulatory regime required this approach. Any such step-down process would be set out for approval in the final DP.

4.4 GUIDING PRINCIPLES


In accordance with DESNZ guidance (BEIS, 2019), the choice of BPEO should be informed by an EIA. The EIA used to inform this DP is the one prepared in support of application for consent. The information relating to decommissioning in the ES will be reviewed to assess whether the final decommissioning methods and programme are substantially different from those detailed within this DP (for example, if the removal of marine growth before decommissioning is required or if the presence of invasive species on the structure is possible).

If necessary, more detailed assessment will be undertaken to accompany the application(s) for Marine Licence(s) (or appropriate consenting regime at the time of decommissioning) which will be required for decommissioning of EA TWO.

In considering the proposed DP for EA TWO, EATL will seek solutions for each offshore element of EA TWO which follow the principles described in Table 4-1.

Table 4-1 Guiding principles

Guiding principles	Comments
No harm to people	EATL is committed to adhering to the highest standards for health and safety throughout the lifecycle of the project. EATL seek to promote safe practices and minimise risk in the development and implementation of decommissioning solutions.
Consider the rights and needs of legitimate users of the sea	EATL respects the rights and needs of other users of the sea. Decommissioning activities will seek to minimise the impact on stakeholders and emphasis will be placed on clear, open communication.

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Guiding principles	Comments
Minimise environmental impact	The BPEO, at the time of considering the precise decommissioning procedure, will be chosen in order to minimise impact on the environment at an acceptable cost.
Promote sustainable development	In decommissioning, EATL will seek to ensure that, as far as is reasonably practicable, future generations do not suffer from a diminished environment or from a compromised ability to make use of marine resources.
Adhere to the 'Polluter Pays' principle	EATL's decommissioning and waste management provisions acknowledge our responsibility to incur the costs associated with our impact on the environment.
Maximise re-use of materials	EATL is committed to maximising the re-use of waste materials and pays full regard to the 'waste hierarchy'.
Ensure commercial viability	In order that commercial viability is maintained, the best available technique not entailing excessive cost decommissioning solutions will be sought.
Ensure practical integrity	Solutions that are necessary to achieve one or more of the above objectives must be practicable.

Considering the UK's commitments under the UNCLOS; IMO standards and OSPAR, EATL's starting assumption in establishing the decommissioning requirements has been complete removal of all offshore components to shore for reuse, recycling or incineration with energy recovery or disposal at a licensed site. This assumption has been assessed for all components against the key principles presented above. In some instances, this option has not been considered appropriate and alternative options have been considered. These alternatives have also been assessed according to the above principles and the optimum solution selected.

Drawing on the DESNZ guidance (BEIS, 2019), in certain circumstances decommissioning can be deferred to a later date. However, DESNZ expect a robust case demonstrating definite re-use or justifiable reasons for deferring and any deferral will need to be approved by the Secretary of State. Amongst the factors to be taken into account in considering the case for deferral will be the condition of the installation, the presence of any hazards, the environmental impact and the impact on other users of the sea.


It is possible that, in future, certain projects may be repowered (subject to the necessary regulatory consents). DESNZ will consider any amendment of DPs as a result of a proposed repowering on a case-by-case basis. DESNZ requires early engagement before decommissioning can be deferred, or repowering can be actioned.

The DESNZ guidance (BEIS, 2019) also notes there are some cases where it may be possible to consider solutions other than complete removal.

"If making arguments for exceptions to full decommissioning, developers/owners should take the following points into account:

- *Arguments should be tailored to the individual site and should set out whether the risks of buried cables etc are equal across all parts of the site (for example, are some areas of the site more prone to sediment shift?);*
- *Arguments should be relative to the effect of conducting the activity during construction;*
- *The IMO exception for 'extreme cost' is not normally expected to be accepted where it is the sole reason being cited for partial decommissioning;*
- *Where safety concerns are being cited, this is likely to be given greater weight if written evidence from a third party (such as the Health and Safety Executive or a known decommissioning contractor) can be provided; and*
- *The developer/owner is encouraged to consider using the 'Comparative Assessment Framework' set out in decommissioning guidance for the Oil and Gas sector when determining and setting out their position.*

Where less than full decommissioning is proposed, developers/owners will need to engage with other regulators (such as the Marine Management Organisation and Natural Resources Wales in respect of Marine

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Licences and Maritime and Coastguard Agency and the General Lighthouse Authority in connection with navigational risk) and their landlord on the acceptability of the proposals.”

4.5 PROPOSED DECOMMISSIONING MEASURES

This section identifies parts of EA TWO where EATL propose that the infrastructure will be removed, or be left *in situ*, and provides an assessment of the decommissioning options in relation to the guiding principles set out in Table 4-1.

A summary of the proposed decommissioning measures for the offshore components of EA TWO are outlined in Table 4-2. The sections below go into further detail on the proposed decommissioning measures.

Table 4-2 Summary of proposed decommissioning measures for EA TWO

Component	Proposed decommissioning measures
Wind Turbines	Complete removal from site and recycle at a suitable onshore facility preferably in the UK.
Monopiles	Complete removal of the transition pieces. Removal of monopile cut at a depth of approximately 1 to 2 m below the seabed.
Offshore Substation	Complete removal of topside and jacket from site. Cutting of pin piles approximately 1 to 2 m below the seabed. The top length of the cut section of the pin piles will then be recovered, leaving the length of pin pile below the cut line remaining in the seabed.
Scour Protection	Left <i>in situ</i> .
Inter-array Cables	If the IAC is buried it will be left <i>in situ</i> and only the ends of the cables including Cable Protection System (CPS) will be removed where they cross the scour protection. Cable cut ends beyond the scour protection will be left at the required Depth Of Lowering (DOL).
Export Cables and Cable Protection	If the export cabling is buried it will be left <i>in situ</i> and only the ends of the cables including CPS will be removed where they cross the scour protection. Cable cut ends beyond the scour protection will be left at the required DOL.

It is noted that future revisions of the DP will consider new technologies as appropriate. If proposed methodologies are changed in subsequent revisions, consultation with stakeholders and regulators will be summarised and included.


In addition, it is assumed that the UK government will have established a number of ports on the east coast of the UK which are capable of decommissioning the large volume of material from monopiles, transition pieces and wind turbine generators. At present this does not exist, and the only potentially suitable ports would be located in the northeast of England namely in the Teeside and Tyneside regions.

Where considered necessary, post-decommissioning monitoring surveys of the seabed will be carried out following the completion of the decommissioning works. The requirement for monitoring and the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to other marine users and is further discussed in Section 2.2.4 of this DP.

4.5.1 Wind Turbine Generators

4.5.1.1 Wind Turbine Components

Decommissioning of the wind turbine components is expected largely to be a reversal of the installation process, including blades, nacelle, and tower, and subsequently subject to the same constraints. Using today's technologies, dismantling of the turbines would require a jack-up vessel to ensure adequate control and to cope with the relatively high lifts and crane hook loads. Even though decommissioning may not require the same level of precision and care as during installation, it would be undertaken in the same controlled manner and in accordance with a risk management plan to ensure the same level of safety and pollution control measures.

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The first phase of decommissioning would be to prepare the site, which would typically include the following:

- De-energise and isolate required electrical control and power cables from the grid;
- Removal of all loose items from the structures;
- Removal of liquids such as lube oils / transformer liquids etc.;
- Installation/certification of lifting points;
- Hot bolting key bolts to aid unbolting process; and,
- Cutting and securing of cabling crossing from nacelle to the tower and tower to the Transition Piece.

Once the preparation has been completed, the turbine structures would be removed. It is expected that structures would be removed by crane, with actual procedures being dictated according to capacities of the available plant. An example of the procedures that may be employed is described below:

- Attach blade lifting tool to crane hook;
- Removal of the three individual turbine blades from the blade hub and place on the deck of the vessel;
- Attach nacelle lifting tool to main crane hook;
- Disconnection of nacelle from tower and lift to the deck of vessel;
- Attached tower lifting tool to main crane hook;
- Unbolt tower at transition piece and remove to a jack-up vessel;
- Sea fasten all decommissioned WTG components to the deck of the jack-up vessel;
- Remove all components to an appropriate handling facility onshore, and disassemble all parts to sizes suitable for reuse, recycling or disposal as follows;
 - All hazardous substances and fluids from the turbines (e.g. oil reservoirs and hazardous substances) to be disposed of in accordance with relevant regulations at the time of decommissioning;
 - All steel components sold for scrap to be recycled. This forms the bulk of the structures and substructures; and
 - The fibreglass turbine blades to be recycled.

4.5.1.2 Monopiles

Following the separation of the WTG from the monopile the transition piece will be cut from the monopile and will be removed.


The monopile will then be cut to remove at approximately 1-2 m below the seabed. In order to access the monopile cutting point some jetting and suction of sediment as well as some shifting and movement of the scour protection may be required. At the time of writing, it is expected that monopiles will be cut with a high velocity stream of water using abrasive materials to cut the monopile at the required depth. However, it is recognised that at the time of decommissioning there may be improved technologies available for consideration. Once cut; the top section of the monopile will then be lifted onto a vessel. Monopiles and transition pieces will be transported to port for dismantling and reuse and recycling where possible. The remaining section of the monopile below the cut line will be left in the seabed.

4.5.2 Offshore Substation

The decommissioning of the OFSS will follow a similar method as described for the wind turbines and turbine foundations. It is expected that the offshore substation would be decommissioned in two main stages, comprising the complete removal firstly of the topside, followed by removal of the jacket foundation.

4.5.2.1 Topside

Prior to removal of the topside, a number of preparatory activities would be conducted including the following:

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- De-energise and isolate required electrical control and power cables from National Grid and Supervisory Control and Data Acquisition (SCADA) system;
- Dismantle terminations for export and array cables;
- Inter array and export cables would be cut at the cable deck area to allow the topside to be lifted freely. Ends of cables going to the J-Tubes would be secured to the cable deck for subsequent recovery with the jacket after the cables have been cut at the subsea J-Tube entry point. Removal of all unsecured loose items from the topside;
- Containment and/or removal of potentially hazardous/polluting fluids. A special agreement will be made with the Gas Insulated Switchgear supplier to ensure the safe removal of the SF6 Gas; and
- Cutting welded stab-in connections between topside and foundation.

Once this is complete, the topside would be lifted onto a barge for removal from the site. It is expected that the topside would be transported to shore where it would be dismantled, with electrical equipment and oil from transformers being removed and parts processed for reuse, recycled or disposal.

Once the topside is removed, the jacket foundation would be decommissioned by cutting the legs of the jacket structure just above the piles, and removal by crane. This would be achieved either through excavation outside and inside of piles to approximately 0.5 m below anticipated level of cutting (including removal of scour protection or debris around the base of the foundation). The jacket would then be lifted onto a transport vessel and transported to shore for reuse, recycling or disposal.

There is potential that a vibrohammer is used to facilitate lifting of the pin piles out of the ground. In this instance, the pin piles would not require to be cut. The vibrohammer would lift the pin piles out of the ground in one piece prior to removal of the jacket.

4.5.2.2 Pin-pile Foundations


The proposed approach to the decommissioning of the OFSS pin pile foundations is to cut off the piles at a depth of approximately 1 to 2 m below seabed level. The piles would be removed by cutting at an appropriate depth, such that any part of the pile remaining in the ground would be likely to be covered by seabed sediment. The target for cutting is a minimum of 1 m below the seabed, although this is likely to vary due to individual localised factors such as ground conditions at each site. Currently, abrasive diamond wire cutting is considered likely to be the preferred method for the cutting of the pin pile foundations, but other methods may be preferred at the time of decommissioning. The material cut off from the pin piles would be recovered and taken ashore for scrap recycling.

The actual method of cutting will be agreed with the authorities after consultation and feasibility studies have been undertaken and the methodology will seek to be least damaging to the surrounding seabed and the most environmentally acceptable using best available techniques at the time. the use of divers for any removal works will be minimised and if possible, avoided completely. If required, blasting by the use of shaped charges may be employed. Explosive cutting is a well-known method, but it is not expected to be the first choice.

After removal of the cut pile sections, it is anticipated that excavations at the pile leg locations would refill naturally over time.

Removal of foundations may therefore follow the outline process below:

- Excavation to approximately 1 m below the required cutting depth. Excavated sand and silt will be disposed of to the seabed adjacent to the pile. Consideration of the presence of scour protection will also be made with respect to excavation of foundations;
- The foundation will be rigged-up onto the decommissioning vessel crane;
- Cutting off of the pile at an appropriate depth;
- The foundation will be lifted out of the water onto a vessel's deck, if necessary, cutting into sections to allow this; and
- Batches of recovered foundations will be transported to shore for recycling.

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4.5.3 Scour Protection

Scour protection materials, as installed for duration of operations and maintenance, will not be removed during decommissioning. By their nature these materials would be difficult to recover and may provide useful marine habitat as artificial reefs by the time of decommissioning. Relevant stakeholders and regulators will be consulted to establish what the best approach is. If removal is deemed necessary, the removal sequence is anticipated to be:

- For rock armour, the individual boulders are likely to be recovered using a vessel grab, and transferred to a suitable barge for transport to an approved onshore site for appropriate disposal or re-use; and
- The filter layer is likely to be dredged and transported to be disposed of at a licensed disposal area (this could be offshore or onshore).

Consultation on the decommissioning approach for scour protection material will be undertaken prior to decommissioning with all relevant stakeholders including the fishing industry, who will be consulted by means of the commercial fisheries working group.

4.5.4 Inter-array Cables

It is currently anticipated that the removal of the IAC would have a greater impact on the environment than leaving the decommissioned cables buried in the seabed. If the cable length is expected to remain covered and total cable removal is therefore not required, reburying of cut cable ends is likely to be carried out by Remotely Operated Vehicles (ROV) or Mass Flow Excavator (MFE). The method of burial and any monitoring required will be subject to consultation with relevant stakeholders and regulatory bodies prior to the commencement of decommissioning activities. Thus, the intention would be to only remove sections of IAC, or cable ends which are exposed. Any cable removal will only be the cable ends within the CPS.

In the event that removal of inter-array cables is required, the following process is likely to be employed:


- Buried sections of IAC will be left *in situ*;
- Cable ends at foundations and OFSS will be cut, then exposed ends buried;
- Sections of IAC found to be at risk of exposure or otherwise causing a hazard will be cut and exposed ends buried;
- Cut sections will be recovered and sent ashore for disposal; and
- If full removal is required, cables will be 'peeled' out of the seabed recovering to a vessel carousel and assisted where required with an MFE where cable tensions are too high for efficient cable peel out. All recovered cabling will be discharged ashore for disposal.

4.5.5 Export Cables

Relevant stakeholders and regulators will be consulted to determine which sections of the export cables will need to be removed at the relevant time. If there are no issues raised by stakeholders/regulators and the risk of the export cables becoming exposed is considered to be minimal, then it is likely that the export cables will be left *in situ*. The ends of the cables will be cut as close to the OFSS foundation as possible either prior to foundation removal, or at the same time. Cable ends will be buried, likely by MFE or ROV, to ensure they do not represent a hazard to fishing, shipping etc. Further details will be included in the Cable Specification and Installation Plan as required to be submitted for approval to the MMO under the dMLs conditions.

At cable or pipeline crossings, where the export cable is crossing the other third party on top, the export cables will be removed. EATL will install concrete mattresses as a separation medium between the crossed assets during construction. In the case of export cable removal, these mattresses will be removed during decommissioning. Removal of cable mattresses will utilise a mattress subsea recovery tool for the removal of mattresses. The mattress will be lifted from the seabed and recovered to vessel deck to be disposed of ashore.

In the case the export cable is being crossed by another third-party asset, then the export cable will be cut at an agreed distance from the crossing and left *in situ*. Due to third-party agreements, EA TWO are required to

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ensure assets remain protected throughout and following decommissioning of the Project. In the case of EA TWO cable removal, cables will be cut either side of the cable protection and removed leaving the remainder of the cable underneath the protection which will be left *in-situ*. In doing so, the EA TWO and the third-party cables mattress protection will remain in place to reduce potential risk of damaging assets. Burial of the ends may be undertaken by MFE, ROV or a trencher to be confirmed within the DP reissue prior to decommissioning.

Rock at crossings will be left *in situ* irrespective of the crossing design (i.e. the export cables crossing assets or being crossed by third party assets).

In the event that removal of export cables is required, the following process is likely to be employed:

- Survey to identify the location of the export cables that need to be removed;
- Buried export cables will be recovered using a detrenching grapnel train to recover them from the seabed at the initial lifting location. Alternatively, or in addition, it may be necessary to use a ROV Whamobilised with a cut and grab cable recovery tool to initiate the cable recovery process so that the cable can begin to be recovered by peel out of the seabed by the recovery vessel.
- Seabed material may need to be displaced to locate the cable for recovery by ROV cut and grab tooling. This is likely to be carried out using an MFE deployed from the cable recovery vessel.
- The recovery vessel will either spool the recovered cable into a carousel or cut it into lengths as it is brought onboard before transport to shore; and
- Recovered export cables will be stripped and recycled at appropriate onshore recycling facilities.

Materials and volumes of cable protection that will be installed for operations has not been defined at this time. Any removal of cable protection will be in alignment with legislation and guidance at the time of decommissioning and will be informed by surveys.


4.6 PROPOSED WASTE MANAGEMENT SOLUTIONS

The scale of the offshore wind turbines means that a large amount of material would need disposal once the structures are decommissioned. EATL is committed to maximising the re-use of waste materials and will give full regard to the 'waste hierarchy' which suggests that reuse should be considered first, followed by recycling, incineration with energy recovery and, lastly, disposal. In any event, waste management will be carried out in accordance with all relevant legislation and with any necessary disposal taking place at appropriately licensed onshore facilities.

The proposed approach to disposal of the main components of EA TWO is set out in Table 4-3 but is subject to evolution of technology, change in regulations and demand for materials over the lifetime of EA TWO.

Table 4-3 Proposed waste disposal approach

Waste material	Pre-treatment	Approach
Wind turbine monopiles	Establish available design life at end of 25 years	Reuse by repowering with new/superior wind turbines or other renewable generation technology or dismantle and recycle the recovered material as much as possible
Steel from wind turbine tower and nacelle removed to shore	Break down into transportable sizes	Recycle
Copper from power cables and transformers	Strip cable from power cables and transformers	Recycle as permitted by available technologies at the time
Wind turbine blades	Physical processing (e.g. cutting, stripping and/or shredding)	Recycle as permitted by available technologies at the time

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The port(s) associated with the decommissioning are not known at the time of writing however these will be confirmed and appropriately assessed prior to decommissioning. The final details of the DP and waste arrangements will be confirmed prior to decommissioning to accommodate changes in legislation, guidance and technology. As part of this process, appropriate waste management regulations and guidelines will be reviewed. A Waste Management Plan (WMP) will be prepared in advance of the commencement of decommissioning to ensure that adequate time is allowed for the necessary provisions to be made with regards to waste management.

4.7 LIGHTING AND MARKING

In accordance with the requirements of the EA TWO DCO and dMLs, the appropriate marks and lights, sounds, signals, and other aids to navigation shall be exhibited during the decommissioning of EA TWO.

In relation to aviation safety, the shape, colour, and character of the lighting will be compliant with the Air Navigation Order 2009 (or then current regulation or as otherwise directed by the Civil Aviation Authority).

In relation to navigational safety, lights and markings will be discussed with the Trinity House, in consultation with the Maritime and Coastguard Agency (MCA). Trinity House will be consulted at least 6 months prior to decommissioning to specify any obstruction marking that may be required during the removal operations. If any obstruction is left on site that may be considered to present a hazard to navigation the necessary marking specified by Trinity House shall be displayed.


An Aids to Navigation (AtoN) Management Plan (EA2-GEN-CNS-PLN-IBR-000126) has been produced for the lifecycle of the Project. The AToN Management Plan represents the formal submission to the MMO to discharge Schedule 13 Condition 17 (1)(i) and Schedule 14, Condition 13 (1)(i) relating to the requirement for the submission (and subsequent approval by the MMO) of an AtoN Management Plan. This plan is still subject to final approval by the MMO.

5 ENVIRONMENTAL IMPACT ASSESSMENT


In support of the application for Development Consent, EATL prepared an EIA for EA TWO as reported in the ES. In compliance with the EIA Directive, a lifecycle approach was taken in assessing the impacts of EA TWO on the receiving environment and subsequently seeking to mitigate and minimise the effects of the development. In all instances a 'worse-case' Rochdale Envelope approach was taken to the assessment. The assessment of the impacts included the process of decommissioning. Table 5-1 summarises the predicted impacts resulting from the decommissioning phase.

Table 5-1 Predicted impacts of the decommissioning phase

Environmental topic	Assessment conclusions
Fish and Shellfish Ecology	<p>Note that the sensitivity of receptors during the decommissioning is assumed to be the same as given for the construction phase. The magnitude of effect is considered to be no greater and, in all probability, less than that considered for the construction phase. Therefore, it is anticipated that any decommissioning impacts would be no greater, and probably less than those assessed for the construction phase:</p> <ul style="list-style-type: none"> Physical disturbance and temporary loss of seabed habitat– Minor Adverse residual impact Increased suspended sediment and sediment re-deposition – Minor Adverse residual impact Re-mobilisation of contaminated sediment during intrusive works – Minor adverse residual impact Underwater noise impacts to hearing sensitive species – Minor adverse residual impact

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Environmental topic	Assessment conclusions
Marine Mammals	<ul style="list-style-type: none"> Physical and auditory injury resulting from the noise associated with foundation removal (e.g. cutting) - less than for construction (negligible – minor adverse) Behavioural impacts resulting from the noise associated with foundation removal (e.g. cutting) – less than for construction (negligible – minor adverse) Underwater noise and disturbance from vessels – the same of less than for construction (minor adverse) Barrier effects as a result of underwater noise associated with activities above– the same of less than for construction (minor adverse) Vessel interaction (collision risk) – the same of less than for construction (negligible – minor adverse) Changes to prey resource– the same of less than for construction (negligible – minor adverse)
Offshore Ornithology	<p>Any effects generated during the decommissioning phase are expected to be similar, or of reduced magnitude, to those generated during the construction phase (outlined below), as certain activities such as piling would not be required. This is because it would generally involve a reverse of the construction phase through the removal of some structures and materials installed.</p> <ul style="list-style-type: none"> Direct disturbance and displacement – Negligible to minor adverse residual impact Indirect effects due to prey species displacement – Negligible to minor adverse residual impacts
Commercial Fisheries	<p>Decommissioning impacts are anticipated to be the same or less than for the construction phase (outlined below)</p> <ul style="list-style-type: none"> Potential impacts in commercially exploited fish and shellfish – Minor adverse residual impact Temporary loss or restricted access to fishing grounds – Negligible to minor adverse residual impact Displacement of fishing activity into other areas – Negligible to minor adverse residual impact Increased steaming times – Negligible to minor Adverse residual impact Interference with fishing activity – Minor adverse residual impact Safety Issues and Obstacles in the Seabed – Within acceptable limits
Shipping and Navigation	<ul style="list-style-type: none"> Commercial vessel rerouting – Broadly acceptable residual impact Commercial vessel safe navigation – Broadly acceptable residual impact Marine aggregate dredgers – No perceptible effect Commercial fishing vessels – No perceptible effect to broadly acceptable residual impact Recreational craft – No perceptible effect to broadly acceptable residual impact Emergency response capability – N/A residual impact
Marine Archaeological and Cultural Heritage	<ul style="list-style-type: none"> Direct impact to known heritage assets – no impact Direct impact to potential heritage assets – Minor adverse residual impact Indirect impact to heritage assets from changes to physical processes – no impact Impacts to the setting of heritage assets and historic seascape character – Minor adverse residual impact
Marine Geology, Oceanography and Physical Processes	<p>The magnitude of effects would be comparable to those identified for the construction phase. Accordingly, given that no significant impact was assessed for the identified</p>

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Environmental topic	Assessment conclusions
	marine geology, oceanography and physical processes receptors during the construction phase, it is anticipated that the same would be valid for the decommissioning phase.
Marine Water and Sediment Quality	<ul style="list-style-type: none"> Deterioration in water quality due to increased SSCs during removal of accessible installed components – Negligible/minor adverse residual impacts
Benthic Ecology	<ul style="list-style-type: none"> Loss of habitats and species colonising hard structures – Minor adverse residual impacts Loss of habitat resulting from foundation or cable infrastructure not being fully removed during decommissioning – Minor adverse residual impact Impact from the complete removal of piled foundations – Minor adverse residual impact
Infrastructure and Other Users	<ul style="list-style-type: none"> Impacts on sub-sea cables – No change residual impact Impacts on EDF energy infrastructure – No change residual impact
Seascape, landscape and visual amenity	<ul style="list-style-type: none"> No significant impacts
Tourism, recreation and socioeconomics	<ul style="list-style-type: none"> Local and regional labour market – moderate beneficial impact National and regional labour market – moderate beneficial impact Local accommodation businesses and their employees -major beneficial impact Visitors to the area surrounding the project – negligible significance
Civil Aviation	<ul style="list-style-type: none"> No significant impacts

The final details of the DP will be confirmed prior to decommissioning activities taking place, the information relating to decommissioning in the ES will undergo a comprehensive review to assess whether the potential impacts that may arise are covered in the initial EIA, in line with the DESNZ guidance (BEIS, 2019). At this point, a decision will be made as to whether a more detailed assessment is required. Key criteria that will inform this decision include:


- The understanding of the baseline environment at the time just prior to decommissioning, informed by the findings of the environmental monitoring of the development and engineering/ asset surveys such as cable burial monitoring;
- A review of any relevant new or updated legislation, policy or guidance;
- A review of other marine use (fishing, navigation etc.) with potential to be affected by decommissioning;
- Amenities, the activities of communities and on future uses of the environment; and
- Historic environment interests.

If required, a specific EIA covering the decommissioning process will be prepared, which will fill in any gaps in relation to the above. Furthermore, it will describe the measures envisaged to avoid and reduce, and if possible, remedy any significant adverse impacts during decommissioning.

6 CONSULTATION

6.1 INTRODUCTION

EATL regards effective and open communication and consultation as essential elements to the successful development of EA TWO. These principles have been adopted during the development of the project and will be applied during the life of EA TWO, including the decommissioning phase of the project.

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6.2 REQUIREMENTS

As detailed under the EA TWO Section 105(2) notice, EATL are required to carry out consultation specified in the notice before submitting a DP for approval. The Section 105 notice sets out the following bodies:

- Marine Management Organisation;
- Natural England;
- Chamber of Shipping;
- Maritime and Coastguard Agency;
- Royal Yachting Association;
- Trinity House;
- National Federation of Fishermen's Organisation;
- Conservation Agency;
- Relevant Harbour Authorities (Port of Lowestoft and Great Yarmouth Port Authority);
- Relevant Inshore Fisheries;
- Environment Agency; and
- British Marine Aggregate Producers Association (BMAPA).

In addition, and in accordance with the DESNZ guidance (BEIS, 2029), other interested parties such as Historic England, UKHO, JNCC, The Crown Estate and Third-party Asset owners will also be consulted upon.

6.3 ONGOING CONSULTATION AND NOTIFICATIONS


Consultee bodies listed in the Section 105 notice and any other stakeholders who become relevant prior to decommissioning will be provided with the opportunity to comment on the final decommissioning strategy prior to it being finalised. The list of consultees will reflect changes in patterns of activity over the lifetime of the windfarm. Feedback from stakeholder consultation and associated amendments to the DP will be included within subsequent revisions of the DP to provide sufficient confidence that stakeholders concerns have been addressed. This will also be included within a Decommissioning Programme Consultation Report and will include detail of consultee, date of consultation, comment and location of amendment within the accompanying DP.

At the time of decommissioning, and in accordance with relevant clauses of the EA TWO DCO and dMLs, EATL will issue timely and efficient Notices to Mariners (NtM) and other navigational warnings of the position and nature of the decommissioning activities taking place. Efforts will be made to ensure that this information reaches mariners in the shipping and fishing industry as well as recreational mariners. The UK Hydrographic Office will be notified as appropriate on the progress and completion of the works. Trinity House will be consulted at least 6 months prior to decommissioning.

EA TWO is committed to ongoing consultation with the fishing industry including the appointment of a Fisheries Liaison Officer who will be employed throughout the lifetime of the project and through the commercial fisheries working group who will consult the relevant stakeholders on decommissioning activities.

7 COSTS AND FINANCIAL SECURITIES

A detailed cost estimate for decommissioning works will be developed and will be submitted for approval by DESNZ alongside information relating to the financial security provision required under the Energy Act 2004 and in line with the requirements set out in the DESNZ guidance (BEIS, 2019). An accompanying document providing a breakdown of estimated decommissioning costs by category will be provided alongside submission of this DP to DESNZ.

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8 PROPOSED DECOMMISSIONING SCHEDULE

A full decommissioning schedule will be provided closer to the point of decommissioning setting out the detailed programme of the proposed decommissioning works for consultation with the relevant authorities and approval by SoS.

At this stage, it is proposed that decommissioning would commence at year 25 after final commissioning of EA TWO, coinciding with the end of the design life of the wind turbines (but noting the options set out in Section 0). A review of the DP will commence at year 23, two years prior to the expected start date of the decommissioning operations. At this point, the possibility of repowering the site (i.e., removing and replacing the turbine topsides and possibly other transmission equipment) could extend the life of the windfarm for an additional period of approximately 25 years.

This review will include the review of cumulative EIA to determine changes to the assessed baseline, to reflect the baseline and criteria of mitigation at the time of decommissioning.

It is proposed that the full decommissioning of EA TWO will be of similar or less duration than the construction phase. Offshore decommissioning and onshore dismantling of the decommissioned infrastructure would run in parallel.

9 PROJECT MANAGEMENT AND VERIFICATIONS


Once EA TWO is nearing the end of its agreed operational life (25 – 50 years depending on repowering), EATL will initiate a final review of the DP and finalise the detail of the decommissioning provisions. This will include project management arrangements, the schedule, costs, and the verification processes to ensure decommissioning is completed. It is anticipated that the development of the final DP will occur in approximately year 23 (or year 48 depending on repowering) after final commissioning of EA TWO.

Following decommissioning works, it is anticipated that a Decommissioning Report will be submitted to the appropriate regulatory authorities. In accordance with the DESNZ guidance (BEIS, 2019) the decommissioning report will include:

- Evidence (e.g., photographic evidence of infrastructure out of the water, or survey footage of the seabed) that all infrastructure that was due to be removed according to the DP, has been removed;
- Independent verification that decommissioning took place in accordance with the approved DP and the assessed impacts on the environment. Should there be any variations from the approved DP, a statement will be provided with reasoning;
- Any 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 owner's/developer's activities, and which may pose a risk to navigation, other users of the sea or the marine environment. These should cover the site and an appropriate buffer zone to allow a comparison with the environment prior to construction;
- 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 DPs; and
- If infrastructure is left *in situ*, evidence that it has been cut off, buried, or otherwise made safe and treated in accordance with the DP.

10 SEABED LEFT AS INTENDED

In line with the details provided above, EATL is committed to covering the costs required to decommission EA TWO and ensuring the seabed has been cleared as agreed with the authorities. The construction and operation of EA TWO will be in accordance with the MMO's dropped object procedure, however where necessary, upon

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completion of the decommissioning works, a survey will be undertaken to ensure that all project debris which has been identified for removal has been removed. The survey will enable identification and recovery of any debris located on the seabed which may have arisen from activities related to the decommissioning process and which may pose a risk to navigation or fishing gear. The process of collecting and presenting evidence that the site is cleared is required to be independent of EATL. EATL proposes that an independent survey company complete the surveys and that they report in parallel to both EATL and DESNZ. The results of these surveys will be issued to DESNZ for review and comment.

The required survey area would be determined during the decommissioning phase of the project, considering good practice at the time and the views of stakeholders. It is anticipated that the survey area would focus on the renewable energy installations (i.e., the jacket substructure and monopile locations), as it is assumed that inter-array and export cables will be left *in situ*. EATL is aware of the current 500 m survey radius around any oil and gas installation as set out in best practice guidance for post-decommissioning surveys. However, due to the smaller footprint of the EA TWO installations, EATL proposes a smaller radius could be used, for example, 100 m (based on the area within which decommissioning of each structure would occur and within which jack up vessels would operate). This will be agreed with relevant regulators and statutory advisors prior to decommissioning.

Consideration will also be afforded to Archaeological Exclusion Zones (AEZs) described in the EA TWO WSI (EA2-GEN-CNS-PLN-IBR-000109) and *S. spinulosa* buffer areas in order that these are not inadvertently affected in the process of removing any potential windfarm debris. Analysis of any survey data gathered will also ensure that items for removal and disposal relate only to EA TWO. Consultation with relevant stakeholders will be conducted in the event that other anomalies of archaeological interest are identified during seabed clearance.

11 RESTORATION OF THE SITE

EATL is committed to restoring the site of EA TWO and the ECC as far as is reasonably practicable and in the manner agreed with the relevant authorities and stakeholders. Consistent with the decommissioning provisions detailed above, the key restoration work will relate to:

- Ensuring that foundations are cut below the level of the surrounding seabed and are made safe and adequately covered; and
- Ensuring that cable ends are adequately buried or otherwise protected.


It is anticipated that following the decommissioning of WTG and the OFSS components, indentations will be left in the seabed. It is anticipated that these indentations will back-filled naturally.

In addition, EA TWO confirms scour protection materials will not be removed during decommissioning. By their nature these materials would be difficult to recover and, in any case, may provide useful marine habitat as artificial reefs by the time of decommissioning. Active restoration by mechanical excavation is not considered to be appropriate, as it would pose an unnecessary risk to personnel and the environment. Allowing the seabed to 'self-settle' is considered sufficient and in proportion to the limited environmental impact of the proposed decommissioning process. This latter approach is also proposed with respect to the in-filling of any scour pits left after the main decommissioning works. Any scour pits that form in this area will have been produced due to the presence of the pile structures acting on local hydrodynamic processes. Upon removal of these structures, it is predicted that these scour pits will start to infill naturally.

Further details on how the site will be restored will be provided in the updated DP towards the end of the project's life.

12 POST-DECOMMISSIONING MONITORING, MAINTENANCE AND MANAGEMENT

Given that EATL are not proposing to fully remove the entire EA TWO infrastructure, some post-decommissioning activities may be required to identify and mitigate any unexpected risks to commercial fishing, navigation or other users of the sea. For example, this could be because of foundation piles or cables


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becoming exposed through natural sediment movement. The requirement for monitoring, timing, the extent and approach taken will be determined based on the scale of the remaining infrastructure, the risk of exposure and the risk to other marine users. EATL is committed to ongoing consultation with the fishing industry including the appointment of a Fisheries Liaison Officer who will be employed throughout the lifetime of the project and through the commercial fisheries working group who will consult the relevant stakeholders on decommissioning activities.

Relevant stakeholders will be consulted to determine if post-decommissioning monitoring surveys will be required following the completion of the decommissioning works, and appropriate timescales to carry them out. At the time of writing, it is assumed that monitoring surveys will be required at defined intervals following decommissioning which will be agreed with the relevant stakeholders prior to decommissioning. Indicative monitoring survey intervals are anticipated to be approximately two, five and ten years following decommissioning (exact dates yet to be confirmed). The surveys are expected to comprise geophysical surveys (such as swath bathymetry, side scan sonar and magnetometer) and will be carried out according to the applicable and relevant guidance and standards at the time of decommissioning. Consultation will also be undertaken with the MMO and appropriate stakeholders prior to these surveys to ensure the appropriate licences and permits are in place. The results of these surveys will be issued to DESNZ for review and comment.

If an obstruction appears above the level of the surrounding seabed following decommissioning which is attributable to EA TWO, it will be appropriately marked so as not to present a hazard to other sea users. The navigational marking will remain in place until such time as the obstruction is removed or no longer considered a hazard. The monitoring of the obstruction will be built into any monitoring and maintenance programme.

Details of the post-decommissioning monitoring, maintenance and management will be discussed with stakeholders closer to the point of decommissioning.

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